Investigating the Role of Government Support in the Resource-Process-Performance Relationship in Indonesian Container Terminal Operations: An Empirical Study

Teddy Laksmana

B. Accounting, Universitas Pembangunan Nasional “Veteran” Jawa Timur, Indonesia

B. International Relations, Universitas Airlangga, Indonesia

Master of Business Administration, Monash University, Australia

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Abstract

International seaborne trade has involved seaports as vital nodes of the global supply chain. Therefore, the performance standard of container terminal within the port plays a key role in logistics cost, trade facilitation, and operational competitiveness. In this context, the availability of resources is quite strategic, and that has been extensively researched (Bichou, 2013; Cullinane & Wang, 2010; Lee, Yeo, & Thai, 2014; Sun, Yuan, Yang, Ji, & Wu, 2017, p. 584; Wanke & Barros, 2015). The resources, from RBV perspective, are referred to as valuable, rare, inimitable, and non-substitutable (VRIN) to enhance the sustained competitive advantages (Barney, 1991). Nevertheless, resources that the firm can also exploit are likely to be a conventional type, albeit they offer a temporary competitive advantage (Ray, Barney, & Muhanna, 2004). The case is valid for Indonesia container terminal operations where resources are inadequate, and performance is negatively affected.

Preceding studies have found a positive effect of resources and capabilities on firm performance (Huselid, 1995; Kuo, Lin, & Lu, 2017; Ray et al., 2004; Yang, Marlow, & Lu, 2009; Yang & Lirn, 2017). However, it is essential to note that capability and process, although used separately, this study uses them as just one construct "resourses". As the resources are the set of assests and capabilities are the ability to successfully employ these resources to satisfy customers' requirement (Lai, 2004), they are treated as antecedents to firm performance. The business process, on the other hand, is a routine task of processing these resources and delivers the finished products/services to the customers (Ray et al., 2004). This is central to this research that examines the influence of resources and business processes on the terminal service performance, which is under-investigated in literature.

In term of strategizing the regulation and policy for port development, the institutional environment, financial support, privatization policy and other supportive regulations are beneficial for port firms to leverage their operations in the national and international level (Dunning, 2000; Hall & Soskice, 2001; Hoskisson, Eden, Lau, & Wright, 2000; Landau, Karna, Richter, & Uhlenbruck, 2016; Lazzarini, 2015). While government policy is not a direct resource, it can play supportive role to formulate an advantage for the organization to operate in a competitive business environment. Firms can utilize government support as a source of advantage (Hall & Soskice, 2001; Landau et al., 2016). Further, government supports the development of capital goods projects that facilitate the terminal operators to complete the tasks within the terminal. Further, terminal operators are also encouraged to add firm-specific tangible and intangible resources. Therefore, this research argues for government support and terminal operators' assets as a bundle of resources used in the terminal operations. A study combining government support, firm resources, and logistics processes within a comprehensive framework and assessing their influence on terminal service performance is considered to be understudied in the area of port research. Building on the resource-based view and institutional theory, the aim of the research is to investigate empirically the relationship between resources, processes, and performance (RPP), a newly conceptualized theoretical model in a terminal container context. The processes as the mediator in the RPP relationship is also investigated.

The study used cross-sectional survey data of 216 respondents from Indonesian container terminals. A structural equation modeling (SEM) was employed to test the hypothesized relationship between resources, processes, and performance constructs in a theoretical model. Results show that container terminal resources, both sourced from government and terminal operator firms, have positive and significant effect on logistics processes that in turn have a positive effect on service performance. Also, logistics processes mediate fully the relationship between container terminal resources and service performance. Resources, however, are not found to have a direct effect on terminal service performance. A mediation analysis confirmed that logistics processes act as a full mediator of the relationship between resources and service performance.

The study offers significant theoretical and practical contributions. The theoretical framework developed to analyze the RPP relationship reveals that amalgamation of government support and firm resources is crucial to impact service performance, and this can be leveraged through configuration of logistics processes. Practically, the terminal managers need to understand that resource composition and accumulation alone cannot enhance the overall service performance. Instead, an adequate logistics process can mediate resource extraction to the optimum delivery of service performance.

Declaration

I, Teddy Laksmana, declare that the PhD thesis entitled "**Investigating the Role of Government Support in the Resource-Process-Performance Relationship in Indonesian Container Terminal Operations: An Empirical Study",** is no more than 100,000 words in length, including quotes and exclusive of tables, figures, appendices, bibliography, references, and footnotes. This thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work.

Signature: ………………. Date: 9 August 2019

Dedication

This thesis is dedicated to:

My loving wife,

Novi Dian Ratna Purry

My dearest sons,

R. Farraz Haydar Rasheed Laksmana

R. Ayden Zhafran Shah Laksmana

AND

My beloved parents,

R. Tri Samdiono Harsono

Erna Koesmintarti

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To my wife Novi, I dedicated this thesis that I successfully completed during our Australia journey.

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Laksmana, Teddy, Shee, Himanshu and Thai, Vinh (2019). *Resource-Process-Performance relationship in container terminal: the moderating role of logistics process in container terminal context*. Under second review in Int J. of Physical Distribution and Logistics Management.

Laksmana, Teddy, Shee, Himanshu, Thai, Vinh (2018). *Managing container flow performance in import supply chain at Indonesian ports*. A paper presented to 16th ANZAM Operations, Supply Chain and Services Management Symposium on Entrepreneurship and Global Supply Chain Management Driving Sustainability and Social Innovation, CQ University, 3–5 May 2018, Brisbane, Australia.

Laksmana, Teddy, Shee, Himanshu, Thai, Vinh (2018). *Managing container flow performance in import supply chain at Indonesian ports*. A paper presented to the 11th International Conference of Asian Shipping and Logistics, Incheon National University, 21–23 June 2018, Incheon, Korea.

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Laksmana, Teddy, Shee, Himanshu, Thai, Vinh (2019). *Factors Influencing Container Terminal Service Performance: Indonesian Case Study*. An extended abstract presented at the 17th ANZAM Operations, Supply Chain and Services Management Symposium, University of Melbourne, 10–12 July 2019, Melbourne, Australia.

List of Abbreviations

AGFI	Adjusted Goodness-of-Fit
AVE	Average Variance Extracted
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
DGCE	Directorate General of Customs and Excise
DO	Delivery Order
EFA	Exploratory Factor Analysis
EM	Expectation Maximization
GOI	Government of Indonesia
GFI	Goodness-of-Fit Index
ICT	Information & Communication Technology
KMO	Kaiser-Meyer-Olkin
LPI	Logistics Performance Index
MAR	Missing at Random
MCAR	Missing Completely at Random
MI	Multiple Imputation
ML	Maximum Likelihood
NFI	Normed Fit Index
PAF	Principal Axis Factoring
RBV	Resource-Based View
RDT	Resource Dependence Theory
RMSEA	Root Mean Square of Approximation
SCI	Supply Chain Integration
SEM	Structural Equation Modeling
SFL	Standardized Factor Loadings
SMC	Squared Multiple Correlation
SRMR	Standardised Root Mean Square Residual
TLI	Tucker-Lewis Index
UNCTAD	United Nations Conference on Trade and Development
$\mathbf{x^2}$	Chi-Square

Chapter 1
Introduction

1.1. Introduction

This chapter introduces the research topic. Section 1.2 provides the background to the research. Section 1.3 provides the rationale for the research problem, and section 1.4 covers the research objectives and questions. The methodology of the study and the research scope is discussed in section 1.5. Section 1.6 gives an overview of the significance and contribution of the study, while ethical considerations are highlighted in section 1.7. The thesis structure is outlined in section 1.8, and finally, the thesis is summarized in section 1.9.

1.2. Research background

Seaports (hereafter referred to as ports) have long been established as facilitators of infrastructure for vessel berthing, cargo loading/ unloading, short-term storage, and logistics processes (Burns, 2015). Ports also act as vital nodes in the export and import supply chains (Burns, 2015; Flitsch, 2012), where they execute diverse logistics and transportation functions while delivering value to customers (Braziotis, Bourlakis, Rogers, & Tannock, 2013; Christopher, 2011). The role of ports in trade and economic development is well-researched in the literature, including the study of port–city development (Merk, 2013; Merk & Comtois, 2012; Merk & Notteboom, 2013); ports as economic infrastructure and catalysts (Lee & Lee, 2016); ports as trade facilitators and hubs in the global supply chain (Czerny, Höffler, & Mun, 2014; Lam, 2016; Nam & Song, 2015); and ports as determinants for logistics costs, efficiency and competitiveness (Kunaka, Antoci, & Sáez, 2013; Lam, 2016).

Port operations have attracted many scholars who have investigated the drivers of port performance and container terminal efficiency and improvement. To date, there are an abundance of studies on port efficiency measurement (Nguyen, Nguyen, Chang, Chin, & Tongzon, 2015; Serebrisky et al., 2016; Tovar & Rodríguez-Déniz, 2015; Tovar & Wall, 2015) as well as integration of lean principles to optimize terminal efficiency, particularly in developing countries (Olesen, Powell, Hvolby, & Fraser, 2015). Seaports also act as a focal point for maritime transport that provides navigation services, cargo handling processes, and storage within port areas to achieve optimum supply chain performance (Burns, 2015). It can be summarized that the integration of port-centric activities plays a vital role in making operations efficient. For that reason, efficient flow of information, documents, services, and goods, within the port and specifically in the container terminal, are crucial (Olesen et al., 2015). The state is otherwise known as supply chain integration (SCI) in the context of a supply chain or goods and services (Ataseven & Nair, 2017).

Ports act as international logistics chain connection points where intermediaries stack their goods in bulk or containers. This temporary build-up may disrupt the flow of goods and contribute to additional time and cost (Dappe & Suárez-Alemán, 2016; Talley & Ng, 2016). Tovar, Trujillo, and Jara-Díaz (2004) highlight that cargo handling accounts for around 80% of the cost of loading and unloading containers. The cost of cargo handling primarily depends on the facilities and equipment used for the purpose. They are managed by the port authority, terminal operators, or inland logistics corporations. These agents provide berthing services, container stacking yards, cranes, and vehicles used exclusively for container movement. While these agents are engaged in numerous operations within a container port, their vested interest is to maximize economic benefits by doing the same activities (Burns, 2015). Therefore, the conflict of interest is obvious, and terminal operators are required to manage their relationship with these stakeholders to avoid operational delays.

Further, factors affecting port performance are varied, including - the quality of port infrastructure, efficiency of hinterland transportation (Chen, Cullinane, & Liu, 2017), sufficient regulation (Czerny et al., 2014; Nugroho, Whiteing, & de Jong, 2016) , and information technology application (Tseng & Liao, 2015) The inadequacy of these factors are the cause for operational inefficiency and increasing transport and logistics costs within the terminal and described as *"bottleneck-derived terminalization"* (Rodrigue & Notteboom, 2009, p. 167) Any operational disruptions and non-value-added processes need further attention for container terminals in particular. To overcome these issues, the lean port concept offers the notion that the port should transform into a provider of transport solutions (Olesen et al., 2015; Paixão & Marlow, 2003). The evolution converts ports into centers of supply chain excellence where they are required to streamline their operational processes by adopting logistics approaches such as leanness, just-in-time, network collaboration and agility (Casaca, 2005; Sufian Qrunfleh & Monideepa Tarafdar, 2013). By eliminating processes that generate waste and cost, seaport processes are expected to result in synergies and value creation (Casaca, 2005; Olesen et al., 2015). Lean and agile port operations would double ports' output with the same inputs as they remove the current and upcoming bottlenecks (Marlow & Casaca, 2003; Paixão & Marlow, 2003). Another crucial factor is government support in port development that can be in the form of various policies, regulations and incentives, i.e. government supports in the development of port infrastructure (Gordon, Lee, & Lucas, 2005; Munim & Schramm, 2018), provision of favorable land pricing and distribution, as well as establishing new facilities and terminals (Lee & Flynn, 2011; Ng & Gujar, 2009), development of hinterland road and port access (De Borger & De Bruyne, 2011; de Langen & Chouly, 2004; Lee & Flynn, 2011) and regulate privatization and port ownership structure law in enhancing port performance and development (Choi & Lim, 2016; Venkita Subramanian & Thill, 2019; Wang, Liu, Ding, Li, & Zhang, 2018).

Earlier studies have found a positive effect of resources and capabilities on performance (Kuo et al., 2017; Yang & Lirn, 2017). Nonetheless, the influence of resources and business processes on container terminal performance has been overlooked. Considering the resource-based view (RBV), Ray et al. (2004) argue that firm performance depends on the net effect of business processes. The business process is a routine task of processing and delivering products/services to customers. Therefore, logistics (business) processes are deemed as a conduit between resources as input and service performance as output within the container yard. The resources can be a source of competitive advantage if they are realized through effective processes (Porter, 1991; Ray et al., 2004). The success of the port as a logistics system is closely related to the logistics process that contributes to the efficiency of operator service performance (Paixão & Marlow, 2003). The process here means that everything related to procedures, tasks, schedules, mechanisms, activities, and port service routines are delivered to its customers. In other words, a process is an activity or group of activities which simultaneously becomes an input to be processed, and the output is a value-added product that is useful for the customer (Paixão & Marlow, 2003). From a port perspective, the intangible resources are beneficial for ports to augment the service quality and terminal capacity to accommodate inbound container berths (Chang, Tongzon, Luo, & Lee, 2012; Pak, Thai, & Yeo, 2015). Ability to control port operations regularly would assist ports in future investment savings and formulate a strategy for survival amidst competition (Paixão & Marlow, 2003).

Hence, port operators, governments, investors, and stakeholders need to assess the container terminal performance and explore key elements that require further attention for trade competitiveness and port efficiency. Government support is viewed as strategic in the development of Asian container ports (Lee and Flynn, 2011), and arguably an antecedent to terminal resources in this study. Government policy regulates port environment, development and operations; whilst port operators, investors, and stakeholders control the procurement and organization of terminal resources, how the resource is consumed and utilized in the operational and logistics processes, and how to administer the process to produce optimum service performance outcome. Within this context, the presence of beneficial government support in port development and operations, advantageous configuration of terminal resources, and streamlined logistics processes improvement may enhance port performance. However, studies in establishing resources (tangible and intangible), processes, and performance (RPP) within the container terminal are limited. A study combining government support, firm resources, and logistics processes within a comprehensive framework and assessing their influence on terminal service performance is considered to be understudied in the area of port research. Thus, this study proposes to fill the gap in maritime studies by examining empirically the effect of resources and processes on container terminal service performance based on RBV theory.

Therefore, this research examines the nature of the relationship between firm resources, terminal logistics processes and government support (as a set of organizational inputs) and terminal service performance (as output). In the context of an emerging economy, in this case, Indonesia, this thesis outlines how this relationship occurs when logistics processes utilize firm resources to deliver service in terminal operations. This thesis develops and validates a theoretical model of terminal service performance synthesized from supply chain and port-related studies. It is argued that this model is useful to articulate the relationship among the study variables using the hypotheses.

1.3.Research problem

The globalization of trade has encouraged companies to engage in the import and export of goods across borders. In this context, container terminals represent a convergence point between intermodal transport and cargo transshipment (Cho & Kim, 2015). Ports inevitably act as vital nodes in global supply chains facilitating diverse logistics and transshipment functions through container terminals within the port (Kunaka et al., 2013; Lam, 2016; Thai & Grewal, 2005). As the majority of seaborne container cargo passes through the terminals, the performance of the container terminal is very vital and depends on operating efficiency (Bichou, 2013; Ju & Liu, 2015; Yeh et al., 2007), and smooth flow of inbound and outbound logistics (Geweke & Busse, 2011).

Seaports are vital to the country's international trade and affect logistics costs (Wu & Goh, 2010). Accordingly, lower performance will significantly affect the country's economic growth. Munim and Schramm (2018) found that seaborne trade provides major contribution to the economy where both port infrastructure and logistics performance play an important role. In the context of an emerging economy, this study highlights the importance of container terminals within the ports of Indonesia.

Indonesia, at present, is the largest economy in ASEAN and has stable political and economic growth in the South-East Asian region (Ryu, 2015). Also, Indonesia is the 16th largest GDP in the world (IMF, 2018), ranked 13 in world annual container throughput (UNCTAD, 2018a). In 2016, Indonesia exported 3,889 commodities to 220 countries and imported 4,403 commodities from 213 countries with an overall export value (FOB) of US$ 144,490 million and an overall import value (CIF) of US$ 135,653 million (WITS, 2018). As the world's largest archipelago consisting of about 17,000 islands, Indonesia experiences ever-increasing trade volume and suffers from inadequate port capacity and infrastructure resulting in shipping congestion problems and poor dwelling times (DT) (Ray, 2008). The container terminal within the port experiences significant operational challenges in dealing with the volume of cargo passing through it.

Additionally, compared to neighboring countries, Indonesia was recently ranked 46th in the 2018 Logistics Performance Index (LPI), facing tighter trade competition with neighbors such as Singapore (ranked 7th), Thailand (32nd), Vietnam (39th), and Malaysia (41st) (World Bank, 2018b). LPI contains a quality parameter of logistics, infrastructure, timeliness and service, as well as customs inspection. As a result, the low LPI poses a competitive pressure in improving terminal service performance in current terminal resources and logistics processes; and this requires an investigation to understand the dimensions that the port authority and government need to address. However, it is crucial to keep in mind that the LPI calculation may distort the figure and ranking, for example, the Indonesian figure consists of hundreds of ports from many provinces, while Singapore consists of only one port.

The additional impetus for the investigation is the port outcome measurement unit. The cargo unit is commonly used to measure port output rather than the service unit, thus neglecting resource utilization by the port in cargo handling operations (Talley & Ng, 2016). Current research highlights the nature of resource usage in service units to describe the quality of service provision, and regards the relationship between firm resources, terminal logistics processes and government support (as a set of organizational inputs) and terminal service performance (as output). Whilst the importance of service quality in the maritime industry and ports specifically is well recognized (Thai, 2008; Thai, Tay, Tan, & Lai, 2014; Yuen & Thai, 2015), corresponding service performance studies in the container terminal are few and do not have uniformity on definition and attributed dimensions (Ha, 2003; Yeo, Thai, & Roh, 2015). For instance, Ha (2003) identified seven port service quality factors, namely: ready information availability of port-related activities, port location, port turnaround time, facilities available, port management, port costs and customer convenience. Cho, Kim, and Hyun (2010) introduced endogenous, exogenous and relational quality as determinants of port service quality and investigated its effect on customer satisfaction, loyalty and referral intentions.

Further, Thai (2008) confirmed a six dimensions model, namely: resources, outcomes, process, management, image and social responsibility (ROPMIS) to define service quality concept in maritime transportation. Subsequently, Yeo et al. (2015) confirmed that resources, outcomes, process, management, and image and social responsibility simultaneously reflect port service quality, which has a positive effect on customer satisfaction. However, these prior studies omit the imperative dimension, such as government support which is considered as a characteristic of the Asian container port strategic development initiative (Lee & Flynn, 2011). Further, from a resource-based view (RBV) perspective, the current study comprises physical and non-physical resources to factor in container terminal resources (Cho & Kim, 2015) as well as taking into account government support and terminal logistics processes as important determinants that contribute to terminal service performance. Service performance, as coined by Grove, Fisk, and Dorsch (1998) in the field of marketing, is defined as the support and procedures offered by the provider during a service encounter to achieve customer satisfaction. Thus, this study defines terminal service performance here as all service provisions offered by terminal operators during the import of goods to the satisfaction of all parties using adequate resources.

1.4. Research objectives and questions

The objective of the research is to examine empirically the effect of resources (both from government and stakeholders) on terminal logistics processes and the extent to which it improves terminal service performance. In order to achieve the objective, the following specific sub-objectives are developed to investigate the impact of government policy support on firm resources and terminal logistics processes, and, subsequently on terminal service performance.

In order to achieve the objective, the following three research questions are developed to address and achieve the objectives above:

1. How do government support and firm resources together affect terminal logistics processes?
2. To what extent the improvement in terminal logistics processes will affect the terminal service performance?
3. How does the terminal logistics processes mediate the relationship between container terminal resources and performance?

1.5. Methodology

A positivist paradigm is deemed appropriate as this thesis uses hypotheses to investigate the proposed relationship amongst study variables. A survey questionnaire was developed to gather information. A pre-test and experts' views from industry and academia confirmed content validity. Subsequently, a pilot study was undertaken to confirm content validity, sentence structure, and clarity as well as response time to fill in the survey. The survey used a drop-and-collect method to distribute questionnaires to Indonesian container terminal operators. Data were initially screened for completeness or no missing values, the use of appropriate variables followed by analysis for outliers normality distribution. Exploratory Factor Analysis (EFA) was used to factorize the items into few clusters followed by Confirmatory Factor Analysis (CFA) for testing reliability and validity of constructs used in the model. Structural equation modeling (SEM) was performed to investigate the concurrent relationship among constructs and used further for hypotheses testing.

1.6. Significance of the study

1.6.1. Academic significance

Theoretically, the study contributes to the literature in maritime studies in several ways. First, in terms of the development of service quality in port studies, this research refines models of evaluation of container port logistics performance. The model is adapted from Yang and Lirn (2017) who investigated the effect of intra-firm resources, inter-firm relationships, and logistics service capabilities on logistics performance (LP) in Taiwan. Their results show that inter-firm relationships and logistics service capabilities perform as the mediator between intra-firm resources and LP. However, the current study focusses on the effect of terminal resources on terminal service performance. In terms of theoretical contribution, this study has used the RBV perspective of common resources which is unique. While the RBV is based on the premise of limited and scarce resources, such scarcity indicates that managers need to use available resources optimally. However, these resources (e.g., material handling equipment, container yard, storage space) appear to be inadequate in the current situation, and the f government support is argued to be a source of these resources, particularly capital infrastructure. This research argues that these resources are not necessarily rare and valuable. Instead, arguably they are basic and conventional types that can be used to manage day-to-day terminal operations. In the absence of these common resources, terminal performance is likely to slow down. The current study argues that resources alone are not enough to improve the performance, but these resources need to be deployed through right processes. In addition, this study argues that the role of the government as an antecedent factor can influence the performance of terminal services, thus it needs to be included in the research framework. Further, this study has introduced logistics processes as a mediator between resources and performance arguing that processes have no direct effect on performance unless right processes are deployed to exploit these resources. Such features have not been covered in the literature, and thus, fills the gap in the body of knowledge, especially in the context of container terminal operations in Indonesia.

Second, building on the study by Lee and Flynn (2011) on the conceptual model of port development policy, the research establishes the significant, direct effect of government support on firm resources and terminal logistics processes in the Indonesian context. This current research is a development of the previous conceptual study by providing empirical results on how government support as a policy contributes a positive impact on port development and operations.

Third, the results imply there is an indirect correlation amongst government support and firm resources to the terminal logistics processes that lead to the achievement and realization of terminal service performance. This study supports the investigation of value chain perspective where a set of inputs, conversion processes and outputs engage in resources consumption (Porter, 1998). Essentially, the study confirms the significance of managing the SCM internal process (terminal operations) and external process (government and external stakeholders) equally in an integrated state to impact terminal service performance in a positive way, which the end customers experience. In other words, both intra-organizational and inter-organizational actions are imperative, and, consequently, a firm is likely to gain higher performance when attaining remarkable degrees of process efficiency, internally and externally.

Finally, this study contributes to the body of knowledge on port study and supply chain management by investigating the determinant factors of container terminal service performance. Terminal service performance was found in the research to have been influenced by three dimensions, namely: terminal resources, terminal logistics processes and government support. As such, this result is distinctive for the container port study because it includes the role of government support, which empirically validated the measurement of terminal service performance via Structural Equation Modeling. The model defined in this study could be utilized for future research on the container terminal management and delivery of service quality to achieve terminal service performance in other regions or contexts.

1.6.2. Practical significance

Practically, the research provides useful insights for container terminal managers and policymakers in three ways. First, Indonesia as an emerging economy, is still undergoing a gradual transition to improving port operations, customs clearance procedures and related processes to develop its container terminal performance. Second, the study offers insight for managers about the resource-process-performance relationship in the container terminal context. The government support and operator firms' resources are believed as the sources of resources. This is true for ports and container terminals in developing economy like Indonesia. The managers must understand that major portion of the assets are common types and they are the source of competitive parity (if not an advantage). As the container terminals play critical role in Indonesia's GDP contribution, availability of these resources will help the terminal keep going for survival. These resources will have a positive influence on service performance mediated by processes. From the results of the research, it appears that managers are required to uphold lean practices, managing stakeholder relationships, integration practices, and information sharing, as these practices are vital to performing a smooth terminal logistics process which in turn affects terminal service performance. Third, resource deployment alone does not improve terminal performance. Results indicate that the managers need to blend these resources with other functional areas within the terminal in order to reap the best possible return.

1.7. Ethical considerations

This research involved data collection from individuals; hence, human ethics was appropriate to protect their privacy. In order to ensure confidentiality, this study followed the ethical guidelines and requirements set by the Victoria University Human Research Ethics Committee (VUHREC). The approval of the research method, survey procedures, consent form, ethics application, information sheets, and survey questionnaires are available in the appendices. The ethics application ID: HRE16-285 was submitted on 23/11/2016 via QUEST. The application has been accepted and deemed to meet the requirements of the National Health and Medical Research Council (NHMRC) 'National Statement on Ethical Conduct in Human Research (2007)' by the Victoria University Human Research Ethics Committee. Approval has been granted for two (2) years from the approval date; 20/12/2016. Therefore, the research has gone through low risk human ethics approval and it was imperative to provide all respondents with a consent form prior to the survey. The participants' consent was sought, and they were informed of the voluntary nature of their participation, and were assured of privacy, anonymity, and confidentiality. The collected responses were safeguarded and treated as confidential, in line with business ethics and code of conduct (Australian Government, 2007; ICoMJ Editors, 1997; Oliver, 2010; Swerdlow, 2005). All hardcopy files were stored and locked securely in secure storage for five years, and softcopy stored in a VU repository. As the research was undertaken in Indonesia, there were translations provided for respondents from the English version of informed consent.

1.8.Thesis structure

This thesis comprised seven chapters as outlined in Figure 1 below.

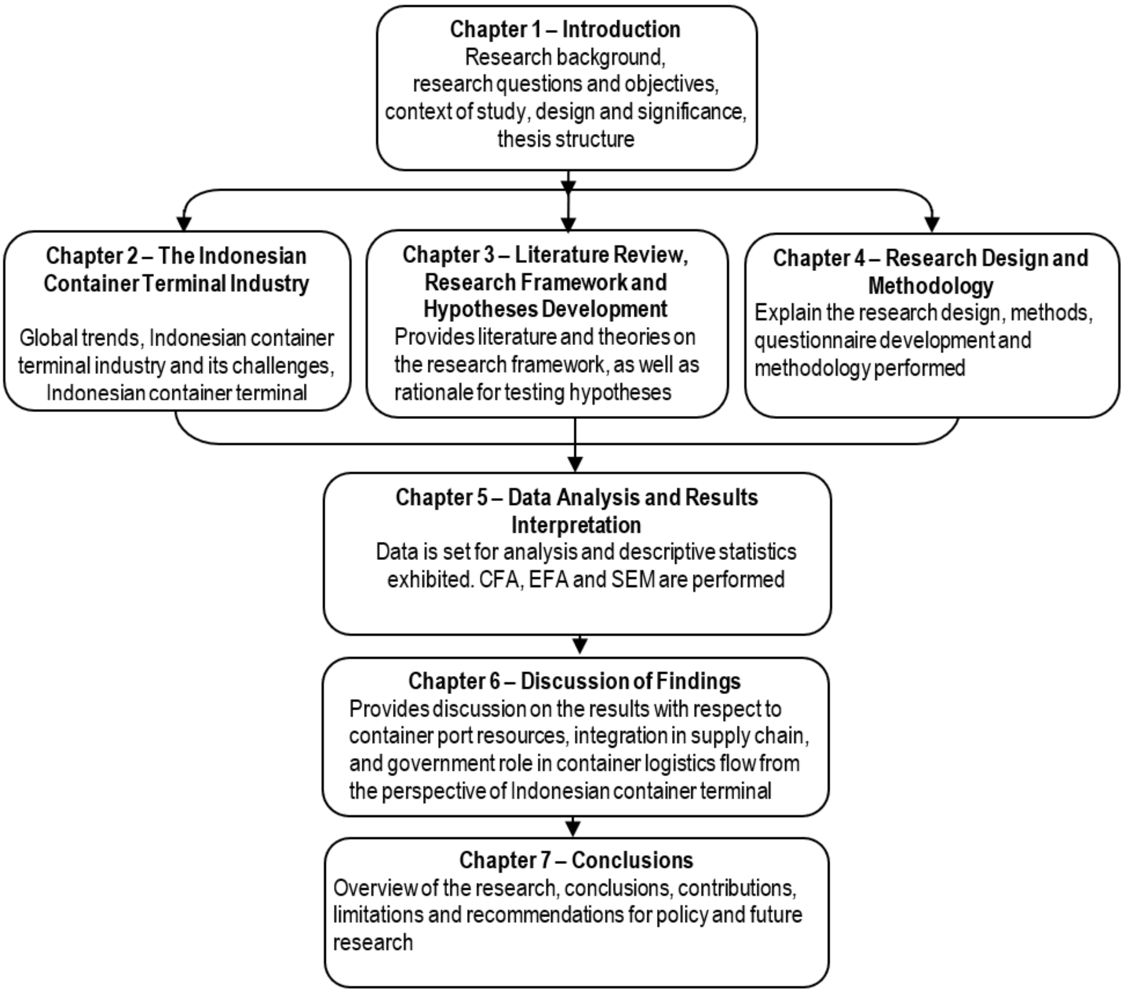


Figure 1.1: Research structure

sThe current chapter covers background information for the study, as well as an overview of research aims and questions, design and methodology, significance and limitations. Chapter 2 (The Indonesian Container Terminal Industry), provides a broad overview of global trends in the container terminal industry, the Indonesian container terminal industry context and its challenges.

Chapter 3 (Literature Review and Hypothesis Development) gives a broad overview of the relevant literature and theories on the research framework. This chapter also presents a comprehensive elaboration and rationale of the research framework constructs and research hypotheses. It overviews the synopses the quantitative methods used in data collection and analysis, including the research instruments, as well as outlining the validity and reliability assessment and ethical considerations. The sample justification, data collection methods, and data analysis techniques are outlined.

Chapter 4 (Research Design and Methodology) provides an elaboration of the research paradigm, data collection, validation, coding, cleaning and analysis, employing Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM). Chapter 5 (Data Analysis) details preliminary data analysis, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM) as well as the validation of the measurement model using reliability and validity assessment.

Chapter 6 (Findings and Discussion) emphasizes the results of evolved interaction amongst constructs and variables as well as presenting and discussing the findings to answer the research questions and hypotheses testing.

Finally, Chapter 7 (Contributions, Conclusions and Recommendations) offers a summary of the research and its primary findings within the context of study limitations and the theoretical framework. The significance of the study, implications and recommendations are presented, and recommendations for future research are proposed.

1.9. Summary

This chapter provides the rationale for terminal service performance as the main investigated domain of interest. The impetus for investigating terminal service performance is due to Indonesia’s performance that lags behind its neighboring countries in the region, for example, Singapore, Malaysia, Thailand and Vietnam. Further, this chapter provides a context to the importance of the role of government in the Indonesian port industry. Based on the relevant literature, this chapter has also identified the research gaps by examining the relationship between container terminal resources, terminal logistics processes and terminal service performance. Preliminary research by Marlow and Casaca (2003) and Olesen et al. (2015) have highlighted lean concept, supply chain practices, and capability-based approaches, yet research in this area is still in its early stages with only a handful of conceptual and empirical studies. Lean practices, information technology, managing stakeholders’ relationships, and integration processes have been promoted as fitting competencies for port service performance; but measurement and applicability to streamlined logistics, especially in the container port area, have not been adequately explored thus far. These variables articulate key business choices for container terminal supply chain links and influence streamlined container cargo flow and these are significant areas for investigation. To date, limited studies have explored the stakeholders’ perspective to determine input and output indicators to streamline cargo flow processes within the container terminal. Hence, this research presents these standpoints and envisages an incorporative approach to refining and achieving optimum terminal service performance.

Chapter 2

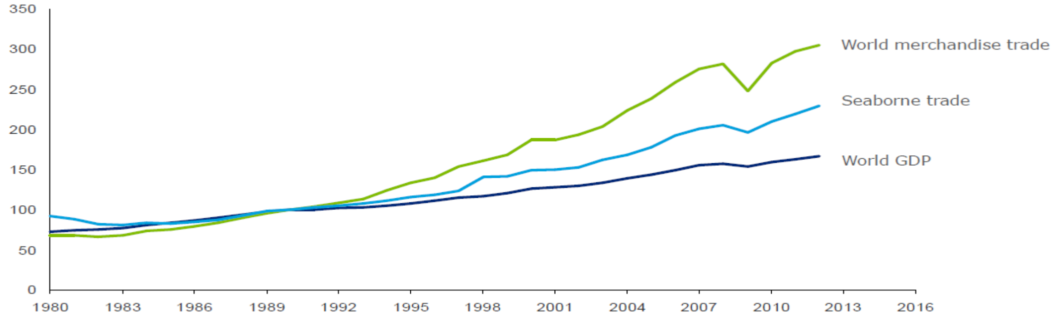
The Indonesian Container Terminal Industry

2.1. Introduction

This chapter presents a detailed synopsis of the Indonesian container terminal industry, explicitly its development, challenges and hindrances. Apart from the importance of the industry to the national economy and the country's efforts to develop its container ports, several challenges and hindrances are also confronted by the industry. Section 2.1 presents an introduction of the Indonesian container terminal industry, subsequently followed by section 2.2 that outlines global trends in the container port industry. Section 2.3 briefly explains the state of the Indonesian container terminal industry: its regulations, ownership structure, development and challenges. Finally, section 2.4 summarizes the chapter.

2.2. Global trends in the container terminal industry

To highlight the importance of seaborne trade, UNCTAD (2014b) interlinked the world's GDP, merchandise trade and seaborne trade (see Figure 2.1 below). For the past 30 years, the three indicators have globally increased and continue to progress simultaneously. This phenomenon shows that worldwide GDP and trade are the main contributors to seaborne trade (UNCTAD, 2017).



Source: UNCTAD (2014b)

Figure 2.1: GDP, merchandise trade and seaborne trade trends

As seaborne trade increases, thus seaports become the vital point of import and export activities. Cost, location, quality and reputation of port operations, speed/time, availability of infrastructure and facilities, efficiency, sailing frequency, information systems, hinterland and congestion have all been highlighted as determinants of commercial and competition success factors for ports (UNCTAD, 2014b). Further, the sea transportation mode of shipping has also evolved where various container shipping companies have dominated the market via alliances or consolidation endeavors in the form of mergers or takeovers (UNCTAD, 2017) as detailed in Table 2.1.

Table 2.1: Top 10 container shipping lines

Rank	Operator	Group	TEU	Ships	Share
1	APM-Maersk	Maersk Line, Hamburg Süd (incl Alianca and CCNI), Safmarine, Sealand Asia, Sealand Americas and Europr & Med	4,004,268	656	16.8%
2	Mediterranean Shg Co	WEC Lines	3,665,706	550	15.4%
3	COSCO Shipping Co Ltd	COSCO Shipping Co Ltd, OOCL, Shanghai Pan Asian Shipping, New Golden Sea Shipping and Coheung	2,869,970	469	12.1%
3	CMA CGM Group	CMA CGM, APL, ANL, Cheng Lie Navigation Co, CoMaNav, Containerships PLC, Feeder Associate System, MacAndrews, Mercosul Line and SoFraNa	2,659,741	480	11.2%
5	Hapag-Lloyd	Hapag-Lloyd integrates the former UASC fleet	1,689,132	235	7.1%
6	ONE (Ocean Network Express)	ONE (Ocean Network Express)	1,575,013	213	6.6%
7	Evergreen Line	Evergreen Line and Italiana Marittima	1,215,280	189	5.1%
8	Yang Ming Marine Transport Corp.	Yang Ming Marine Transport Corp.	596,641	91	2.5%
9	HMM Co Ltd	HMM Co Ltd	527,768	66	2.2.%
10	PIL (Pacific Int. Line)	PIL (Pacific International Line) includes Advance Container Lines (ACL) Pacific Direct Line (PDL), and Mariana Express Lines Ltd (MELL)	350,390	111	1.5%

Source: Alphaliner (2020) as per 28 May 2020

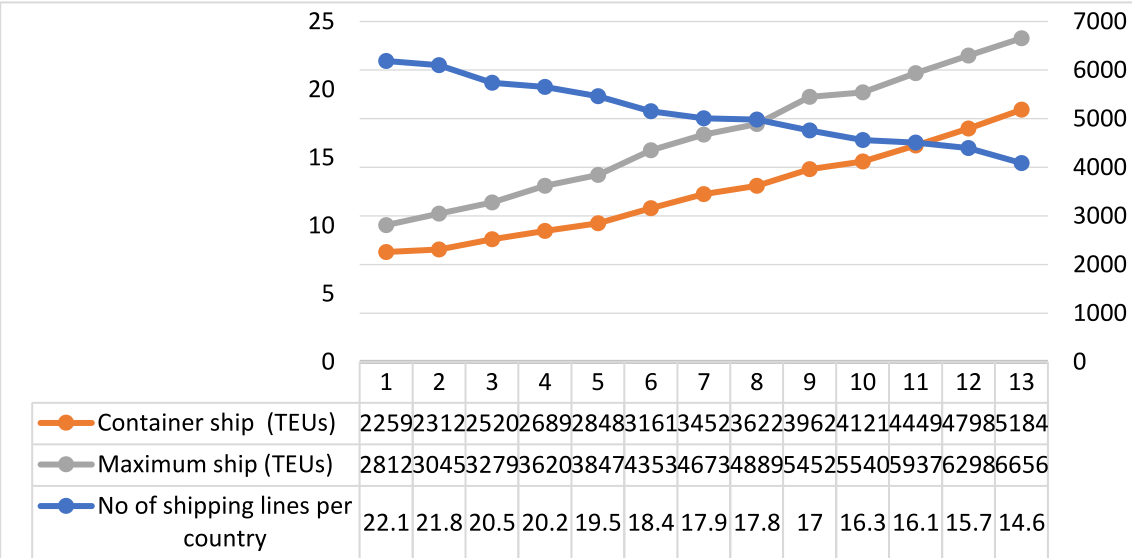
The strategic alliances formation demonstrates the attempt to create operational efficiencies and broader service exposure through economies of scale (for example, the utilization of bigger vessels) and scope (for example, proposing a complete worldwide transport linkage by the service consolidation of shipping lines' member) (Thai & Grewal, 2019). Following the trend, it is evidenced that the number of shipping lines per country decreases while the number of container ships increases due to the increase level of consolidation in container shipping industry (UNCTAD, 2018b). The amalgamation shapes the latest three strategic alliances configuration consisting of 2M, Ocean Alliance, and THE Alliance that holds 76.8% of worldwide container shipping market share (Alphaliner, 2020; Thai & Grewal, 2019) as Table 2.2 pointed below.

Table 2.2: Three Strategic Alliances in Container Shipping

<table>
<tr><th>Alliance</th><th>Carriers</th><th>Worldwide Market Share</th><th>Aggregate Share</th><th>Total</th></tr>
<tr><td rowspan="2">2 M</td><td>Maersk</td><td>16.8%</td><td rowspan="2">32.2%</td><td rowspan="8">76.8%</td></tr>
<tr><td>MSC</td><td>15.4%</td></tr>
<tr><td rowspan="3">Ocean Alliance</td><td>COSCO – OOCL</td><td>12.1%</td><td rowspan="3">28.4%</td></tr>
<tr><td>CMA CGM</td><td>11.2%</td></tr>
<tr><td>Evergreen</td><td>5.1%</td></tr>
<tr><td rowspan="3">THE Alliance</td><td>Hapag- Lloyd</td><td>7.1%</td><td rowspan="3">16.2%</td></tr>
<tr><td>ONE</td><td>6.6%</td></tr>
<tr><td>Yang Ming</td><td>2.5%</td></tr>
</table>

Source: Alphaliner (2020) as per 28 May 2020 and adapted from Thai and Grewal (2019)

Since the invention of containerized cargo, world container ports are equipped to handle ever-increasing container throughput as a result of the operation of mega-vessels, concentrated and consolidated shipping lines and growing cybersecurity hazards (UNCTAD, 2017). Regarding this matter, the global trend on containerized cargo has exhibited an increase for the last two decades, followed by a worldwide trend in the increased size of container ship capacity and size (See Figure 2.2.) (UNCTAD, 2016). Nowadays, container vessels are the largest average size vessel, and have reached their peak (UNCTAD, 2017). To accommodate the greater size, the entrée canals and shipyards are required to expand capacity significantly, and this may cause diseconomies of scale (UNCTAD, 2017).



Source: UNCTAD (2016)

Figure 2.2: Total number of container ships, maximum size (TEUs) and shipping lines per country 2004–2016

Therefore, in the next development, the global shipping liners thus have held the importance of port route selection. Ng (2006) discovered that shipping companies are attracted not only to optimizing their revenue when selecting a transit port, they are also concerned about the service quality, time effectiveness, geographic site, quality of infrastructure/ equipment and cost. Thus, to capture economy of scale, value-added logistics and competitiveness in port and supply chain performance (Rodrigue & Notteboom, 2010), the individual scattered ports have developed to form port regionalization (Notteboom & Rodrigue, 2005). The regionalization can be demonstrated in Table 2.3 below. Asian countries led the world's top container ports throughput in 2018, with almost two thirds of the 20 top world containers are located in China, as shown below.

Table 2.3: Top 20 container port terminals 2017 throughput (in thousand TEUs)

2017 Rank	Port	Country	2017	2016
1	Shanghai	China	40 230	37 133
2	Singapore	Singapore	33 670	30 904
3	Shenzen	China	25 210	23 979
4	Ningbo-Zhoushan	China	24 610	21 560
5	Busan	Republic of Korea	21 400	19 850
6	Hong Kong	Hong Kong (China)	20 760	19 813

2017 Rank	Port	Country	2017	2016
7	Guangzhou	China	20 370	18 858
8	Qingdao	China	18 260	18 010
9	Dubai	United Arab Emirates	15 440	14 772
10	Tianjin	China	15 210	14 490
11	Rotterdam	Netherlands	13 600	12 385
12	Port Klang	Malaysia	12 060	13 170
13	Antwerp	Belgium	10 450	10 037
14	Xiamen	China	10 380	9 614
15	Kaohsiung	Taiwan	10 240	10 465
16	Dalian	China	9 710	9 614
17	Los Angeles	United States	9 340	8 857
18	Hamburg	Germany	9 600	8 910
19	Tanjung Pelepas	Malaysia	8 330	8 281
20	Laem Chabang	Thailand	7 760	7 227
	TOTAL		336 630	317 929

Source: (UNCTAD, 2018c)

Further, massive container vessels deliver economies of scale at sea; however, this does not necessarily the case in seaports (Guan, Yahalom, & Yu, 2017) as the augments in cargo quantity also generate larger requests on exit-gate access, together with additional inward and outward trucks with considerably more containers. Such a situation could generate more local bottlenecks as extra trucks are waiting to enter the port (UNCTAD, 2017). Further, larger vessels may require more time for berthing, more space, and remain longer in port (JOC Group, 2014). The trend of mega-ships comes with hindrances for developing countries such as choosing terminal designs, investment on the type of equipment with its technology, digitalization and automation and the human capital that operates this equipment (Lloyd's Loading List, 2017 in UNCTAD, 2017).

As the cause of increasing vessel size, this implies there are limitations for trade routes, as only several channels are able to accommodate mega-vessels. For the past 13 years, China has led the shipping liner connectivity index (see Table 2.4) as its ports are the world's foremost loading sites, causing China to have the most deployed ships to and from its seaports.

The global trend in ICT implementation in transport and logistics has advanced to the seaport environment as the utilization of multimodal transportation in the port environment has taken place. ICT use in multimodal transport and freight transport has extensively developed, especially with the uptake of cloud computing via web technologies, wi-fi/mobile cellular communication technologies (GPS/NFC/RFID) (Coronado Mondragon, Lalwani, Coronado Mondragon, Coronado Mondragon, & Pawar, 2012), Internet of Things (IoT) (Abdel-Basset, Manogaran, & Mohamed, 2018), Web3.0, social networking and augmented reality (AR) technology (Harris, Wang, & Wang, 2015). Further trends show a movement towards green values where carbon emissions (Lee, Lam, & Lee, 2016; Liao, Tseng, Cullinane, & Lu, 2010), environmental efficiency (Chang, 2013; Chang, Zhang, Danao, & Zhang, 2013; Lee et al., 2014; Song, 2014) and eco-friendly ports (Erdas, Fokaides, & Charalambous, 2015; Tichavska & Tovar, 2015) have captured attention. In recent years, efforts to counteract the negative consequences of environmental pollution are mainly through local government and international emissions regulations (Lee et al., 2014; Lee et al., 2016). Likewise, ports may differentiate openly from other industry where they can emphasize on lean and green supply chain concepts to enhance overall output of transshipment operations (Chandrakumar, Gowrynathan, Kulatunga, & Sanjeevan, 2016; Esmemr, Ceti, & Tuna, 2010).

Table 2.4: Shipping liner connectivity index, 2004–2017

No	Year / Economy	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
1	China	100	108.3	113.1	127.8	137.4	132.5	143.6	152.1	156.2	157.5	165.1	167.1	170.8	158.8
2	Singapore	81.9	83.9	86.1	87.5	94.5	99.5	103.8	105	113.2	106.9	113.2	117.1	119.5	115.1
3	Korea, Republic of	68.7	73	71.9	77.2	76.4	86.7	82.6	92	101.7	100.4	108.1	113.2	112.6	109.9
4	China, Hong Kong SAR	94.4	96.8	99.3	106.2	108.8	104.5	113.6	115.3	117.2	116.6	116	116.8	100.5	105.4
5	Malaysia	62.8	65	69.2	81.6	77.6	81.2	88.1	91	99.7	98.2	104	110.6	102.5	98.1
6	Netherlands	78.8	80	81	84.8	87.6	88.7	90	92.1	88.9	87.5	94.2	96.3	84.4	86.4
7	United States	83.3	87.6	85.8	83.7	82.5	82.4	83.8	81.6	91.7	92.8	95.1	96.7	93.6	86.3
8	Germany	76.6	78.4	80.7	89	89.3	84.3	90.9	93.3	90.6	88.6	94	97.8	89.8	85.9
9	Belgium	73.2	74.2	76.2	73.9	78	82.8	84	88.5	78.8	82.2	80.8	87	86.1	83.1
10	United Kingdom	81.7	79.6	81.5	76.8	78	84.8	87.5	87.5	84	87.7	88	95.2	93.6	82.8
11	Spain	54.4	58.2	62.3	71.3	67.7	70.2	74.3	76.6	74.4	70.4	70.8	84.9	81.4	82.2
12	United Arab Emirates	38.1	39.2	46.7	48.2	48.8	60.5	63.4	62.5	61.1	67	66.5	70.4	73.1	73.7
13	France	67.3	70	67.8	64.8	66.2	67	74.9	71.8	70.1	74.9	75.2	77.1	67	72.2
14	China, Taiwan Province of	59.6	63.7	65.6	62.4	62.6	60.9	64.4	66.7	66.6	64.2	75.4	76.2	77.6	71.5
15	Sri Lanka	34.7	33.4	37.3	42.4	46.1	34.7	40.2	41.1	43.4	43	53	54.4	61.9	69.4
16	Morocco	9.4	8.7	8.5	9	29.8	38.4	49.4	55.1	55.1	55.5	64.3	68.3	59.9	67
17	Japan	69.2	66.7	64.5	62.7	66.6	66.3	67.4	67.8	63.1	65.7	62.1	68.8	73.9	66.4
18	Oman	23.3	23.6	20.3	29	30.4	45.3	48.5	49.3	47.3	48.5	49.9	48.4	49.4	63.6
19	Italy	58.1	62.2	58.1	58.8	55.9	70	59.6	70.2	66.3	67.3	67.6	67.4	62.8	62.5
20	Viet Nam	12.9	14.3	15.1	17.6	18.7	26.4	31.4	49.7	48.7	43.3	46.1	46.4	61.9	60.5
21	Saudi Arabia	35.8	36.2	40.7	45	47.4	47.3	50.4	60	60.4	59.7	61.3	64.8	61.1	59.5
22	Turkey	25.6	27.1	27.1	32.6	35.6	32	36.1	39.4	53.1	52.1	52.4	52	57.1	57.2
23	Sweden	14.8	26.6	28.2	25.8	30.3	31.3	30.6	30	49.5	42.3	54.9	56	53.2	56.5
24	Denmark	11.6	24.3	25.4	22.1	26.5	27.7	26.8	26.4	44.7	38.7	52	52.3	50.1	55.8
25	Poland	7.3	7.5	7.5	7.9	9.3	9.2	26.2	26.5	44.6	38	51.1	51.2	55.8	55.4
26	Egypt	42.9	49.2	50	45.4	52.5	52	47.5	51.1	57.4	57.5	61.8	61.5	58.7	54.6
27	Portugal	17.5	16.8	23.6	25.4	35	33	38.1	21.1	46.2	46.1	46.3	45.7	47.8	54
28	India	34.1	36.9	42.9	40.5	42.2	41	41.4	41.5	41.3	44.4	45.6	45.9	58.2	52.9
29	Panama	32	29.1	27.6	30.5	30.4	32.7	41.1	37.5	42.4	44.9	43.6	45.6	50.7	52
30	Greece	30.2	29.1	31.3	30.7	27.1	41.9	34.3	32.1	45.5	45.4	47.3	46.8	47.8	50.1
31	Malta	27.5	25.7	30.3	29.5	29.9	37.7	37.5	41	45	49.8	50.5	54.7	51.9	48.2
32	Israel	20.4	20.1	20.4	21.4	19.8	18.6	33.2	28.5	31.2	32.4	31.8	33.2	39	46.5
33	Canada	39.7	39.8	36.3	34.4	34.3	41.3	42.4	38.4	38.3	38.4	42.5	42.9	42.1	45.4
34	Colombia	18.6	19.2	20.5	21.1	21.6	23.2	26.1	27.3	37.3	37.5	33.1	42.3	49.9	45
35	Lebanon	10.6	12.5	25.6	30	28.9	29.6	30.3	35.1	43.2	43.2	42.6	41.8	41.6	44.5
36	Mexico	25.3	25.5	29.8	31	31.2	31.9	36.4	36.1	38.8	41.8	40.1	43	42.7	43.7
37	Peru	14.8	14.9	16.3	16.9	17.4	17	21.8	21.2	32.8	32.8	33.6	37	35.2	42.1
38	Chile	15.5	15.5	16.1	17.5	17.4	18.8	22.1	22.8	33	33	32.5	36.3	33.5	41.4
39	Thailand	31	31.9	33.9	35.3	36.5	36.8	43.8	36.7	37.7	38.3	44.9	44.4	47.3	41
40	Bahrain	5.4	4.3	4.4	6	5.8	8	7.8	9.8	17.9	17.9	27	26.7	21.9	41
41	Indonesia	25.9	28.8	25.8	26.3	24.9	25.7	25.6	25.9	26.3	27.4	28.1	27	29.6	40.9
42	Iran (Islamic Republic of)	13.7	14.2	17.4	23.6	22.9	28.9	30.7	30.3	22.6	21.3	5.8	11.9	32.4	40.8
43	Ukraine	11.2	10.8	14.9	16.7	23.6	22.8	21.1	21.4	24.5	26.7	27.7	30.1	28.5	38
44	Slovenia	13.9	13.9	11	12.9	15.7	19.8	20.6	21.9	21.9	20.8	24.3	29.6	31.5	37.4
45	South Africa	23.1	25.8	26.2	27.5	28.5	32.1	32.5	35.7	36.8	43	37.9	41.4	35.5	37.4

Source: UNCTAD (http://unctadstat.unctad.org/wds/TableViewer/tableView.aspx)

2.3. The Indonesian container terminal industry

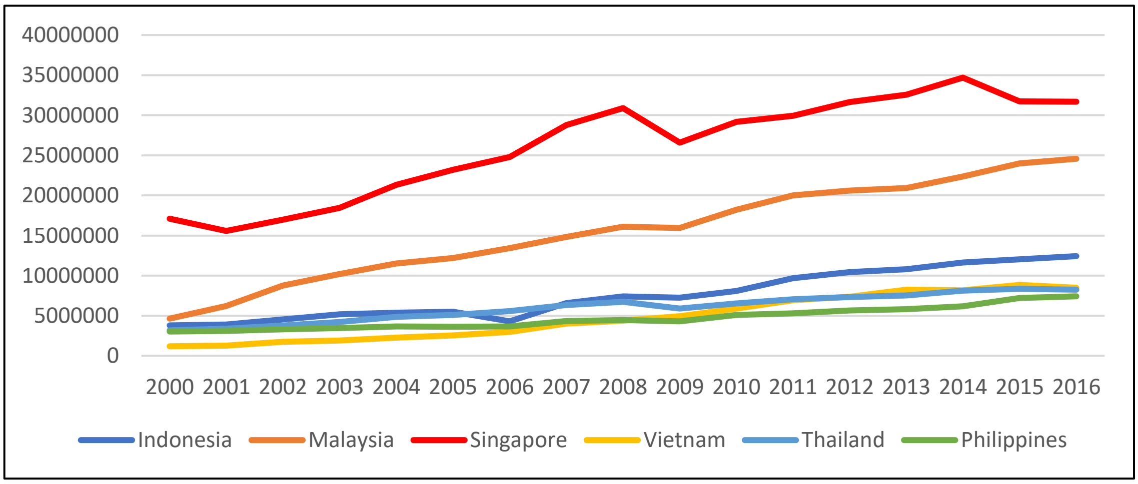
Indonesia owns around 1,700 ports, of which 111 are considered to be commercial ports, including 25 main ports under the management of State-owned enterprises (SOE) (Ray, 2008). Consisting of about 17,000 islands, archipelagic Indonesia is experiencing an ever-increasing volume of trade, however, suffers from inadequate port capacity and infrastructure resulting in shipping congestion problems and poor dwelling times (Ray, 2008).

Table 2.5: Indonesian Port Corporations (IPCs) regional coverage

PORT CORPORATION	COVERAGE (PROVINCES)	REGIONAL PORTS MANAGED
Pelindo I	Aceh, North Sumatera, Riau	Belawan, Pekanbaru, Dumai, Tanjung Pinang, Lhokseumawe
Pelindo II	West Sumatra, Jambi, South Sumatra, Bengkulu, Lampung, Bangka Belitung, Banten, DKI Jakarta, West Java, West Kalimantan	Tanjung Priok, Panjang, Palembang, Teluk Bayur, Pontianak, Cirebon, Jambi, Bengkulu, Banten, Sunda Kelapa, Pangkal Balam, Tanjung Pandan
Pelindo III	East Java, Central Kalimantan, South Kalimantan, Bali, West Nusa Tenggara, East Nusa Tenggara	Tanjung Perak, Gresik, Banyuwangi, Tanjung Emas, Tanjung Intan, Banjarmasin Kotabaru, Sampit, Benoa Lembar, Tenau/ Kupang
Pelindo IV	Sulawesi (South ,South East, Central and North), Maluku, Papua	Makassar, Balikpapan, Samarinda, Bitung, Ambon, Sorong, Biak, Jayapura

Source: Indonesian Port Corporations (IPCs), 2015

Sea transportation has been a significant link for Indonesia's domestic and international trade (OECD, 2012). At the ASEAN level, Indonesia produces the third largest container throughput in ASEAN after Singapore (1st) and Malaysia (2nd) (See Figure 2.3. below). Further, based on the Indonesian customs database on import declaration documents (DGCE, 2020), there were effectively 58 seaports for import during the period 2010 to 2017 with 86,85% imports performed via seaports in Jakarta, Surabaya and Semarang (59,52%, 20,91% and 6,41% respectively) (See Appendix 1).



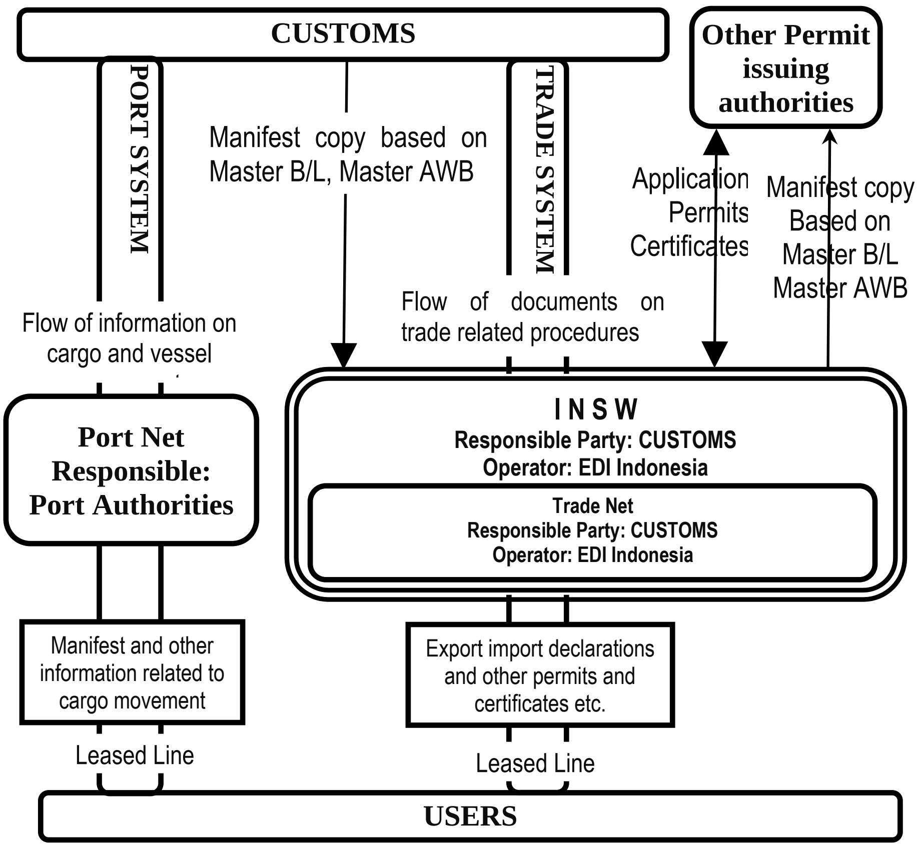
Source: UNCTAD (http://unctad.org/en/Pages/statistics.aspx)

Figure 2.3: ASEAN 6 container port traffic TEUs (20-foot equivalent units)

In port technology integration, Indonesia's National Single Window (INSW) digital trading approach uses a Two Pillars Policy (DJBC, 2011; JASTPRO, 2012) which consists of 1) The Trading System (INSW) pillar, which is employed to expedite licenses for export-import process and customs clearance; and 2) the Port System pillar, which is utilized to accelerate cargo release procedures at the port (See Figure 2.4). However, the two stand-alone systems are not integrated, resulting in slow data transfer concerning the import-export process, customs clearance process as well as cargo and terminal handling practices. The country's logistics cost is equal to 24% of its GDP, the highest amongst its ASEAN counterparts (World Bank, 2015b).

The official INSW website is used to access information as well as the homepage of operational services INSW Portal (INSW, 2019) and encompasses two functions:

1. Information display to the public, where INSW operates as publicly assessed information gateway, contains all related information to the implementation of NSW system in Indonesia and all the pre-requisites to obtain the NSW system services; and
2. Operational system for users, where INSW performs as an operational system that can only be accessed by the registered INSW Portal user. It serves all INSW operational services such as specialized information, transactional services, document tracking, license viewing, manifest viewing, the report on licensing realization, and viewing the process of analyzing point.



Source: JASTPRO (2012)

Figure 2.4: Two Pillars policy in Indonesia's National Single Window

Although the advantages of INSW have been known, there are several basic issues in INSW implementation in Indonesia as follows (JASTPRO, 2012):

1. Government bureaucratic structure in promoting the National Single Window (NSW)

   In regulating the formation of NSW, the Coordinating Ministry for Economic Affairs (CMEA) has the mission to coordinate and oversee the formation, implementation and tackle related issues of NSW in several ministries related to economic affairs and trade. The problem is that several government agencies do not have a system to provide digital services to the community. However, CMEA is not in a position to provide financial support to each government agencies to develop the system. Therefore, government agencies are required to negotiate individually with the Ministry of Finance and thus delayed full INSW implementation.

2. The National Legal Framework for digital transactions

   a. The Law on Electronic Documents in Indonesia

      There is a contradiction in the Law No.11 of 2008 on Information and Electronic Transactions (Informasi dan Transaksi Elektronik/ ITE Law) where the law stated that: "Electronic information and documents, including its printout, can be regarded as valid legal evidence, with exception that the law requires that the document shall be in written format."

   b. Digital Signature

      ITE law also regulates digital signature application where it is 100% required for cross-border transactions and not necessary for domestic transactions. An authority certification is required to provide a certificate with a secret code, to authorize the features of Digital Signatures. In Indonesia, several private Authority Certification agencies provides such services, including PT EDI Indonesia (INSW operator). However, none of them were approved by the Government of Indonesia, thus making digital signature unavailable.

   c. Other legal issues

      Tax law, which requires ten years commercial document retention is no longer relevant in the digital age.

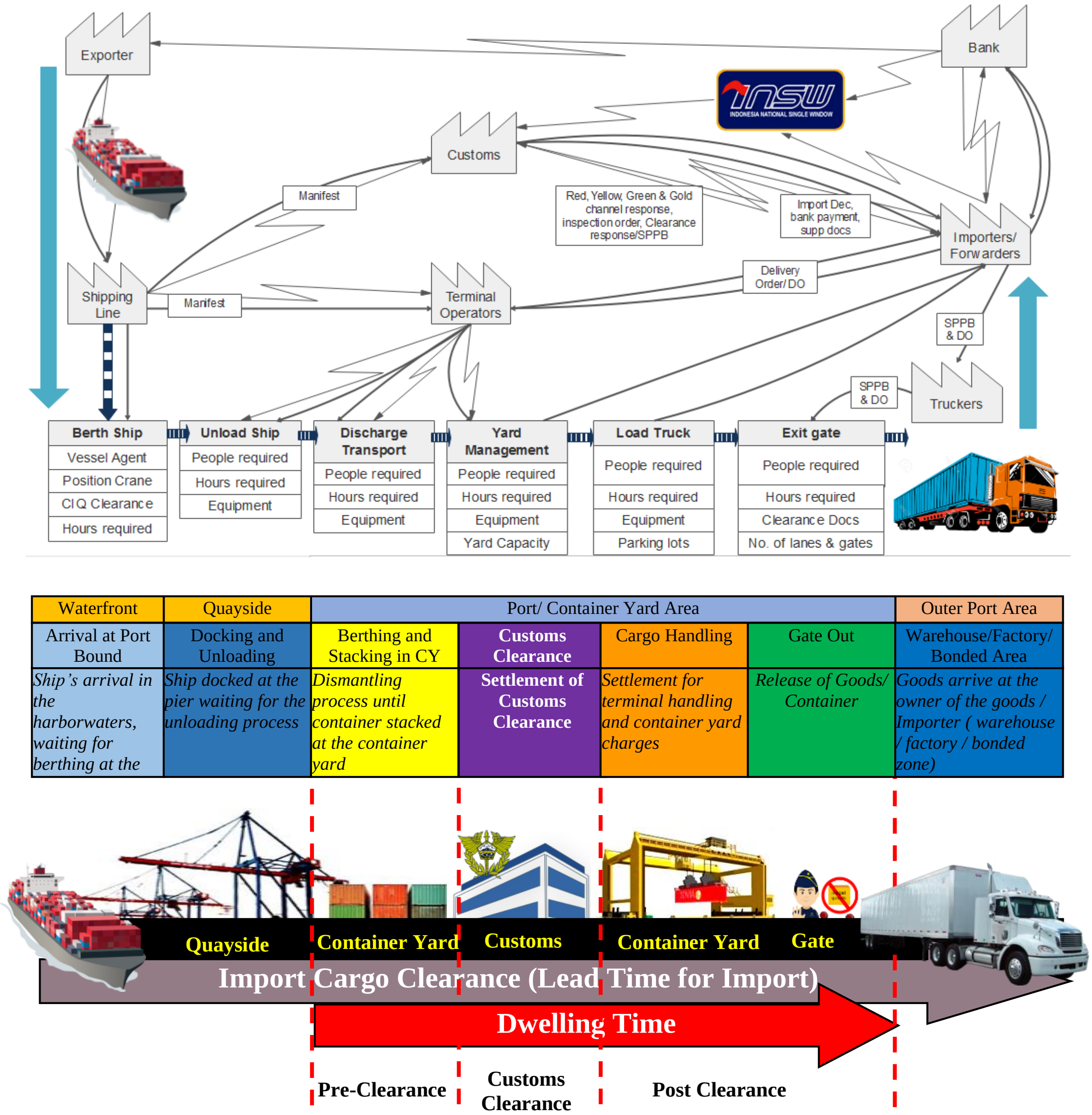
3. The entire scope of the system Import / Export in Indonesia

   In Indonesia, the National Single Window using the Two Pillars Policy described by DJBC (2011), due to considerations of national interest:

   - Trading System is one of the pillars to promote the smooth issuance of export-import and customs clearance;
   - Port System is one of the cornerstones to encourage the flow of goods at the port, especially in connection with the release of the cargo; and
   - Trading System is listed as INSW, while the Port System is not accounted for as a Single Window. Customs is entitled to handle manifest data by law, but INSW began to

accommodate other government agencies with manifest data information based on the Master B/L and Master Air Way Bill obtained from customs.

Also, Hausman, Lee, and Subramanian (2005) argued that terminal congestions caused by policy and institutional restrictions, such as constrained protocols on cargo movement, weak enforcement of rules and contracts, and delays at ports and customs. Thus, internal and external factors contribute to terminal congestion. This study will evaluate only the internal contributors within terminal container chains. Therefore, the examination of terminal container chains will be within the import process flow, concerning containers unloading from the ship, processing customs documents and clearing the gate at the container terminal. The typical flow of Indonesia's container terminal activities is shown in Figure 2.5 below.



Source: Adapted from Directorate General of Customs and Excise, Indonesia (2017)

Figure 2.5: Import flow diagram of Indonesian container terminals

Further, high dwelling time (DT) of containers within the port leads to delays in unloading-loading of goods resulting in poor port performance (World Bank, 2015b). Moreover, the industries with just-in-time inventory systems will experience higher losses due to the chaotic schedule of imported raw materials. High seaborne costs and logistics costs reduce the competitive edge of international trade, subsequently leading to an increase in the final goods' pricing passed on to end consumers who are paying more than they should pay. Inadequate infrastructure is a significant cause for Indonesia' delay in national economic development and regional production chains integration (World Bank, 2015a). Transportation problems can be attributed to lack of connecting roads and the port itself, combined with inefficient regulatory policies, customs procedures and planning (Brown, 2013). Subsequent sections discuss three main container ports in Indonesia as well as the container terminal operators used as samples in this study.

2.3.1. Port of Tanjung Priok and its development

Ever since Indonesia's independence, Tanjung Priok has been the most significant and major port in the country. Tanjung Priok is Indonesia's largest port by container volume and serves as the main gateway to international markets.

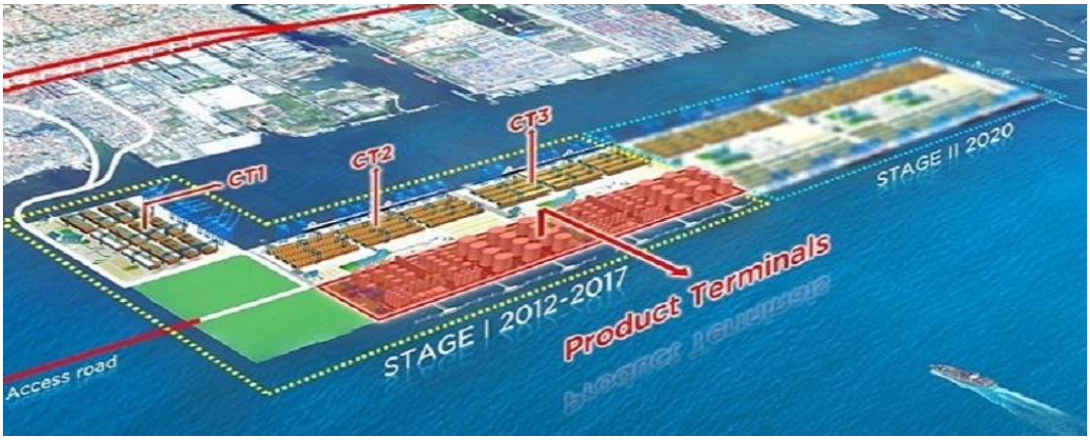
Tanjung Priok accounts for around 70% of Indonesia's total international trade (Bahagia, Sandee, & Meeuws, 2013) and has not been expanded for the last 130 years although container traffic has increased by 24% per annum (Dodd, 2015). Although Tanjung Priok port possesses a typical import flow, it experiences widespread access traffic blocking from and into Tanjung Priok precinct, lack of road and ICT infrastructure, and inefficiency and duplication process in port regulations. These conditions further deteriorate container traffic and lead to an increase in logistics costs (Parsons, Smith, & Cain, 2015). Further, Tanjung Priok is already operating over capacity, no longer accommodating incoming containers, thus causing inefficiency and high logistics costs (Sari & Haryanto, 2011). As a result, ship waiting time reached four days in 2014 (Tempo, 2014) and container dwelling time (DT) in JICT increased from 6.1 days in 2012 to 7.9 days in 2013 (Parsons et al., 2015). The World Bank (2015b) indicated that a container requires an average of six days to unload from the ship and pass through the exit gate, which is two times longer than Malaysia and five times that of Singapore. The port has faced port congestion and inefficiency which result in high logistics and immeasurable social costs. The high logistics cost is caused by high stock inventory and dominant land transport mode, which is 10 times more costly than sea transportation (IPC II, 2014). Indonesia's logistics cost in 2014 was equivalent to 24% of the country's GDP which is the highest percentage among its ASEAN neighbours (Muna, 2018; World Bank, 2015b). Poor performance in Tanjung Priok has had an undesirable impact on the national economy and inhibits Indonesia from being one part of an efficient global supply chain.

Source: Pelindo (2017)

Figure 2.6: Map location of container terminal operators in Tanjung Priok

Currently, to support the country's rapid container growth and energize Indonesia's international trade, Tanjung Priok is undergoing expansion and upgrading. Tanjung Priok is currently operated by PT Pelindo II (Indonesia Port Corporation II/IPC II), which is a state-owned enterprise and operating territory covers ten provinces to manage 12 ports, including Tanjung Priok. Other key players in the Tanjung Priok Port are PT Jakarta International Container Terminal (JICT), PT Terminal Peti Kemas (TPK) Koja, PT Multi Terminal Indonesia (MTI) and PT Mustika Alam Lestari (MAL) (See Figure 2.6. above which shows the map location of each container terminal in Tanjung Priok Port).

As mentioned above, the government tried to overcome the problem of 'bottleneck terminalization' by expanding the port and developed a new extension project called New Priok Port (See Figure 2.7).



Source: Pelindo (2017)

Figure 2.7: Tanjung Priok Port development plan

The New Priok Port development is funded by Pelindo II and projected to reinforce the nation's logistics chain significantly, to boost trade and convey the country's port facilities as equal to world-class seaports. In its full operation, the New Priok Port is estimated to have triple annual capacity of the preceding port in 2023.As of 2016, the CT1 expansion has operated as the New Priok Container-1 (NPCT-1) (Pelindo II, 2016).

A description of the profile of each container terminal operator that conducted international container handling processes follows.

1. PT Jakarta International Container Terminal (JICT)

Historically, containerization in Indonesia started in 1973. Following increasing container flow, construction of a container terminal at Tanjung Priok Port began in 1974, located in the East Port III. The first phase of the container terminal was completed and inaugurated by President Soeharto on 20 May 1981. As anticipation for escalating container shipment, the second container terminal was built and established by the Ministry of Transportation on 14 September 1991. In the same year, GOI established Government Regulation 57 of 1991. This regulation transferred port management from Port State Enterprise to PT Pelabuhan Indonesia II.

Further, in 1992, container terminal management was conducted by Container Terminal Unit Tanjung Priok. This was a separate management from Tanjung Priok Harbor Branch and directly reported to the Board of Directors of PT Pelabuhan Indonesia II (Persero). Based on Notarial Act number 72, dated 27 March 1999 by notary N.Y. Nelly Else Tahamata, SH, Tanjung Priok Container Terminal Unit changed its status to a legal entity, namely PT Jakarta International Container Terminal (JICT), with 51% of shares owned by Hutchison Port Holdings Group (HPH Group), 48.9% of shares owned by Pelindo II and 0.1% owned by the Maritime Employees Cooperative.

JICT has a strategic location in the northern part of Jakarta and acts as an economic gateway for Indonesia. In order to optimize service and support to increase national economic growth, JICT has initiated a number of expansion projects since 2008, including the addition of dock and piling page, using a changing terminal operating system and automatic gate systems in Indonesia. JICT refines and develops the Container Terminal Management System (CTMS), a system utilized to serve export and import activities and to offset increasing container traffic flow. JICT provides services such as the provision of port container yards, container loading-unloading activities with facilities such as container cranes, transtainer, forklifts, head truck, chassis and other equipment. By scope and capacity of existing operations, PT JICT is the largest and busiest container terminal in Indonesia. The facilities, company size and shareholder ownership of PT JICT is shown in Tables 2.6 and 2.7 below.

Table 2.6: JICT equipment and facility

I. Berth	**Terminal I**	**Terminal II**	**Total**
Length	1643 m	518.5m	2161.5m
Width	26.5 – 34.9 m	19m	
Draught	11 – 14 m	8.6m	
II. Container Yard			
Area	57.47 Ha	12.16 Ha	69.63 Ha
Capacity	45,824 TEUS	7,644 TEUS	53,468 TEUS
Ground Slot			
- Import	985 slots	210 slots	1195 slots
- Export	659 slots	200 slots	859 slots
- Reefer 380V	909 plugs	130 plugs	1039 plugs
III. Equipment			
Quay Crane Container	16 units	3 units	19 units
Rubber Tyred Gantry Crane	60 units	11 units	71 units
Forklift Diesel	23 units	3 units	26 units
Head Truck	122 units	10 units	132 units
Reach Stacker	3 units	1 units	4 units
Side Loader	6 units	1 units	7 units
Chassis	113 units	13 units	126 units
IV. Berth	7	2	9

Source: JICT (ww.jict.co.id)

Table 2.7: JICT company size and shareholder ownership

Company Size	1,000–1,500 employees
Shareholder ownership	
PT Hutchinson Ports Indonesia	51%
PT Pelabuhan Indonesia II/ Indonesia Port Corp II	48.9%
Maritime Employees Cooperative	0.1%

Source: IPC II (2016)

2. PT Terminal Peti Kemas Koja (TPK Koja)

The growth of Indonesia in the early 1990s has led to increased export and import activities through Tanjung Priok Port. The existing two container terminals were no longer able to handle the massive volume of containers. In order to meet the steeply rising demand from container handling services, a completely new terminal named the Koja Container Terminal (Terminal Peti Kemas Koja – TPK KOJA) was established. TPK Koja is a Joint Operation (JO) established in 1994 between IPC II and PT Ocean Container Terminal which was then transferred to Hutchison Ports Indonesia in 1998. Electronics and online systems such as OBX Single Billing Overview, Cargolink and nGen are provided to support fast data access and smooth information exchange between TPK Koja and its customers. The company also established an Auto-gate system in

August 2014 to comply with the Government of Indonesia's program to reduce dwelling time. TPK Koja capacity, equipment shareholder ownership is as follows (See Tables 2.8 and 2.9):

Table 2.8: TPK Koja facilities

No	Facilities	Capacity
1	Container yard	Area: 21,80 has CY Import Capacity: 9,828 TEUs CY Export Capacity: 9,072 TEUs CY Reefer Capacity: 310 Plugs
2	Quay cranes	2 Super Post Panamax 2 Post Panamax 3 Panamax
3	Equipment	25 Rubber Tyre Gantry Cranes (RTG) 48 Head Trucks, 60 Chassis, 3 Reach Stacker 1 Empty Handler, Fire Fighter Car
4	Pool facility	Area: 84.500 m2 (8.45 Ha) Dock length: 650m Pool depth: 13 - 14 MLWS

Source: TPK Koja and IPC II (2016)

Table 2.9: TPK KOJA company size and shareholder ownership

Company Size	1,000–1,500 employees
Shareholder Ownership	
PT Pelabuhan Indonesia II/ Indonesia Port Corp II	54.91%
Hutchison Ports Indonesia	45.09%

Source: IPC II (2016)

3. PT New Priok Container Terminal 1 (NPCT-1)

The company is part of Phase-1 of New Priok development and launched its operation on 18 August 2016. NPCT-1 is owned by four shareholders: Pelindo II (PT IPC TPK); Mitsui & Co., Ltd.; PSA International Pte Ltd; and Nippon Yusen Kabushiki Kaisha (NYK Line) (IPC II, 2016).

Besides being the most modern terminal in Jakarta, able to accommodate mega container ships, NPCT-1 is also responding actively to the Indonesian Government's appeal to Go Greenby introducing ERTGs and exploring a cold ironing facility to make it one of the most environmentally friendly entities in the container business. With its deep drafts, latest equipment, enhanced customs and quarantine system coupled with a commitment to excellence, intelligent planning and focused efforts, the aim is to provide best-in-class port services at Tanjung Priok, Jakarta (NPCT-1, 2018). The facilities, company size and shareholder ownership of PT NPCT-1 is shown in Tables 2.10 and 2.11 below.

Table 2.10: PT NPCT-1 facilities

TERMINAL SPECIFICATIONS		**EQUIPMENT**		**FACILITIES**	
Berth Length (m)	850	Quay Cranes	8	CY Groundslot	5400
Max Draft (m)	-16	Twin-lift Capable Cranes	8	Reefer Groundslot (5 tier capable)	198
Capacity (mio TEU)	1.5	eRTG	20	Reefer Plugs	990

Facility Space (ha)	32	Prime Movers	44	DG Groundslot	80
Ha per Quay Crane	4	Quay Cranes	8	Empty Groundslot	184

Source: PT NPCT-1

Table 2.11: PT NPCT-1 company size and shareholder ownership

Company Size	0–500 employees
Shareholder Ownership	
PT Pelabuhan Indonesia II/ Indonesia Port Corp II	51%
Mitsui led consortium consist of Mitsui & Co., Ltd., PSA International Pte Lt and Nippon Yusen Kabushiki Kaisha (NYK Line).	49%

Source: IPC II (2016)

4. PT Pelabuhan Tanjung Priok (PT PTP)

The company is a subsidiary of Tanjung Priok Port which serves passenger, domestic and international vessels. PT PTP's effective ownership is owned by PT Pelabuhan Indonesia II (Persero) 99% and PT Multi Terminal Indonesia 1% (IPC II, 2016).

The facilities, company size and shareholder ownership of PT PTP is shown in Tables 2.12 and 2.13 below.

Table 2.12: PT PTP facilities and equipment

Facilities						**Category**
Berth					9,631 m	
Warehouse					84,182.36 m^2	Main Facilities
Yard					963,481.36 m^2	
International Container					1,000 m	
Domestic Container					4,169 m	
Int Breakbulk					1,176 m	Berth Length
Others					3,286 m	
Equipment	**TO1**	**TO2**	**TO3**		**Total PTP**	**Category**
			Domestic	**Ocean Going**		
HMC	3	5	7	2	17	
GLC	-	13	-	-	13	
QCC	4	8	4	9	25	Quay Crane
Mobile Crane	1	4	-	-	5	
Container Crane	4		-	-	4	
RTGC	22	13	14	10	59	Yard Crane
RMGC	-	6	-	5	11	
Reach Stacker	6	8	5	10	29	Loader
Side Loader	1	2	2	-	5	
Top Loader	1	-	-	-	171	
Stager	9	-	-	-	139	
UHC	0	12	-	-	2512	
Excavator	3	-	-	-	53	
Head Truck	28	20	33	49	130	
Forklift	21	29	-	-	50	
TOTAL	**103**	**120**	**65**	**85**	**373**	

Source: PT PTP

Table 2.13: PT PTP company size and shareholder ownership

Company Size	2,000–2,500 employees
Shareholder Ownership	
PT Pelabuhan Indonesia II/ Indonesia Port Corp II	99%
PT Multi Terminal Indonesia 1%	1%

Source: PT PTP

5. PT Mustika Alam Lestari (MAL)

PT Mustika Alam Lestari (MAL) provides activities in handling and stevedoring container services for export/ import commodity, and all services related to terminal management and port facilities at Tanjung Priok, Jakarta.

PT MAL was later acquired 100% by PT Kharisma Mutiara Agung (KMA) established in 2003. PT KMA then officially changed its name to PT Nusantara Pelabuhan Handal (NPH) in November 2016. PT NPH itself acquired many companies and became a holding company from several companies operating in the port of Tanjung Priok. The facilities, company size and shareholder ownership of PT MAL is shown in Tables 2.14 and 2.15 below.

Table 2.14: PT MAL facilities

Terminal Facility	
I. Berth	**Terminal**
Length	258
Width	±30 M
Depth	12 M
II. Container Yard	
Area	5 Ha
Capacity	5894 TEU
Ground Slot	TBA
- Import	2870 TEU
- Export	3024 TEU
- Reefer	92 Plug
III. Equipment	
Quay Crane Container	4 Unit
Rubber Tyred Gantry Crane	12
Forklift Diesel	2
Head Truck	12
Reach Stacker	3
Side Loader	2
Chassis	12

Source: PT MAL

Table 2.15: PT MAL company size and shareholder ownership

Company Size	255 employees
Shareholder Ownership	
PT Nusantara Pelabuhan Handal (NPH)	100%

Source: PT MAL

6. PT Terminal Petikemas Surabaya (PT TPS)

In 1992, a port business unit under the management of PT Pelindo III (IPC III) was established, namely Unit Terminal Peti Kemas (UTPK). In 1999, Indonesian government conducted privatization, under the name of PT Terminal Petikemas Surabaya (PT TPS), where 49% of shares were sold to P&O Dover. The purpose and objectives of this privatization was to: (1) improve the company's efficiency and productivity; (2) create a strong financial structure and good financial management; (3) create a competitive and healthy industry structure; (4) create a competitive and globally oriented enterprise; and (5) grow the business climate , macroeconomic and market capacity (Pelindo III, 2017).

In 2006, holding company P&O Dover was acquired by DP World. All assets and investments owned by P&O Dover changed ownership to Dubai Port World (DP World), including 49% shares in PT TPS. Thus, the facilities, company size and shareholder ownership of PT TPS is shown in Tables 2.16 and 2.17 below.

Table 2.16: PT TPS facilities

CONTAINER YARD	**International**		**Domestic**		**BERTH**	**International**	
	Area	35 ha	Area	4,7 ha		Length	1.000 m
	Capacity	32,223 TEUS	Capacity	2.029 TEUS		Width	50 m
	Reefer Container Stacking		Behandle Area	1.068 TEUS		Depth	-13 m
	Export	350 TEUS				**Domestic**	
	Import	882 TEUS	**CFS (Warehouse)**			Length	450 m
	Reefer Plug	909 Plugging	Total Area	10,000 M2		Width	45 m
	Railway (2 track)	429 m	Dangerous Goods	6,500 M2		Depth	-8 m

Source: PT TPS

Table 2.17: PT TPS company size and shareholder ownership

Company Size	1,000–1,500 employees
Shareholder Ownership	
PT Pelabuhan Indonesia III	50.50%
DP World	49%
Koperasi Pegawai PT Pelindo III (KOPELINDO III)	0.50%

Source: Pelindo III (2017)

7. PT Terminal Teluk Lamong (PT TTL)

The port of Tanjung Perak has become the lifeblood of Surabaya's economy since the 20th century. This port continues to be the mainstay of trade traffic and distribution that supports Surabaya and East Java and indeed almost all of Eastern Indonesia. Along with the economic growth rate of East Java which has always exceeded the national economic growth, the density of goods flow activity in Tanjung Perak Port is increasingly high and even predicted to experience over capacity in 2012. Therefore, PT Pelindo III as its operator and stakeholder innovation expansion and acceleration by presenting Terminal Teluk Lamong as a solution to port service availability to support loading and unloading activities at Tanjung Perak (Pelindo III, 2017).

Built in 2010, Lamong Bay Terminal has a masterplan which constitutes the most sophisticated and environmentally friendly terminal harbor in Indonesia. The depth of the waters that meet the requirements of large ship docks is the main reason for choosing the Lamong Bay area as the location for this mega project. Lamong Bay terminal has become a significant solution to the constraints of docking large tonnage vessels. The strategic location of this terminal related to accessibility and connectivity is also expected to increase productivity in order to support regional economic growth.

By advancing the concept of a green port, almost all equipment supporting the terminal operating system and loading and unloading, will be performed efficiently using computerized facilities tested for minimal emissions and a safe, ecofriendly environment. Teluk Lamong is expected to boost national logistics efficiency for a prosperous society. This is part of integrated national logistics transportation system support and plays an active role as the gateway of the economy, the pride of Indonesia, especially Eastern Indonesia. (PT. Terminal Teluk Lamong, 2018). The facilities, company size and shareholder ownership of PT TTL is shown in Tables 2.18 and 2.19 below.

Table 2.18: PT TTL facilities

Container Yard Intl/ Domestic		**Berth (International)**		**Berth (Domestic)**	
Area	15 blocks	Length	500 m	Length	450 m
Capacity	1,500,000 TEUS	Width	50 m	Width	30 m
CFS	8 hectares	Depth	-14 m	Depth	-13 m

Source: PT TTL

Table 2.19: PT TTL company size and shareholder ownership

Company Size	0 - 300 employees
Shareholders Ownership	
PT Pelindo III (Persero)	99.50%
Kopelindo III	0.50%

Source: PT TTL

8. PT Terminal Peti Kemas Semarang (PT TPKS)

The establishment of the Semarang Container Terminal (PT TPKS) is inseparable from the history of Tanjung Emas Port. Port management has undergone several changes, ranging from the 1960 Port State Company (Perusahaan Negara/ PN), the Port Management Agency (Badan Pengusahaan Pelabuhan/ BPP) in 1969, to the Port Corporation in 1983. Based on its distribution, Semarang Port comes under the Pelindo III, with its headquarters in Surabaya.

PT TPKS or the Semarang Container Terminal is a stand-alone branch separate from Tanjung Emas Port in Semarang, and was formally established as a Container Terminal by July

1, 2009 (TPKS, 2016). The facilities, company size and shareholder ownership of PT TPKS are shown in Tables 2.20, 2.21 and 2.22 below.

Table 2.20: PT TPKS equipment

Loading and Unloading Equipment							
No.	Equipment	Amount	No.	Equipment	Amount	Other	
1	Head Truck	43	6	Rubber Tyred Gantry	12	Building	18,7 Ha Yard
2	Top Loader	1	7	Reach Stacker	3	CFS	9.564 M²
3	Chasis	43	8	Electrical Forklift	7	Reefer Installation	24 x 4 plug
4	Automatic RTG	11	9	Diesel Forklift	1		
5	Side Loader	2	10	Container Crane	7		

Source: PT TPKS

Table 2.21: PT TPKS facilities

Quay								
No.	Quay Description	Dimensions **Length**	**Width**	**Area**	Pool Depth (MLWS)	Construction	Fender Type	Year Made
1	TPKS Quay	381 m	25 m	9525 M2	10	Steel Pole	Fenter	1999
2	TPKS New Quay	150 m	25 m	3750 M2	10	Steel Pole	Bridgestone	2005

Container Yard Stacking							
No.	**CY Name**	**CY Dimensions Length (M)**	**Width (M)**	**Area (M2)**	**Floor Loading Capacity (Ton/M2)**	**Floor Construction**	**Year Made**
1	Container Yard 01	372	222.15	82,640	3	Thick paving 10 cm	1999
2	Container Yard 02	140.9	109.57	15,438	3	Thick paving 10 cm	1999
3	Container Yard 03	182	160.4	29,193	3	Thick paving 10 cm	1995
4	Container Yard 04	160.9	130.36	29,193	3	Thick paving 10 cm	1995
5	Container Yard 05	150	56.67	8,501	3	Thick paving 10 cm	2005
6	Container Yard 06	259.5	117.23	30,421	3	Thick paving 10 cm	2008

Table 2.22: PT TPKS company size and shareholder ownership

Company Size	**1,000–1,500 employees**
Shareholder Ownership	
PT Pelabuhan Indonesia III	100%

Source: PT TPKS

2.3.2. InaPortNet, online Delivery Order (DO), and National Logistics Ecosystem (NLE)

In August 2018, IPC II cooperated with Bank Negara Indonesia (BNI) implementing the Port Service Financing (PSF) and IPC Smart Card programs to facilitate port service users in making transactions 24/7. The PSF aims to ensure the certainty of port services 24/7, supported by easy payments, and can be monitored directly through BNI direct. There are currently around 12,000 vehicles incoming and outgoing of the gate of the Tanjung Priok port every day, ranging from trucks to two-wheel vehicles. The IPC Smart Card with BNI Tap-Cash feature is claimed to reduce the queue at the entrance gate due to electronic and cashless transactions. BNI provides integrated solutions to all operational activities of IPC in managing the company's finances effectively and efficiently. The framework synergizes SOEs and supports port business with BNI channeling SCF loans to users of the IPC integrated port services payment system. Loyal IPC customers that meet requirements will obtain financing from BNI and this extends from small to medium or corporate businesses (Mabrori, 2018).

At present, the implementation of InaPortNet at Tanjung Priok supports the realization of an improved port service. Service improvement is apparent from changes in the process of arriving/ departing vessels that were previously done manually around six hours and now, InaPortNet enables ship arrivals/ departures in 30 minutes. Also, previously, the arrangement of Delivery Orders (DO) and payment of the non-tax State Revenue (PNBP) were done at the port counter, the shipping office, the bank and the terminal container which took one to three days. However, with the InaPortNet, the PNBP payment is currently integrated with the SIMPONI application, and the online DOs only take 10 minutes without the need to queue on site.

Previously, in reporting the arrival or departure of ships, the party needed to directly approach the Harbormaster's office and the Port Authority by presenting the vessel's arrival/ departure documents, including the DO arrangement, which resulted in difficulties in knowing the current position of the vessel and container. By having InaPortNet, the vessel's arrival/ departure reporting can be done anytime anywhere, DO procedures are done with the online DO application, as well as the tracking and tracing of ships and goods. Additionally, the application of InaPortNet at Tanjung Priok Port creates transparent services. Before this system was implemented, service users still needed to communicate to various parties to obtain the position of ships and goods and the length of time for the movement of goods was unknown. The container time is not yet known in real time and the issuance of related documents has not been measured and cannot be known. These problems have been resolved with the application of InaPortNet. By accessing the online InaPortNet, real-time tracking and tracing position of ships, goods and containers can be easily carried out. Overall, the application of internet services will contribute to creating a cheaper port service (Amin, 2018).

The latest development to solve the country's logistics inefficiency is the initiation of National Logistics Ecosystem (NLE) by Indonesian Customs. NLE is a program that harmonize the flow of goods and international documents from the arrival of the transport facility until the goods arrive at the warehouse. NLE combines all existing logistical platforms between government and private agencies, from port systems, warehousing, trucking, shipping, container depo, terminal operation platforms, finance and insurance, and licensing systems of various ministries. NLE is oriented to simplify logistics flow processes, removing repetition and duplication, and connecting the existing logistical systems.

2.3.3. Organizational and ownership structure in Indonesian ports

To achieve a streamlined container supply chain, the document and material flow should be efficient, which requires an efficient port. A global trend is to apply privatization in ports, which has been a common phenomenon, as this improves efficiency (Burns, 2015; Cullinane, Ji, & Wang, 2005; Cullinane & Song, 2002). UNCTAD (1998, p. 1) defined privatization as *"the transfer of property ownership from the public to the private sector or the utilization of private investment capital to finance ventures in port facilities, machinery, infrastructure and superstructure"*.

The private sector participation in port management is deemed to create efficiency to some extent (Pagano, Wang, Sanchez, & Ungo, 2013; Tongzon & Heng, 2005). However, greater privatization in the container port sector is only a partial remedy (Cullinane & Song, 2002) and does not lead to improved efficiency in the long run (Cullinane, Ji, et al., 2005). Intra- and inter-port competition, port labour relations and agreements (Cullinane, Ji, et al., 2005), and geographical location and deregulation (Cullinane & Song, 2002) are amongst other factors that influence port efficiency. As indicated by Sanchez et al. (2003), the role of government as regulator is vital in port efficiency, which in turn determines a country's economic development and competitiveness. In support of this viewpoint, Bouchartat, Hajbi, and Abbar (2011) claimed that port performance is influenced by government policy to incorporate private firms as strategic operators. For example, the fundamental role of government in shipping and port growth is shown in Korean ports where its government launched export-oriented industrialisation policy in the 1960s and included investment in the maritime infrastructure for port developments (Lee, 1996; Song & Lee, 2007). Further, several studies in China demonstrated that government has a vital role in shaping investment and policies in China's container port development (Cullinane, Cullinane, & Wang, 2005; Cullinane & Wang, 2007b; Shen & Lee, 2002a, 2002b). China's economic and political liberalization varied in shipping policies, joint-venture investment in terminal constructions, port charge and cabotage restrictions, as well as privatization and commercialization policies. The promulgated Chinese open-door policies brought international market and foreign direct investment (FDI) which in turn advanced China's shipping and logistics sectors (Panayides, 2002). A parallel set of circumstances is also found in Port of Tanjung Pelepas (PTP) where the Malaysian Government was committed to support PTP's development by financing infrastructure, loans, land reclamation and providing concession policy (Leong, 2007). In addition, Tongzon (2005, 2007) also confirmed that proactive government intervention in effective implementation of seaport policies and infrastructure development had helped the port of Singapore to be a successful transhipment hub. Privatization or ownership restructuring as public policy has been introduced globally to increase port competition and efficiency, including in the Asian region (Cullinane & Song, 2003; Leong, 2007; Tongzon, 2005, 2007; Tongzon & Heng, 2005; Tsai & Su, 2005; Yuen, Zhang, & Cheung, 2013). In the ASEAN region, countries who have adopted port corporatization since the 1990s, such as Singapore and Malaysia, have benefited from the transhipment hub (Leong, 2007; Tongzon, 2005, 2007) whilst Indonesia still lags. These case studies reveal similarity in domination of national economic interest and government's role in public policy to transform economic and politic direction. In other words, privatization is an act of public policy to increase economic and political benefits. Nonetheless, the study of this matter in the Indonesian context is limited.

In the previous years, the entrance of private companies in Indonesian port management was limited to the monopoly of government entities (GOI, 1969, 1992). According to the Act No. 21/1992, the state-owned company Indonesia Port Corporation (IPC) functioned as both port regulator and port operator, and the governmental function was held by Port Administration in which the Harbor Master was one division of Port Administration. Prior to the establishment of Shipping Law 2008, the Indonesian Port Companies (IPCs) acted as a solitary port authority as well as terminal operator. The birth of Law Number 17 of 2008 concerning Shipping has separated the functions of regulators and operators in the port industry. The birth of the Act caused IPCs are only authorized as operators and have changed status to become ordinary business operators. Therefore, the new Shipping Law makes the monopoly rights of IPCs in the port industry business activities was abolished. Previously, the legislated monopoly provided IPCs with a competitive advantage over private sector ports and supply domination in nearly every major port. By law, IPCs governance structure obligates each IPC to subsidize the other to sustain business continuity financially, to prevent intra-competition among and within IPCs as well as to maintain good public service delivery. Lucrative IPC ports are obligated to financially support losing other IPC ports thereby reducing performance stimulus. Further, central government also controls port tariffs and are obligated to standard implementation across ports to prevent competition. Its purpose is to reduce IPCs inter-port competition (Ray, 2008).

In regard to this matter, Cullinane, Ji, et al. (2005) argued that when a public authority control the whole port, thus competition is non-existent. Goss (1990) added that intra-port competition exists when the market is contestable, and entry and exit is relatively easy for new firms. Therefore, intra-port competition is linked to the structure of seaport administration and ownership. To overcome the issues, Ray (2008) offered options for promoting competition and private sector participation based on the establishment of the new Shipping Law. However, the recommendation only offers general advice on privatization such as splitting port assets *"into separate and preferably private-held competing entities"* (Ray, 2008, p. 22).. This resolution is inadequate, considering the assets split did not mention the amount to be shared between public and private entities and was not backed up by academic research.

Further, Indonesia adopted a privatization policy where the country issued new national legislation, the Shipping Law No. 17/2008, regarding shipping and port management. On the contrary, as ruled in the new law, Indonesia Port Corporation (IPC) monopoly in managing ports is ended, and as mandated in this new act, there is only one agency that functions as the Port Authority. As part of the implementation of the new law, Port Administration of all ports in Indonesia were transformed into Port Authority and Harbor Master, as separate organizations, to carry out the mandate of the new law. Currently there are four (4) main ports that constitute Port Authority in Indonesia as stated in the Minister of Transportation Decree No. 63/2010 concerning the Port Authority Organization and Work Procedure, then replaced by the Minister of Transportation Decree No. 35/2012 regarding Organization and Work Procedure of Main Port Authority as follows:

1. Belawan Port Authority, Medan-South Sumatera.
2. Tanjung Priok Port Authority, Jakarta.
3. Tanjung Perak Port Authority, Surabaya-East Java.
4. Makassar Port Authority, South Sulawesi.

In principle, based on the new law, there are three separate port management roles in Indonesia, briefly explained as follows:

1. Port Authority that functions as government representative and performs commercial and operational roles.
2. Harbor Master who performs technical function.
3. Port Business Entities that function as terminal operator or facilities operator.

Due to its separation function, the role of IPC is only as Port Business Entities together with other terminal or facilities operators. The Port Authority previously called Port Administrator basically only functions as government representative. But with the implementation of the new act, several functions previously managed by IPC have now been taken by the Port Authority, such as commercial and operational roles, under which there are several service activities. To run these functions definitively there would need to be some changes as to whether it is better managed under the new Port Authority or under IPC as the previous port authority.

The impact of key economic regulations embodied in Shipping Law 2008 is also explored by Dick (2008) and Patunru and Rahardja (2015). Both studies remarked that there is a continuous clash in government between protectionism and finding profit from leasing and expansion. The abovementioned research concurred that the country’s protectionism policy tends to discourage government strategy to advance trade and logistics facilitation. On the other hand, there is an anomaly by the establishment of 2008 Shipping Law where it allows the private sector to invest and play a constructive role in the Indonesian shipping management sector (GOI, 2008). Consequently, the implementation of the new Law is expected to increase private sector involvement in order to lower logistics costs and increase competition and port performance as well as the country's economic growth. This will also contribute to discussion on public benefits of the privatization model and the possibility for further terminal expansion. In regard to this area, Suryanti (2001) pointed out that port privatization positively impacts the port sector in Indonesia; however, adjustment on the existing regulation is required.

To justify the type of Indonesian ports, several classification based on port authority responsibility is described below. Goss (1990) has classified ports based on the role played by the port authority into three types:

Table 2.23: Type of port based on port authority responsibility

Type	Port Authority Responsibility
Comprehensive port	Conducts almost overall activities in the port.
Landlord port	Planning the port and managing overall control, however, assigning majority of the activities in the port to private sector.
Hybrid port	Somewhere in between.

Source: Goss (1990)

In regard to port performance and ownership, Goss (1990) argued that efficiency is achieved by comprehensive ports using direct and skilled management. On the other hand, the landlord ports attained efficiency by initiating intra-port competition and thus port authority played a role in maintaining competition (Goss, 1990). As private companies' determination and performance surpass the public's, thus port privatization has become a global trend to introduce intra-port competition in order to increase port efficiency in a competitive market (Cullinane, Ji, et al., 2005). This phenomenon is also common in the organizational and ownership structure in Indonesian ports environment and should be accounted to understand of how Indonesian ports work.

Alternatively, whether the port is publicly or privately operated, Baird (1997) advised that a port has three main functions:

1. As a regulator, primarily legal status to manage a port. Mostly, it is viewed as the port authority's role.
2. As a landowner, where the responsible port entity should administer the land, engage policies to develop and supervise superstructure and infrastructure works, organize marketing, conserve channels, basins, berths, piers as well as prepare road and rail to access port facilities.
3. As an operator, related to the movement of goods and passengers between sea and land (See Table 2.24).

Table 2.24: Port function based on port administration and ownership

Port Administration and Ownership Models	Port Functions		
	Regulator	Landowner	Operator
PUBLIC	Public	Public	Public
PUBLIC/private	Public	Public	Private

PRIVATE/public	Public	Private	Private
PRIVATE	Private	Private	Private

Source: Baird (1997)

Additionally, Burns (2015) proposed a port management typology and its service arrangement as follows:

Table 2.25: Port management typology and predominant service arrangement

Characteristics	Port Types			
	Public Service Port	**Tool Port**	**Landlord Port**	**Privatized Port**
Port management	Public	Public	Public	**Private**
Navigational management	Public	Public	Public	Public
Navigational infrastructure	Public	Public	Public	**Private**
Port infrastructure	Public	Public	Public	**Private**
Superstructure (equipment)	Public	Public	**Private**	**Private**
Superstructure (buildings)	Public	Public	**Private**	**Private**
Cargo handling activities	Public	**Private**	**Private**	**Private**
Pilotage	Public and **private**	Public and **private**	Public and **private**	**Private**
Towage	Public and **private**	Public and **private**	Public and **private**	**Private**
Mooring services	Public and **private**	Public and **private**	Public and **private**	**Private**
Dredging	Public and **private**	Public and **private**	Public and **private**	Public and **private**
Other function	Public and **private**	Public and **private**	Public and **private**	Public and **private**
Ownership/ management characteristics	- Unity of command - Over-structured management	- Terminals/ private cargo handling company do not entirely control cargo operations - Power struggles due to private entity's limited funding contribution, administrative and equipment usage issues	- Long-term contracts - Terminal's loyalty to port - Terminals/ private cargo handling company owns and operates cargo handling equipment	- Limited government authority and interference - Government loses financial control and ability to benefit from future profit or development - Regional development may not be apriority to the private sector - Any future gains mainly benefit the private sector. Long-term benefits from port's previous clients and supply chains - Serious security concerns - Risk of speculation. Private company free to resell, redevelop, or lease to third party, with huge profits, no government control or interference. - Strategic location encourages private company to expand business activities - Risk of monopolistic behaviour, as tariffs are decided by the private sector. Port tariff regulator may need to avoid overcharge, conflict with regional/ national interest and supply chain - Motivation to invest and take high financial risks - Jobs creation may not be a priority to the private sector
Private sector role	Limited	Moderate	Positive partnership	High
Flexibility	Limited	Moderate	High, most adaptable to industry requirements	High, most adaptable to industry requirements
Stability	Yes	Moderate	High, long-term contracts	N/A
Problem solving potential	Limited	Moderate	High	N/A
Innovation, modernization	Limited	Limited, private entity acts as labour pool, limited innovation incentive	High	High
Access to public funds	Limited	Limited, private entity does not own equipment; hence, there is limited investment incentive	High	High
Dependence on government budget and support	High	High	Moderate	Limited
Incentives for growth	Limited	Moderate	High	High
Internal conflict/ competition	Limited	Yes, because of split cargo handling operations	Limited	High conflict potential pertaining to social responsibility, and all the above factors

Source: Burns (2015, pp. 24-25)

Thus, based on the abovementioned typologies, Indonesia's container terminal characteristics can be categorized as a landlord port (Masassya, 2017).

2.3.4. Challenges of Indonesian container terminal industry

2.3.4.1. Modernization delay

As depicted in section 2.2, global shipping companies have priority in port route selection as they not only optimize revenue, but also service quality, time effectiveness, geographic site, quality of infrastructure/ equipment and costs should be considered (Ng, 2006). Trends also show that mega-vessels development has become common to reduce costs by using massal transportation. As Indonesia attempts to reduce its logistics costs by having more direct calls and make Tanjung Priok a hub port, the maximum terminal depth in Tanjung Priok Port is 16 m (located in PT NPCT-1). Compared to the latest project Tuas Mega Port of Singapore, the new contender container port will have 20-meter depth and total capacity of 65 million TEUs. Singapore's Tuas Terminal expansion will have the newest port automated technology, 20-meter depth and 20 million TEUs per annum handling capacity (Marex, 2016). Trends in megaships and mega-alliance have not been updated in the Indonesian container terminal industries where the current development of New Priok is only focused on capacity expansion; however, the depth of pool is not yet considered to accommodate megaships. The current expansion is meant to pursue its development and capacity lag with the current Port of Singapore. However, Singapore is transitioning to a port where the technology will be more advanced by 2040 and the Port of Priok will be left behind (UNCTAD, 2017). A challenge for Indonesia is to build new terminals or upgrade the current ones to over 16 meter-depth, otherwise, in the next five years, its terminals will not be able to accommodate larger ships. In this case, as Indonesia is surrounded by similar container port competitors, the basic conventional resources owned by Indonesia are only a temporary solution and cannot continue to compete globally. Over time, Indonesia must pursue modernization.

2.3.4.2. Capacity shortage

Further, Tanjung Priok Port is predicted to be able to carry out transshipment functions in order to contest with other international seaports such as the port of Singapore. At present, Singapore has a more transshipment service pattern, while ports in Indonesia are more directed to service patterns as destination ports. Thus, Tanjung Priok or other ports in Indonesia tend to be feeder ports of Singapore. In addition, Tanjung Priok's land access to and from the port has increased, as well as expansion on equipment, gates, container yards, docks and Container Freight Station (CFS). Even so, there is an indication that capacity growth is still less than the acceleration of service requirements for ships and goods, including land accessibility to and from Tanjung Priok Port, which still seems to be larger than the existing capacity. Tanjung Priok's layout creates bottlenecks, apparent in limited container storage space, limited space for truck parking as well as limited space for additional operating locations. PT Pelindo II, as the land owner, has built a buffer area that can accommodate around 12,000 container trucks per day to reduce density in the port area. Even so, the source of congestion may also be from external factors, such as ineffective toll roads in the port area because of expensive tariffs (Febrianto, 2018). Another challenge for the busiest port in Indonesia is to streamline the container transportation access internally in the port, and externally in the toll roads.

2.3.4.3. Bureaucratic inefficiency

As regulated by the Ministry of Transportation regulation number: 120/2017 which came into effect on June 28, 2018, it is required for shipping companies to enforce DOs online and the pilot project is carried out at the port of Priok. The DO is a document that states the ownership of goods (imports) issued by a shipping company. Until the imported goods release is finalized, the goods owner/forwarder must complete the payment fee to the shipping company and receives a DO from shipping firms. The DO is then submitted to the terminal operator/ inland transporters in order to pick up the container (See Figure 2.5, section 2.3). The DO payment process is manually completed in the shipping firm office. By having a delivery order online, it will expedite and simplify the process and reduce costs. Logistics companies or forwarders are expected to no longer have to send couriers to report cargo in and out as the DO has been integrated in the INAPORT system. Previously, service users complained about the length of time for the DO redemption process because many foreign shipping agent offices were located off shore and have limited working hours. However, in practice, a manual DO receipt is still required for goods release after payment settlement. This wastes time as the logistics companies/ forwarders still have to go back and forth to take the DO payment receipt to be submitted to trucking companies and terminal operators to pick up a container (Sembiring, 2018). Such bureaucracy plus lack of ICT implementation and integration are not in line with lean integration principles, as this hampers the flow of goods and documents.

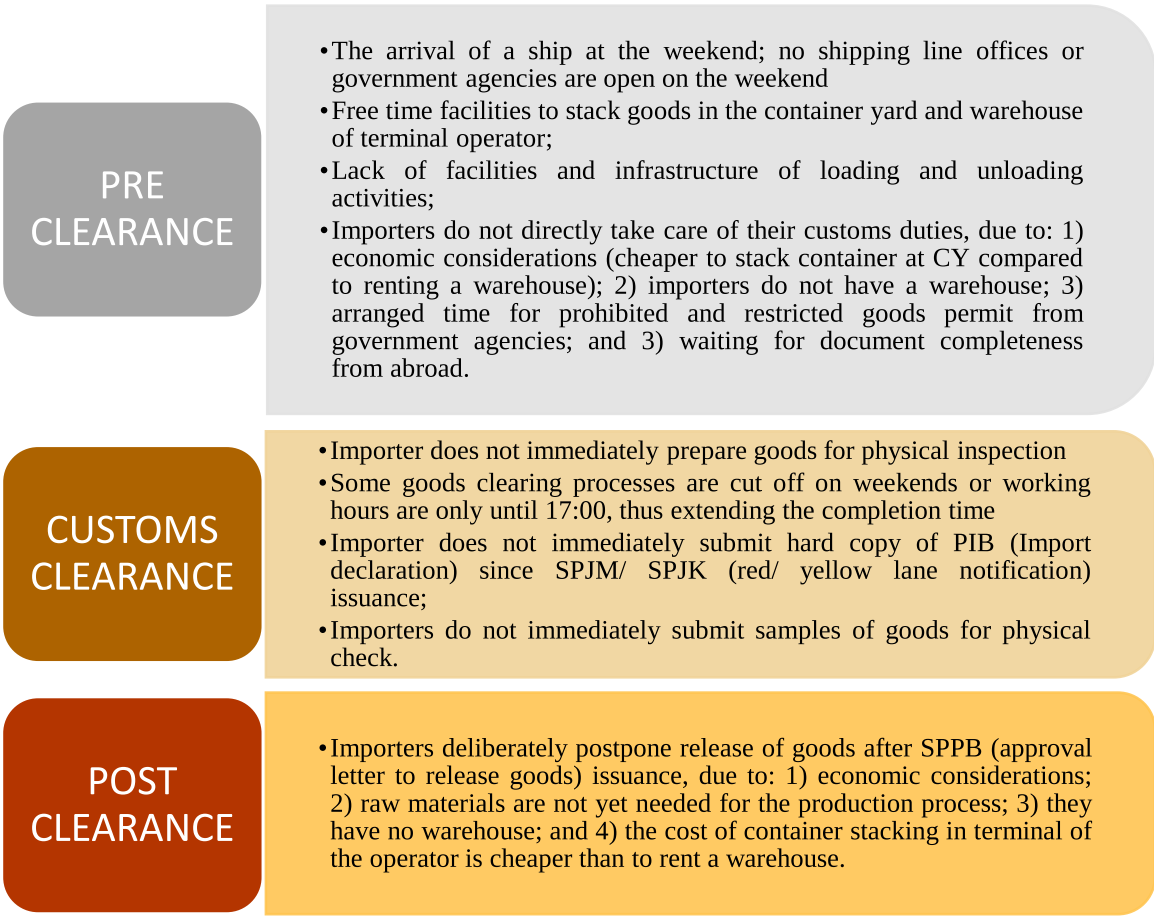
2.3.4.4. High logistics cost

Indonesia's logistics performance at the world level improved with Indonesia's ranking rising from position 63 in 2016 to the 46th position out of 168 countries in 2018 in the World Bank's Logistics Performance Index (LPI). However, this performance is quite bad compared to ASEAN countries, namely Singapore (7th), Thailand (32nd), Vietnam (39th), and Malaysia (41st)) (World Bank, 2018b).

Indonesia's logistics costs remain the highest compared to neighboring countries, where these costs include transportation, warehousing and inventory costs that contribute 24% of Indonesia's gross domestic product (GDP) (Muna, 2018; World Bank, 2015b). The cost-to-GDP logistics ratio in Indonesia is also much higher compared to Thailand and Malaysia, where the ratios reach 15% and 13% respectively. Extensive trade procedures, non-competitive logistics services markets and ineffective port operations are criticized to inhibit Indonesia's competitiveness. Disadvantaged by inadequate infrastructure, arduous regulations, low productivity and bottlenecked ports, Indonesia's industrial competitiveness is delayed. These constraints also cause logistics chain deferrals and contribute to higher logistics costs for Indonesian manufacture firms compared to Thailand and Vietnam, and therefore relatively dropping the Indonesian logistics performance contrasted to other countries in the region (World Bank, 2018a).

2.3.4.5. Dwelling time problems

As previously explained, high dwelling times is a problem in Indonesian container ports. Figure2.8 outlines the challenges related to dwelling times in Indonesian container ports.



Source: Directorate General of Customs and Excise (2017)

Figure 2.8: Problems related to dwelling time

The Ministry of Transportation has tried to overcome the problem by removing long-stay containers (longer than three days) in CY to be moved to line 2 (ring 2) or container stacking outside the port. The procedure is regulated in the Decree of Ministry of Transportation No PM 25/ 2017 (Ministry of Transportation of The Republic of Indonesia, 2017). Thus, it is expected that there will be no over-stacking in the CY terminal of the operator so as to facilitate flow of goods. However, the container that was transferred to CY ring 2 has not finished its customs settlement yet. This presents another problem to the CY ring 2, as they may have a limited inspection area and equipment as well as a further problem for importers who have to pay container transfer costs from CY ring 1 (terminal operator owned) to CY ring 2 (non-terminal operator company owned). This situation adds a logistics cost as well as prolonging the dwelling time. Another problem is a matter of government jurisdiction in the port area where terminal operator CY1 are mostly state-owned enterprises (Pelindo/ SOE owned) whilst CY2 business are privately owned. Currently, the regulation and ICT enforcement to monitor container movement on private entities remains an issue that has not been addressed by the government. The delay that problem settlement causes is inefficiency in container movement, and this may increase the overall dwelling time (World Bank, 2015a).

2.4. Summary

Indonesia has emerged as the biggest economy in South-East Asia; however, Indonesia recorded a low performance in its logistics index. This chapter has outlined the development of the container terminal industry in order to understand the factors that contribute to the industry's development. To understand the complexity and the challenges faced by the industry, the supply chain and organisational ownership structures were presented. In addition, this chapter described the company profile sample in this research. Finally, this chapter also reviewed the hindrances for Indonesian container ports in order to understand the current situation in the industry and areas for potential future research. Most hindrances are caused by lack of lean integration practices, deficiency of stakeholder relationship management and information sharing, bureaucracy, and ICT implementation inefficiency, all of which lead to a bottleneck inflow of goods and documents.

In relation to the overall objective of the study, the comprehensive background is relevant to understand how the government support will facilitate the container terminal with resources to improve the terminal service performance. The government controls almost every port area and its operations except on a few private ports owned by State-Owned Enterprises. The literature review in Chapter 3 will present the theories underpinning this research, in addition to developing the study's conceptual framework.

Chapter 3

Literature Review

Research Framework and Hypotheses Development

3.1. Introduction

In the previous chapter, this thesis offered a detailed description of container terminals within the context of the Indonesian port. Some of the key challenges raised were modernisation delay, capacity shortages, high logistics cost and dwelling time issues. This chapter discusses the theoretical foundation of the research framework used in this study. The chapter is organised into three main sections. Section 3.2 discusses the relevant theories underpinning this research. Section 3.3 reviews state-of-the art literature, and section 3.4 outlines the research framework and hypotheses development. Finally, section 3.5 summarizes the chapter.

3.2. Theoretical foundation

3.2.1. Relevant theories and justification

Studies in logistics and supply chain management mostly use equivalent theories and may vary in application (Touboulic & Walker, 2015). The theories most appropriate for this research, inter alia, are Resource-Based View (RBV), Resource Dependence Theory (RDT), Stakeholder theory and Institutional theory (Touboulic & Walker, 2015). The following discussion provides a brief explanation of all theories and argues for RBV as the most appropriate theory to underpin this research.

Logically, RDT leads to an understanding of the underlying resources within a firm. RDT suggests that resources, which are hard to acquire, can come through partnership with external firms and also from functional areas internal to the firm (Yang & Lirn, 2017). However, resource acquisition through interfirm relationships (i.e., shipping carriers, shipping agencies, ocean freight forwarders) and intrafirm negotiation is beyond the scope of this research. As discussed above, the thesis focuses on government support in relation to how it can assist infrastructure, equipment and ICT development and associated policies. Stakeholder theory states that external entities may influence a firm's decision regardless of the relationship between the firm and the entities/stakeholders (e.g., regulators, communities, employees) (Miles, 2012). As this study is confined to container terminal operations, stakeholder participation is not considered as part of the research framework.

On the other hand, the institutional theory emphasizes that organizations sharing the similar environment engage same identical procedures and, thus, develop isomorphic behavior with one another (Hoskisson et al., 2000). Opportunities as well constraints can be derived from institutional settings like cultures, norms, and regulations. Further, adapting to the institutional environments is regarded to be essential for organizational triumph and endurance (Kostova & Roth, 2002). Institutional theory argues that external entities such as regulatory bodies, customers, competitors and social activists put pressure on firms to become similar to one another. For example, firms adopt could technologies (Shee, Miah, Fairfield, & Pujawan, 2018), adopt environmental practices (Yang, 2018; Zhu, Sarkis, & Lai, 2013) and adoption of financial EDI (Teo, Kee Wei, & Benbasat, 2003). Stakeholder theory states that external entities may influence a firm's decision regardless of the relationship between the firm and the entities/stakeholders (e.g., regulators, communities, employees) (Miles, 2012). As this study is confined to container terminal operations, stakeholder participation is not considered as part of the research framework.

The RBV emphasises firm-specific resources, where a set of tangible and intangible resources are bundled for the firm to outperform other firms (Yang & Lirn, 2017). In RBV, firm resources are elements that firms can utilize to apprehend and execute their strategies (Cho & Ha, 2009). RBV theory, from a strategic management perspective, has important components like resources and capability. Amit and Schoemaker (1993, p. 35) define resources (e.g., plant, equipment, container yard, IT infrastructure, management know-how and skills) as *"stocks of available factors"* in a firm; and also define capability as a firm's capacity to combine, develop and deploy resources. Grant (1991) asserts that capabilities are what a firm can do, using bundled resources. Further, Day (1994, p. 38) defines capabilities as *"complex bundles of skills and accumulated knowledge, exercised through organisational processes, which enable firms to coordinate activities and make use of their assets"*. The definition provided by Day (1994), incorporates the resources, capabilities and processes in an organisational setting. Because resources are viewed as limited, rare and invaluable, organisations organise resources that are predominantly guided by selective capabilities and competencies. While resources are easy to understand, it is imperative to link them with capabilities and processes in delivering performance. Amit and Schoemaker (1993, p. 35) define business processes as a means to *"effect a desired end"*, while Ray et al. (2004, p. 24) define them as accomplishing *"some business purpose or objective"*. Therefore, resources are meant to be inputs into systems; capabilities are the specific ability to perform a task through processes; and processes convert the resources into meaningful outputs. Day (1994) posits that capabilities and resources complement each other where capabilities (i.e., technology) enable activities in a business process. Thus, business processes are routine with activities to get the work accomplished and deliver a result to customers (Paixão & Marlow, 2003). The study introduces a notion of common resources where the right processes can exploit its potential for desired performance. The resources, that this study argues, can also be a common, basic and valuable type which is rarely investigated so far. Although common resources are easily imitable, arguably they can be a source of competitive parity (if not an advantage) when bundled with other pre-existing resources. The focus is to organize the common resources for the port which is facing challenges while it comes to day to day operations. The resources remain a concern for the port. The other two theories assume as if the port has no issues with the resources which is not true. The RBV therefore can provide a theoretical foundation for this study. It has been performed in logistics investigations to study the effect of service capability on firm performance (Lai, 2004; Shang & Marlow, 2005; Yang et al., 2009). Further, Yang et al. (2009) found a positive relationship between resources, capability and performance in the context of the container shipping firm using RBV theory. This study investigates the relationship between resources, processes and performance within container terminals.

3.2.2. Resource Based View (RBV) Theory

This section elaborates more on resource-based view (RBV). RBV, initiated by Wernerfelt (1984), asserts that a firm can develop competitive advantage by deploying rare, valuable and inimitable resources (Barney, 1991). The firm can perform better than its competitors through unique and firm specific resources that others cannot imitate and substitute (Amit & Schoemaker, 1993; Barney, 1991). While these resources are treated as core elements of RBV (Yang et al., 2009), they are the likely inputs in routine processes within the firm (Grant, 1991). The container terminal within the port uses physical resources as tangible assets (Burns, 2015), such as channels, exit gates, container yard and forklifts (Bichou, 2013; Wanke & Barros, 2015), cranes (Cullinane & Wang, 2007a), labor, tugboats (Tongzon, 2001) and warehousing (Nguyen et al., 2015) as well as facilities and hinterland (Wang, Jung, Yeo, & Chou, 2014). There are also intangible resources; for example, organizational culture (Barney, 1991, 1996), value-adding activities (Burns, 2015; Lai, 2004), knowledge, information and capabilities (Pak et al., 2015) that play a critical role in container operations. Carmeli and Tishler (2004) assert that organizational resources and capabilities (i.e., perceived organizational reputation, organizational culture and communication, and managerial skills) significantly enhance firm performance.

The literature shows that RBV, as a theoretical foundation, is employed in logistics studies to examine the effect of service capability on firm performance (Lai, 2004; Shang & Marlow, 2005; Yang et al., 2009). Using RBV theory, Yang et al. (2009) find a positive relationship between resources, capability and performance in the context of a container shipping firm. In this study, the service capability is replaced with business (logistics) processes involving interaction of tangible resources such as plant, equipment and technologies; and intangible resources such as knowledge, relationship network, reputation and connectivity in performance delivery (Chapman, Soosay, & Kandampully, 2003). In doing so, the thesis argues that resources act as the driver of organizational capability (Yang et al., 2009). From an RBV theory perspective, adequate resources as inputs can enhance container terminal processes to streamline the flow of containers that results in service delivery. The importance of resources allocation and adequacy are also demonstrated in port selection studies. Chang, Lee, and Tongzon (2008) propose that local cargo volume; terminal handling charge; berth availability; port location; transshipment volume and feeder network is crucial for shipping liners, and supported by the study from Hsu, Huang, Tseng, and Li (2020) shows that cargo volume is more important than port charge. On the contrary, Wang and Yeo (2019) favors cost, availability of space allocation, and connectivity as important factors for port selection. All in all, the sufficiency of terminal resources is crucial for port operations.

The RBV theory therefore is found to be useful to examine the relationship between resources, processes and performance in many ways. First, RBV explains how terminal operators select and allocate resources while investing in infrastructure, equipment and even recruitment of human resources (Casaca, 2005). Second, RBV defines the resource allocation for effective throughput of containers in logistics processes while achieving optimum performance (Casaca, 2005; Talley & Ng, 2016). The terminal process may experience a likely bottleneck in the absence of such resources. Further, earlier research in the maritime context has used RBV in a limited way to explain port competitiveness (Cho & Kim, 2015; Gordon et al., 2005).

Therefore, this study relies on these two theories, RBV and institutional theory, as the theoretical foundations to provide comprehensive explanations of the relationship between resources, processes and performance in the container terminal context.

3.2.3. Conceptualising the Resources, Processes and Performance (RPP) relationship gap

The input-process-output model, a simple and powerful concept, is applied in this research where three constructs, namely resources, process and performance (RPP), are conceptualized through a linear relationship. This concept is the first of its kind and adopted in this research. Resources are the inputs that with the help of appropriate processes deliver tangible outputs. Resources are both tangible (i.e., land/ labour/ equipment) and intangible (i.e., services) (Kamasak, 2017; Pak et al., 2015). Tangible resources are, for example, marine plant, material handling equipment, information equipment, containers, warehouses, cranes, quayside and yard gantries, land, buildings, berth length, hinterland road connectivity (Wu & Goh, 2010) and human resources creating the knowledge (Blome, Schoenherr, & Eckstein, 2014). Intangibles are, for example, culture and relationship, corporate image and reputation (Hafeez, Zhang, & Malak, 2002), logistics information, and knowledge and expertise to deal with challenges and complexities (Yang & Lirn, 2017). While resources are mostly static in nature, it is the process that integrates and reconfigures these resources to accomplish and deliver outputs (Arend, Patel, & Park, 2014). This ultimately accounts for variation in performance.

The competitive advantage arises from resource synergies, where a bundle of resources interacts through an efficient process (Yang et al., 2009). This implies that resources are the inputs to the process. When a firm (i.e., container terminal) devises a new process as a strategic move, it consumes these resources that others are unable to acquire, thus giving the firm a competitive edge. Therefore, competitive advantage lies in the wise deployment of resources through selected capabilities and is not simply based on their accumulation. For example, some firms may find it easier to invest in information and communication technologies (ICT) than other firms; they may therefore gain the competitive advantage easily in the market. However, competitive advantage can be achieved by utilization of ICT in combination with other resources (Bharadwaj, 2000; Liang, You, & Liu, 2010), such as managerial IT skills and service environment (Ray et al., 2004), so that other firms cannot easily copy. Zardini, Rossignoli, and Ricciardi (2016) support the view that better collaboration of ICT with other functions will enhance the competitive advantage. A finding of Kamasak (2017) is that intangible resources are likely to contribute more to firm performance than tangible resources. Further, Arend et al. (2014) claim that knowledge is an important intangible resource significantly correlated to a firm's return on assets (ROA). It is argued, therefore, that resources are not necessarily rare, valuable and inimitable, as inherently embedded in RBV theory, but they can be conventional ones that can be bundled up judiciously with other available resources to create a unique capability and generate a competitive advantage that others cannot imitate.

The logistics process, as defined for this study, is the logical way of scheduling routine operations, sequentially or concurrently, and accomplishing them in cost efficient means for effective throughput of goods and services within specified rules and regulations. It is the coordinated process of the flow of goods, documents and information internally within a firm and externally with suppliers and customers (Braziotis et al., 2013; Melnyk, Lummus, Vokurka, Burns, & Sandor, 2009). The integrated logistics process delivers value-added goods and/or services to customers. This study considers logistics services/activities internal to container terminals engaged in the import of goods. These activities broadly cover cargo storage and consolidation facilities, packing and documentation, customs clearance, cargo tracing and tracking, loss/damage claim, delayed delivery, information and transportation services, and customer services from unloading at the berth to the landside exit gate (Lu, 2003; Lu, 2007). These activities are not necessarily performed independently but passed through in-terminal processes where they interact with each other resulting in value-added services (e.g., sorting, consolidation, custom clearance).

Further, terminal operators provide services like container handling from the ship's berth to the exit gate where it accounts for around 80% of the cost of stacking and unstacking containers (Tovar et al., 2004). These services pass through processes that involve various operators who are required to strictly observe customs procedures. These operators add value through process integration of logistics functions/activities rather than relying solely on individual operations (Jacobs & Hall, 2007). Taken from the marketing field, Grönroos (1990) defines service processes as intangible activities such as the interaction of client, facility supplier and service provider. In the context of container terminals, the client is the service user (e.g., ocean freight forwarder, shipping carrier, shipping agency), and the facility supplier and service provider is the terminal operator that provides cargo handling facilities and equipment. The services offered by terminal operators are numerous, ranging from berthing services, container stacking yards, cranes and vehicles (Burns, 2015). Therefore, resource adequacy to perform optimum service provision to customers is essential. In this context, the terminal logistics process plays an important role, accounting for all procedures, routines and activities to process inputs to deliver service outputs with optimum performance and develop value-added enrichment services for customers (Paixão & Marlow, 2003).

From the RBV perspective, strategic resources and capabilities can help improve performance (Barney, 1991; Peng, Wang, & Jiang, 2008; Ray et al., 2004). Both tangible and intangible resources are bundled up to create service capabilities for competitive advantage (Yang & Lirn, 2017). Further, tangible (Huang, Ou, Chen, & Lin, 2006; Wu, Yeniyurt, Kim, & Cavusgil, 2006) and intangible (Carmeli & Tishler, 2004) resources are positively associated with performance. Kamasak (2017) found that intangible resources (e.g., brand name, service and customer reputation, patents and copyrights) contribute more to firm performance than tangible resources (e.g., raw materials, physical infrastructure, equipment, land and cash). While earlier studies established the capability-performance relationship, that is, the ability to combine resources using organizational processes (Fainshmidt, Pezeshkan, Lance Frazier, Nair, & Markowski, 2016; Yang et al., 2009). and Fainshmidt et al. (2016) argue that intangibles (i.e., branding and corporate image) are the outcome of managerial action and skills. This study therefore uses only tangible resources (e.g., infrastructure, equipment and material handling equipment) as inputs in logistics processes within the container terminal. While resources and capability have a positive relationship with performance (Yang et al., 2009), this research argues that capability development is always supported and backed up by processes. All these resources are combined to create capabilities. Therefore, efficient logistics processes, not capabilities, are perceived to have a positive effect on performance. In other words, the overall performance of a container terminal relies on the net effect of terminal processes (Ray et al., 2004). However, Yeo et al. (2015) found that resources and processes had no significant relationship with port customer satisfaction.

This study therefore conceptualizes a relationship between resources, processes and performance (RPP) in the context of container terminal logistics. The literature, to the best of my knowledge, has shown no evidence of any author(s) who used this earlier. However, a similar relationship has been spotted but it is between resources, capability and performance. Thus, this research differentiates capability from logistics processes and the claims that efficient logistics processes can drive logistics service performance. Therefore, this study fills a gap in the literature by reassessing the relationship between resources utilized in logistics processes, and thereby resulting in service provision performance in the context of container terminal operators. The following sections review the literature in order to review each variable used to measure the abovementioned constructs.

3.3. Literature review

This study differentiates government support and firm resources. Government support here is defined as all policies and incentives received by terminal operators from any government agencies in terms of port development while firm resources is defined as all available resources owned by the terminal operators allocated to perform container handling operations and service provision. In this regard government support has two functions: 1) a supportive policy provider that favours port operations and development; and 2) terminal operator's stakeholder where government maintains its majority ownership to safeguard its supremacy in strategic direction. The following sections elaborate the importance of these two important container terminal resources.

3.3.1. Government support

Much literature discusses the importance of government support in port development, where governments have three main roles in port: catalytic (e.g., generate regulatory aiding setting and public transportation financing), statutory (e.g., regulate coastal management and navigation safety) and facilitator (e.g., trade facilitation) (Juhel, 2001). All these roles are mainly supportive in terms of port development and operations.

In this context, the policies developed by the government supports resource allocation to enhance firms' performance (Lazzarini, 2015). The link between industrial policy and firm's competitive advantage through resources (Lazzarini, 2015) favours government support as the source of resources. Firms must be aware of this governmental support as a source of competitive advantage (Hall & Soskice, 2001; Landau et al., 2016).

Especially in the heavily regulated container terminal industry, institutional support helps in resource accretion to ensure firm performance (Hoskisson et al., 2000). As port is considered as a national asset (Lee & Flynn, 2011), government tends to provide location-based resources (Dunning, 2000) such as land, ICT, warehousing and road networks, human, financial and social capital, as well as ownership via privatization policy (Choi & Lim, 2016; Dunning & Lundan, 2008; Xu & Meyer, 2013). Furthermore, government supports the firms to create unique resources via interaction with its institutional environment (Martin, 2014). Further, government encourages private firms to participate in port operation where they spend on firm-specific assets. Therefore, government support and terminal operator firms are two sources of resources in this study.

Supportive government policies are regarded as part of port resources along with investment, efficient management, ICT, adequate infrastructure and hinterland to achieve sustainable advantage (Gordon et al., 2005). Government support is important to assist in the development of port infrastructure that leads to enhancement of logistics performance and economic growth (Munim & Schramm, 2018). For example, a major component of port development is the cost of land. The government can advocate, providing favorable land pricing and distribution, and stipulate preferential treatment to ensure the development of new facilities and terminals with minimum financial difficulties (Lee & Flynn, 2011; Ng & Gujar, 2009). Due to the role of central ownership (with latter private investment assistance), the supremacy of the pricing strategy, subsidies and policy maker as port development agent, government support is viewed as financial resources in supporting port investment and development, especially in Asian region (Lee & Flynn, 2011). Further, government policy and investment in hinterland road toll and port access is vital to support port efficiency and competitiveness (De Borger & De Bruyne, 2011; de Langen & Chouly, 2004; Lee & Flynn, 2011). The role of government is thus vital when it comes to port regulation and policy decision making in increasing port efficiency as it determines economic development and competitiveness (Munim & Schramm, 2018; Pagano et al., 2013; Wu, Li, Shi, & Yang, 2016; Yuen et al., 2013). Government policy is deemed to influence port's performance via the policy of private firms' incorporation as strategic port operators, including encouraging private entities to invest in transport infrastructure (Bouchartat et al., 2011; Yuen et al., 2013). Additionally, as seaports are considered essential resources and act as national security, most port assets, access and infrastructure are owned by government to prevent the risk of private entities monopolization (Lee & Flynn, 2011). In this regard, government support plays important function as container port resources in terms of financial provider for infrastructure and hinterland access development. Government also play role as container terminal's stakeholder where Government also maintains majority ownership in strategic and profitable container terminals and also opens ownership access to private entities via its privatization policy (Czerny et al., 2014; Hamzah, Adisasmita, Harianto, & Pallu, 2014; Pagano et al., 2013; Venkita Subramanian & Thill, 2019; Wang, Knox, & Lee, 2013; Wang et al., 2018; Wanke & Barros, 2015; Yeo, 2015). Therefore, government support is predicted to have contributions in firm resources' procurements, allocation, operations and development.

In regard to the port supply chain, facilities and equipment are primarily managed by the port authority, terminal operators or inland logistics corporations. These operators provide numerous services ranging from berthing arrangements, container stacking yards, cranes and vehicles (Burns, 2015). Government makes a financial contribution to the improvement of terminal performance (E. Park et al., 2016) and operations (Ng & Gujar, 2009), and is further associated with incentives, policies and regulations in regard to the container terminal industry. Therefore, government support is a new dimension to be investigated in this study.

An example of another possible regulatory role of government is in Korean ports where the government launched an export-oriented industrialization policy in the 1960s that included investment in the maritime infrastructure for port developments (Lee, 1996; Song & Lee, 2007).

Further, several studies in China have demonstrated that the government has a vital role in shaping investment and policies in China's container port development (Cullinane, Cullinane, et al., 2005; Cullinane & Wang, 2007b; Shen & Lee, 2002a, 2002b; Yuen et al., 2013). China's economic and political liberalization has varied from shipping policies, joint-venture investment in terminal constructions, port charges, cabotage restrictions, as well as privatization and commercialization policies. The promulgated Chinese open-door policies brought international market and foreign direct investment (FDI) which in turn advanced China's shipping and logistics sectors (Panayides, 2002).

The significant role of government is further demonstrated in the following examples. The development of berths, infrastructure, superstructure, and hinterlands in major container ports in Korea is largely constructed by Korean port authorities (Yeo, Roe, & Dinwoodie, 2008). A parallel set of circumstances is also found in the Port of Tanjung Pelepas (PTP) where the Malaysian Government is committed to supporting PTP's development by financing infrastructure, loans, land reclamation and providing concession policies (Leong, 2007). Moreover, Tongzon (2005, 2007) noted that proactive government intervention in effective implementation of seaport policies and infrastructure development assisted the Port of Singapore to be a successful trans-shipment hub. Privatization or ownership restructuring as public policy has been introduced globally to increase port competition and efficiency , including in the Asian region (Leong, 2007; Tongzon, 2007; Yuen et al., 2013). Further, countries in the ASEAN region, who have adopted port corporatization since the 1990s, such as Singapore and Malaysia, have benefited from trans-shipment hubs (Leong, 2007; Tongzon, 2005, 2007). However, Indonesia still lags behind on this front, and therefore government support is compulsory to confirm the development of Indonesian ports into a global competitive business (Jansen, van Tulder, & Afrianto, 2018). These studies demonstrated that government's influence in public policy supports the container port industry in terms of economic and political direction. In other words, privatization is an act of public policy to increase economic and political benefits. Especially in Asian countries, the central government has multi-dimensional roles in driving the development of container ports (Lee & Flynn, 2011). Nonetheless, research on government support in Indonesian port development is lacking and needs further attention to understand how such support influences the interaction between firm resources allocation, terminal logistics processes utilization and service performance output, to keep the terminal operations competitive.

As discussed in Chapter 2, the involvement of government in the Indonesian port business environment is influential in relation to establishing regulations on port ownership and privatization, enforcing shipping and port laws, regulating shipping routes and ownership of shipping firms, forwarder and other port related business entities, investing in port infrastructure and superstructure, arranging and developing port hinterland connectivity via highway and road constructions, and supporting the establishment of educational institutions in maritime and shipping areas. Therefore, several measurement items are adapted from previous studies to capture the extent of government's role in the Indonesian terminal container environment. Table 3.1 outlines dimensions of government support as well as selected resources.

Table 3.1: Government support dimensions and selected sources

Attributes	Operational Definition	Adapted from
Govt. support in tolls and roads	Provision of government on support, incentives, policy and regulation in tolls and road network development	Cai, Jun, and Yang (2010); Gordon et al. (2005); Maskey, Fei, and Nguyen (2018); Tetther and Ferreira (2004); UNCTAD (1998); Wang (2018)
Govt. support in implementation of container transportation best practice	Provision of government on support, incentives, policy and regulation in identifying and implementing best practice in container transportation	
Govt. support in implementation of container transportation ICT (information and communication technologies)	Provision of government on support, incentives, policy and regulation in container transportation ICT (e-Gate, tracking system, RFID, etc.)	
Govt. support in the logistics education system	Provision of government on support, incentives, policy and regulation in logistics education system	
Govt. support in financial support to build new container facilities	Provision of government on support, incentives, policy and regulation in financial support to build new container facilities	
Govt. support in container logistics warehousing and storage	Provision of government on support, incentives, policy and regulation in container logistics warehousing and storage	
Govt. support in expediting import container logistics flow	Provision of government on support, incentives, policy and regulation to expedite import container logistics flow	

Governmental organizations is vital to support the effectiveness global supply chains (Koberg & Longoni, 2019), especially in their enforcement in laws that provide stable and reliable conditions for business operations, establish collaborative relationships with institutional partners, and supporting the development of information technology (Landau et al., 2016; Lazzarini, 2015; Martin, 2014; Maskey et al., 2018). As market alone is unable to cater sufficient incentives for knowledge development, therefore, government involvement is important to enhance technology and innovation (Wang, 2018). Further, government ownership in a company contributes to long-term survival of a company, and thus, protecting the other investor's wealth (Ting, Kweh, Lean, & Juan, 2018). Government support also assists firms to deal with dynamic endogeneity, external heterogeneity and unobservable factors, and in the end, contributes positively to financial performance (Nguyen, Van, Bartolacci, & Tran, 2018). All in all, resources in the context of Indonesian container parks appear inadequate for the smooth flow of goods, documents and information within the terminal. Subsequently, the container movement within the terminal area causes congestion partly due to resources constraint. Therefore, government intervention and support are perceived to have a significant effect on terminal resources. The argument is consistent with the earlier study by Lee and Flynn (2011) who argue that cross-subsidization, and strategic and administered port pricing mechanisms can help port development, maritime infrastructure development and landside connections to the container port.

3.3.2. Firm resources

The role of the port in trade and economic development is well researched in the literature, including the study of port-city development (Fan, Wilson, & Tolliver, 2009; Merk, 2013; Merk & Comtois, 2012; Merk & Notteboom, 2013; Pallis & Vaggelas, 2005); the port as economic infrastructure and catalyst (Lee & Lee, 2016); the port as a trade facilitator and hub in the global supply chain (Cullinane & Song, 2002); and the port as a determinant of logistics cost, efficiency and competitiveness (Kunaka et al., 2013; Lam, 2016; Leong, 2007; Manuj & Mentzer, 2008; Ryoo & Hur, 2007; Thai & Grewal, 2005; Tongzon, 2005, 2007; Tongzon & Heng, 2005; Wang & Oliver, 2007a, 2007b).

As the port manages the abovementioned functions, it requires adequate resources to facilitate trade operations efficiently (De Monie, 1987; Tongzon & Heng, 2005). Resource adequacy was found to significantly influence logistics performance via logistics service capability as mediator (Yang et al., 2009; Yang & Lirn, 2017). Further, Wu and Goh (2010) suggest labour, land, capital, equipment and infrastructure as port resources. In the context of a container terminal, such resource inputs are processed at a certain level of service provision. The level of resources employed to operate the port defines the level of service performance (Talley & Ng, 2016). The services offered by terminal operators are numerous, ranging from berthing, container stacking yards, cranes and vehicles (Burns, 2015). Consequently, adequate resources are required for the terminal to provide optimum service performance.

Reviewing existing port performance frontier studies, common variables used as container terminal resources include land, labor, cranes and other tangible features listed in Table 3.2.

Table 3.2: Common resource input variables in port frontier studies

Authors	Common Resources Inputs	Sampling	Methodology
Chang et al. (2013)	Number of employed labor; amount of fixed capital investment; volume of energy consumed	China’s transportation sector in 2010	DEA
Chang (2013)	Number of labor employed; length of quay; area of terminal; energy consumed (ton of equivalent)	23 Korean ports in 2010	DEA
Schøyen and Odeck (2013)	Berth length; terminal area; yard gantry cranes; straddle carriers	24 container ports in Norway, Nordic countries and UK from 2002 to 2008	DEA
Bichou (2013)	Terminal area; max draft; total quay length; STS crane index; yard stacking index; number of trucks and vehicles; number of gates	60 container terminals from 2004 to 2010	DEA

Authors	Common Resources Inputs	Sampling	Methodology
Chang, Park, Jeong, and Lee (2014)	Available ton kilometers with fuel consumption; number of employees; available seat kilometers	27 global airlines in 2010	DEA
Wanke and Barros (2015)	Quay length; max quay depth; number of berths; warehousing area; yard area; channel width; channel depth	27 Brazilian ports in 2011	PCA -DEA
Zheng and Park (2016)	Berth length; yard area; number of quay cranes; number of yard cranes	1 Korean port and 8 Chinese ports	DEA
Nguyen et al. (2015)	Berth length; terminal areas; warehouse capacity; cargo handling equipment; capacity of information and communication technology (ICT)	43 largest Vietnamese ports	DEA
Cheon, Maltz, and Dooley (2017)	Berth length; crane ton	10 US ports	DEA
Sun et al. (2017)	Number of staffs; operational costs; fixed assets	17 Chinese port enterprises	DEA
Kutin, Nguyen, and Vallée (2017)	Maximum depth at berth; size of container yard; length of quays; no of quay cranes; no of rubber-tired gantry (RTG); no of yard cranes (rail-mounted gantry (RMG), straddle carrier (SC) and RTG); No of forklift truck (FT); No of trucks	50 ASEAN container ports and terminals	DEA
Chen and Lam (2018)	Terminal area; berth length; number of quay crane; land area; energy consumption; labor; container throughput	20 world container ports	DEA
Tovar and Wall (2019)	Labor; intermediate consumption expenditures; capital assets; deposit surface area	26 Spanish port authorities	DEA

The resources listed in Table 3.2 have been adapted in this study as tangible firm resources and can be classified into three main categories: terminal personnel, terminal equipment, and infrastructure and hinterland. These tangible resources are conventional resources that can be found in many container terminals and thus it may only serve as a basis for competitive equivalence (Ray et al., 2004). Despite these tangible resource categories being commonly found in container terminal operations, intangible resources are vital for a firm to execute a logistics process.

Earlier studies mostly highlight the measurement unit in cargo units (tangible) rather than service units (intangible) (Talley & Ng, 2016); therefore, the current research attempts and highlights the nature of intangible characteristics of firm resources as the measurement unit. Bundled together, tangible and intangible resources with efficient and effective logistics processes may result in a firm’s competitive advantage (Ray et al., 2004). Hence, the following sections attempt to further describe the intangible characteristics of each tangible resource mentioned above in more detail.

3.3.2.1. Terminal personnel

Management literature has reviewed human resource management as a means to achieving positive turnover, higher labour productivity and improved financial performance (Buchari & Basri, 2015; Huselid, 1995; Ichniowski, Shaw, & Prennushi, 1987; Katou, 2017) as well as competitive advantage (Dappe & Suárez-Alemán, 2016; Methot, Rosado-Solomon, & Allen, 2018; Prajogo, Oke, & Olhager, 2016; Schuler & Jackson, 1987). The human element is an important resource in modern port management; however, it has been overlooked during globalization and technological innovation (Burns, 2015).

The firm's core competencies are a mixture of resources and capabilities that act as the basis for competitive advantage over its competitors (Hitt, Ireland, & Hoskisson, 2005) contributed by the human capital factor (Thai, Yeo, & Pak, 2016). In the port context, the human resource dimension is frequently associated with adequate labour quantity and used to measure container terminal operations performance (Chang & Tovar, 2014; Chang, 2013; Chang et al., 2013; Tongzon, 2001; UNCTAD, 1976). Port human capital competencies such as integrity, and port operational and management capability need to be developed further to convert the port into an effective supply chain collaborator (Thai, 2012; Thai et al., 2016). In this respect, personnel quantity, integrity and capability are highlighted as pivotal features of terminal personnel.

Further, as container terminal operations involve complex tasks, personnel should be able to work individually or in a team to achieve streamlined logistics flow (Burns, 2015). Reliability to complete a given task is vital in this regard. Additionally, it is found that skilled workers increase firm efficiency (DEEWR, 2012; ILO, 2011) and forward-thinking and problem-solving workers contribute to a firm's competitive edge (Burns, 2015). Therefore, specialized skills and competencies in port and logistics sectors are crucial for port personnel.

Based on the preceding features, the conceptualization of terminal personnel dimension converges into five sub-categories: number of personnel, capability, competencies, reliability and integrity. These features are listed in Table 3.3 with their references.

Table 3.3: Terminal personnel and attributes

Terminal Personnel Dimension		
Attributes	**Operational Definition**	**Adapted from**
Number of personnel	Number of personnel worked in terminal operation	Chang and Tovar (2014); Chang (2013); Chang et al. (2013)
Capability in its functional position	Operational capability of personnel worked in terminal operation	Burns (2015), Thai et al. (2016)
Specialized port and logistics competencies	Specific competencies of personnel worked in terminal operation	Suwandi, Wibowo, and Rusdi (2017); Thai (2012); Pak et al. (2015); , Burns (2015)
Reliability to complete task	Reliability of personnel worked in terminal operation	Thai (2012), Burns (2015)
Integrity	Integrity of personnel worked in terminal operation	Thai (2012); Thai et al. (2016)

3.3.2.2. Terminal equipment

Container terminal firms use specific cargo handling equipment such as top handlers, yard tractors, rubber-tired gantry cranes (RTG), forklifts, side picks, man lifts, trucks, sweepers, rail pushers and reach stackers (Burns, 2015). Many preceding studies have used this equipment feature as a measure of port performance. Table 3.4 provides a list of most equipment used in cargo handling within the container port and its utilization in the previous literature.

Table 3.4: Number of equipment variables and selected sources

Equipment	Operational Definition	Adapted from
Number of STS/RTG cranes	Number of gantry cranes to move container from ship to shore	Bichou (2013)
Number of yard cranes	Number of cranes to stack containers or move container from yard to trucks	Schøyen and Odeck (2013)
Number of straddle carriers	Number of straddle carriers located on terminal	Schøyen and Odeck (2013)
Number of forklifts	Number of forklifts located on terminal	Bichou (2013), Schøyen and Odeck (2013)
Warehousing area	Warehouse area in square kilometres	Nguyen et al. (2015), Wanke and Barros (2015)

In the earlier studies, container handling equipment is considered and measured as a tangible resource. Conversely, this study examines intangible characteristics of equipment. Bundled together, tangible and intangible resources executed with efficient and effective logistics processes may result in a firm's competitive advantage (Ray et al., 2004). Hence, the following sections attempt to further describe intangible characteristics of terminal equipment. From the above literature, it is clear that specific equipment is required in container handling operations; therefore, the adequacy of equipment employed in terminal operation is essential (Burns, 2015). Subsequently, adapting the Total Productive Maintenance (TPM) concept, intangible characteristics of equipment are drawn. By inhibiting equipment malfunctioning via maintenance and refining equipment quality and standardization, equipment reliability and quality of outcomes increases (Ahuja, 2011; Ahuja & Khamba, 2008; Ahuja & Kumar, 2009; Andersson, Manfredsson, & Lantz, 2015; Pascal, Toufik, Manuel, Florent, & Frédéric, 2019). To commence an operation, equipment must be available, ready to start the task (readiness) and durable to accomplish the task (reliability) (Zhang, Mei, & Xu, 2008). Equipment maintenance is essential to prolong equipment lifecycle and optimise equipment utilization with minimal breakdown and reduces up to 40% of the production non-value-adding time (Ahuja & Khamba, 2008; Andersson et al., 2015)

Subsequently, the quality characteristics of terminal equipment are further developed and adapted for quantity, readiness, reliability, modernization and maintenance (see Table 3.5 below).

Table 3.5: Terminal equipment dimensions and attributes

Terminal Equipment Dimension		
Attributes	**Operational Definition**	**Adapted from**
Quantity of equipment	Sufficiency of equipment employed in terminal operation	Bichou (2013), Schøyen and Odeck (2013), Nguyen et al. (2015), Wanke and Barros (2015)
Equipment Readiness	Equipment readiness and promptness to be utilized in terminal operation	Ma (2017); Wang (2017), Hijji, Iqbal, Amin, and Harrop (2016)
Equipment Reliability	Equipment reliability in terminal operation	Devadasan, Sivakumar, Murugesh, and Shalij (2012), Modrák (2014), Díaz-Reza et al. (2018)
Equipment Modernization	Equipment modernization to increase efficiency in terminal operation	Devadasan et al. (2012), Burns (2015)
Equipment Maintenance	Regular equipment maintenance to increase efficiency in terminal operation	Pascal et al. (2019); Shinde and Prasad (2017)

3.3.2.3. Infrastructure and hinterland

The majority of port commodities are manufactured or utilized in the hinterland. Consequently, good infrastructure is essential to ensure seamless port–hinterland transportation to serve businesses and consumers, safeguarding port capacity and performance (Hou & Geerlings, 2016). Port and transportation infrastructure is essential for port efficiency and thus enhances logistics performance, and yields higher economic development and performance (Munim & Schramm, 2018; Yuen et al., 2013). The managerial efficiency and infrastructure quality of container ports are likely to accelerate exports and imports and they are frequently used as a means to gain market share and customers (Cho & Kim, 2015). Therefore, port infrastructure is crucial resource for container ports and has been used in much literature as an indicator of port competitiveness (WEF, 2018) (See Table 3.6).

Furthermore, port hinterland is commonly categorized as port resources as it provides a strategic value to port location and a source of competitive advantage (Almotairi, Flodén, Stefansson, & Woxenius, 2011; Chen et al., 2017; De Borger & De Bruyne, 2011; de Langen & Douma, 2010; de Langen & Chouly, 2004; Flitsch, 2012; Geweke & Busse, 2011; Hou & Geerlings, 2016; Iannone, 2012; Notteboom & Rodrigue, 2007; Rodrigue & Notteboom, 2009, 2010; Van den Berg & De Langen, 2011; Wanke, 2013). Generally, most seaports' performance studies exclusively emphasize and examine sea entrance variables; hinterland transportation to inland zone factors and stakeholders' interests within ports are overlooked (Bichou, 2006). Port hinterland facilitates consignees to trade with suppliers with its emphasis on expenses, accessibility and lead-time in goods distribution (Chen et al., 2017). Hence, port hinterland and its connectivity play a key role in goods movement from seaside to landside (Chen et al., 2017; Notteboom & Winkelmans, 2001; Robinson, 2002; Wang & Cullinane, 2016). And the quality of inbound and outbound hinterland transport systems is considered to contribute to port competitiveness (Gaur, Pundir, & Sharma, 2011; Geweke & Busse, 2011; Haezendonck & Notteboom, 2002; Wang & Cullinane, 2016; Yeo et al., 2008).

In sum, infrastructure and hinterland is proposed as the dimension of firm resources in this study. Based on earlier port performance studies, several tangible infrastructure and hinterland resources have been highlighted and depicted in Table 3.6 below.

Table 3.6: Port infrastructure and hinterland variables and selected sources

Attributes	Operational Definition	Adapted from
Channel depth	Vertical depth in metres for anchoring ship	Wanke and Barros (2015)
Channel length	Horizontal length in metres for anchoring ships	Chang (2013); Schøyen and Odeck (2013); Bichou (2013); Wanke and Barros (2015); Nguyen et al. (2015)
Channel width	Channel width for anchoring ships	Wanke and Barros (2015)
Number of gates	Number of gates in investigated terminal	Bichou (2013)
Terminal area	Terminal Area for container stacking in kilometre square metres	Schøyen and Odeck (2013), Bichou (2013), Wanke and Barros (2015)
Yard Occupancy Rate	(No. of container x Dwelling Time (Day) x 100%) / Effective stacking capacity (Ton)	Bichou (2013)
Cargo handling capacity	Gantry crane moves per hour	Park and De (2004)
Number of berths	Number of ship berths	Wanke (2013)
Berth Occupancy Rate	(Ship berth time x 365) / total ship number	Park, Yoon, and Park (2014)
Average berth time	Total berthing time / Total berthing number	Park et al. (2014)
Hinterland connectivity	Surrounding land area connectivity and accessibility to port	Wang et al. (2014), Lee, Wu, Suthiwartnarueput, Hu, and Rodjanapradied (2015)

The literature has often used terminal area as a variable covering land as well as the number of quayside gantries, yard gantries and straddle carriers plus the number of berths and total length of terminals as port infrastructure (Wu & Goh, 2010). Hence, container terminals need land area to stack containers, install equipment, build offices, warehouses and access roads, carry out container handling and relocation activities and to conduct other port services. Thus, the existence of terminal land area is vital. As most container terminal operators utilize land area for container stacking business activity, the attribute of container yard adequacy is preferred.

As mentioned above, the number of berths, Berth Occupancy Rate (BOR) and average berth time are frequently utilized as a measurement of port performance. Associated with resource-based logic, adequacy and availability of ship berth is important. Therefore, this study proposed berth adequacy as one of the dimension attributes. Further, as 80% of terminal operators' service provision is in container handling and stacking operations (Tovar et al., 2004), container handling operations capacity is also an attribute to represent the adequate capacity of infrastructure in container handling operations. Furthermore, as the end point of the arrival of ships and cargo operations within the terminal, the exit gate operational capacity plays a major role in preventing long queues and congestion within the terminal, as well as smooth goods outflow to the hinterland (Slack, 2007). Another important intangible feature of the container terminal is its ability to effectively connect sea and inland access and accommodate inflow and outflow of cargo between ships and inland transporters, whether via toll roads or railroads (Wanke, Barbastefano, & Hijjar, 2011; Wanke & Barros, 2015) . Subsequently, similar to other tangible resources, port infrastructure such as ship channels is required for maintenance and improvement, such as channel extension, dredging and facility upgrading (Bhaskaran, Mangalagiri, & Bonthu, 2014; Wayne K, 2007).

Based on the RBV assumption that adequacy of resources is essential for organizational operation and performance (Barney, 1996), the item's operational definition is based on sufficiency of infrastructure and hinterland attributes developed earlier. It involves the attributes of adequate berth and CY area, capacity of container handling and exit gate, connectivity between ship and inland transporter as well as channel maintenance. Subsequently, the attributes listed in Table 3.7 below were developed based on the intangible characteristics of port infrastructure and hinterland.

Table 3.7: Infrastructure and hinterland dimensions and attributes

Infrastructure and Hinterland Dimension		
Attributes	**Operational Definition**	**Adapted from**
Berth adequacy	The berth's adequacy and availability for ship's arrival	Park et al. (2014); Wanke (2013)
CY area adequacy	The adequacy and availability of container yard for container stacking	Bichou (2013); Schøyen and Odeck (2013); Wanke and Barros (2015)
Container handling operations capacity	Adequate infrastructure capacity to carry out container handling operations	Schøyen and Odeck (2013), Bichou (2013), Wanke and Barros (2015), Park and De (2004)
Container handling capacity operations in red lane area	Adequate infrastructure capacity to carry out container handling operations in the red lane area	Schøyen and Odeck (2013), Bichou (2013), Wanke and Barros (2015), Park and De (2004)
Exit gate operations capacity	Adequate infrastructure capacity to carry out seamless exit gate operations	Bichou (2013)
Connectivity for ship and inland transporter	Adequate infrastructure connectivity to accommodate the inflow and outflow access of goods to ship and inland transporters	Wang et al. (2014), P. T. W. Lee et al. (2015)
Channel's maintenance	Regular maintenance of channel depth/ length/ width by extension/ upgrading/ dredging	Chang (2013); Schøyen and Odeck (2013); Bichou (2013); Wanke and Barros (2015); Nguyen et al. (2015)

3.3.3. Terminal logistics processes

Terminal operators provide services in container handling from the ship's berth to the exit gate where they account for around 80% of the cost of stacking and unstacking containers (Tovar et al., 2004). This process involves various operators and customs procedures. Therefore, terminal operators are required to integrate the logistics functions to maximize their efficiency and add value rather than limiting themselves solely to location and individual operation (Jacobs & Hall, 2007).

Terminal logistics processes, or logistics processes as defined for this study, are the coordinated routine processes of flow of goods, documents and information intrafirm or interfirm with providers and consumers to convey value-added goods and/or services to consumers (Braziotis et al., 2013; Melnyk et al., 2009). Borrowed from the field of service marketing, processes regarded as an endeavour that encompasses the procedures, duties, timetables, mechanisms, and activities and routines by which services are presented to clients (Payne, 1993). Additionally, a process can be described as the form of action or combination of several actions that become input material to be processed and the result is adding value to a product that benefits consumers (Berry, 1999). Henceforth, the port operators' choice of process technique determines the cost-effectiveness of port operation (Paixão & Marlow, 2003).

This study considers logistics services/activities internal to container terminals engaged in import of goods, comprising cargo storage and consolidation facilities, packing and documentation, custom clearance, cargo tracing and tracking, loss/damage claims, delayed delivery, information and transportation services and customer services from unloading at berth to landside exit gate (Burns, 2015; Lu, 2003; Lu, 2007). Logistics processes are routinely completed jointly, via in-terminal processes where they interact, resulting in value-added services (e.g., sorting, consolidation, custom clearance). These services are essential to pass through lean processes to achieve optimum performance (Prajogo et al., 2016), involving various operators who add value through process integration of logistics undertakings rather than relying solely on individual operation (Jacobs & Hall, 2007; McCarthy-Byrne & Mentzer, 2011; Robinson, 2002). As most of the cargo handling facilities and equipment are managed by terminal operators or inland logistics corporations, a conflict of interest may arise along the container terminal supply chain causing delays in in-terminal processing. As mentioned in Chapter 1 (section 1.2), Rodrigue and Notteboom (2009, p. 167) describe this situation as *"bottleneck-derived terminalization"*. Congestion may arise from varying inadequate inland access infrastructure and government policy on port reforms (Haralambides & Veenstra, 1995), insufficient regulatory and customs settings and e-business networks (Wilson, Mann, & Otsuki, 2003). These factors contribute to inefficiency due to increasing transport as well logistics costs (Clark, Dollar, & Micco, 2004) in the terminal operations. Consistent with the concept of improved efficiency, any disruption in operations that causes delays and non-value adding processes should be eliminated. A reduction in lead time and trading costs and improvement in service quality advancement need to be included as output indicators (Lee, Nam, & Song, 2015). For that reason, the lean principles concept is applicable in diminishing waste in the terminal process.

Further, various cargo handling services are provided by assigning and employing limited resources as effectively as possible (Talley, Ng, & Marsillac, 2014) via logistics processes to reach optimum service outputs (Talley & Ng, 2016). Prajogo and Olhager (2012) highlights the importance of both information and material flow integration to firm's performance.

Simultaneously, supply chain integration involves hard and soft information exchange methods and require management mechanisms in terms of managing a long-term relationship between supply chain stakeholders (Prajogo & Olhager, 2012). Integration aspects deliver a streamlined supply chain where material and information flows are highly connected and provide high visibility across the chain which includes both internal and external processes. Such connectivity improves performance by eliminating process waste (occurrences of late or wrong actions) , thus, positively impacting competitive performance (Prajogo et al., 2016). Reflecting from this preceding study, therefore, terminal logistics processes emphasize the significance of lean practices, integration practices, managing relationship and information sharing to achieve competitive performance.

Therefore, logistics processes are likely to include: lean practices to improve the supply chain within ports (Chandrakumar et al., 2016; Marlow & Casaca, 2003; Olesen et al., 2015); managing relationships among various stakeholders while achieving efficient flow of cargo, services and information (Braziotis et al., 2013); and supporting supply chain process integration (Rodrigue & Notteboom, 2009) by utilizing information technology (IT) (Marlow & Casaca, 2003; Paixão & Marlow, 2003; Tseng & Liao, 2015; Yang et al., 2009). The integrated internal process will enhance supply chain performance within the terminal (Shee et al., 2018). Obviously, only several logistics processes can be developed as the foundation for a firm's competitive advantage (Ray et al., 2004). However, from the abovementioned literature, this study has extracted several features of important logistics processes.

Drawing on the above literature, several important dimensions can be identified as determinants of logistics processes: lean practices to eliminate waste and managing intrafirm and interfirm relationships plus integration practices and information sharing to achieve efficient service performance. In sum, the determinants of terminal processes comprise: 1) lean practices; 2) managing relationships; 3) integration practices; and 4) information sharing. The detail is discussed in the subsections below.

3.3.3.1. Lean practices

One way of improving information and goods flow is the principle of lean management. Lean concepts stem from the Toyota Production System (TPS) with the goal of trimming down production processes or value streams via waste elimination (Liker, 2004). Waste is defined as any non-value adding activity or delay in production or service processes. These activities where waste can be eliminated include faults, excess production, waiting time, unnecessary transportation, excess stock, unnecessary movement (Liker, 2004), excess processing (Ohno, 1988) and unused employee creativity (Liker, 2004). Guidance for waste elimination has been set up by Womack and Jones (1996) by determining customer value, mapping the value stream, creating a smooth flow of products and services, withdrawing the rate of flow from customer demand, and continuous improvement for excellence.

Previously, a number of studies on lean practices have been consistently linked with production processes (Jeong & Phillips, 2011; Khan et al., 2013; Liker & Morgan, 2006; Rahani & al-Ashraf, 2012; Rohani & Zahraee, 2015; Schmidtke, Heiser, & Hinrichsen, 2014). More recently , application of lean principles has also been used in logistics and supply chain management (Coronado Mondragon et al., 2012; Coronado Mondragon & Lyons, 2008; Kużdowicz, Witkowski, & Vidová, 2013), the financial services industry (Swank, 2003), healthcare (Duska, Mueller, Lothamer, Pelkofski, & Novicoff, 2015; Huddle et al., 2016; Lummus, Vokurka, & Rodeghiero, 2006; Michael, Naik, & McVicker, 2013), software development (Ali, Petersen, & de França, 2015; Ali, Petersen, & Schneider, 2016), maritime carbon emissions (Rigot-Muller, Lalwani, Mangan, Gregory, & Gibbs, 2013), product development (Tyagi, Choudhary, Cai, & Yang, 2015), and administration processes (Liker & Morgan, 2006). Although lean principles are often used in manufacturing, values and working practices are applicable to many industries including the seaport environment. For example, Dirnberger and Barkan (2007) investigated a lean approach to overcoming the bottleneck of car loading at railroad terminals, whilst a similar study by Loyd et al. (2009) suggested the application of lean methods in car railroads and workplaces in seaport operations. Supporting the use of lean values in transportation and logistics operations, several studies undertook a conceptual examination of the usage of lean principles in container facilities and found that waste elimination, standardization, leveling and continuous improvement were essential for lean terminal operations (Beškovnik & Twrdy, 2011; Khan et al., 2013; Martínez-Jurado & Moyano-Fuentes, 2014); Olesen et al. (2015); (Prajogo et al., 2016; Sufian Qrunfleh & Monideepa Tarafdar, 2013; Ridwan, 2016; Tortorella, Miorando, & Marodin, 2017).

Apart from lean principles, resilience is identified as an important variable in lean practice, particularly in supply chain risk management where a firm needs to adapt and provide services in disrupting circumstances. Additionally, resilience is also an important element of supply chain risk management where a firm is required to adapt and survive in disrupting circumstances. Resilience also means capability to avoid the source of disruption (Winston, 2014); therefore, identifying the source of disruption is important (Chopra & Sodhi, 2014). Supply chain resilience works in disruptive settings in two ways. Initially, it will continue to operate despite the disruption. While enduring the function, supply chain resilience reaches the end until operations are halted. Subsequently, the second stage develops as a response to recovering from losses (Melnyk, Closs, Griffis, Zobel, & Macdonald, 2014). Therefore, the critical phase of the supply chain network needs to be understood by firms. To address market changes, additional capacities are required at certain points, such as adding new suppliers, or information sharing with partners to mutually create policies (Christopher & Peck, 2004). On the other hand, the accumulative amount of supply chain partners and their robust interrelationships intensify supply chain vulnerability to interference caused by an individual partner (Chopra & Sodhi, 2014). This is also the case in the container port context where a strategic supply chain information system is utilized to achieve efficiency and flexibility in supply chain performance (Qrunfleh & Tarafdar, 2014).

The adoption of lean production theory to port environment will drive all participants in the multimodal process performance to deliver elevated levels of operation effectiveness and efficiency (Marlow & Casaca, 2003). Therefore, this study proposes lean practices in acknowledging nine waste factors in manufacturing production (Womack & Jones, 1996). They are: 1) administration errors; 2) unnecessary process stage; 3) waiting time; 4) manual documentation; 5) unnecessary movement; 6) resilience; 7) time management; 8) standardized methods; and 9) procedures update/ renewal. The attributes for lean practice are listed in Table 3.8.

Table 3.8: Lean practice dimensions and proposed attributes

Attributes	Operational Definition	References
Administration errors elimination	Methods and tools implementation to reduce administration errors during the import container handling process	Alpenberg and Scarbrough (2016); Andrés-López, González-Requena, and Sanz-Lobera (2015); Modrák (2014); Olesen et al. (2015); Prajogo et al. (2016); Sufian Qrunfleh and Monideepa Tarafdar (2013); Tortorella et al. (2017)
Unnecessary process stage elimination	Methods and tools implementation to reduce irrelevant/ unnecessary steps during the import container handling process	
Waiting time elimination	Methods and tools implementation to reduce waiting time for customers during the import container handling process	
Manual documentation elimination	Methods and tools implementation to reduce manual documentation during the import container handling process	
Unnecessary movement elimination	Methods and tools implementation to reduce unnecessary movement of equipment or people during the import container handling process	
Resilience	Contingency/business plan to resume normal operations after system downtime	Thai (2008)
Time management	Methods and tools implementation to calculate the time of container and document flows	Alpenberg and Scarbrough (2016); Andrés-López et al. (2015); Modrák (2014); Olesen et al. (2015); Prajogo et al. (2016); Sufian Qrunfleh and Monideepa Tarafdar (2013); Tortorella et al. (2017)
Standardized method	Methods and tools implementation to standardize our operational procedures regularly	
Procedures update/ renewal	Operational procedure updates by taking suggestions from staff	

A lean supply chain (SC) is suitable for companies that employ higher importance on cost, quality and delivery strategies, while an agile SC is suitable as well for companies competing on the flexibility strategy. Further, both lean and agile supply chain demand greater extent of internal and external integration, but lean SC has a significant impact on external integration than agile SC (Qi, Huo, Wang, & Yeung, 2017). The application of lean SC practices is then reasoned to be appropriate for the dynamics of port environment. Table 3.8 points out variable of lean practices (Womack & Jones, 1994, 1996; Womack, Jones, & Roos, 1990) to be adopted to port environment. The employment of lean practices develops required process phases and eliminates steps that add no value, thus enhancing material and flow and ultimately, the firm performance (Olesen et al., 2015).

3.3.3.2. Managing relationships

Seaport logistics integration is vital to provide multiple services (World Bank, 1999), achieving efficient flow of cargo, service and information that involve a multi-stakeholder container terminal (Braziotis et al., 2013) from shippers, freight forwarders, shipping lines and terminal operators working jointly to move cargo through terminals. The triumph of a modern seaport depends not only on its internal strengths and weaknesses, but increasingly established by the capability to collaborate with other transport providers and other actors in logistics networks (Hou & Geerlings, 2016). Therefore, managing relationships among key actors in ports, such as port authorities, terminal operators and logistics providers, support the smooth flow of cargo (Rodrigue & Notteboom, 2009). On the other hand, managing employee relationships is also essential as human resources are the backbone of an organization (Methot et al., 2018). Further, the established internal and external relationship management supports logistics processes and assists logistics integration that impacts the firm's performance and competitiveness (Prajogo et al., 2016). Therefore, from various aspects of managing relationships internally and externally, the attributes of managing relationships are presented in Table 3.9.

Table 3.9: Managing relationships dimensions and proposed attributes

Attributes	Perspective	Operational Definition	References
Forging and maintaining strategic partner relations	External	Shipping lines, government agencies and inland transport operators viewed as strategic partners in mutually designing the flow of goods and information	Prajogo and Olhager (2012)
Forging and maintaining mutual trust	External	Mutual trust relationship built with shipping lines, government agencies and inland transport operators	Prajogo and Olhager (2012)
Collaboration to reduce cost and increase quality of service	External	Collaboration with shipping lines, government agencies and inland transport operators to reduce cost and ensure higher quality of service	Prajogo and Olhager (2012)
Customer requirements analysis	Internal	Identification of external customers' current and future requirements	Feng, Wang, and Prajogo (2014)
Customer requirements, internal dissemination	Internal	Customers' requirements dissemination to terminal personnel	Feng et al. (2014)
Incorporation of customer requirements	Internal	Incorporation of customers' need and requirements into the firm's services	Feng et al. (2014)
Record customers' complaints	Internal	Effective process of customers' complaints record	Feng et al. (2014)
Service improvement using customers' complaints	Internal	Incorporation of customers' complaints to improve current services	Feng et al. (2014)

As terminal operators are more focused on their principal business, thus their dependence on external stakeholders escalates (Prahalad & Hamel, 1990). Firms tend to build a strategic relationship with their stakeholders (Burns, 2015) and considered as the integral part of the firm's operations (Chen & Paulraj, 2004; Paulraj, Lado, & Chen, 2008; Prajogo & Olhager, 2012). To maintain the collaboration and relationships with stakeholders, thus firms are required to invest in IT and information sharing (Klein, Rai, & Straub, 2007; Paulraj et al., 2008). Further, Chen and Paulraj (2004) found that a lasting relationship contributes to buyer performance. Overall, lasting relationships and collaboration result in improved firm performance (Singh & Power, 2009). Therefore, managing relationships with stakeholders is considered to be important as an element in terminal logistics processes.

3.3.3.3. Integration practices

The dynamics of sea transportation and international manufacturing have highlighted the prominence of container ports as international supply chain hubs (Flitsch, 2012). Ports are playing a supportive role in global just-in-time manufacturing by increasing the performance at sea and landside processes along with smooth distribution of goods to the hinterland (Flitsch, 2012). Further, to create competitive advantage, terminal operators are required to extract the value of logistics networks integration rather than solely relying on port location and operational efficiency (Jacobs & Hall, 2007).

Integration practices in ports are closely related to supply chain integration, ranging from flow management of material, services and information from providers to consumers (Braziotis et al., 2013; Ellram & Cooper, 1990; Melnyk et al., 2009), a firm's collaboration and coordination (Mentzer et al., 2001), and establishing network relationships (Stock & Boyer, 2009; Walters & Lancaster, 2000) internally or externally (Meredith & Roth, 1998) to create efficient, cost-effective and cohesive processes (Elmuti, 2002; Lummus, Krumwiede, & Vokurka, 2001), and delivering value-added goods and/or services to customers (Basnet, Corner, Wisner, & Tan, 2003; Braziotis et al., 2013; Christopher, 2011). Integrated transport affords cost and time efficiency between trans-shipment nodes, shared risk of cargo damage and losses, network and coordination flexibility, efficient flow of information and funds along the entire supply chain, and simplified formalities and documentation processes (Burns, 2015, p. 42).

The main aims of integration include: a) benefits from economies of scale from joint resources; b) visibility throughout the overall supply chain; c) meeting and exceeding customer's product needs; and d) strengthening the supply chain's performance and enhancing its marketing edge, (Burns, 2015). Subsequently, from a port's perspective, integration includes three levels: a) port operations, from cargo handling to storage; b) port facilities planning, monitoring, controlling and maintenance; and c) port reaches out to the entire supply chain for exchange of information, resources and corporate goals (Burns, 2015).

The ample literature on internal and external integration explains a cross-functional integration inside the firm and between the terminal operators and external port stakeholders respectively. As integration implementation focuses on connecting and simplifying the processes (Chen, Daugherty, & Roath, 2009), several integration practice attributes are used in this study and presented in Table 3.10.

Table 3.10: Integration practices dimensions and proposed attributes

Attributes	Operational Definition	References
Intermodal transport integration	Multiple transport modes available for linking the port/ terminal to its hinterland destinations	Álvarez-SanJaime, Cantos-Sánchez, Moner-Colonques, and Sempere-Monerris (2015)
Route integration for efficient transportation	Available multiple routes to achieve efficient cargo transport via the port/ terminal	Song and Panayides (2008) Tongzon, Chang, and Lee (2009)
Players' collaboration	Collaboration with other channel members (e.g., shipping lines, shippers, etc.) to plan for greater channel optimization	Banchuen, Sadler, and Shee (2017), Donato, Ahsan, and Shee (2015)
Channel integration	Available competing channels for cargo that might flow through our port	Song and Panayides (2008) Tongzon et al. (2009)
Logistics/supply chain options integration	Benchmarking the available logistics/supply chain options for cargo flow through the port versus alternative routes via competing ports	de Vass, Shee, and Miah (2018); Qi et al. (2017); Yuen and Thai (2017)
Minimum integration cost	Availability of least cost options for cargo transport to hinterland destinations	Qi et al. (2017), Ataseven and Nair (2017), Prajogo et al. (2016); Prajogo and Olhager (2012)

As previously elaborated, supply chain integration requires the integration of information systems, thus the combination can improve performance at both supply chain and firm level (de Vass et al., 2018). intermodal transport, routes and channels for efficient transportation, as well as considering logistics/supply chain integration best options in term of retaining minimum cost, in which all the practices employ the stakeholders collaboration. Furthermore, Ataseven and Nair (2017) found that firm's financial performance is affected by internal integration, supplier integration, and customer integration. The overall integration is largely motivated by top management initiatives (Shee et al., 2018) and enhances the firm's performance in term of cost, quality, delivery, and flexibility (Ataseven & Nair, 2017).

3.3.3.4. Information sharing

The importance of information and communication technology (ICT) in maritime and port supply chains and logistics has been highlighted in several earlier studies (Marlow & Casaca, 2003; Paixão & Marlow, 2003; Tseng & Liao, 2015; Yang et al., 2009). The literature also demonstrates that ICT positively supports SCM (Zhang, Pieter van Donk, & van der Vaart, 2011), supply chain integration, and supply chain performance (Shee et al., 2018). Further, integrated ICT escalates the flow of pertinent information among participants within the terminal and sends the information beyond the boundaries of the firm (Bowersox & Daugherty, 1995). The most important part is sharing information with the upstream supply chain partners, regulator, downstream supply chain partners and across internal functions (Mollenkopf & Dapiran, 2005; Prajogo & Olhager, 2012; Song & Panayides, 2008). Practically, this means that the terminal operators are required to use integrated ICT systems to communicate and share data/information with shipping lines, government agencies, inland transport operators and internally among administrators. Measurements items for information sharing are summarised in Table 3.11.

Table 3.11: Information sharing dimensions and proposed attributes

Attributes	Operational Definition	References
Knowledge transfer	The accommodation of regulations that supports innovative ideas research and exploitation by the company and utilize information systems or data bases that allow knowledge to widespread through the company	Blome et al. (2014); Marin-Garcia and Carneiro (2010); Maskey et al. (2018)
Research team	The accommodation of groups of workers in the company that continuously have access, put into practice and update their working knowledge	Alfalla-Luque, Medina-Lopez, and Dey (2013); Marin-Garcia and Carneiro (2010)
Best practices dissemination	The usage of all formal mechanisms the company to share the best practices amongst the company personnel	Alfalla-Luque et al. (2013); Marin-Garcia and Carneiro (2010)
Information and knowledge exchange	The exchange of information by stakeholders to company on issues that affect common interest	Alfalla-Luque et al. (2013); Maskey et al. (2018); Prajogo and Olhager (2012)
	The exchange of business knowledge by company with stakeholders	Maskey et al. (2018); Prajogo and Olhager (2012)
	The exchange of information by company with stakeholders in order to assist container flow	Maskey et al. (2018); Prajogo and Olhager (2012)
Training and development	We have training and development courses related to the acceleration of import container flow	Lu and Tsai (2010); UNCTAD (2014a)
Top management involvement	Our directors and senior managers actively encourage personnel to change and apply best practices of import container handling	Maskey et al. (2018); Shee et al. (2018); Ting et al. (2018)
Problem-solving team	We have a problem-solving team to improve import container processes and services	Alfalla-Luque et al. (2013); Campany, Dubinsky, Druskat, Mangino, and Flynn (2007)

According to Prajogo and Olhager (2012, p. 56), the information shared in the system includes the aspects of frequency, quantity and quality. This notion has been accommodated in the constructs, items and questionnaires above. The construct of Information Sharing has elaborated information quality (Maskey et al., 2018) (timeliness, easy to understand, useful), where the item of best practices dissemination is considered to be the exercise to distribute the best information quality to all terminal personnel. The information related to business and issues in container flow is disseminated using the knowledge transfer best practices including using ICT between the company and stakeholders. Further, the item of ‘top management involvement’ is developed to ensure the application of container-handling best practices which include the information quality within the procedures (Alfalla-Luque et al., 2013; Blome et al., 2014; Marin-Garcia & Carneiro, 2010; Prajogo & Olhager, 2012; Shee et al., 2018; Ting et al., 2018). The strategic supply chain information delivers benefits to the supply chain partner for making strategic operations decision (Li, Ragu-Nathan, Ragu-Nathan, & Rao, 2006). Additionally, the practices are reflected in the construct of Managing Relationships with the item of ‘collaboration to reduce cost and increase quality of service’. This item is established to ensure that the collaboration amongst the stakeholders utilized the best information quality to reduce cost and increase quality of service.

3.3.4. Terminal service performance

The core business within the terminal container is service provision to move containers from the ship’s berth to the exit gate within the port (Burns, 2015; Tovar et al., 2004). Various service operations that are provided in container terminals account for variation in performance. The performance of logistics service depends on the service provider’s capability of delivering a desired product at an affordable cost, in a timely and reliable manner (Arif & Jawab, 2018). As container terminals provide container handling services, hence, this study proposes that the output measure of the resources processed to provide services to consumers is defined as terminal service performance. Therefore, terminal service performance, adapted from Yang and Lirn (2017), is defined as all service provisions offered by terminal operators to deliver goods and services by seamless integration of container logistics to the satisfaction of key customers using adequate resources.

However, literature that directly addresses the determinants of service performance in transport, specifically in container terminals, is very limited. Previously, Thai (2008) proposed speed, timeliness, consistent manner in service, safety, error-free documentation processes and competitive pricing as service performance attributes for service quality dimension outcomes. In this study, service performance is considered as the interaction between resources and logistics processes in container terminals. Further, as all service provisions are supposed to endow customers with value-added enrichment, the value-added services dimension will be used as a determinant of service performance in this study. Customer satisfaction has a significant association with the performance service provider and consumer satisfaction (Sayareh, Iranshahi, & Golfakhrabadi, 2016; Thai, 2008; Yeo et al., 2015). Additionally, value-added service improvement is also expected to increase customer satisfaction, and therefore the customer satisfaction dimension is also proposed as a determinant of service performance. The adoption of a logistics approach to port performance measurement is advantageous to port efficiency as the method guides port strategy towards value-added logistics activities (Bichou & Gray, 2004; Yang & Lirn, 2017). Accordingly, the author proposed a newly developed construct of terminal service performance, which encompasses service achievement in terms of time, cost and quality that result in value-added service, rapid response and greater customer satisfaction.

The individual items were adapted from various sources that categorized them into different constructs; however, these items possess characteristics that fit into the construct category set up in this study. Hence, the measurement of terminal service performance is categorised into three sub-categories, accordingly: 1) value-added service; 2) responsiveness; and 3) customer satisfaction indicators. The following sections discuss these sub-categories in more detail.

3.3.4.1. Value-added service

The value-added service dimension entails the port capability to add and enhance value to the service it delivers. For example, ports can add value to the goods transiting through them (Robinson, 2002). Carbone and De Martino (2003) indicate that pre-assembly and procurement of goods become the ultimate activity of future ports. Thus, value-added activities within the port environment need to be prioritised (Paixão & Marlow, 2003). These activities may include: competency to provide competitive service charges (Chang et al., 2008; Tongzon & Heng, 2005) with adequate terminal capacity to handle different types of cargo and to provide the widest possible hinterland access (Carbone & De Martino, 2003; Song & Panayides, 2008); competitive lead time of container handling and delivery time through the most diversified routes/modes (Song & Panayides, 2008); service performance excellence that creates higher value for customers (Lu, 2000; Song & Panayides, 2008); and quickness and flexibility in making decisions regarding altering schedules, amending orders, and customized service to meet customers' demands (Song & Panayides, 2008). Hence, the attributes of value-added services were compiled and adapted as the groundwork for developing further measurement items, as depicted in Table 3.12.

Table 3.12: Value-added service dimensions and proposed attributes

Attributes	Operational Definition	References
Service charges	Low service charges compare to competitors	Talley and Ng (2016)
Proportionate service	Adequate facilities for adding value to cargo (e.g., packaging and consolidation), capacity to handle different types of cargo (container/LCL/ bulk), capacity to provide the widest possible hinterland access, and the service provided is comparable to money paid	Chen and Lam (2018), Jansen et al. (2018)
Lead time	Competitive lead time of container handling and capacity to convey cargo through the most diversified routes/modes at the least possible time to customers premises	Aminatou, Jiaqi, and Okyere (2018), Guan et al. (2017)
On time delivery	On time container service delivery (minimize delays)	Schellinck and Brooks (2015) Thai (2008)

Attributes	Operational Definition	References
Corporate image	Provision of port service performance excellence that creates higher value for customers	Chang and Thai (2016); Jansen et al. (2018); Thai (2008, 2016); Thai et al. (2014); Yeo et al. (2015); Yuen and Thai (2015)
Fast service	Quickness on taking decisions regarding altering schedules, amending orders and changing design processes to meet customers' demands	Aqmarina and Achjar (2017)
Customized service	Provision of customized container services to customers	Aqmarina and Achjar (2017),
Flexibility	The ability to alter service offerings to meet customers' needs	Bergantino and Musso (2011); Blome et al. (2014); Fayezi, Zutshi, and O'Loughlin (2015)

Table 3.12 points out the essence of value-added service dimension entails the port capability. In term of cost, time and delivery, the attributes of fees and proportionate service charges, lead time, on-time delivery and fast service are considered to be crucial. Further, the aspect of flexibility is reflected in the provision of customized service and capability to alter the service according to the customer requirements. The activities in these attributes are referring to ports that focus on cargo handling in association with value-added services such as warehousing, packaging, distribution and other types of actions producing supplementary employment vacancies and regional economic development (Lee, Lam, Lin, Hu, & Cheong, 2018). Additionally, corporate image is important to be incorporated in the attribute as customers often view the image or reputation of the firms, and hence the perceived quality of their services (Thai, 2008; Thai et al., 2014; Yeo et al., 2015).

3.3.4.2. Responsiveness

The agility (similar to responsiveness) was initially drawn from manufacturing systems and extended further to supply chain management. Yauch (2011) suggest that agile capability assists firms to react swiftly to dynamic market conditions while fulfilling customer demand. Agile ability can be used to identify market variations and reconstruct resources to serve the market (Yusuf, Gunasekaran, et al., 2014). Agility results in increasing responsiveness in terms of identification of market changes and responding ahead of competitors (S. Qrunfleh & M. Tarafdar, 2013). The agility should not only be measured in responsiveness (Swafford, Ghosh, & Murthy, 2008), but also proactive actions to explore opportunities (Fayezi et al., 2015). Further, agile manufacturing has evolved from capability development on the production speed, mix, volume and reaction to demand (Christopher, 2000), to a reactive and proactive effort which emphasized customer needs by customizing processes, production volume, and goods or services (Castro, Putnik, & Shah, 2012).

All in all, a firm's agility is used to describe its responsiveness in dealing with customer demands and rapid market change in the business environment. With interruptions in the supply chain caused by environmental catastrophes, economic uncertainties, oil price rises, and terrorist threats, the development of agility in the supply chain becomes imperative (Chopra & Sodhi, 2014), and this concept can be applied in the port environment as well. As supply chains depend on various geographical groups of providers and clients, they are susceptible to uncertainty and hazards that disrupt information and resources flow (Gunasekaran, Subramanian, & Rahman, 2015). Therefore, supply chains need to be adaptable (Christopher & Holweg, 2011), flexible (Roh, Min, & Hong, 2011) and resilient (Gunasekaran et al., 2015) to endure such circumstances and risks. Paixão and Marlow (2003) highlight reactive or proactive agility that needs to feature in fourth-generation ports: otherwise it would be hard to compete in the current uncertain environment.

As agile manufacturing provides benefits for cost, quality, flexibility, service and technology proficiency (Eshlaghy, Mashayekhi, Rajabzadeh, & Razavian, 2010), managers applied the notion to the whole corporate sector (Christopher, 2000) in order to strengthen financial, market and operational performance (Vázquez-Bustelo, Avella, & Fernández, 2007). However, the agility level of a firm is restricted by the type of the employment setting (Yusuf, Musa, et al., 2014) and the capability of other associates in the partnership (Prater, Biehl, & Smith, 2001). van Hoek, Harrison, and Christopher (2001) argue that agility encompasses all partners and supply chains with which the firm engaged. Therefore, the scope of agile supply chains extends from the firm level to all partners within the supply chain by integrating information and leveraging the agility of partners (Braunscheidel & Suresh, 2009).

Various definitions and conceptions are interchangeably employed in the literature referring to organizational agility, for example, ‘responsiveness’, ‘flexibility’, ‘agility’ and ‘adaptability’. Several academics differentiate these conceptions while others use them synonymously. In conclusion, all notions of a firm’s agility focus on the firm’s capabilities to respond to changes in the environment by adapting its resources, business processes, strategies, and so on. Thus, this research employs ‘responsiveness’ to describe the firm’s agile capability, as *responsiveness* is a term widely used in supply chain management to denote mobilizing of a company’s efforts and supply chain resources to meet customer demand, which in turn, allows for enhanced firm performance (Sufian Qrunfleh & Monideepa Tarafdar, 2013). In the terminal container context, the firm’s responsiveness to customer demand determines the success of its competitiveness (Paixão & Marlow, 2003). Further, responsiveness to unforeseen events during transit of cargo is included as a logistics service attribute (Yang et al., 2009). Hence, the attributes of responsiveness were synthesized to develop further measurement items described in Table 3.13.

Table 3.13: Responsiveness dimensions and their proposed attributes

Responsiveness Dimension		
Attributes	**Operational Definition**	**References**
Assigned team to respond to market changes	Company provide a specific container services development division team to respond the market change	Shi and Liao (2013), Panayides (2007)
The speed of delivering services to market demand	Provision of fast service delivery to market	Schellinck and Brooks (2015), Panayides (2007)
Innovative service provided to market	Ability to provide and introduce new services in the market	Heuermann, Duin, Gorldt, and Thoben (2017); Wang et al. (2017), Song and Panayides (2008)
Recognizing and responding to external demand	Responsiveness to customer demand for 'new' service features or specific performance	Chang and Thai (2016), Song and Panayides (2008)

Table 3.13. proposes out the attributes to determine the firm responsiveness to container operations market change. Reactive or proactive responsiveness is crucial for port competitiveness (Paixão & Marlow, 2003) and therefore a dedicated team could be assigned to respond and recognize the market changes by altering and innovating the current service to the new market requirement and demand. The required response ability and deliver the service quickly affects the success of firm competitiveness (Paixão & Marlow, 2003; Sufian Qrunfleh & Monideepa Tarafdar, 2013).

3.3.4.3. Customer satisfaction

Literature on port service quality also indicates a significant link between performance of service provider and consumer satisfaction (Sayareh et al., 2016; Thai, 2008; Yeo et al., 2015). Ovretveit (1993) posits that service quality depends on internal management processes, and not just customers' perceptions. Subsequently, Thai (2008) identifies that the quality of internal and external management processes is also as important as the satisfaction of customers. Satisfaction can also occur after the performance of a transportation service (Yuen & Thai, 2015). Therefore, the terminal operators' perception of customer satisfaction is used in this study as the source of perceived service quality within the terminal.

In the context of supply chain integration, the customer and supplier relationship are crucial as the development of a long-term partnership among supply chain stakeholders signifies information integration and mutual trust to achieve shared benefits from the relationship (Prajogo & Olhager, 2012). Therefore, the attributes of customer satisfaction were synthesized to develop further measurement items, as described in Table 3.14 below.

Table 3.14: Customer satisfaction dimensions and proposed attributes

Attributes	Operational Definition	References
Performance satisfaction	The company's service performance exceeds customers' requirements and expectations	Feng et al. (2014), Bozarth, Warsing, Flynn, and Flynn (2009)

Attributes	Operational Definition	References
Standard satisfaction	The fulfilment of customer standards by company	Feng et al. (2014), Bozarth et al. (2009)
Service satisfaction	The satisfaction of customers by the product and service provided by company	Lai, Ngai, and Cheng (2002), Feng et al. (2014), Bozarth et al. (2009)
Responsiveness satisfaction	The customers' satisfaction to the company's responsiveness to their service requirements	Feng et al. (2014), Bozarth et al. (2009)

3.3.5. Gap analysis

In the maritime study, port performance is central in trade facilitation and economic development (Chen et al., 2017; de Langen & Chouly, 2004; Lee et al., 2018). The impact of resource quantity inputs on port performance in terms of container output have been extensively researched in the final frontier studies (Bichou, 2013; Cullinane & Wang, 2010; Lee et al., 2014; Nguyen et al., 2015; Sun et al., 2017; Wanke et al., 2011; Wanke & Barros, 2015). These earlier studies mostly scrutinize the effect of distinct resources on the total firm's performance. However, there are two setbacks as follows: first, Yang et al. (2009) find that resources and firm performance in shipping services have no significant relations; and second, these earlier frontier studies omitted a pivotal dimension between resource inputs and outputs.

Preceding examinations have discovered the positive impact of operational capabilities on firm performance (Huselid, 1995; Kuo et al., 2017; Ray et al., 2004; Yang et al., 2009; Yang & Lirn, 2017); however, the influence of resources and business processes on container terminal performance needs further investigation. There is a difference between capability and process where service capabilities are the ability to effectively utilize resources to fulfil the customers' requirement (Lai, 2004), while the business process is a routine task of processing and delivering products/services to customers (Ray et al., 2004). As the net effect of business processes may determine the performance of a firm (Ray et al., 2004); therefore, this study introduces logistics (business) processes deemed appropriate between resources as input and service performance as output within the container terminal. A similar study has been conducted previously by Yang and Lirn (2017) which investigates the effect of intrafirm resources, interfirm relationships, and logistics service capabilities on logistics performance (LP) in the context of container logistics. Their findings demonstrate that interfirm relationships and logistics service capabilities mediate between intrafirm resources and LP. The proposed RPP framework includes government support and operator firms as two sources of resources. In examining its effect on service performance, the study finds that terminal logistics processes can fully moderate this relationship.

As firms' activities may have different business advantages and disadvantages, investigating the relations between resources related to various processes within a business entity and its general performance may lead to ambiguous decisions (Ray et al., 2004). This study uses a sample of a container terminal that operates in container handling service, and thus focusing on output specifically in its service performance. Further, due to the supremacy role of government in supporting port investment and development, especially in the Asian region (Lee & Flynn, 2011), this study incorporates supportive government policies as part of port resources (Gordon et al., 2005). Supportive government policies are crucial to assist in the development of port infrastructure (Munim & Schramm, 2018) such as providing favourable land pricing and distribution, establishing new facilities and terminals (Lee & Flynn, 2011; Ng & Gujar, 2009) and developing hinterland road tolls and port access (De Borger & De Bruyne, 2011; de Langen & Chouly, 2004; Lee & Flynn, 2011). Thus, this research fills the gap in maritime studies by conceptualizing the effect of government support and firm resources (tangible and intangible) as a bundle of container terminal resources on processes and performance (RPP) within the container terminal operations. Investigating RPP empirically in a terminal container context is a unique contribution to this study.

3.4. Research framework and hypotheses development

The previous section provides an overview of the literature relating to port economics and related studies. This section builds on existing theory to propose a comprehensive research framework to analyse terminal service performance influenced by government support and firm resources bundled as container terminal resources and logistics processes.

Hence, a framework is proposed incorporating (1) *Government Support:* associated with government policy, regulation and support and incentive in the terminal container industry; (2) *Firm Resources*: associated with tangible and intangible inputs, such as personnel, equipment, infrastructure, hinterland, and knowledge and skills; (3) *Terminal Logistics Processes*: associated with business and related logistics processes, including lean practices, managing employee and customer relationships as well as managing information sharing, together with integration practices in the terminal; and (4) *Terminal Service Performance*: encompasses value-added service, responsiveness, and customer satisfaction.

The attributes of the terminal service performance were investigated in preceding studies (Thai, 2008, 2016); however, the previous studies mainly focus on the impact of service quality on customer satisfaction. While authors have touched on the role of government in the Asian context, for example, India, China, Australia, the United States of America and Europe (Everett, 2007; Gaur et al., 2011; Ng & Gujar, 2009; Pagano et al., 2013; Robinson, 2007; Tetther & Ferreira, 2004; Trujillo & Tovar, 2007; Wu et al., 2016), studies exploring the role of government in the Indonesian context are limited. Thus, in this thesis, the proposed model expands the maritime study by investigating the impact of government support bundled together with firm resources as the holistic container terminal resources that impact terminal service performance via terminal logistics processes. Earlier studies have tended to explore the interfirm and intrafirm relationship in accessing resources (Yang & Lirn, 2017).

A conceptual framework is developed to model the structural relationships among variables involved in the study as shown in Figure 3.1 below:

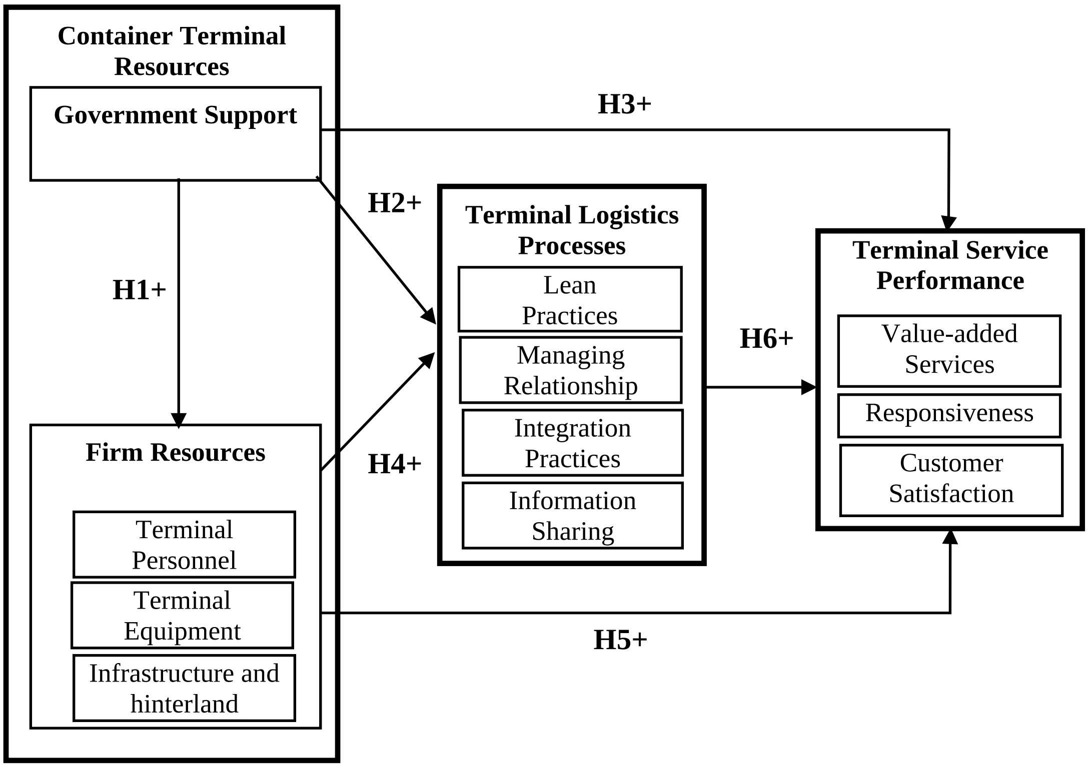


Figure 3.1: Proposed theoretical framework

The research framework attempts to answer the core question of how government support influences operator resources and terminal logistics processes that lead to an improvement in terminal service performance. The following sections undertake a discussion on inter-construct relationships and develop hypotheses.

3.4.1. Government support and firm resources

Government support, in terms of incentive, policy, and regulation, is critical in improving terminal operations, especially in infrastructure development, policy reforms, preference and protection (Ng & Gujar, 2009).

The government can provide assistance to logistics sectors via regulatory policy, curriculum improvement and funding for training schemes, standardization and certification for skills, and development of human capital for infrastructure expansion enhancement (World Bank, 2016). From the RBV perspective, organizations should be equipped with these support services to give an edge over competitors given the fierce competition in the market. In term of strategizing the regulation and policy for port development, the institutional environment, financial support, privatization policy and other supportive regulations are beneficial for port firms to leverage their operations in the national and international level (Dunning, 2000; Hall & Soskice, 2001;

Hoskisson et al., 2000; Landau et al., 2016; Lazzarini, 2015), therefore, government support is believed as the source of container terminal resources. These include, for example, the regulation enforcement on the use of ICT in the port environment, passing regulations and laws pertaining to port ownership, and establishing policy for infrastructure development to reduce logistics inefficiencies and transportation costs. Therefore, government support in the container terminal context can influence resource development. Thus, the hypothesis is formulated as follows:
H1: *Government support has a positive effect on firm resources in container terminals*

3.4.2. Government support and terminal logistics processes

Improving logistics performance is achieved through service integration, infrastructure development and streamlining administrative processes (World Bank, 2007). Stevens and Vis (2015) state that port supply chain integration can be achieved when port authorities facilitate flow, encourage new flow, conduct value-adding actions, and act as a knowledge centre. Further, government can establish regulation and policy in the port environment such as port privatization (Cullinane & Song, 2002; Tongzon & Heng, 2005), hinterland connectivity (de Langen & Chouly, 2004; Notteboom & Rodrigue, 2007) and freight logistics (McKinnon, 2009; Tetther & Ferreira, 2004). Government support is also found to considerably influence interfirm trust, which subsequently affects information sharing and collaborative planning between firms (Cai et al., 2010). Aside from these factors, ports are regarded as national assets (Lee & Flynn, 2011) that boost the national economy (Wu et al., 2016). Therefore, typical Asian container port development is characterized by the vital role of central government in designing, developing, operating, investing, determining cross-subsidization and controlling port pricing procedures (Lee & Flynn, 2011).

Government support in terms of policy and regulations affect how the port supply chain integration and daily operations are performed, i.e. Customs law, Shipping law, Ministry of Transportation regulation regarding shipping route, port design, development, operations, tariff, port pricing and cross-subsidization (Choi & Lim, 2016; Munim & Schramm, 2018), thus enforcing the terminal operators to accommodate the government policy into their operations to achieve streamlined and effective terminal logistics processes. Thus, the following hypothesis is proposed:
H2: *Government support has a positive effect on logistics processes of container terminals*

3.4.3. Government support and terminal service performance

Gaur et al. (2011) suggest that port performance enhancement can be achieved via cooperation within regional ports initiated by government. In doing so, government may encourage private entities to conduct capacity addition and port operations can simultaneously be improved, thereby increasing capacity and efficiency. The mechanisms of knowledge, operations and information sharing as well as technology transfer were suggested to initiate cooperation amongst government agencies, port authorities and port stakeholders (Gaur et al., 2011). Ng and Gujar (2009) assert that government support significantly influences the efficiency and competitiveness of the logistics industry and intermodal supply chain. Earlier studies also have examined government support and ownership that positively influence firm performance (Alfaraih, Alanezi, & Almujamed, 2012; Nguyen et al., 2018; Ting et al., 2018). From the RBV perspective, government support impacts the overall container terminal operational environment; hence, the hypothesis is formulated as follow:

H3: *Government support has a positive effect on service performance of container terminals*

3.4.4. Firm resources and terminal logistics processes

Inadequate port infrastructure is likely to slow operational efficiency of a container terminal where container flow is vital. Adding to the number of exit gates and upgrading computer systems will improve container flow. The non-value-adding activities such as waste in waiting time, crane movement, miscoordination, and disorderly administration and plant maintenance that cause further service delays at the container terminal disappear with improved infrastructure and operation systems within the terminal (Olesen et al., 2015). Well-equipped facilities and integrated business processes help to reduce the inventory level, container waiting time and related document processing by eliminating any unnecessary steps in the process. Smoother material and information traffic as well as seamless operations are likely to result in fewer deficiencies in the container flow process. An increased number of berths, improvements in yard occupancy and berth dwelling time, and a reduction in the bottleneck operations will lead to faster document processing, less waiting time and reduced inventory (Casaca, 2005; Chandrakumar et al., 2016; Marlow & Casaca, 2003; Prajogo et al., 2016).

When a port provides a service, ideally it allocates resources in the most efficient way (Talley et al., 2014) to maximize outputs (Talley & Ng, 2016). Physical infrastructure, equipment and personnel are those resources that help speed up routine operations within a container terminal. Therefore, adding resources and upgrading computer systems, for example, can improve work flow. These resources when bundled up through integrated business processes help in faster document processing by eliminating unnecessary steps, a standard example of lean practices. Business processes are routines or activities that help process products and services for customer satisfaction (Ray et al., 2004). The resources are consumed in this transformation process to create value-added products and/services. Further, timely information sharing helps in processing container throughput. Increased number of berths, improved yard occupancy, berth dwelling time and reduction in bottleneck operations ultimately lead to less waiting time, reduced inventory levels and faster container clearance in terminal processes. Utilization and transformation of port resources into delivering value-added products to consumers define the logistics service capability (Liu & Lyons, 2011). Accordingly, the study hypothesizes that:

H4: *Firm resources have positive effects on logistics processes of container terminals*

3.4.5. Firm resources and terminal service performance

From the RBV perspective, firms can achieve competitive advantage by possessing and utilizing valuable, rare and costly-to-imitate resources (Barney, 1991). These resources are physical/tangible such as channel, exit gates, container yards, forklifts (Bichou, 2013; Wanke & Barros, 2015); cranes and gantry (Cullinane & Wang, 2007a); labor, tugboats (Tongzon, 2001); and warehouses (Nguyen et al., 2015). Such resources are specifically categorized as container handling facilities and equipment that differentiate a terminal container from other types of ports (Liu, 2012; Talley, 2009). Wang et al. (2014) also find facilities, information connectivity and hinterland access were beneficial to port operations. RBV scholars further argue that intangible human capital such as skills, expertise, creative thinking, collective learning, and know-how of employees and managers are important elements of a firm's success (Chatterji & Patro, 2014; Coff & Kryscynski, 2011). Similarly, labour performance and port workers' foreign language skills (Ha, 2003), employees' responsiveness, knowledge and skills (Pantouvakis, Chlomoudis, & Dimas, 2008), a quality labour force (Celik, Cebi, Kahraman, & Er, 2009) and employees' qualification/skills level (Kolanović, Skenderović, & Zenzerović, 2008) determine port service quality. However, these conventional, tangible and intangible resources as such do not offer competitive advantage, as any other terminal can acquire them easily. Nevertheless, these resources are essential for managing routine operations of container terminals. The allocation of resources and amount of resources needed are vital in providing quality port services (Talley et al., 2014). Further, a lean process is deemed to contribute to a firm's competitive performance (Prajogo et al., 2016) Terminal resources such as personnel, equipment and infrastructure are perceived to improve terminal performance measured in value-added services, customer satisfaction and market responsiveness. Accordingly, the author's view of terminal resources relationship to service performance from a RBV perspective leads to the following hypothesis:

H5: *Firm resources have positive effects on service performance of container terminals*

3.4.6. Terminal logistics processes and terminal service performance

Integrated seaport logistics is essential in order to serve the multiple purposes of ports (World Bank, 1999). Further, adequate infrastructure and superstructure as well as reliable equipment, sufficient intermodals connections, well-driven organization and competent workers are necessary for a seaport to be efficient (World Bank, 1999). The flow of containerized cargo and associated information from berth to landside are critical in a multi-stakeholder container terminal (Braziotis et al., 2013). For example, shippers, freight forwarders, shipping lines and terminal operators work jointly to move cargo through terminals. Therefore, collaboration of these stakeholders is essential for faster cargo movement from berth to exit gate (Autry, Rose, & Bell, 2014; Cai et al., 2010). While cargo units are the measure of terminal output, more throughput will offer a competitive advantage over other terminals in the region. Further, partner integration facilitates successful information sharing for effective decision making (Cai et al., 2010). This is well represented in the supply chain integration literature where internal integration of functions offers timely information sharing opportunities for effective decisions resulting in operational performance improvement (Shee et al., 2018). Moreover, timely and frequent information sharing through trusted relationships provide a positive contribution to performance (Cai et al., 2010; Mohr & Spekman, 1994).

A firm's overall performance is likely to depend on its business processes. There are, of course, many dimensions of processes that interact with each other to deliver satisfactory output (Ray et al., 2004). Lean principles, usually popular in adding value in manufacturing, remove waste from the service system (e.g., container terminal operations) making operations more productive and efficient (Marlow & Casaca, 2003; Olesen et al., 2015). Olesen et al. (2015), applying lean practices to an intermodal container terminal, stated that lean practices enhance process steps within a terminal thereby improving material (container) flow leading to performance improvement. Lean practices reduce unnecessary process steps (e.g., routines and procedures) that help to speed up containerized cargo flow thereby highlighting its implementation in an intermodal container terminal (Beškovnik & Twrdy, 2011).

Borrowed from the field of service marketing, processes encompass procedures, duties, timetables, mechanisms, activities and routines by which port services are presented to clients (Payne, 1993). Additionally, a process can be described as a form of action or combination of several actions that become input material to be processed, and the results add value to a product that benefits consumers (Berry, 1999). Henceforth, the port operators' choice in process techniques determines the cost effectiveness of port operations (Paixão & Marlow, 2003).

Consistent with this view, the elimination of non-value-adding activities in each step of the import operations in a container terminal is critical. A procedural defect is any activity or process that does not follow set procedures. As the container terminal provides cargo handling services, waiting time within the terminal and repeated vehicle movements in the terminal add no value to cargo services. Included in this is the unnecessary movement of cranes that add no value to cargo services as well. Also, excess capacity is similar to idle capacity and is considered as a waste in the terminal. Any waste in the process decreases terminal efficiency (Casaca, 2005; Loyd et al., 2009; Marlow & Casaca, 2003). The elimination of waste and improvement in overall processes may increase the efficiency of container flow performance. As lean practices, integration process and agility in seaport operations enhance overall port performance (Beškovnik & Twrdy, 2011; Loyd et al., 2009; van Hoek et al., 2001), these attributes are critical to container movement.

An efficient port is one that is proficient in its operations (De Monie, 1987). The requirement to be efficient drives a port to streamlining its operational processes by adopting the lean principle, just-in-time, network collaboration, and agility approach which eventually convert the port into a center of excellence (Casaca, 2005). The lean port network offers a notion that a port should transform itself into a provider of transport solutions where services to customers are delivered with no delays (process waste) in the system (Paixão & Marlow, 2003). As lean practices and process integration in port operations enhance overall port performance (Beškovnik & Twrdy, 2011; Loyd et al., 2009; van Hoek et al., 2001), these attributes are critical to container movement.

Further, information sharing (Olesen, Dukovska-Popovska, & Hvolby, 2011) and resources exchange are important to provide total 'supply chain integration' in container terminal operations (Burns, 2015). The flow of material, services and information from berth to landside is critical (Braziotis et al., 2013); therefore, the collaboration and coordination among stakeholders to expedite flow is also important (Mentzer et al., 2001). Subsequently, the network of relationships in internal functions or external activities within the supply chain (Stock & Boyer, 2009; Walters & Lancaster, 2000) create an efficient, cost-effective and cohesive process (Elmuti, 2002; Lummus et al., 2001) to deliver value-added services to end customers (Basnet et al., 2003; Christopher, 2011). The effort to improve logistics performance can be made by integrating services, infrastructure development and achieving streamlined administrative processes (World Bank, 2007). Also, managing relationships among key actors in ports such as port authorities, terminal operators and logistics providers supports supply chain process integration (Rodrigue & Notteboom, 2009). The abovementioned logistics where inputs are transformed into value-added outcomes that satisfy the consumer can be categorized as a process (Berry, 1999).

Container terminal performance depends on the combined action of terminal processes where all stakeholders take part. The joint interaction of these activities results in value-added services like labelling, packaging, warehousing and processing a container ready for dispatch. Further, the logistics processes deploy resources to create service provision to fulfil customers' (shippers and consignees) requirements. Improved logistics processes with accurate delivery in full and on time (DIFOT), reduce cycle time and damage frequency, and this increases market responsiveness. Hence, the terminal logistics processes comprising of lean practices, information sharing, managing relationships and integration practices enhance terminal service performance. Thus, the following hypothesis is proposed:

H6: *Terminal logistics processes have positive effects on terminal service performance of container terminals*

3.4.7. Mediating role of logistics process

The main prescription of RBV is that resources, both tangible and intangible, are the source of competitive advantage. Porter (1991) posits that resources are valuable for organizations because they use them to perform a range of activities. Since the resources are inherently static in nature (Helfat & Martin, 2015; Teece, 2007), the organization therefore must have some ways to integrate them (Kamasak, 2017). Business processes, as such, have been argued to have a positive effect on performance (Ray et al., 2004), and also a source of competitive advantage (Barney, 1991). It is the joint effect of all resources that determines the service performance. These resources do not automatically lead to the desired performance if they are not efficiently used through the best practices of business process. Business processes therefore play critical role between resources and performance. While the service performance depends on aggregated resources, adding resources can improve work flow (processes). These resources when bundled up through efficient business processes help in faster workflow and create value-added products and/services. In the context of container terminals, the business processes (i.e. lean principles, relationship management, integration practices and information sharing) act between the resources and service performance. Therefore, we can formulate the hypothesis as below.

H7: *Terminal logistics processes mediate the relationship between resources and service performance of container terminals.*

3.5. Summary

This chapter discussed the importance of the RBV perspective as the foundation for the relationship framework between resources, processes and service performance in the context of a container terminal. It is argued that the combination of government support and firm resources are utilized via logistics processes to impact terminal service performance. These resources are critical for managing routine activities within the terminal. Further, ‘government support’, characterized as strategic development initiatives of Asian container ports (Lee & Flynn, 2011), acts as an antecedent to firm resources. Six testable hypotheses were proposed, considering the effect of antecedents on criterion/dependent variable. The next chapter discusses survey design and data collection procedures.

Chapter 4
Research Design and Methodology

4.1. Introduction

The previous chapter synthesized the research framework and hypotheses based on the literature review. This chapter elaborates the research paradigm relevant to the study. The objectives and research questions guide the choice of methodology used in this research.

This chapter includes 12 sections. Following the introduction, Section 4.2 presents the diversity of research paradigm. Section 4.3 discusses various elements of research design and the research process whereas the use of quantitative method is justified in section 4.4. Section 4.5 outlines the questionnaire design and its development, while the details of the research population, sampling and sample size are elaborated in section 4.6. Subsequently, section 4.7 delivers data collection procedure whilst section 4.8 presents the unit of analysis. Section 4.9 discusses the data collection period, and section 4.10 outlines the preliminary data analysis procedure. Section 4.11 discusses Structural Equation Modeling and finally, section 4.12 summarises the chapter.

4.2. Research paradigm

Each research project is governed by a set of beliefs namely the research paradigm (Mertens, 2007). A paradigm is defined as a group of shared beliefs amongst the research community about the world they investigate (Deshpande, 1983). Hence, paradigms assist scholars to provide a rigorous basis for problem identification, conducting research and investigation and obtaining possible solution methods. The research area, research question and researcher's independence determine the selection of the research paradigm. An overview of various categories and justification for the selected research paradigm in the current study are discussed in the following section.

4.2.1. Research paradigm principles

Research paradigm principles provide justification for the phenomenon and offer a framework to identify the initial occurrence of the phenomenon (Filstead, 1979). A paradigm encompasses four main objectives: (1) to offer guidance for professionals in a scientific discipline to raise important and controversial issues; (2) to explain scheme development (model and theory) to solve research problems; (3) to determine a methodology criterion, instruments, and the types and forms of data collection deemed appropriate for problem solving; and (4) to deliver an epistemology in which the preceding work steps were seen as the principle for performing 'normal procedure' of the discipline (Filstead, 1979). The basic principles of the research paradigm are: ontology, epistemology and methodology.

Ontology is a metaphysics division that study the philosophy of existence (Deshpande, 1983). Ontology asks ‘what’ connects to the nature of presence and reality (Crotty, 1998) and highlights beliefs about the core of the phenomenon under examination (Burrell & Morgan, 1979). In ontology, a researcher may take a standpoint that the investigated phenomenon has an independent objective apart from the researcher’s method (Orlikowski & Baroudi, 1991).

Epistemology questions the philosophy of the relationship between one who knows and what is known (or which can be known) (Guba & Lincoln, 1994). It offers a philosophical basis to decide what knowledge is possible and assurance of its adequacy and legitimacy (Maynard, 1994) as well as conveying the understanding of researchers about the world to humanity (Burrell & Morgan, 1979). Finally, methodology acts as the operationalization of ontological and epistemological beliefs to perform research and classify practices employed to obtain knowledge. It is also denoted as ‘research design’, which forms the selection and use of a specific method and relates it to anticipated results. In contrast, a methodology subgroup that concentrates on the procedures and techniques employed for data collection and analysis is called method (e.g., literature review, questionnaire) (Crotty, 1998).

4.2.2. Research paradigm classification

A summary of the four research paradigms is given in Table 4.1 below: positivism, post-positivism, critical theory and constructivism, from which it can be concluded that in positivist and post-positivist paradigms, the researcher is the autonomous spectator.

On the other hand, the researcher is an integral part of the research within the paradigm of critical theory and constructivism. It is clear from the table that the recognized hypotheses are investigated using positivism and post-positivism paradigms. Henceforth, positivism and post-positivism match the objectives of this research. This research develops hypotheses to visualize and investigate the proposed relationship between variables, generalizes findings for greater causes, employs goodness-of-fit indices in the modeling, and employs the measurement unit used in other research, and thus quantifiable in statistical terms.

Table 4.1: Research paradigm categories

Item	**Positivism**	**Post positivism**	**Critical Theory**	**Constructivism**
Nature of knowledge	Validated hypotheses established as fact	Non-fabricated hypotheses that are probably facts	Structural/historical insights	Individual knowledge reconstructions coalescing around consensus
Knowledge accumulation	Accretion – ‘building blocks’ adding to the ‘edifice of knowledge’, sophisticated generalizations and cause-effect relations		Generalization by similarity	More informed and accumulated reconstructions,
Goodness or quality criteria	Conventional benchmarks of ‘rigor’: internal and external validity, reliability and objectivity		Historical situatedness, erosion of ignorance, action stimulus	Trustworthiness, authenticity and misapprehensions

Item	Positivism	Post positivism	Critical Theory	Constructivism
Voice	'Disinterested scientist' as the informer of decision makers, policy makers and change agents		'Transformative intellectual' as advocate and activist	'Passionate participant' as facilitator of multi-voice reconstruction
Training	Technical and quantitative, substantive theories	Technical, quantitative and qualitative, substantive theories	Resocialization, qualitative and quantitative, history, values of altruism and empowerment	
Accommodation	Commensurable		Incommensurable	
Hegemony	In control of publication, funding, promotion and tenure		Seeking recognition and input, offering challenges to preceding paradigms, aligned with post-colonial aspirations	

Source: Guba (1990)

Further, Creswell (2009) categorizes into qualitative or quantitative paradigms. The rational positivist's standpoint is identical to the quantitative paradigm, while idealistic world beliefs are represented by the qualitative paradigm (Creswell, 2009). Both qualitative and quantitative paradigm assumptions are listed in Table 4.2.

Table 4.2: Qualitative and quantitative paradigm assumptions

Qualitative Paradigm	Quantitative Paradigm
Qualitative methods preferred	**Quantitative methods preferred**
Concerned with understanding human behaviour from the actor's frame of reference	Seeks the facts or causes of social phenomena without advocating subjective interpretations
Phenomenological approach	**Logical-positivistic approach**
Uncontrolled, naturalistic observational measurement	Obtrusive, controlled measurement
Subjective: 'insider's' perspective; close to data	Objective: 'outsider's' perspective: distance from the data
Grounded, discovery-oriented, exploratory, expansionist, descriptive, inductive	Ungrounded, verification-oriented, confirmatory, reductionist, inferential, hypothetic-deductive
Process-oriented	Outcome-oriented
Validity is critical; 'real', 'rich', and 'deep' data	Reliability is critical: 'hard' and replicable data
Holistic-attempts to synthesize	Particularistic – attempts to analyse.

Source: Guba and Lincoln (1994)

Each paradigm classification offers insights into the research problem. Research paradigms provide a research problem conceptualization and assist the researcher to choose suitable data collection methods and data analysis procedures to solve the problem (Sethi, Smith, & Park, 2001). Thus, the methodology determines the relation between methods and associated paradigms (Healy & Perry, 2000). Accordingly, the nature of the research falls under the quantitative paradigm, as the research is particularly investigating container terminal performance, the researcher stands as outsider, investigating and interpreting the phenomenon 'as it is' with measured statistical outcomes, and the instruments are replicable to attain consistent results.

4.3. Elements of the research design and research process

This current research aims to investigate government support mechanisms and their impact on operator resources, logistics processes and service performance in the Indonesian terminal container environment through a set of testable hypotheses proposed in Chapter 3. To assess these hypotheses, the researcher stands independently and observes nature without altering the environment. The positivist research paradigm reflects the study's purpose and the researcher's role in the study. Further, statistical methods are used to test hypotheses and the findings are generalized to a larger sample. A quantitative survey method is deemed appropriate for this research, and specifically, Structural Equation Modeling (SEM) is employed to assess the proposed model. Section 4.4 will explain the selection and justification of the research methodology. Table 4.3 details the elements of research design followed by an explanation on the research stages.

Table 4.3: Research design dimensions

Dimension	Study context
Purpose of the study	Hypotheses testing
Types of investigation	Correlation, causal relationship
Extent of researcher's interference	Minimal
Study setting	Field study
Unit of analysis	Organizational level
Sampling design	Convenient sampling
Time horizon	One-off cross-sectional study
Data collection method	Questionnaire method (Drop-and-collect)
Measurement of variables	interval scale (seven–point Likert scale),

The initial phase was an exploratory study that encompassed a broad literature review, performed in different fields to determine the significance of the research topic and rationale. The literature review outlined in Chapter 3 formulated the research aims, questions, conceptual model and hypotheses to be assessed. This phase defines the clarity of constructs. Theories that administer the constructs were employed to determine the clarity of the domain and the level of distinctiveness of a construct. A set of theories and literature review were utilized to categorize and support the distinctiveness of each construct, which in turn established the measurement for each constructs (DeVellis, 2012).

The second phase was to assemble the research measurement and data. Variables were operationalized from the literature to determine the research instrument. Three stages of data collection were conducted in this research: pre-test, pilot study and main survey. The pre-test and pilot study were performed prior to the main survey and employed to refine the measurement. The research sampling frame was also planned at this phase. The required sample for the main survey was determined based on the requirement of SEM analysis. The main survey was then disseminated.

The third phase was data analysis using statistical tools. The sample adequacy was assessed to check its suitability for structural equation modeling. Data cleaning was then performed by examining missing values and outliers before exploratory and confirmatory tests were used. An overview of these phases is discussed in subsequent sections.

4.4. Research method

The positivist paradigm prefers quantitative methods to allow for an examination of the proposed hypotheses using a deductive approach (Sobh & Perry, 2006). A quantitative methodology allows for hypotheses validation and offers survey instruments to test reliability and validity (Brown & Eisenhardt, 1995). As this study aims to investigate the significant relationship between government's role, terminal resources, terminal logistics processes and terminal service performance, a quantitative methodology is the most suitable method.

The frequently employed quantitative technique is survey questionnaire to collect data from potential respondents. Surveys are regarded as the most effective and economical means by which to collect data using a sampling technique from within a research population. A mail survey was undertaken for this study. A pre-test of the questionnaire was conducted with two practitioners from Indonesian container terminals, two scholars researching in port logistics and two academics. They were requested to make comments on the clarity of statements, length of questionnaire, response time and suggest improvements. The suggestions received in relation to clarity and comprehensiveness of the questionnaire items were incorporated in the final version. Sample respondents were then sent an electronic link of the questionnaire developed in Qualtrics, an online tool that helps develop, distribute and collect responses in SPSS statistical software format. Also, hard copies of the questionnaire were mailed on request. Both online and hard copies were administered through the human resource (HR) department of the container terminal with an expectation that respondents would be quite responsive through their HR department. Those who participated in the survey have prior knowledge and experience in terminal operations, container handling and supply chain management in the context of port. Following Dillman (2011) procedure, a follow-up reminder resulted in a higher response rate.

4.5. Questionnaire design and development

The following section describes questionnaire design and elements in detail.

4.5.1. Questionnaire layout

The survey questionnaire was established to capture all essential information for addressing research objective and questions. This survey investigates critical factors that influence import flow efficiency in container terminals through implementation of lean principles. It is proposed for personnel who possess the knowledge and capability in container port management and operations, shipping, import procedures, and regulations and policies, such as supervisors, managers, directors, local authorities and government agencies.

The questionnaire is comprised of six parts (A-F): A consists of the respondent's demographics; B aims to identify the determinants of firm resources construct, comprising terminal personnel, equipment and infrastructure and hinterland; C investigates factors that are critical to terminal logistics processes construct, ranging from lean practices, managing relationships with stakeholders, integration practices and information sharing; D discusses the construct of government support; E examines critical factors for terminal service performance, encompassing value-added services, responsiveness and customer satisfaction; and F allows respondents to explain and add further specific information included in the survey.

4.5.2. Measurement scales

The measurement scales were tailored to precise the research context so that it would be relevant for terminal container personnel. A Likert scale is suggested by DeVellis (2012) as the most suitable measurement for evaluating participants' perceptions, beliefs, opinions and attitudes. The Likert scale has several advantages in terms of the direction and intensity of participant's viewpoints. It is simple and possesses sufficient capacity to deal with multifaceted and conceptual characteristics of constructs (Hair, Black, Babin, & Anderson, 2014). Likert scales have been frequently employed in supply chain research (Banchuen et al., 2017; Shee et al., 2018; Tseng & Liao, 2015). Additionally, Likert scales are recommended for SEM data analysis application (Hair et al., 2014; Tabachnick & Fidell, 2013).

A seven-point Likert scale was employed that uses indicators ranging from strongly agree to strongly disagree, allowing complex statistical investigation approaches to be performed (Sekaran, 2006; Sekaran & Bougie, 2010). An odd numbered-scale (e.g., seven-point) offers a neutral option with other options in a continuum. However, this type of odd-numbered Likert scale tends to drive participants toward being neutral (DeVellis, 2012). Ambiguity will be evaluated later in the data screening phase.

As mentioned in the preceding subsection, a six-part questionnaire was used where part A consisted of the description of the respondents' demographic. Items in parts B to E are in the form of a Likert scale where respondents are informed to choose numbers 1 (conforming to totally disagree) to 7 (totally agree) with 3 being neither disagree or agree. The following section outlines questionnaire development.

4.5.3. Questionnaire development

As discussed earlier in Chapter 3, the questionnaire is developed based on: 1) input, which is container terminal resources construct, consisting of: 1) government support, 2) operator resources, 3) terminal logistics processes as the mediator that alters resources into output, and 4) service performance as output.

4.5.3.1. Operationalization of constructs

As previously mentioned, the framework developed for this research encompasses four theoretical constructs: governmental support, business resources, terminal processes and terminal performance improvement. Multiple indicators are employed to measure wide-ranging issues within the study domain (Bryman, 2008). DeVellis (2012) suggested that the constructs dimension within the specific domain should be reflected in measurement items. Further, the measures established previously in the literature that fit the context of this research will strengthen the stability of the scales, and increase measurement reliability and validity (Kalafatis, Sarpong, & Sharif, 2005; Robinson, 2018).

DeVellis (2012) suggest that the items need to be selected with distinct measurement, systematically worded to confirm clarity and capture the constructs' main idea. To lessen the mechanical responses tendency and response bias, negatively-worded items may be presented (DeVellis, 2012). Additionally, questionnaire items need to be adapted to reflect the current research in context of the container terminal logistics. The measures of each item and construct have been elaborated earlier in Chapter 3. The expert review processes that resulted in improved measurement items are shown in Table 4.4. below.

Table 4.4: Refined measurement items and their relevant sources

	Code	Item	Operational Definition	Relevant Sources
Government Support	**Government Support (GS)** Government support is defined as all policies and incentives received from any government agencies in terms of port development ranging from tolls and road network development, any provision of best practices implementation in container transportation, ICT, financial support, logistics education system, warehousing and storage, as well as any effort to expedite import container logistics flow.			
	GS1	Government support in tolls and road network development	Currently, the government provides support, incentive, policy and regulation in tolls and road network development	Cai et al. (2010); Gordon et al. (2005); Maskey et al. (2018); Tetther and Ferreira (2004); UNCTAD (1998); Wang (2018)
	GS2	Government support in best practice in container transportation	Currently, the government provides support, incentive, policy and regulation in identifying and implementing best practices in container transportation	
	GS3	Government support in container transportation ICT	Currently, the government provides support, incentive, policy and regulation in container transportation ICT (e-Gate, tracking system, RFID, etc.)	
	GS4	Government support in logistics education system	Currently, the government provides support, incentive, policy and regulation in logistics education system	
	GS5	Government support in financial support	Currently, the government provides support, incentive, policy and regulation in financial support to build new container facilities	
	GS6	Government support in container logistics warehousing and storage	Currently, the government provides support, incentive, policy and regulation in container logistics warehousing and storage	
	GS7	Government support in expedite import container logistics flow	Currently, the government provides support, incentive, policy and regulation to expedite import container logistics flow	
Firm Resources	**Firm Resources (FR)** FR is defined as all available resources owned by the terminal operator firms, allocated to perform container handling operations and service provision, consisting of terminal personnel, equipment, infrastructure and hinterland.			
	Terminal Personnel (TP)			
	TP1	Number of personnel	In general, we have sufficient personnel engaged along the import container flow	Chang and Tovar (2014); Chang (2013); Chang et al. (2013)
	TP2	Capability in its functional position	In general, we have capable personnel engaged along the import container flow	Burns (2015); Thai et al. (2016)
	TP3	Specialized port and logistics competencies	In general, we have certified personnel engaged along the import container flow	Suwandi et al. (2017); Thai (2012); Pak et al. (2015); Burns (2015)
	TP4	Reliability to complete task	In general, we have reliable personnel engaged along the import container flow	Thai (2012),Burns (2015)
	TP5	Integrity	In general, we have trustworthy personnel engaged along the import container flow	Thai (2012); Thai et al. (2016)
	Terminal Equipment (TE)			

	TE1	Quantity of equipment	We have sufficient quantity of terminal equipment engaged along the import container flow	Bichou (2013), Schøyen and Odeck (2013), Nguyen et al. (2015), Wanke and Barros (2015)
	TE2	Equipment Readiness	Our equipment is always ready to engage along the import container flow	Ma (2017); Wang (2017), Doolen and Hacker (2005); Hijji et al. (2016); Shah and Ward (2007)
	TE3	Equipment Reliability	We have reliable equipment engaged along the import container flow	Devadasan et al. (2012), Modrák (2014), Díaz-Reza et al. (2018); Doolen and Hacker (2005); Shah and Ward (2007)
	TE4	Equipment Modernization	We regularly modernize the equipment engaged along the import container flow	Devadasan et al. (2012), Burns (2015); Doolen and Hacker (2005); Shah and Ward (2007)
	TE5	Equipment Maintenance	We regularly maintain the equipment engaged along the import container flow	Doolen and Hacker (2005); Pascal et al. (2019); Shah and Ward (2007); Shinde and Prasad (2017)
	Infrastructure and hinterland (IH)			
	IH1	Berth adequacy	Generally, we always have berths available when the ships arrive	Park et al. (2014); Wanke (2013)
	IH2	CY area adequacy	We have sufficient storage capacity in Container Yard (CY)	Bichou (2013); Schøyen and Odeck (2013); Wanke and Barros (2015)
	IH3	Container handling operations capacity	We have sufficient container handling capacity in our CY	Schøyen and Odeck (2013), Bichou (2013), Wanke and Barros (2015), Park and De (2004)
	IH4	Container handling capacity operations in red lane area	We have sufficient container handling capability in our *behandle* yard area (for red channel physical customs inspection)	Schøyen and Odeck (2013), Bichou (2013), Wanke and Barros (2015), Park and De (2004)
	IH5	Exit gate operations capacity	We have sufficient capability of exit gate operations	Bichou (2013)
	IH6	Connectivity for ship and inland transportation	We have sufficient connectivity capability for ship and inland transportation interface	Wang et al. (2014); P. T. W. Lee et al. (2015); Notteboom and Winkelmans (2001); Robinson (2002)
	IH7	Channel maintenance	We regularly maintain our channel depth/ length/ width by extension/ upgrading/ dredging	Chang (2013); Schøyen and Odeck (2013); Bichou (2013); Wanke and Barros (2015); Nguyen et al. (2015)
Terminal Logistics P	**Terminal Logistics Processes (TLP)** All service provisions offered by terminal operators to deliver goods and services by seamless integration of container logistics to the satisfaction of key customers using adequate resources.			
	Lean Practices (LP)			
	LP1	Administration errors elimination	In the import container handling process, we implement methods and tools to reduce errors	Alpenberg and Scarbrough (2016); Andrés-López et al. (2015); Modrák (2014); Olesen et al. (2015); Prajogo et al. (2016); Sufian Qrunfleh and Monideepa Tarafdar (2013); Tortorella et al. (2017)
	LP2	Unnecessary process stage elimination	In the import container handling process, we implement methods and tools to reduce irrelevant/ unnecessary process stage/ steps	
	LP3	Waiting time elimination	In the import container handling process, we implement methods and tools to reduce waiting time for customers	
	LP4	Manual documentation elimination	In the import container handling process, we implement methods and tools to reduce manual documentation	
	LP5	Unnecessary movement elimination	In the import container handling process, we implement methods and tools to reduce unnecessary movement of equipment or people	
	LP6	Resilience	In the import container handling process, we have contingency/business plan to resume	Thai (2008)

			normal operations after system downtime	
	LP7	Time management	In the import container handling process, we implement methods and tools to calculate the time of container and document flows	Alpenberg and Scarbrough (2016); Andrés-López et al. (2015); Modrák (2014); Olesen et al. (2015); Prajogo et al. (2016); Sufian Qrunfleh and Monideepa Tarafdar (2013); Tortorella et al. (2017)
	LP8	Standardized method	In the import container handling process, we implement methods and tools to standardize our operational procedures regularly	
	LP9	Procedures update/ renewal	In the import container handling process, we take suggestions from staff to update our operational procedures	
	Managing Relationship (MR)			
	MR1	Forging and maintaining strategic partner relations	We view shipping lines, government agencies and inland transport operators as strategic partners in mutually designing the flow of goods and information	Prajogo and Olhager (2012); Song and Panayides (2008)
	MR2	Forging and maintaining mutual trust	We build mutual trust relationship with shipping lines, government agencies and inland transport operators	Prajogo and Olhager (2012); Tongzon et al. (2009)
	MR3	Collaboration to reduce cost and increase quality of service	We work together with shipping lines, government agencies and inland transport operators to reduce cost and ensure higher quality of service	Prajogo and Olhager (2012); Tongzon et al. (2009)
	MR4	Customer requirements analysis	We diagnose our external customers' current and future requirements	Feng et al. (2014)
	MR5	Customer requirements internal dissemination	Customer requirements are effectively disseminated and understood by our terminal personnel	Feng et al. (2014); Samson and Terziovski (1999)
	MR6	Incorporation of customer requirements	We incorporate our customers' need and requirements into our services	Feng et al. (2014); Samson and Terziovski (1999)
	MR7	Record customers' complaints	We have an effective process to record customers' complaints	Feng et al. (2014); Samson and Terziovski (1999)
	MR8	Service improvement using customers' complaints	We incorporate our customers' complaints to improve current services	Feng et al. (2014); Samson and Terziovski (1999)
	Integration Practices (IP)			
	IP1	Intermodal transport integration	We constantly evaluate the performance of various transport modes available for linking our port/ terminal to its hinterland destinations	Álvarez-SanJaime et al. (2015)
	IP2	Route integration for efficient transportation	We evaluate alternative routes for more efficient transportation of cargo via our port/ terminal	Song and Panayides (2008); Song and Panayides (2008); Tongzon et al. (2009)
	IP3	Players collaboration	We collaborate with other channel members (e.g., shipping lines, shippers, etc.) to plan for greater channel optimization	Banchuen et al. (2017), Donato et al. (2015)
	IP4	Channel integration	We seek to identify other competing channels for cargo that might flow through our port	Song and Panayides (2008); Tongzon et al. (2009)
	IP5	Logistics/supply chain options integration	We benchmark the logistics/supply chain options available for cargo that will flow through our port versus alternative routes via competing ports	de Vass et al. (2018); Qi et al. (2017); Yuen and Thai (2017)
	IP6	Minimum integration cost	We seek to identify least cost options for the transport of cargo to hinterland destinations	Qi et al. (2017), Ataseven and Nair (2017), Prajogo et al. (2016); Prajogo and Olhager (2012)

	Information Sharing (IS)			
	IS1	Knowledge transfer	We have a knowledge transfer system via workshop, conference and ICT systems that permits information to widespread through our terminal personnel	Blome et al. (2014); Marin-Garcia and Carneiro (2010); Maskey et al. (2018)
	IS2	Research team	We have a particular team that continuously have access, put into practice and update their working knowledge	Marin-Garcia and Carneiro (2010); Alfalla-Luque et al. (2013);
	IS3	Best practices dissemination	We use all formal mechanisms in order to share best practices amongst our terminal personnel	Marin-Garcia and Carneiro (2010); Alfalla-Luque et al. (2013);
	IS4	Information and Knowledge exchange	We are informed about issues that affect each other by our stakeholders	Maskey et al. (2018); Prajogo and Olhager (2012); Alfalla-Luque et al. (2013);
	IS5	Information and Knowledge exchange	We share business knowledge and processes with our stakeholders	Maskey et al. (2018); Prajogo and Olhager (2012)
	IS6	Information and Knowledge exchange	We exchange information with our stakeholders to assist the import container flow	Maskey et al. (2018);Prajogo and Olhager (2012)
	IS7	Training and development	We have training and development courses related to the acceleration of import container flow	Lu and Tsai (2010); UNCTAD (2014a)
	IS8	Top management involvement	Our directors and senior managers actively encourage personnel to change and apply best practices of the import container handling	Maskey et al. (2018); Shee et al. (2018); Ting et al. (2018)
	IS9	Problem solver team	We have a problem-solving team to improve the import container processes and services	Alfalla-Luque et al. (2013); Campany et al. (2007)
Terminal Service Performance	**Terminal Service Performance (TSP)** Terminal service performance is all the intangible activities during the interaction between the client, the facility supplier, and the service provider that provides employees, goods and a system in order to achieve the best port service provision by performing resources allocation and consumption in the most efficient way			
	Value-Added Services (VAS)			
	VAS1	Service charges	Our terminal’s import container service charges are competitive	Talley and Ng (2016)
	VAS2	Proportionate service	Customers view the value of our import container services comparable to money paid	Chen and Lam (2018), Jansen et al. (2018)
	VAS3	Lead time	The lead time of import container flow in our terminal is appropriate to customer requirements	Aminatou et al. (2018), Guan et al. (2017); Song and Panayides (2008)
	VAS4	On time delivery	We deliver import container services on time (minimized delays)	Thai (2008); Schellinck and Brooks (2015)
	VAS5	Corporate image	Our terminal’s service performance delivers higher value for customers	Chang and Thai (2016); Jansen et al. (2018); Song and Panayides (2008); Thai (2008, 2016); Thai et al. (2014); Yeo et al. (2015); Yuen and Thai (2015)
	VAS6	Fast service	The import container services at our terminal are faster than those of competitors	Aqmarina and Achjar (2017)
	VAS7	Customized service	We provide customized import container services to our customers	Aqmarina and Achjar (2017)
	VAS8	Flexibility	We adjust our import container service offerings to meet customers’ need whenever and wherever required	Bergantino and Musso (2011); Blome et al. (2014); Fayezi et al. (2015)
	Responsiveness (R)			
	R1	Assigned team to response to market changes	We have a responsive import container services development division	Shi and Liao (2013), Panayides (2007)
	R2	The quickness of delivering	We deliver new import container related services to the market quickly	Schellinck and Brooks (2015), Panayides (2007)

		service to market demand		
	R3	Renovate and innovate service provided to market	We are first in the market in introducing new import container related services	Heuermann et al. (2017); Wang et al. (2017), Song and Panayides (2008)
	R4	Recognizing external demand and provide respond	We respond well to customer demand for 'new' import container related service features	Chang and Thai (2016), Song and Panayides (2008)
	Customer Satisfaction (CS)			
	CS1	Performance satisfaction	Our performance relating to import container related services exceeds our customers' requirements and expectation	Feng et al. (2014); Bozarth et al. (2009)
	CS2	Standard satisfaction	We always met customer standards of import container related services	Feng et al. (2014); Bozarth et al. (2009)
	CS3	Service satisfaction	Our customers are pleased with the import container related services we provide them	Lai et al. (2002); Feng et al. (2014); Bozarth et al. (2009)
	CS4	Responsiveness satisfaction	Our customers are pleased with our responsiveness to their requirements for import container related services	Feng et al. (2014); Bozarth et al. (2009)

4.5.3.2. Pilot study

A pilot study is done to assess and improve the questionnaire items prior to the main survey (Zikmund, Babin, Carr, & Griffin, 2010). A pilot study was conducted with key personnel from five companies within the container terminal at Indonesia. These personnel, with supervisory experiences within the container terminal, were sent an electronic link of the questionnaire and requested to make comments on the clarity of statements, length of questionnaire as well as make suggestions and recommendations for improvement.

4.6. Sampling design

Sampling in quantitative research is imperative and therefore it requires comprehensive planning (Zikmund et al., 2010). The sampling frame, method and size employed in this study are outlined in this section.

4.6.1. Sampling frame

Based on the Indonesian customs database on Import Declaration documents (DGCE, 2020), there were effectively 58 seaports for import during the period 2010 to 2017 with 86,85% imports performed via seaports in Jakarta, Surabaya and Semarang (59,52%, 20,91% and 6,41% respectively) (See Appendix 1). However, there are only 11 container ports in Indonesia (Global Business Guide Indonesia, 2020) and the top 2 Indonesian container ports are located in Java island (Port of Tanjung Priok in the West Java and Tanjung Perak in the East Java). These two ports hold 80% of Indonesian container throughput. In addition, in the central Java, there is Port of Tanjung Emas that serves the middle hinterland of the island. Port of importation entry is located throughout Indonesian territory and these ports are managed by different entities, namely, the Ministry of Transportation (Port Master, Port Authority, Port Operating Units) and state-owned enterprises consists of Pelindo I, Pelindo II, Pelindo III to Pelindo IV.

Taking into account the wide range of total container volume coverage (90% for three ports), operations complexity, number of terminal operators as well as time and cost constraints in this research, the port of Tanjung Priok Jakarta, Tanjung Emas Semarang and Tanjung Perak Surabaya were chosen for this research. Tanjung Priok Jakarta represents the trade and logistics distribution centre for western Indonesia while Tanjung Perak corresponds for the eastern region of Indonesia. Tanjung Priok holds five major container terminal operators as outlined below:

1) PT. Jakarta International Container Terminal (JICT)
2) PT. Terminal Peti Kemas (TPK) Koja
3) PT. Pelabuhan Tanjung Priok (Terminal 3)
4) PT. New Priok Container Terminal 1 (NPCT1)

5) PT. Mustika Alam Lestari (MAL).

Further, Tanjung Emas holds one container terminal operator: PT. Terminal Peti Kemas Semarang (TPKS) and Tanjung Perak holds two container terminal operators: 1) PT. Terminal Petikemas Surabaya (TPS) and PT. Terminal Teluk Lamong (TTL).

Together, these three ports (i.e., Jakarta, Semarang and Surabaya) have accounted for about 86.85% import of container volume in Indonesia for the last eight years (DGCE, 2020) and have played a central role in establishing swift container movement. Thus, these eight operators were chosen as the sample for this research. These terminal operators have different ownership structures and their own operational policies, and therefore, it represents the diversity of the business environment and logistics processes. Priok has more advantages due to the location close to Singapore as Asian hub, and serves bigger population and area. Further, these prospective respondents constitute the personnel with supervisory experience working in container terminal operations located in the abovementioned terminals of Indonesia.

4.6.2. Sampling methods

Random sampling is suggested for quantitative studies (Creswell (2009), as randomization provides equal opportunity and reduces bias, thus a representative sample can be achieved and allows a generalization of findings (Sekaran & Bougie, 2010). In random sampling, the sample frame is used to select cases (Neuman, 2014). As mentioned in subsection 4.6.1, the DGCE directory acted as the sampling frame for this study, from which respondents were selected through simple random sampling.

4.6.3. Sampling size

As several structural equation modeling (SEM) statistical algorithms are inaccurate when the sample is small, thus SEM highlights the importance of sample size. Likewise, larger sample size reduces sampling error and increases statistical power (Hair et al. 2010).

Hazen, Overstreet, and Boone (2015) reported in their study that 36% of CB-SEM studies use a sample size less than 200. In SCM literature, Shee et al. (2018) used 105 sample in their SEM study, Banchuen et al. (2017) analyzed 185 cases and de Vass et al. (2018) used 185 samples. Given that terminal operator firms are scarce within Indonesian ports, the size of the population is limited. Hence, 216 samples is regarded as sufficient to analyze the model. To provide a sufficient basis for ML estimation and reduce the impact of data non-normality, a sample of 200 or more is recommended (Hair et al. 2010). Also, to diminish the SEM inappropriate estimations probability, a sample-set of 150 or larger is recommended (Bollen

1989). Additionally, precise SEM constraint estimations with non-normal data can be provided with a sample of 100 or more (Lei & Lomax 2005).

4.7. Data collection procedure

Survey is popular and constitutes the appropriate method of data collection (Dillman (2007). In particular, literature in the supply chain management field quoted surveys as the utmost employed method of data collection followed by case studies (Seuring, 2008). Questionnaire comprises of a set of queries (Sekaran, 2006) completed by contributors, scholars or survey associates (Bryman & Bell, 2011).

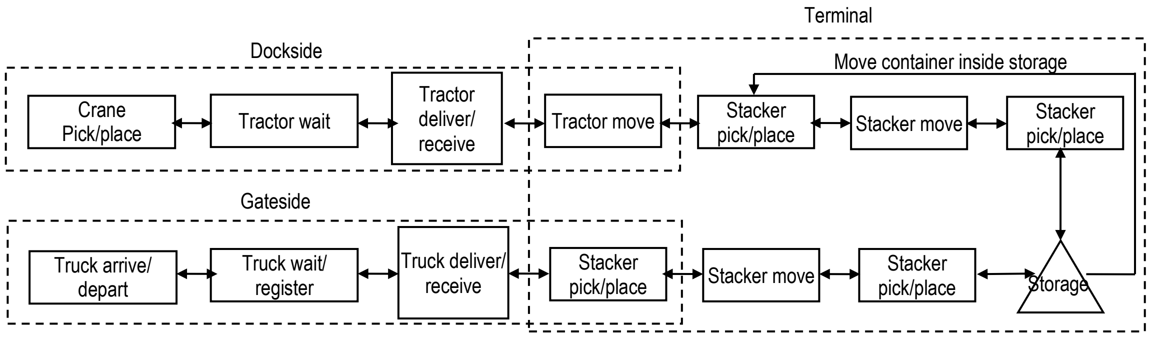
This study involves the distribution of self-completed questionnaires to potential participants from the sampling frame. The survey is popularly known to cover responses from a large sample. To ease the cost of mailing out hardcopies through postal surveys, a drop-and-collect method was employed because the method is reliable, fast and cheap (Brown, 1993). This method provides advantages of face-to-face appointments and follow-up on the collection period, that may diminish the risk of bias from non-participants and other external social influences, and offer respondents the opportunity to complete the survey in their own time (Maclennan, Langley, & Kypri, 2011). The questionnaires were delivered to human resource departments who helped with distribution to key employees as respondents.

Further, a Qualtrics link was sent to human resource departments in each company which forwarded to each eligible respondent within the company. Therefore, participants were given the option to choose either hardcopy or softcopy via the Qualtrics link. However, there was no account of how many were used from each category. Qualtrics is an online tool that helps a researcher to design, develop, distribute and collect data online from the respondents. Based on preceding studies, Dillman (2007) suggests that a suitably managed online questionnaire with sufficient reminders generates an equivalent response rate to postal surveys.

The questionnaire was sent to 354 employees working across 8 terminal operators/companies located in the city of Jakarta, Semarang and Surabaya. These employees are distributed in 3 major container ports in the cities, namely Tanjung Priok in Jakarta, Tanjung Emas in Semarang, and Tanjung Perak and Teluk Lamong in Surabaya. The survey resulted in 276 responses. After rejecting 21 unusable responses, a total 255 valid responses resulted in a response rate of 72%. Further, outlier analysis decreased the sample size from 255 to a usable 216 sample for further analysis. Hence, the sample demonstrates a sufficient size for SEM examination.

4.8. Unit of analysis

As cargo handling becomes a more prominent business activity in the port environment, many studies focus on container terminal operations for maritime studies (Ding, Jo, Wang, & Yeo, 2015; Figueiredo De Oliveira & Cariou, 2015; Serebrisky et al., 2016; Slack, 2007; Slack & Wang, 2002; Zheng & Park, 2016). For this study, therefore, the terminal operator is chosen as the population and responses of key employees within the terminal operator reflect views on its behalf. Therefore, the practices and operations are examined at the employee level. The respondents were chosen carefully to represent the activities in relation to the container being unloaded from the ship, processing the customs documents and clearing the gate at the container terminal. The typical flow of world's container terminal activities is shown in Figure 4.1 below.



Source: Olesen, Dukovska-Popovska, and Hvolby (2012)

Figure 4.1: Terminal operation flow

According to Swerdlow (2005), human subjects mean living individuals who the researcher interacts and communicates with to collect private information that is individually identifiable. As the study will investigate terminal operators, subjects will be individuals who are involved in the port environment and possess the knowledge and capability to make decisions in port operations, regulations and policies. These subjects/respondents comprise individuals from operation departments (i.e., managers, directors, principals, and chiefs) ranging from private companies and the port authority. Data collection is estimated to take four months. The following operators identified for data collection are:

1. PT Jakarta International Container Terminal (JICT), Port of Tanjung Priok, Jakarta
2. Terminal Peti Kemas Koja (TPK KOJA), Port of Tanjung Priok, Jakarta
3. PT Pelabuhan Tanjung Priok Terminal 3 (TER3), Port of Tanjung Priok, Jakarta
4. PT Mustika Alam Lestari (MAL), Port of Tanjung Priok, Jakarta
5. PT Terminal Peti Kemas Semarang (TPKS), Port of Tanjung Emas, Semarang
6. PT Terminal Petikemas Surabaya (TPS), Port of Tanjung Perak, Surabaya
7. PT Terminal Teluk Lamong (TTL), Port of Tanjung Perak, Surabaya.

4.9. Data collection period

Cross-sectional survey studies are collected only once, perhaps over several days, weeks or months, are cheaper and easier to run (Sekaran, 2006) and become the most popular form of survey (Zikmund et al., 2010). A cross-sectional study is generally employed to investigate relationships among variables (Graziano & Raulin, 2007). Accordingly, this research employed cross-sectional data to test the relations between variables. The data was collected from January to April 2017. These dates fall between two major cultural events in Indonesia (Christmas in December 2016 and Eid al-Fitr in June 2017) where port processes are relatively calm. This helped in data collection.

4.10. Data analysis procedure

The survey data is analysed in three phases: data screening, psychometric properties to test the data reliability and validity, and structural modeling (Hair, Hult, Ringle, & Sarstedt, 2017). Data screening is performed to detect missing values and scrutinize data normality. Following data screening, a non-response and common method bias test are performed. To confirm the questionnaire as valid and reliable, the newly developed or adapted items and constructs are examined through psychometric assessment for reliability and validity assurance. Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA) are carried out to test the reliability and validity of the constructs (DeVellis, 2012). The last test is performed to run the path model using SEM to test the concurrent relationship between variables in the model. IBM SPSS 24 and AMOS 24 are used for analysis. The following subsection outlines the stages and procedures of each phase.

4.10.1. Assessment of missing values

As a requirement for SEM analysis, it is important to assess missing values. Hair et al. (2014) advise four stages to identify missing data and implement remedies. They are: 1) define the missing data type; 2) verify the magnitude of missing data; 3) analyse the randomness of the missing data; and 4) perform the required imputation method. Further, Little's test (Little, 1988) is performed to determine the randomness of the missing data. The test shows two results, whether the data is missing completely at random (MCAR) or missing at random (MAR). If the test value is insignificant ($p > 0.05$), the result indicates for MCAR value.

Hair et al. (2014) suggests several methods to treat missing values i.e., pairwise and list wise deletion, applying regression or mean values replacement, and model-based approaches i.e., expectation maximization (EM) and multiple imputation (MI) (Hair et al., 2014). The EM method is deemed to be suitable as shown comparable estimations regardless the percentage of missing data and yields fewer biased outcomes even just using 100 samples (Olinsky, Chen, & Harlow, 2003).

4.10.2. Normality and outliers assessment

Continuing from the previous stage, a normality check was performed to check the figure of data distribution of the sample obtained from the population, particularly the degree of skewness and kurtosis when compared with the normal distribution. Skewness signifies the degree of the distribution symmetry contrasted to normal distribution with a skewness value of zero. Both skewness (positive and negative) denotes that the distribution tails off to the right or left respectively. A skewed distribution indicated by values larger than ±1. Kurtosis is the degree of the peak sharpness of distribution. When the distribution is normal, the kurtosis value will be zero. A relatively peaked distribution is indicated by a positive value and a relatively flat distribution is indicated by a negative value (Hair et al., 2014). For univariate normality, skewness is recommended to be less than 3 and kurtosis less than 10 (Kline, 2010). The univariate normality of variable is confirmed individually in order to define multivariate normality. Retaining univariate normality provides no assurance for such normality; however, it is essential to achieve multivariate normality (Hair et al., 2014).

Next, outliers examination is performed on the dataset. Outliers are distinctive features dissimilar from other examinations and can be found in the Mahalanobis distance (MD) calculation (Pallant, 2013). Mahalanobis distance itself is a distance measurement of a certain point from the central point of the other multivariate data (Tabachnick & Fidell, 2013). As the factor solution is affected by univariate and multivariate outliers (Tabachnick & Fidell, 2013), thus it is important to identify the outliers (Shah & Goldstein, 2006).

4.10.3. Non-response and common method bias test

Armstrong and Overton (1977) suggest significant differences between early and later wave responses (i.e., a widely used extrapolation technique) should be investigated as a measure of non-response bias (Wagner & Kemmerling, 2010). Wiengarten and Longoni (2015) affirm this technique as a simple way to record the returns of both early and late responses. This was tested using a two paired t-test of demographics (i.e., number of employees, department and education level). The outcomes indicated no significant differences ($p < 0.05$) in early versus late responses, suggesting response bias was non-existent in this study.

As this research used a self-reported questionnaire with perceptual measures, the outcomes may be affected by common method bias (Chang, Witteloostuijn, & Eden, 2010). Podsakoff, MacKenzie, Lee, and Podsakoff (2003) state that method biases result from the respondent who is the same person responding to the predictor and criterion variable in a research model. Subsequently, to strengthen the validity and reliability of measures, the common method bias examination is performed employing procedural and statistical conducts. Procedurally, Chang et al. (2010) suggest several remedies to manage the method bias, from randomizing the sequence of questions to employing distinct measurement types. As numerous respondents from the same company participated in the survey, double-barrelled and vague queries were avoided, and a mid-point scale was employed to reduce bias. In addition, Harman's one-factor test was employed (Podsakoff et al., 2003) utilizing EFA and CFA methods. The EFA assessment indicates that a common method bias exists when outcomes demonstrate one factor resolution, or if single factor held responsible for the most of covariances amongst measures.

The self-report survey introduces a bias that results from any covariance between the predictor and criterion variable. Further, they argue that the method bias is a source of measurement errors and consequently mislead the conclusion validity on the relationships between measures. Harman's one-factor test (Podsakoff et al., 2003) was employed where all variables were restrained with no rotation and loaded onto a single factor utilizing CFA method.

4.10.4. Exploratory Factor Analysis (EFA)

Exploratory Factor Analysis (EFA) using Principal Component Analysis (PCA) extraction is employed to categorize various dimensions into a smaller group of factors. The factor being generated through EFA is ideally a group of items loaded onto the same group that represent the underlying theoretical structure of the factor. The EFA requires the following to be satisfied:

1. Sample adequacy

de Winter, Dodou, and Wieringa (2009) suggest that EFA is able to generate excellent quality outcomes for a sample size below 50. However, as this study employs SEM modeling, sample adequacy is required. Hazen et al. (2015) reported in their study that 36% of CB-SEM studies use a sample size less than 200. Given that terminal operator firms are scarce within Indonesian ports, the size of population is constricted. Henceforth, 216 sample size is regarded as sufficient and the model can be analyzed further. Thus, the data matrix correlations for factor analysis are justified with the Kaiser-Meyer-Olkin (KMO) as sampling adequacy measurement and Bartlett's test of sphericity, where the KMO value should larger than 0.6 and Bartlett's test of sphericity must be significant (Hair et al., 2014; Williams, Brown, & Onsman, 2012).

2. Factors extraction method

Factors can be extracted using several methods: Principal components analysis (PCA), principal axis factoring (PAF), image factoring, maximum likelihood, alpha factoring and canonical (Tabachnick & Fidell, 2007; Thompson, 2004). Amongst these methods, the most common is

PCA and PAF (Henson & Roberts, 2006; Tabachnick & Fidell, 2007; Thompson, 2004). Researchers often end up with PCA which is a default method in SPSS (Thompson, 2004), but PAF is the suggested extraction method.

3. Rotating technique selection

Orthogonal and oblique rotations are commonly used rotation in EFA. Orthogonal Varimax rotation by Thompson (2004) is commonly used in factor analysis, which generates uncorrelated factor structures (Costello & Osborne, 2005). The factor rotation maximises the loading of items under each factor.

4. Factors labelling

In general, a factor consists at least two or three items linked to the same topic. Researchers interpret and determine the level of factors that suits most of the items within (Henson & Roberts, 2006). The labelling process is a technique of obtaining the parallel theme amongst the factors and generates an operational description of the labels that reflect theoretical and conceptual content (Williams et al., 2012).

As the questionnaire originates from a variety of studies with various contexts in numerous countries and different study discipline backgrounds, such as insurance, management, marketing, ports and supply chain, thus, this study employs EFA to find out whether the variable as a questionnaire fits into a one-unit construct or not.

4.10.5. Confirmatory Factor Analysis (CFA)

CFA is used to test the suitability of quantified variables in denoting constructs (Hair et al., 2014). A two-step CFA is then performed to test the first-order factorial validity of measurement models for the individual latent construct, namely the congeneric model. And second, testing the second-order for models that consist of all latent constructs, known as the full measurement model. Subsequently, the full measurement CFA model results were measured for reliability (e.g., Cronbach-alpha and composite reliability) and validity (e.g., convergent and discriminant validity) (Byrne, 2010).

4.11. Structural Equation Modeling

Structural Equation Modeling (SEM) is a formula of causal modeling to analyse covariance structures or path analysis (Ullman, 2013).

Following Hair et al. (2014), a further two-step SEM process is performed. First, using CFA, the measurement model is verified to assure the appropriateness of constructs through reliability and validity (Anderson & Gerbing, 1988). Second, the structural path model and the significance of the inter-construct relationship are tested. The maximum likelihood (ML) approach in AMOS24 was performed for the above test (Jöreskog & Sörbom, 1993).

Further, to establish the acceptance level of goodness-of-fit (GOF) for the model, three types of model fit indices are used: absolute, incremental fit and parsimonious fit indices may be used to indicate goodness-of-fit. There are no strict rules to define goodness-of-fit (Schermelleh-Engel, Moosbrugger, & Müller, 2003). Absolute fit indices measure the goodness of a theoretical model that replicates the sample data, whilst incremental fit indices otherwise known as comparative fit indices endeavour to compare fit improvement with a standard model (Hu & Bentler, 1999), and parsimony fit indices reports the best competing models considering its fit compare to its complexity (Hair et al., 2014). The general usage and criterion of fit indices are elaborated in Table 4.5 below.

Table 4.5: Fit indices for SEM modeling

Indices	Description
Absolute fit indices	
Chi-square (χ^2)	A significant χ^2 value is a low χ^2 value that produces a significance level $\geq$ 0.05 ($p \geq 0.05$) indicating the better fit and accepted null hypothesis (Haryono, 2017). This means the predicted with the observed input matrix is not statistically different. However, if χ^2 is large and $p \leq 0.05$, it is not necessarily mean that the predicted input matrices are not the same as the actual input matrices. It still needs to be seen further how large the difference is. If the difference is small, it can still be stated that the predicted input matrix has a good match rate with the observed input matrix. Thus, Chi-square (χ^2) cannot be used as the only measure of overall fit of the model due to its sensitivity to sample size (Hair et al., 2014). The larger the sample, the value of χ^2 will increase and lead to the rejection of the model although the value of the difference between the sample covariant matrix and the covariant matrix of the model has been minimal and small. Bootstrapping application is suggested for χ^2 for a non-normal data and Bollen-Stine *p-value* will represent the χ^2 (Bollen & Stine, 1992)
Goodness of fit index (GFI)	GFI is the fit ratio between the examined and hypothesised covariance matrices (Schumacker & Lomax, 2004). GFI larger than 0.90 is considered good, around 0.95 is better (Hair et al., 2014). GFI performs weakly in small samples (n <= 250) (Hu & Bentler, 1995). In the case of small samples, the increase of factors number in the model would decrease GFI value (Anderson & Gerbing, 1984). GFI usage is decline due the advancement of other indices (Hair et al., 2014).
Standardized Root Mean-square Residual (SRMR)	It denotes the variance between the examined and predicted standardized correlation (Ullman, 2013). Comparison of various models with the same data can use SRMR as reference index. (Bagozzi & Yi, 1994). A satisfactory model is indicated by value < 0.8 (Hu & Bentler, 1999). Sample size and distribution do not influence the index, thus, it is suggested for data with small sampling amount (n <= 250) (Hu & Bentler, 1999).
Root mean square of approximation (RMSEA)	RMSEA appraises the lack of model fit contrasted to an absolute model (Ullman, 2013). RMSEA between 0.05 and 0.08 is acceptable (Hair et al., 2014), between 0.08 to 1 suggests a middling fitness and larger than 0.1 denotes an inferior fitness (Byrne, 2010). The estimation method selection influences the value of RMSEA (Ullman, 2013). RMSEA is not suggested for small samples (n <= 250) (Hu & Bentler, 1999).
Incremental fit indices	
Normed fit index (NFI)	NFI contrasts the value of chi-square of the hypothesized and the null model (Ullman, 2013). NFI > 0.90 signifies a satisfactory model (Hu & Bentler, 1999). NFI overlooked the fit in small samples (Hu & Bentler, 1999). NFI shown moderate sensitivity to complicated model and less insensitive to minimal model (Hu & Bentler, 1999).
Tucker-Lewis index (TLI)	TLI, known as non-normed fit index (NNFI), is an adjusted NFI (Ullman, 2013). TLI equals to zero signifies a non-fit model, TLI equals to 1 denotes an absolute fit model. The threshold is 0.90 (Bentler & Bonett, 1980). TLI is highly sensitive to complex model and shown moderate sensitivity to simple model (Hu & Bentler, 1999).
Comparative fit index (CFI)	CFI is the enhanced form of NFI and a value higher than 0.9 denotes a satisfactory fit model (Bentler & Bonett, 1980; Hair et al., 2014). CFI is superior for small samples (n<=250) (Hu & Bentler, 1999). CFI shown moderate sensitivity to minimal model and shown large

Indices	Description
	sensitivity to complicated model (Hu & Bentler, 1999). CFI is among the most broadly used indices due to its advantages (Hair et al. 2014).
Parsimony Fit Indices	
Adjusted goodness-of-fit (AGFI)	AGFI is the adjusted GFI by comparing the degrees of freedom (*df*) performed in the model with the total available *df* (Byrne, 2010; Hair et al., 2014). When the goodness-of-fit increases, AGFI also increases with cut-off value at 0.9 (Hu & Bentler, 1999). AGFI does not favour models with small samples (Hu & Bentler, 1995). Similar to GFI, AGFI is rarely exercised due to its high sensitivity to complicated model and sample amount (Hair et al. 2014).

Due to their inferior fit in data with small respondents (n < 250), therefore, GFI, AGFI and NFI were not accounted in the complex combined full measurement model (Hair et al. 2014). Additionally, Hair et al. (2014, p. 583) propose that the use of three to four goodness-of-fit criteria is sufficient to assess the feasibility of a model. The goodness of fit indices reports of X^2 and degrees of freedom, CFI or TLI are suggested, as well as the reporting of RMSEA and SRMR to represent the badness of fit (Hair et al., 2014, p. 583). Also, significant p-value is expected for small sample (n < 250) with measurement items more than 30 (Hair et al., 2014, p. 584). Thus, in this case, Bollen-Stine *p-value* is considered.

4.12. Summary

This chapter provided an overview of research paradigms and explained the positive paradigm suitable for this research. Additionally, this chapter outlined the research design and method employed in the study. This was followed by questionnaire development and sampling design, data collection procedure, unit of analysis, period of data collection, data analysis procedure, SEM modelling and chapter summary.

The questionnaire design incorporates various study contexts from many countries, and therefore EFA is employed to examine whether the questionnaire fits into a one-unit construct or not. CFA follows the examination to check the suitability of the variables in the model. Finally, SEM is utilized to analyse the significance of the inter-construct relationship in the model. Chapter 5 will present preliminary data analysis.

Chapter 5
Data Analysis and Results Interpretation

5.1. Introduction

The previous chapter outlined the details of the survey method which was used to collect the data on Indonesia container terminals. Also, the theoretical aspects of data analysis were discussed at length. This chapter discusses quantitative analysis of previously obtained survey data. There are several major sections in this chapter: preliminary analysis of data cleansing for missing value, normality and outliers. Afterward, the individual construct measurement model is verified, followed by combining each model into a full measurement model. Subsequently, the psychometric assessment, SEM analysis, hypothesis testing, and mediation tests are discussed.

5.2. Sample size and data collection

Hardcopy and the online questionnaire link were distributed to eight terminal operators located in the city of Jakarta, Semarang and Surabaya. These employees are distributed in three major container ports in cities, namely Tanjung Priok in Jakarta, Tanjung Emas in Semarang, and Tanjung Perak and Teluk Lamong in Surabaya. The survey, though distributed to 354 employees, resulted in 276 returned surveys and 255 valid responses that constituted a response rate of 72%. Further, outlier analysis decreased the sample size from 255 to 216 that was used for further analysis. Therefore, the sample signifies a sufficient size for SEM analysis.

5.3. Demographic profile

5.3.1. Sample distribution

Questionnaire surveys were distributed to respondents in the companies and cities presented below in Table 5.1.

Table 5.1: Sample distribution

Company	Distributed Survey	Form	Returned	Full/Partial Answered	Response Rate
PT Jakarta International Container Terminal (JICT)	80	Hardcopy	48	48	60%
PT New Priok Container Terminal 1 (NPCT1)	40	Hardcopy	31	31	78%
PT Mustika Alam Lestari (MAL)	20	Hardcopy	11	11	55%
PT Pelabuhan Tanjung Priok Terminal 3 (TER3)	30	Hardcopy	29	29	97%
PT Terminal Peti Kemas KOJA (TPK KOJA)	60	Hardcopy	49	44	73%
PT Terminal Peti Kemas Semarang (TPKS)	30	Hardcopy	24	24	80%
PT Terminal Petikemas Surabaya (TPS)	40	Hardcopy	32	32	80%
	15	Online	13	13	87%
PT Terminal Teluk Lamong (TTL)	30	Hardcopy	22	18	60%
	9	Online	5	5	56%
Total	**354**		**276**	**255**	**72%**

Source: Data processed by author

Table 5.2 displays the sample distribution in terms of city location of the organization surveyed. The highest proportion of respondents were from the city of Jakarta (63.92%), followed by Surabaya (26.67%) and Semarang (9.41%). Most respondents were from JICT, followed by KOJA, TPS, NPCT1, TER3, TPKS, TTL and MAL respectively.

Table 5.2: Sample distribution based on cities

Companies/ Cities	Jakarta	Semarang	Surabaya	Total	%
PT Jakarta International Container Terminal (JICT)	48			48	18.8%
PT Mustika Alam Lestari (MAL)	11			11	4.3%
PT New Priok Container Terminal 1 (NPCT1)	31			31	12.2%
PT Pelabuhan Tanjung Priok Terminal 3 (TER3)	29			29	11.4%
PT Terminal Peti Kemas KOJA (TPK KOJA)	44			44	17.3%
PT Terminal Peti Kemas Semarang (TPKS)		24		24	9.4%
PT Terminal Petikemas Surabaya (TPS)			45	45	17.6%
PT Terminal Teluk Lamong (TTL)			23	23	9.0%
Total	**163**	**24**	**68**	**255**	**100.0%**

Source: Data processed by author

5.3.2. Respondents' profile

Table 5.3 shows the sample distribution in terms of job level and companies in which the respondents work. The majority of respondents were at a supervisory level (70.20%), followed by managers (16.47%) and assistant managers (6.67%). The majority of supervisors' responses were received from KOJA, followed by JICT, TPS, NPCT1, TER3, TPKS, MAL, and TTL respectively.

Table 5.3: Job level distribution based on companies

Job Level/ Company	JICT	MAL	NPCT1	TER3	KOJA	TPKS	TPS	TTL	Total	%
Assistant Manager		1	1	5		5	5		17	6.7%
Director		1						1	2	0.8%
General Manager		1				1			2	0.8%
Manager	5	2	7	2		3	7	16	42	16.5%
President Director							1		1	0.4%
Senior Manager	3								3	1.2%
Senior Staff	7				1				8	3.1%
Supervisor	33	6	23	22	43	15	31	6	179	70.2%
Vice President Director							1		1	0.4%
Total	**48**	**11**	**31**	**29**	**44**	**24**	**45**	**23**	**255**	**100.0%**

Source: Data processed by author

Table 5.4: Job level distribution based on education

Job Level/ Education	Bachelor	Diploma	Doctoral	High School	Master	Total
Assistant Manager	10	1			6	17
Director	1				1	2
General Manager	1				1	2
Manager	27	1		1	13	42
President Director					1	1
Senior Manager	1	1			1	3
Senior Staff	1	1		4	2	8
Supervisor	120	29	1	12	17	179
Vice President Director					1	1
Total	**161**	**33**	**1**	**17**	**43**	**255**
%	63.1%	12.9%	0.4%	6.7%	16.9%	**100.0%**

Source: Data processed by author

Table 5.4 above displays that most of the respondents have passed their bachelor's degree (63%) followed by master (16.9%) and diploma degrees (12.9%) respectively. Also, most of the supervisors in the sample had a wide range of work experience in the container port industry, ranging from below five years to above 21 years of experience (Table 5.5).

Table 5.5: Summary of demographic profile (N=216)

Department	Frequency (N=216)	%	Accumulative %
Human Resources	1	0.46%	0.46%
Marketing	1	0.46%	0.93%
Quality, Health & Safety	1	0.46%	1.39%
Finance	2	0.93%	2.31%
Corporate Communication	3	1.39%	3.70%
General Affairs	3	1.39%	5.09%
Legal and Commercial	4	1.85%	6.94%
Management	6	2.78%	9.72%
ICT	12	5.56%	15.28%
Engineering	18	8.33%	23.61%
Operation	165	76.39%	100.00%
Position Level	**Frequency (N=216)**	**%**	**Accumulative %**
Director	1	0.46%	0.46%
General Manager	1	0.46%	0.93%
President Director	1	0.46%	1.39%
Vice President Director	1	0.46%	1.85%
Senior Manager	2	0.93%	2.78%
Senior Staff	7	3.24%	6.02%
Assistant Manager	11	5.09%	11.11%
Manager	33	15.28%	26.39%
Supervisor	159	73.61%	100.00%
Education Level	**Frequency (N=216)**	**%**	**Accumulative %**
High School	15	6.94%	6.94%
Diploma	28	12.96%	19.91%
Bachelor	140	64.81%	84.72%
Master	32	14.81%	99.54%
Doctoral	1	0.46%	100.00%
Year of Experience in Port Industry	**Frequency (N=216)**	**%**	**Accumulative %**
Less than 5 years	56	25.93%	25.93%
6 - 10 years	42	19.44%	45.37%
11 – 15 years	20	9.26%	54.63%
16 – 20 years	66	30.56%	85.19%
More than 20 years	32	14.81%	100.00%
Work Exp Year in Current Company	**Frequency (N=216)**	**%**	**Accumulative %**
Less than 5 years	74	34.26%	34.26%
6 - 10 years	36	16.67%	50.93%
11 – 15 years	14	6.48%	57.41%
16 – 20 years	70	32.41%	89.81%
More than 20 years	22	10.19%	100.00%
Gender	**Frequency (N=216)**	**%**	**Accumulative %**
Male	195	90.28%	90.28%
Female	21	9.72%	100.00%

Source: Data processed by author

The majority respondents of supervisors and managers were in the operations department (75%). 27% responses represented the Executive level officers, while supervisors represented

70%, and 3% were senior staff. Further, 25% of the respondents had worked in the port industry for less than five years, 25% between 6-10 years, 11% between 11-15 years, 28% between 16-20 years and 15% had experience in the port industry for more than 20 years. The sample represented all the stages of container handling operations. Based on-the-job practise and positions held in the firm, the respondents were well-informed and significantly experienced.

5.4. Preliminary data screening analysis

The purpose of the data reduction process is to reduce the 78 items into 13 variables (constructs) to be used in Structural Equation Modeling (SEM). As such, each construct needs to be validated before the items can be aggregated into a composite value.

5.4.1. Missing value assessment

Hair et al. (2014) propose four stages to identify missing data and implement remedies. These are: 1) decide the type of missing data; 2) establish the degree of missing data; 3) analyse the missing data's randomness; and 4) determine the imputation method.

There are 14 cases with a minor number of missing values (less than 2%) and 241 cases with a complete set of data.

Table 5.6: Missing data per case

Missing Data per Case	Cases	% Sample
0	241	94.5%
1	4	1.6%
2	6	2.4%
3	1	0.4%
4	2	0.8%
5	1	0.4%
Total	**255**	**100%**

Further analysis is then conducted to determine the randomness of the missing data by using Little's (1988) test. The test shows two results, whether the data is missing completely at random way (MCAR) or missing at random way (MAR). This test indicates a result for MCAR value if value is non-significant ($p > 0.05$). On the other hand, although the MAR statistical test is unavailable, it can be inferred from the MCAR's significant value. The missing value analysis in SPSS24 shows that Little's MCAR test: Chi-Square = 746.241, DF = 984, Sig = 1.0000, means the MCAR value is significant. The outcome means that the data can be classified as missing at random (MAR).

When the data showed a MAR missing dataset, Hair et al. (2014) suggest the data be given special treatment with the Expectation Maximization (EM) algorithm. The EM method is deemed to perform better compared to other methods available for MAR or MCAR missing values treatment (Hair et al., 2014). The EM method has established comparable estimates regardless the missing values percentage and generates fewer biased results (Olinsky et al., 2003). Hence, this study applies EM method for missing data treatment (less than 2%, see Table 5.6.). The dataset with no missing values is tested for data distribution normality and outliers check.

5.4.2. Normality assessment

The results in Appendix 2 show the value of skewness and kurtosis. The highest value of skewness was -0.543 and highest value of kurtosis was 11.532. Skewness values are within the satisfactory range of less than 3, and kurtosis is outside the range of less than 10 for univariate normality. The results exhibited a negative skewness as the skewness values are more than -1 and kurtotic. Thus, the univariate normality was established by skewness and kurtosis values within the acceptable scale for univariate normality except for variable MR8 (kurtosis value 11.532) (See the skewness and kurtosis limit in section 4.10.2.).

The subsequent phase is to test the sample for multivariate normality. The hypothesis of multivariate normality should be rejected for both large and small normalized estimate values when using large samples, (i.e., values above +1.96 or below -1.96). Z-values can be established by dividing skewness or kurtosis values with standard errors. According to this standard, the result of data examination did not fulfil the multivariate normality as most z-values are above +1.96 or below -1.96. On the other hand, the histogram and Q-Q Plot examination show that the distribution of individual sample data is non-normal (See Appendix 3 for histogram summary).

Further, the Shapiro-Wilk test for normality was performed, with the null hypothesis that the data are in normal distribution. If *p-value* > 0.05, the null hypothesis is not rejected. (See Appendix 4 for summary). The test result exhibited that the *p-value* is 0.00, indicating that data is not normally distributed.

5.4.3. Multivariate outliers assessment

According to Blunch (2013), AMOS assumes the multivariate normal distribution when estimating the Mahalanobis distance, and therefore, it becomes less reliable. SPSS 24 is then used to compute Mahalanobis distances, and Mahalanobis distance at $p < .001$ is used as the benchmark for multivariate outliers (Tabachnick & Fidell, 2013). To identify outliers, the Mahalanobis distances values is assessed against the critical value of the Chi-square distribution.

According to Kline (2010), the presence of data non-normality can be treated by removing outliers from the sample. Nonetheless, it is suggested that outliers be retained as their removal may reduce generalizability of results where the outliers truthfully represent the population

(Tabachnick & Fidell, 2013). The assessment found 39 outlier cases which signified 15% (39 out of 255) of cases in the sample. The Mahalanobis computation resulted in 39 cases to be labeled as outliers (insignificant at $p < 0.001$). Due to the small sum of outliers, they were discarded from the dataset before continuing factor analysis. The outliers were randomly dispersed among the different companies and cities, and therefore their deletion had no effect on the generalization of outcomes in relation to the population of terminal container operators in Indonesia. The outliers removal decreased the sample size from 255 to 216, and the sample was used for factor analysis and SEM.

The measurement model was tested in two parts. The analysis started with EFA to investigate factorization of items and continued with CFA to confirm factor structure. Based on sample size (n=216), the following indices were chosen to define the goodness-of-fit of the model. They include Chi-square (χ^2) and Chi-square ratio to the degrees of freedom (χ^2/df), Bollen-Stine-p (Bollen & Stine, 1992), Comparative Fit Index (CFI) (Bentler, 1990), Goodness-of-fit Index (GFI) (Anderson & Gerbing, 1988; Schumacker & Lomax, 1996), Tucker-Lewis Index (TLI) (Tucker & Lewis, 1973), Root Mean Square Error of Approximation (RMSEA) (Byrne, 2010; Ullman, 2013) and Standardized Root Mean Square Residual (SRMR) (Ullman, 2013).

5.4.4. Multicollinearity assessment

Hair et al. (2014) suggest that independent variables may highly correlate with the dependent variable but having less correlation among themselves. The presence of .90 and higher correlation coefficient is an indication of substantial collinearity (Hair et al., 2014).

Following Hair et al. (2014), bivariate correlation (Spearman correlation coefficient) was performed to understand the relationship between independent–dependent individual variables. The result showed no correlation values above 0.9, except for GS5 and GS 6 that are likely to have a robust correlation with a correlation coefficient of 0.890. One of the remedies for multicollinearity is to omit one or more highly correlated independent variables and identify other independent variables to help with prediction. As for GS 5 (government's support in financial support to build new container facilities) and GS 6 (government's incentives in container logistics warehousing and storage), GS 5 is considered to have an extensive approach in container facilities. Even though the correlation value of GS 5 and GS 6 is close to 0.9, the author chose to retain the variable for further analysis as it is still below the cut off value of 0.9. Thus, the model had no issue of multicollinearity. Appendix 5 summarizes the concluding remarks of the multicollinearity test.

5.5. Measurement model assessment

Next, the four constructs involved in the study were assessed with a uni-dimensionality check to ensure that all items explained the construct distinctly. As the data demonstrated a multivariate non-normality, Principal Axis Factoring (PAF) procedure in SPSS will provide better extraction in the EFA method (Fabrigar, Wegener, MacCallum, & Strahan, 1999; Hair et al., 2014).

The EFA outcome was then employed to establish the composition of latent variables by verifying the Kaiser criterion, communality values and factor loadings. The Kaiser criterion is performed to conclude the number of factors (eigenvalue greater than one) and confirmed with the scree plot test. The scree plot is an eigenvalue chart in decreasing order, where eigenvalues over 1 are to be retained. If there is more than one factor be recognized, factor loadings for each variable are examined in pattern matrix.

Communality is calculated as the square of standardized construct loadings and represents the quantity of variation among evident variables in the measurement model (Hair et al., 2014). Kline (2010) suggests 0.3 as the cut-off level of communality value and value that is less than 0.3 be removed, as it denotes a low-shared item variance among the total item variance represented by the factor. Subsequently, items with factor loadings < 0.5 were considered for deletion to provide a good factor structure for the CFA stage (Hair et al., 2014). Afterward, sampling adequacy was measured using the Measures of Sampling Adequacy (MSA), and the MSA value has meaning as follows: MSA $\geq$ .80 is excellent, $\geq$ .70 is adequate, $\geq$ .60 is average, $\geq$ .50 is inadequate and under .50 is intolerable (Hair et al., 2014). Finally, the EFA result is assessed with CFA to obtain the final full measurement model. The next section discusses measurement model assessment for each construct.

5.5.1. Analysis rationale

As mentioned earlier in Chapter 4, this study uses EFA and CFA to analyse factors that determine the construct.

The established questionnaire from the literature originates from a variety of container port and supply chain and logistics studies. To confirm the questionnaire as valid and reliable, the newly developed or adapted question items and constructs are examined through psychometric assessment for reliability and validity assurance. Therefore, this study employs EFA to determine whether the variable as a questionnaire fits into a one-unit construct or not. Further, EFA is performed in this study to identify and explore the underlying relationships between variables bundled together in the framework and whether they form a solid construct. Data were composed using numerous personnel per organization as respondents in order to avoid using individuals as main informers for practices and results. To reflect collective perception of examined constructs, the personnel responses within a company are then aggregated at the organizational level (Katou, 2017). Subsequently, CFA is performed to validate the factor structure of a set of investigated variables. CFA uses the averaging technique where all item loadings are aggregated to the next level using the average of item loading. All items are assumed to have equal weight in the aggregation (Hair et al., 2014).

5.5.2. Assessment for government support (GS)

The Kaiser-Meyer-Olkin (KMO) test of sampling adequacy for the GS construct was 0.893 and Bartlett's test of sphericity (i.e., the relationship strength amongst variables) was significant ($X^2 = 1804.999$ and $p < 0.001$), indicating that the sample size was adequate for an EFA (See Table 5.7).

Table 5.7: Government support KMO and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.893
Bartlett's test of sphericity	Approx. Chi-square	1804.999
	Df	21
	Sig.	.000

A further communalities test was performed, and the results in Table 5.8 demonstrated that the overall communalities values were satisfying the minimum 0.3 thresholds. Therefore, the items could adequately explain the variance of the GS construct and retained for further investigation.

Table 5.8: Government support communalities

Item	Initial	Extraction
GS1	.788	.706
GS2	.839	.810
GS3	.832	.823
GS4	.776	.757
GS5	.854	.778
GS6	.856	.768
GS7	.792	.799

Extraction method: Principal axis factoring

Table 5.9 below depicts the result of the factor matrix of GS Construct.

Table 5.9: Government support factor matrix

Item	Factor
GS1	.840
GS2	.900
GS3	.907
GS4	.870
GS5	.882
GS6	.876
GS7	.894

Extraction method: Principal axis factoring
a. 1 factor extracted and 4 iterations required

The results in Table 5.9 revealed that all indicators were loaded onto a single factor. Principal axis factoring was performed using varimax rotation. Based on the anti-image matrices computation in Table 5.10, the lowest MSA value for the GS construct is 0.855. Thus, these results revealed uni-dimensionality of items and was deemed adequate to measure the GS construct.

Table 5.10: Government support anti-image matrices

		GS1	GS2	GS3	GS4	GS5	GS6	GS7
Anti-image correlation	**GS1**	.884[a]	-.589	-.256	.144	.041	-.077	-.045
	GS2	-.589	.895[a]	-.205	-.185	-.138	.010	.005
	GS3	-.256	-.205	.907[a]	-.443	.098	-.027	-.279
	GS4	.144	-.185	-.443	.908[a]	-.288	.107	-.123
	GS5	.041	-.138	.098	-.288	.862[a]	-.682	-.062
	GS6	-.077	.010	-.027	.107	-.682	.855[a]	-.358
	GS7	-.045	.005	-.279	-.123	-.062	-.358	.942[a]

a. Measures of Sampling Adequacy (MSA)

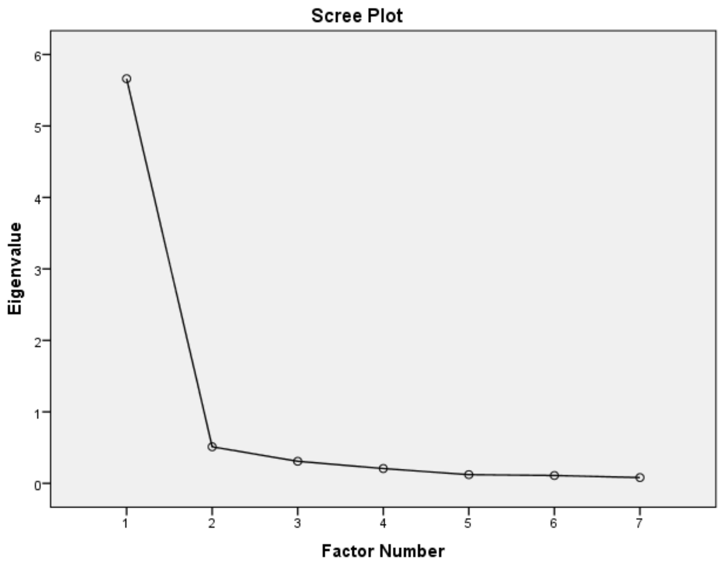


Figure 5.1: Government support scree plot

Further, a specific exceptional value above the elbow is depicted in the scree plot in Figure 5.1. This factor explained 80.877% of the variance of the GS construct. As all the communality values are greater than 0.3 (minimum value of 0.706 for GS1), all items are justified to be retained in the analysis. Based on these outcomes, the uni-dimensionality of GS was confirmed.

As earlier explained in section 5.5.1, the resulting EFA configuration was then confirmed using CFA with analysis shown in Table 5.11. The initial model shown results of χ^2 (14) = 257.157, χ^2/df = 18.368, p = 0.000, CFI = 0.866, TLI = 0.799, GFI = 0.738, RMSEA = 0.284, SRMR = 0.0478, and Bollen-Stine p = 0.005, demonstrating an unsatisfactory fit. The largest covariance of 98.063 in GS5 and GS6 was indicated in the modification index. Further inspection shown that GS6 had a slightly weaker factor loading than GS5 and was then excluded.

As a result, the model parameters of χ^2 (9) = 108.913, χ^2/df = 12.101, p = 0.000, CFI= 0.929, TLI = 0.881, GFI = 0.856, RMSEA = 0.227, SRMR = 0.0356, and Bollen-Stine p = 0.005, signalling a mediocre fit. A misspecification between GS1 and GS2 was suggested by the highest modification index of 48.021. Thus, GS1 was considered for deletion as it demonstrated a weaker factor loading than GS2.

After removing GS1, the measures shown results of χ^2 (5) = 39.226, χ^2/df = 7.845, p = 0.000, CFI= 0.968, TLI = 0.936, GFI = 0.939, RMSEA = 0.178, SRMR = 0.0229, and Bollen-Stine p = 0.010, suggesting a near fit model. A misspecification between GS3 and GS5 was implied in the highest modification index of 18.034. GS5 was considered for deletion as it demonstrated a weaker factor loading than GS3.

After removing GS5, the results signified a good-fit model with χ^2 (2) = 0.787, χ^2/df = 0.393, p = 0.675, CFI= 1.000, TLI = 1.005, GFI = 0.998, RMSEA = 0.000, SRMR = 0.0040, and Bollen-Stine p = 0.791. Factor loadings are significant for all items with the least of 0.861 and the largest of 0.946. The outcomes of the conclusive measurement model for the GS construct are depicted in Figure 5.2 and Table 5.11 below.

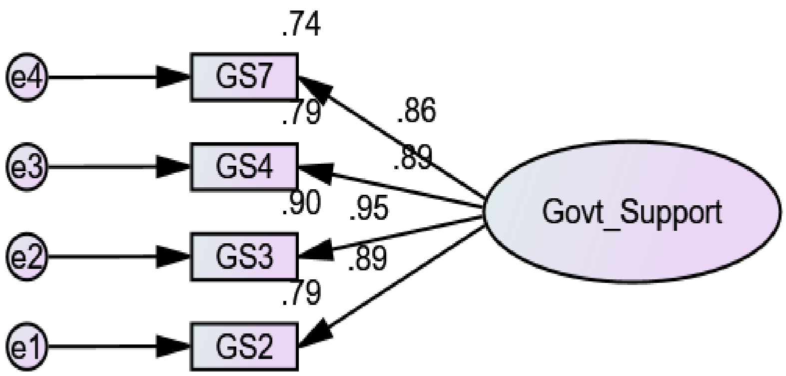


Figure 5.2: Government support measurement model

Table 5.11: Factor analysis for the GS construct

Item	Description	EFA		CFA	
		Loading	Variance Explained	Standardized Factor Loadings	Squared Multiple Correlation
GS1	Currently, the government provides support, incentive, policy and regulation in tolls and road network development	0.706	**80.877%**	Item dropped in CFA	
GS2	Currently, the government provides support, incentive, policy and regulation in identifying and implementing best practices in container transportation	0.810		0.887	0.786
GS3	Currently, the government provides support, incentive, policy and regulation in container	0.823		0.946	0.896

Item	Description	EFA		CFA	
		Loading	Variance Explained	Standardized Factor Loadings	Squared Multiple Correlation
	transportation ICT (e-Gate, tracking system, RFID)				
GS4	Currently, the government provides support, incentive, policy and regulation in the logistics education system	0.757		0.891	0.794
GS5	Currently, the government provides support, incentive, policy and regulation in financial support to build new container facilities	0.778		Item dropped in CFA	
GS6	Currently, the government provides support, incentive, policy and regulation in container logistics warehousing and storage	0.768		Item dropped in CFA	
GS7	Currently, the government provides support, incentive, policy and regulation to expedite import container logistics flow	0.799		0.861	0.741
		KMO = .893 Bartlett's test of sphericity (X^2 = 1804.999 and p < 0.001),		$\chi^2(2)$=.787, p=.675, χ^2/df= .393, GFI=0.998, AGFI =.991, CFI=1.000, TLI=1.005,RMSEA=.000,SRMR=.0040	

Note: $p < .001$

5.5.3. Assessment for firm resources (FR) measurement model

The Kaiser-Meyer-Olkin (KMO) test of sampling adequacy for FR construct (defines whether the replies provided by the sample are adequate or not) was 0.867 and Bartlett's test of sphericity (the relationship strength amongst variables) was significant (X^2 = 2015.262 and $p < 0.001$), suggesting that the data were adequate for an EFA (See Table 5.12).

Table 5.12: Firm resources KMO and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.867
Bartlett's test of sphericity	Approx. Chi-square	2015.262
	df	136
	Sig.	.000

A further communalities test was performed, and the results in Table 5.13 demonstrated that the overall communalities values were satisfying the minimum 0.3 thresholds. Therefore, the items could adequately explain the variance of the FR construct and retained for further investigation.

Table 5.13: Firm resources communalities

Item	Initial	Extraction
TP1	.521	.438
TP2	.589	.717
TP3	.413	.322
TP4	.658	.753
TP5	.352	.387
TE1	.747	.719
TE2	.757	.826
TE3	.805	.791
TE4	.608	.549

Item	Initial	Extraction
TE5	.584	.552
IH1	.388	.338
IH2	.486	.439
IH3	.620	.664
IH4	.319	.393
IH5	.541	.509
IH6	.555	.739
IH7	.485	.486

Extraction method: Principal axis factoring

The result of the factor matrix on firm resources construct variables is shown in Table 5.14 below.

Table 5.14: Firm resources rotated factor matrix

Rotated Factor Matrix[a]			
Items	**Factor**		
	1	**2**	**3**
TP1			.522
TP2			.783
TP3			
TP4			.811
TP5			.538
TE1	.798		
TE2	.877		
TE3	.819		
TE4	.671		
TE5	.618		
IH1			
IH2			
IH3		.686	
IH4			
IH5		.593	
IH6		.668	
IH7		.575	

Extraction method: Principal axis factoring
Rotation method: Varimax with Kaiser normalization[a]
a. Rotation converged in five iterations

EFA (Table 5.14) with principal axis factoring as extraction method and with varimax as rotation method has extracted three factors: Terminal Personnel (TP), Terminal Equipment (TE) and Infrastructure-Hinterland (IH). Items with loadings below < 0.5 were considered for deletion to provide a good factor structure for the CFA stage (Hair et al., 2014). Examination was then performed on Measures of Sampling Adequacy (MSA) with a criterion value as follows: MSA ≥ .80 is excellent, ≥ .70 is adequate, ≥ .60 is average, ≥ .50 is inadequate and under .50 is intolerable (Hair et al., 2014). Based on the anti-image matrices result, the lowest MSA value for FR construct is 0.783 (See Appendix 6). The results revealed the uni-dimensionality of the construct.

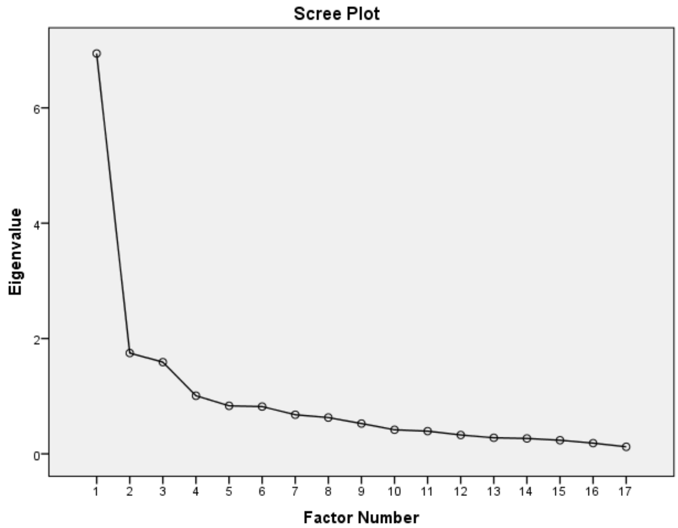


Figure 5.3: Firm resources scree plot

Further, a specific exceptional value above the elbow is depicted in the scree plot in Figure 5.3. This factor explained 40.842% of the variance of the FR construct. As all the communality values are greater than 0.3 (minimum value of 0.322 for TP3), all items are justified to be retained in the analysis. Based on these outcomes, the uni-dimensionality of FR was confirmed.

The EFA result was then validated using CFA with results shown in Table 5.15 below. The first model shown results of χ^2 (62) = 219.063, χ^2/df = 3.533, p = 0.000, CFI = 0.900, TLI = 0.874, GFI = 0.870, RMSEA = 0.109, SRMR = 0.0703 and Bollen-Stine p = 0.005, denoting an unsatisfactory fit. The modification index suggested that item TP1 has many misspecifications with several items. Further inspection discovered that the standardized residual covariance values of TP1 with three other items are larger than 2, and thus, TP1 was removed.

After eliminating TP1, the CFA was repeated, and the outcomes shown measures of χ^2 (51) = 157.107, χ^2/df = 3.081, p = 0.000, CFI= 0.926, TLI = 0.904, GFI = 0.894, RMSEA = 0.098, SRMR = 0.0609 and Bollen-Stine p = 0.005, implying an insufficient fit. A misspecification between IH6 and IH7 was implied by modification index of 33.778. Also, item IH7 had standardized residual covariance values larger than 2 with another item. Thus, item IH7 was considered for deletion.

After removing IH7, the repeated CFA result indicated a satisfactory model fit with χ^2 (41) = 89.313, χ^2/df = 2.178, p = 0.000, CFI = 0.963, TLI = 0.951, GFI= 0.931, RMSEA = 0.074, SRMR = 0.0458, and Bollen-Stine p = 0.095. Factor loadings values were significant between 0.650 and 0.912. The χ^2 with $p < 0.05$ is understood to be an inferior model data fit, however, $p < 0.05$ for a model with measurement items more than 30 and sample n < 250 is acceptable

(Hair et al., 2014, p. 584). Therefore, the chi-square test is not the best fitted measure as the sample is multivariate non-normal and small (Schumacker & Lomax, 2004) and subsequently, the Bollen-Stine bootstrap (p = 0.095; at p > 0.05) was measured to establish the model (Bollen & Stine, 1992; Hazen et al., 2015; Shee et al., 2018). Accordingly, the fit indices of this study are claimed to be acceptable and the model reached a satisfactory model fit. The concluding measurement model for firm resources are depicted in Figure 5.4. and Table 5.15 displayed the EFA and CFA results.

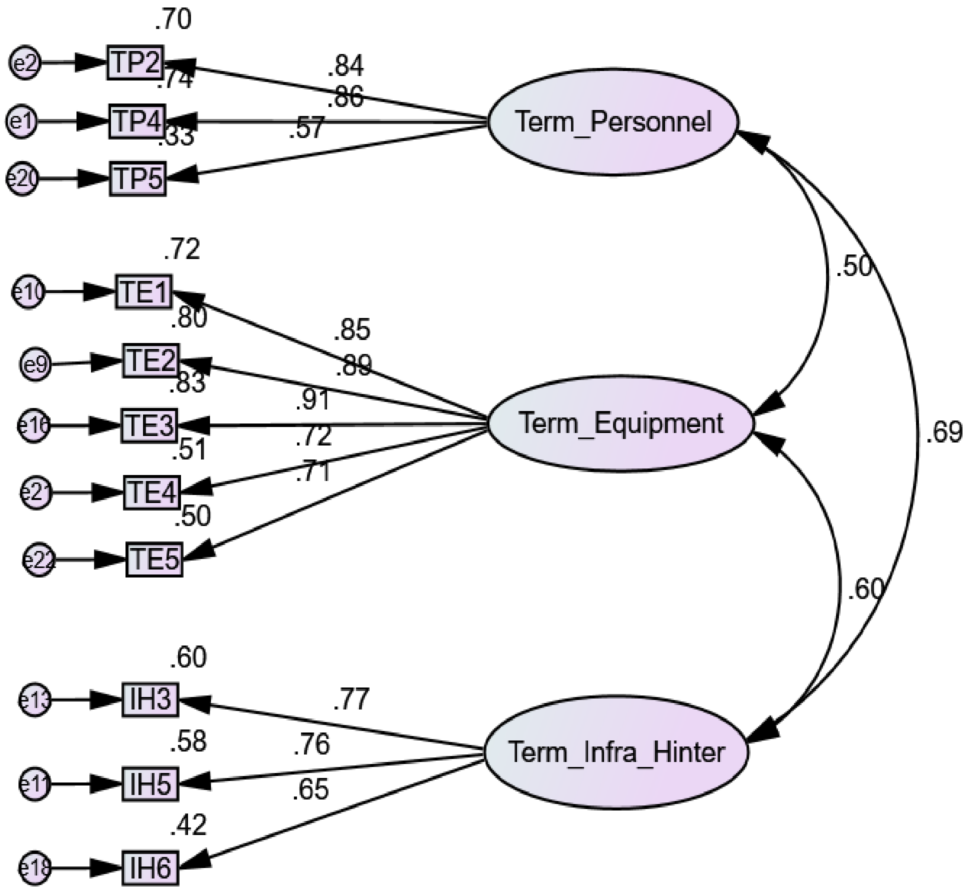


Figure 5.4: Firm resources measurement model

Table 5.15: Factor analysis for firm resources construct

Item	Brief Description	EFA		CFA	
		Loading	Variance Explained	Standardized Factor Loadings	Squared Multiple Correlation
TP1	Sufficient number of personnel	0.438	40.842%	Item dropped in CFA	
TP2	Personnel with sufficient capability	0.717		0.837	0.701
TP3	Key personnel are certified	Item dropped in EFA			
TP4	Key personnel are reliable	0.753		0.858	0.736
TP5	Key personnel are trustworthy	0.387		0.572	0.328
TE1	Sufficient quantity of terminal equipment	0.719		0.850	0.722
TE2	Readiness of equipment	0.826		0.893	0.798

Item	Brief Description	EFA		CFA	
		Loading	Variance Explained	Standardized Factor Loadings	Squared Multiple Correlation
TE3	Reliability of equipment	0.791		0.912	0.832
TE4	Regular modernization of equipment	0.549		0.717	0.514
TE5	Regular maintenance of equipment	0.552		0.708	0.501
IH1	Berths availability	Item dropped in EFA			
IH2	Sufficient storage capacity of Container Yard (CY)	Item dropped in EFA			
IH3	Sufficient container handling capability	0.664		0.774	0.600
IH4	Sufficient CY capability for physical inspection	0.393		Item dropped in CFA	
IH5	Sufficient capability of exit gate operation	0.509		0.759	0.576
IH6	Sufficient connectivity for ship and inland transportation	0.739		0.650	0.422
IH7	Regular maintenance of channel depth/ length/ width by extension/upgrading/dredging	0.486		Item dropped in CFA	
		KMO = .867 Bartlett's test of sphericity (X^2 = 2015.262 and p < 0.001),		χ^2 (41) = 89.313, p = 0.000 and χ^2/df = 2.178, Bollen-Stine p = 0.095, GFI= 0.931, CFI = 0.963, TLI = 0.951, RMSEA = 0.074 and SRMR = 0.0458.	

Note: p <. 001

5.5.4. Assessment for terminal logistics process (TLP) measurement model

The Kaiser-Meyer-Olkin (KMO) test of sampling adequacy for TLP yielded 0.916 and Bartlett's test of sphericity (indicated the relationship strength amongst variables) was significant (X^2 = 6199.807 and $p < 0.001$), indicating that the data were adequate for an EFA. Results for KMO ad Bartlett's test for TLP construct is shown in Table 5.16 below.

Table 5.16: Terminal logistics process KMO and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.916
Bartlett's Test of Sphericity	Approx. Chi-square	5654.519
	Df	496
	Sig.	.000

A further communalities test was performed, and the results in Table 5.17 demonstrated that the overall communalities values were satisfying the minimum 0.3 thresholds. Therefore, the items could adequately explain the variance of the TLP construct and retained for further investigation.

Table 5.17: Terminal logistics process communalities

Communalities					
Items	**Initial**	**Extraction**	**Items**	**Initial**	**Extraction**
LP1	.663	.527	**IP1**	.626	.592
LP2	.796	.653	**IP2**	.685	.665
LP3	.679	.574	**IP3**	.713	.589
LP4	.720	.518	**IP4**	.744	.640
LP5	.767	.634	**IP5**	.728	.649
LP6	.610	.593	**IP6**	.737	.749

LP7	.691	.575	**IS1**	.719	.679
LP8	.693	.603	**IS2**	.694	.629
LP9	.671	.572	**IS3**	.693	.673
MR1	.734	.624	**IS4**	.696	.654
MR2	.807	.777	**IS5**	.766	.666
MR3	.720	.695	**IS6**	.747	.730
MR4	.724	.684	**IS7**	.690	.609
MR5	.783	.710	**IS8**	.619	.488
MR6	.760	.676	**IS9**	.683	.584
MR7	.752	.654			
MR8	.734	.650			
Extraction Method: Principal Axis Factoring					

Table 5.18 shows the results of the rotated factor matrix on TLP construct:

Table 5.18: Terminal logistics process rotated factor matrix

Rotated Factor Matrix[a]					
	Factor				
	1	**2**	**3**	**4**	**5**
LP1		.657			
LP2		.740			
LP3		.672			
LP4		.603			
LP5		.685			
LP6		.554			
LP7		.681			
LP8		.733			
LP9		.684			
MR1			.733		
MR2			.805		
MR3			.700		
MR4			.611		
MR5			.646		
MR6			.658		
MR7			.570		
MR8			.647		
IP1				.703	
IP2				.718	
IP3				.567	
IP4				.671	
IP5					
IP6					.556
IS1	.728				
IS2	.744				
IS3	.747				
IS4	.730				
IS5	.726				
IS6	.778				
IS7	.727				
IS8	.539				
IS9	.651				

Extraction method: Principal axis factoring. Rotation Method: Varimax with Kaiser Normalization

The EFA with principal axis factoring extraction and varimax rotation revealed four factors: Lean Practices (LP), Managing Relationship (MR), Integration Practices (IP) and Information Sharing (IS). Item IP6 was removed as it only formed a single item construct. Based on anti-image matrices computation, the lowest MSA value for the TLP construct was 0.871 (See Appendix 7). Thus, the outcomes shown the item uni-dimensionality was adequate to determine the TLP construct.

The scree plot in Figure 5.5 presented a single outstanding value above the elbow that represented 43.725% of the variance of the TLP construct. All the loaded items are above 0.5 with the least value of 0.539 for item IS8 (See Table 5.18). Based on these outcomes, the uni-dimensionality of TLP was confirmed.

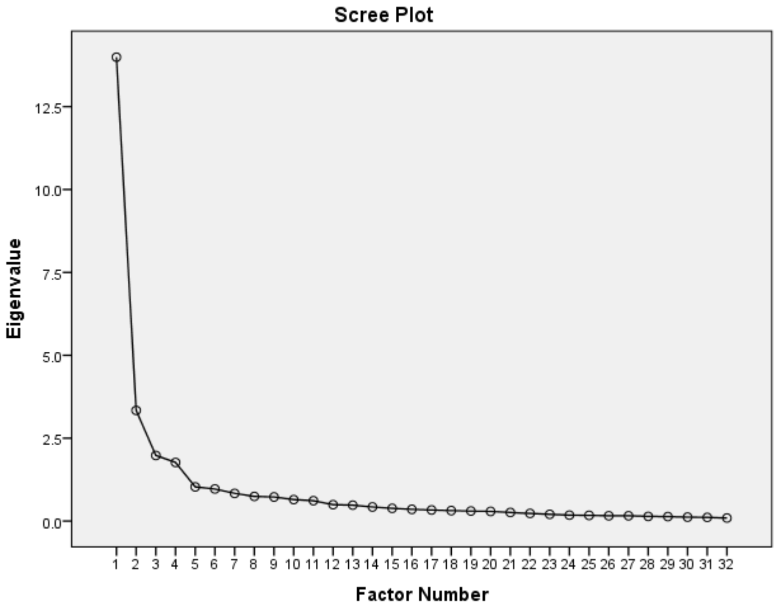


Figure 5.5: Terminal logistics process construct scree plot

The EFA outcomes was confirmed using CFA with elimination results shown in Table 5.19 below. The results of initial model were χ^2 (399) = 1350.115, χ^2/df = 3.384, p = 0.000, CFI = 0.814, TLI = 0.797, GFI = 0.707, RMSEA = 0.105, SRMR = 0.0664, and Bollen-Stine p = 0.005, implying an inferior fit. The highest covariance in modification index was 102.334 between MR1 and MR2. The standardized residual covariance of MR1 and MR2 (4.133) verified the two items' misfit. Further inspection shown that MR1 had standardized residual covariance values larger than 2 with another item. Thus, MR1 was removed.

After MR1 elimination, CFA was repeated, and the data shown a poor model with result of χ^2 (371) = 1179.628, χ^2/df = 3.180, p = 0.000, CFI= 0.833, TLI = 0.817, GFI = 0.730, RMSEA =

0.101, SRMR = 0.0633, and Bollen-Stine $p = 0.005$. A misspecification between LP4 and LP5 is suggested by large modification index of 59.530 and standardized residual value of 2.675. As LP4 demonstrated a weaker loading compared to LP5 it was removed. After removing LP4, the reiteration of CFA was assessed to find the model fit results. Subsequently, the deleted items in CFA stages are IS8, MR2, MR7, IS5, IS7, LP2, LP1, IP2, IS4, LP6, IS9, MR4, MR8 and LP9.

Finally, after deleting LP9, the parameters implied a satisfactory model fit with χ^2 (71) = 168.581, χ^2/df = 2.374, $p = 0.000$, CFI= 0.947, TLI = 0.932, GFI = 0.894, RMSEA = 0.080 and SRMR = 0.0543, and Bollen-Stine $p = 0.063$. All the items had significant factor loadings between 0.662 and 0.903. The χ^2 with $p < 0.05$ is understood to be an inferior model data fit, however, $p < 0.05$ for a model with measurement items more than 30 and sample n < 250 is acceptable (Hair et al., 2014, p. 584). Therefore, the chi-square test is not the best fitted measure as the sample is multivariate non-normal and small (Schumacker & Lomax, 2004) and subsequently, the Bollen-Stine bootstrap ($p = 0.063$; at $p > 0.05$) was measured to establish the model (Bollen & Stine, 1992; Hazen et al., 2015; Shee et al., 2018). Additionally, Kline (2010) recommends that at least two items are adequate to quantify one factor, whilst Anderson and Gerbing (1988) suggests three items. In support of this approach, Kenny (1979) advises a rule of thumb where two items are acceptable, three better, four excellent and above that superior. Henceforth, the measurement items used in this study are not problematic and the model is deemed to be satisfactory. The outcomes of the concluding measurement model for the TLP construct are depicted in Figure 5.6 and the EFA and CFA results are displayed in Table 5.19 below.

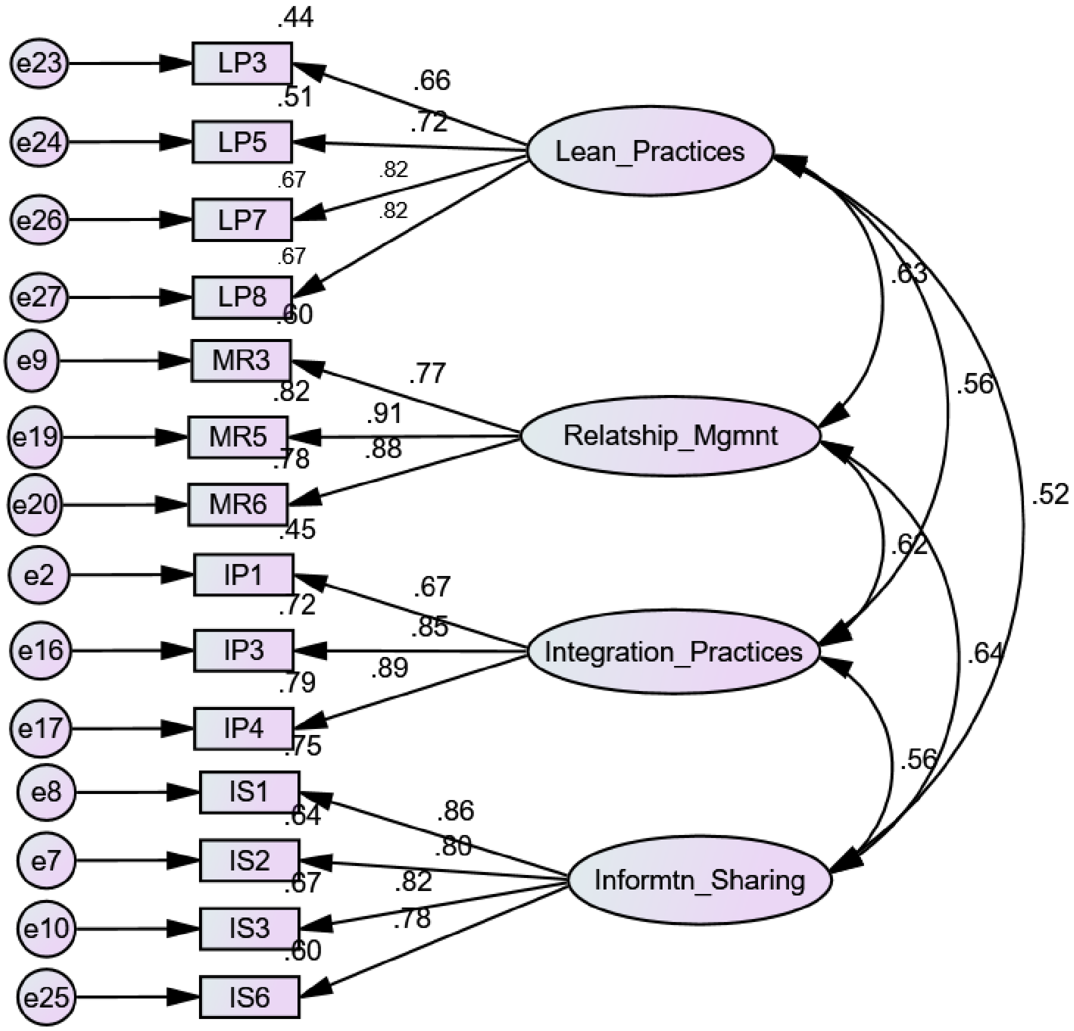


Figure 5.6: Terminal logistics process measurement model

Table 5.19: Factor analysis for terminal logistics process

Item	Description	EFA		CFA	
		Loading	Variance Explained	Standardized Factor Loadings	Squared Multiple Correlation
LP1	We implement methods and tools to reduce administration errors during the import container handling process	.657	**43.725%**	Item dropped in CFA	
LP2	We implement methods and tools to reduce irrelevant/ unnecessary steps during the import container handling process	.740		Item dropped in CFA	
LP3	We implement methods and tools to reduce waiting time for customers during the import container handling process	.672		.663	0.439
LP4	We implement methods and tools to reduce manual documentation during the import container handling process	.603		Item dropped in CFA	
LP5	We implement methods and tools to reduce unnecessary movement of equipment or people during the import container handling process	.685		0.716	0.512
LP6	We have contingency/business plan to resume normal operations after system downtime	.554		Item dropped in CFA	
LP7	We implement methods and tools to calculate the time of container and document flows	.681		0.820	0.672

Item	Description	EFA		CFA	
		Loading	**Variance Explained**	**Standardized Factor Loadings**	**Squared Multiple Correlation**
LP8	We implement methods and tools to standardize our operational procedures regularly	.733		0.819	0.670
LP9	Our operational procedures are updated by taking suggestions from staff	.684		Item dropped in CFA	
MR1	We view shipping lines, government agencies and inland transport operators as strategic partners in mutually designing the flow of goods and information	.733		Item dropped in CFA	
MR2	We build a mutual trust relationship with shipping lines, government agencies, and inland transport operators	.805		Item dropped in CFA	
MR3	We work together with shipping lines, government agencies and inland transport operators to reduce cost and ensure a higher quality of service	.700		0.772	0.596
MR4	We diagnose our external customers' current and future requirements	.611		Item dropped in CFA	
MR5	Customer requirements are effectively disseminated and understood by our terminal personnel	.646		0.906	0.822
MR6	We incorporate our customers' need and requirements into our services	.658		0.883	0.780
MR7	We have an effective process to record customers' complaints	.570		Item dropped in CFA	
MR8	We incorporate our customers' complaints to improve current services	.647		Item dropped in CFA	
IP1	We constantly evaluate the performance of various transport modes available for linking our port/ terminal to its hinterland destinations	.703		0.672	0.451
IP2	We evaluate alternative routes for more efficient transportation of cargo via our port/ terminal	.718		Item dropped in CFA	
IP3	We collaborate with other channel members (e.g., shipping lines, shippers, etc.) to plan for greater channel optimization	.567		0.846	0.717
IP4	We seek to identify other competing channels for cargo that might flow through our port	.671		0.891	0.793
IP5	We benchmark the logistics/supply chain options available for cargo that will flow through our port versus alternative routes via competing ports	Item dropped in EFA		Item dropped in CFA	
IP6	We seek to identify the least cost options for the transport of cargo to hinterland destinations	Item dropped in EFA		Item dropped in CFA	
IS1	We have a knowledge transfer system via workshop, conference and ICT systems that permits information to widespread through our terminal personnel	.728		0.864	0.747
IS2	We have a particular team that continuously have access, put into practice and update their working knowledge	.744		0.799	0.638
IS3	We use all formal mechanisms in order to share best practices amongst our terminal personnel	.747		0.817	0.667
IS4	We are informed about issues that affect each other by our stakeholders	.730		Item dropped in CFA	
IS5	We share business knowledge and processes with our stakeholders	.726		Item dropped in CFA	
IS6	We exchange information with our stakeholders to assist import container flow	.778		0.777	0.604
IS7	We have training and development courses related to acceleration of import container flow	0.595		Item dropped in CFA	
IS8	Our directors and senior managers actively encourage personnel to change and apply best practices of import container handling	0.458		Item dropped in CFA	
IS9	We have a problem-solving team to improve import container processes and services	0.575		Item dropped in CFA	
		KMO = .916 Bartlett's test of sphericity (X^2 =		χ^2 (71) = 168.581, p = 0.000 and χ^2/df = 2.374, Bollen-	

Item	Description	EFA		CFA	
		Loading	Variance Explained	Standardized Factor Loadings	Squared Multiple Correlation
		5654.519 and p < 0.001),		Stine p = 0.063, CFI= 0.947, GFI = 0.894, TLI = 0.932, RMSEA = 0.080, SRMR = 0.0543	

Note: $p < .001$

5.5.5. Assessment for terminal service performance (TSP) measurement model

The Kaiser-Meyer-Olkin (KMO) test for sampling adequacy was 0.927 and Bartlett's test of sphericity (the relationship strength amongst variables) was significant (X^2 = 3101.319 and p < 0.001), implying the data sufficiency for an EFA. Results for KMO ad Bartlett's test for TSP construct are shown in Table 5.20 below.

Table 5.20: Terminal service performance KMO and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		.927
Bartlett's Test of Sphericity	Approx. Chi-square	3101.319
	df	120
	Sig.	.000

A further communalities test was performed, and the results in Table 5.21 demonstrated that the overall communalities values were satisfying the minimum 0.3 thresholds. Therefore, the items could adequately explain the variance of the TSP construct and retained for further investigation.

Table 5.21: Terminal service performance communalities

Item	Initial	Extraction
VAS1	.723	.712
VAS2	.753	.651
VAS3	.689	.679
VAS4	.740	.711
VAS5	.742	.740
VAS6	.609	.583
VAS7	.738	.687
VAS8	.574	.509
R1	.687	.717
R2	.735	.797
R3	.647	.668
R4	.707	.693
CS1	.710	.719
CS2	.775	.812
CS3	.832	.856
CS4	.823	.827

Extraction method: Principal axis factoring

Table 5.22 below depicts the result of factor matrix on TSP construct variables.

Table 5.22: Terminal service performance rotated factor matrix

Rotated Factor Matrix[a]			
Items	Factor		
	1	2	3
VAS1	.790		
VAS2	.617		
VAS3	.731		
VAS4	.762		
VAS5	.770		
VAS6	.559		
VAS7	.624		
VAS8			
R1		.781	
R2		.827	
R3		.754	
R4		.742	
CS1			.715
CS2			.799
CS3			.816
CS4			.794

Extraction method: Principal axis factoring
Rotation method: Varimax with Kaiser normalization
a. Rotation converged in five iterations

The EFA results above with principal axis factoring extraction and varimax rotation revealed that the TSP construct congregated into three definite indicators: Value Added Service (VAS), Responsiveness (R) and Customer Satisfaction (CS). Based on the anti-image matrices computation, the lowest MSA value for the TSP construct is 0.903 (See Appendix 8). Thus, the outcomes shown the adequate uni-dimensionality of the items to measure the TSP construct.

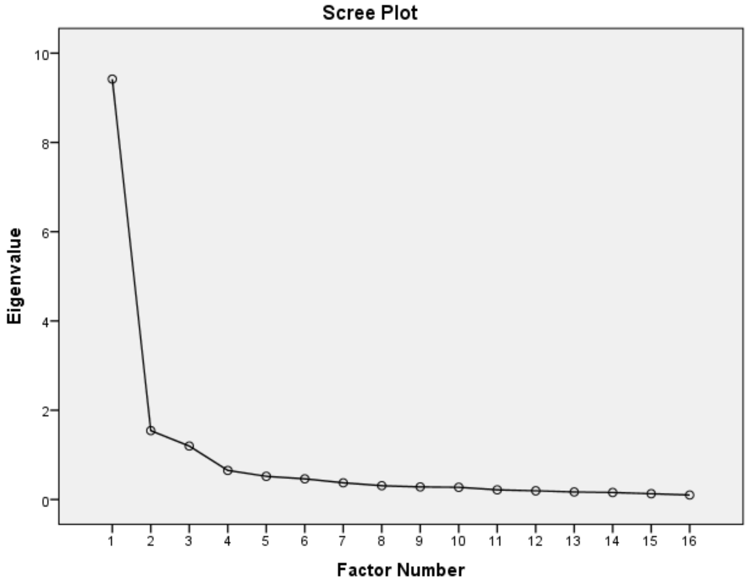


Figure 5.7: Terminal service performance construct scree plot

The scree plot in Figure 5.7 presented a single outstanding value above the elbow that represented 58.870% of the variance of the TSP construct. All the loaded items are above 0.5 with the least value of 0.509 for item VAS8 (See Table 5.21). Based on these outcomes, the uni-dimensionality of TSP was confirmed.

Further, the EFA results was confirmed using CFA with final elimination results shown in Table 5.23. The initial model results of χ^2 (87) = 307.008, χ^2/df = 3.529, p = 0.000, CFI = 0.924, TLI = 0.909, GFI = 0.841, RMSEA = 0.108, SRMR = 0.0499, and Bollen-Stine p = 0.048, implying an unsatisfactory fit. The highest covariance of 27.365 was shown between VAS1 and VAS2, and further inspection revealed that VAS2 had a slightly weaker factor loading than VAS1. VAS2 was therefore excluded from the model. Subsequently, by repeating CFA processes, item VAS7 was then deleted based on its modification indices.

Finally, after removing VAS7, a satisfactory model fit was obtained with χ^2 (62) = 134.579, χ^2/df = 2.171, p = 0.000, CFI= 0.969, TLI = 0.962, GFI = 0.912, RMSEA = 0.074, SRMSR = 0.0407, and Bollen-Stine p = 0.095, with significant factor loadings values between 0.757 and 0.931. The χ^2 with $p < 0.05$ is understood to be an inferior model data fit, however, $p < 0.05$ for a model with measurement items more than 30 and sample n < 250 is acceptable (Hair et al., 2014, p. 584). Therefore, the chi-square test is not the best fitted measure as the sample is multivariate non-normal and small (Schumacker & Lomax, 2004) and subsequently, the Bollen-Stine bootstrap (p = 0.095; at $p > 0.05$) was measured to establish the model (Bollen & Stine, 1992; Hazen et al., 2015; Shee et al., 2018). Additionally, Kline (2010) recommends that at least two items are adequate to quantify one factor, whilst Anderson and Gerbing (1988) suggests three items. In support of this approach, Kenny (1979) advises a rule of thumb where two items are acceptable, three better, four excellent and above that superior. Henceforth, the measurement items used in this study are acceptable and the model is deemed to be satisfactory fit. The concluding measurement model outcomes for the terminal service performance construct are depicted in Figure 5.8 and the EFA and CFA results are presented in Table 5.23 below.

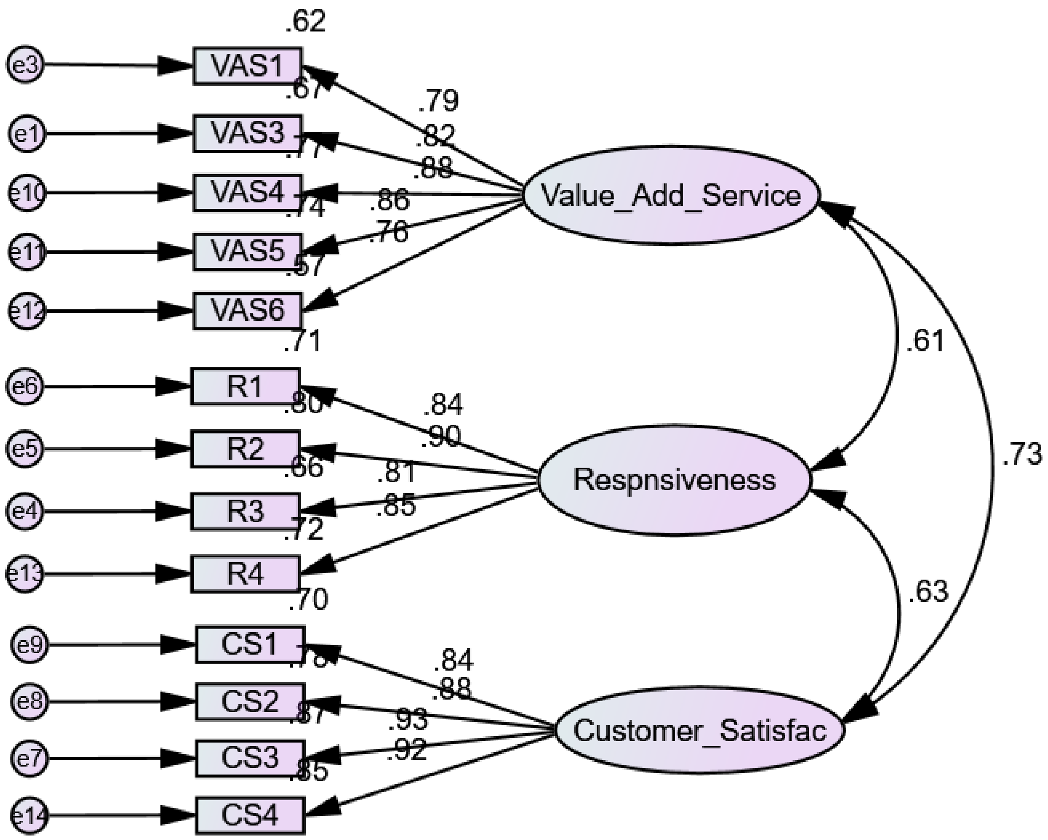


Figure 5.8: Terminal service performance measurement model

Table 5.23: Factor analysis for terminal service performance

Item	Description	EFA		CFA	
		Loading	Variance Explained	Standardized Factor Loadings	Squared Multiple Correlation
VAS1	Our terminal's import container service charges are competitive	.790	**58.870%**	0.787	0.619
VAS2	Customers view the value of our import container services comparable to money paid	.617		Item dropped in CFA	
VAS3	The lead time of import container flow in our terminal is appropriate to customer requirements	.731		0.818	0.669
VAS4	We deliver import container services on time (minimized delays)	.762		0.879	0.773
VAS5	Our terminal's service performance delivers higher value for customers	.770		0.860	0.740
VAS6	The import container services at our terminal are faster than those of competitors	.559		0.757	0.573
VAS7	We provide customized import container services to our customers	.624		Item dropped in CFA	
VAS8	We adjust our import container service offerings to meet customer needs whenever and wherever required	Item dropped in EFA			
R1	We have a responsive import container services development division	.781		0.840	0.706
R2	We deliver new import container related services to the market quickly	.827		0.896	0.803
R3	We were the first in the market to introduce new import container related services	.754		.810	0.656

Item	Description	EFA		CFA	
		Loading	Variance Explained	Standardized Factor Loadings	Squared Multiple Correlation
R4	We respond well to customer demand for 'new' import container related service features	.742		0.847	0.717
CS1	Our performance exceeds our customer requirements and expectation	.715		0.836	0.699
CS2	We always meet customer standards of import container related services	.799		0.885	0.783
CS3	Our customers are pleased with the services we provide	.816		0.931	0.868
CS4	Our customers are pleased with our responsiveness to their requirements	.794		0.924	0.854
		KMO = .927 Bartlett's test of sphericity (X^2 = 3101.319 and p < 0.001),		χ^2 (62) = 134.579, p = 0.000 and χ^2/df = 2.171, Bollen-Stine p = 0.095, CFI= 0.969, GFI = 0.912, TLI = 0.962, RMSEA = 0.074 and SRMR = 0.0407	

Note: $p < .001$

5.6. Non-response bias tests

Armstrong and Overton (1977) suggest investigating the significant differences between early and late wave responses (i.e., a widely used extrapolation technique) as a measure of non-response bias (Wagner & Kemmerling, 2010). Thus, non-response bias test was investigated using independent t-test analysis (i.e., department position, job position, years of work experience, location of the port cities, and data collection method). The results are shown in Table 5.24 (department position), Table 5.25 (job position), Table 5.26 (years of work experience), Table 5.27 (location of port cities) and Table 5.28 (data collection method), showed no statistically significant differences between the mean of the early versus late wave responses. using 95% confidence interval (p-value > 0.05 in the 2-tailed significance level). Therefore, the outcomes suggest non-existence of response bias in this study.

Table 5.24: Independent t-test on department position

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference: Lower	95% Confidence Interval of the Difference: Upper
Department	Equal variances assumed	.556	.457	.358	214	.721	.12963	.36221	-.58433	.84359
	Equal variances not assumed			.358	212.885	.721	.12963	.36221	-.58435	.84361

Table 5.25: Independent t-test on job position

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
Position	Equal variances assumed	4.762	.030	-1.109	214	.269	-.30556	.27547	-.84854	.23743
	Equal variances not assumed			-1.109	210.039	.269	-.30556	.27547	-.84860	.23749

Table 5.26: Independent t-test on years of work experience

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
Year_work_exp	Equal variances assumed	.061	.806	-1.390	214	.166	-1.55556	1.11874	-3.76071	.64960
	Equal variances not assumed			-1.390	212.775	.166	-1.55556	1.11874	-3.76078	.64967

Table 5.27: Independent t-test on port cities (Jakarta/ Semarang/ Surabaya)

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
Port_City	Equal variances assumed	5.505	.020	1.271	214	.205	.14815	.11655	-.08158	.37787
	Equal variances not assumed			1.271	212.054	.205	.14815	.11655	-.08159	.37788

Table 5.28: Independent t-test on data collection method (hardcopy/ online)

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference Lower	Upper
Data_ Collect_ Method	Equal variances assumed	1.076	.301	.518	214	.605	.01852	.03578	-.05201	.08905
	Equal variances not assumed			.518	211.200	.605	.01852	.03578	-.05202	.08906

5.7. Common method bias tests

The self-reported questionnaire with perceptual measures is likely to be affected by common method bias (Chang et al., 2010). Podsakoff et al. (2003) state that method bias results from the respondent who is the same person responding to the predictor and criterion variables. Method bias is the source of measurement errors and consequently misleads the conclusion validity of relationships between measures (Podsakoff et al., 2003).

To verify the extent of remaining common method bias after application of procedural remedies, Harman's one-factor test was employed statistically where all variables are restrained with no rotation and loaded onto a single factor (Podsakoff et al., 2003) both in in exploratory factor analysis (EFA) and then in confirmatory factor analysis (CFA) methods. The first test, the EFA assessment, indicates 10 factors with an eigen value more than 1 which explained around 75.193% of total variance, while the first factor explained only 35.090% of total variance, which is not the majority of the total variance (See results in Table 5.29 and Figure 5.9 below).

Table 5.29: EFA Harman's one-factor test

Total Variance Explained						
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Factor	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	16.417	36.482	36.482	15.791	35.090	35.090
2	3.536	7.858	44.340			
3	2.909	6.464	50.803			
4	2.322	5.159	55.963			
5	1.951	4.335	60.298			
6	1.535	3.411	63.709			
7	1.433	3.184	66.893			
8	1.412	3.138	70.030			
9	1.177	2.616	72.646			
10	1.146	2.547	75.193			

The second common method bias test is that of CFA performed to Harman's single factor model (Cao & Zhang, 2011; Flynn, Huo, & Zhao, 2010). Subsequently, the data were analyzed using Harman's CFA assessment where the entire variables were loaded onto a single factor. The result yielded an inferior model with χ^2 (2484) = 11197.959, χ^2/df = 4.508, p = 0.000, CFI = 0.400, TLI = 0.383, GFI = 0.317, RMSEA = 0.128 and SRMR = 0.1121. The indices demonstrated that the fit is worse than those of the measurement model. The assertion suggests that a single factor is unacceptable and hence, common method bias is insignificant. It is then reasonable to conclude non-existence of common method bias in the data.

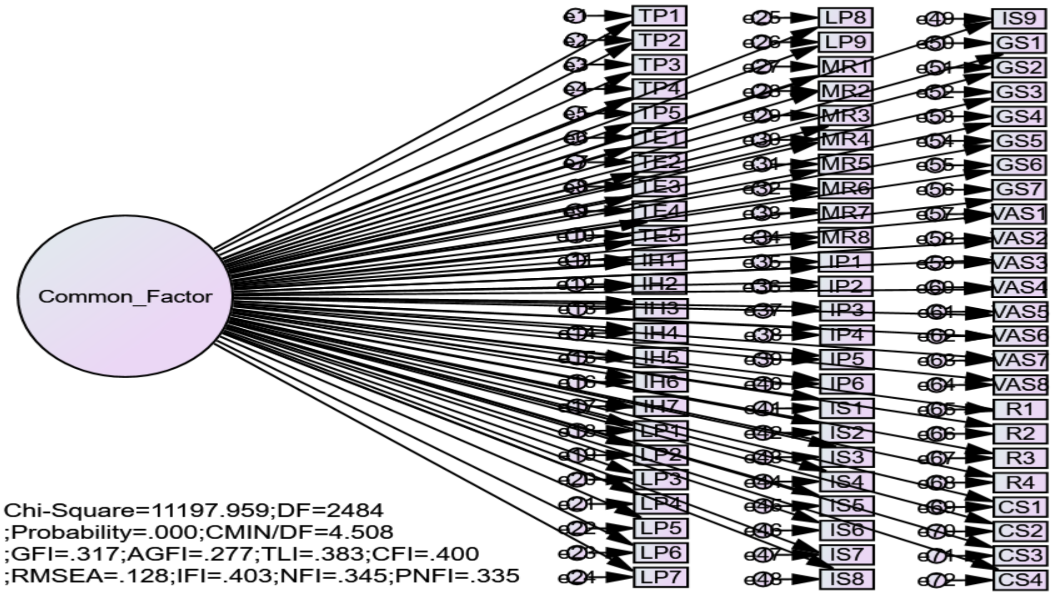


Figure 5.9: CFA Harman's one-factor test

5.8. Full measurement model assessment

The model has total 11 constructs: Terminal Personnel, Terminal Equipment, Infrastructure and hinterland, Lean Practices, Managing Relationship, Integration Practices, Information Sharing, Government Support, Value Added Services, Responsiveness and Customer Satisfaction.

Subsequently, a combined measurement model of each construct was established and investigated by merging constructs entirely into one particular CFA model (with sample of n = 216) (Tanaka, 1987). The model resulted at χ^2 (610) = 1199.790, χ^2/df = 1.967, p = 0.000, CFI = 0.905, TLI = 0.890, GFI = 0.787, RMSEA = 0.067, SRMR = 0.0547, and Bollen-Stine p = 0.053, signifying a near model fit, only GFI is still below the cut-off point of 0.950. The modification indices exhibited the largest covariance group existed in item IH6 (9 covariances with other items). Hence, IH6 was considered for deletion.

Subsequently, the next model enhanced the fit at χ^2 (574) = 1090.291, χ^2/df = 1.899, p = 0.000, CFI = 0.914, TLI = 0.901, GFI = 0.798, RMSEA = 0.065, SRMR = 0.0526, and Bollen-Stine p = 0.053. The modification indices exhibited the largest covariance group existed in item LP3 (2 largest covariances with other items). LP3 was therefore excluded from the model.

After LP3 deletion, the reiteration of CFA process was performed, and the subsequent model improved the fit at χ^2 (539) = 1008.938, χ^2/df = 1.872, p = 0.000, CFI = 0.920, TLI = 0.907, GFI = 0.806, RMSEA = 0.064, SRMR = 0.0512, and Bollen-Stine p = 0.053. The modification indices exhibited the largest covariance group existed in item TE5. TE5 was therefore excluded from the model. Subsequently, the replication of CFA steps resulted in the removal of items IS6 and CS1.

The decisive full measurement model signified a moderate fit at χ^2 (472) = 870.995, χ^2/df = 1.845, p = 0.000, CFI = 0.927, TLI = 0.913, GFI = 0.817, RMSEA = 0.063, SRMR = 0.0503, and Bollen-Stine p = 0.053. The χ^2 with $p < 0.05$ is identified to be an inferior model data fit, however, $p < 0.05$ for a model with measurement items more than 30 and sample n < 250 is acceptable (Hair et al., 2014, p. 584). Therefore, the chi-square test is not the best fitted measure as the sample is multivariate non-normal and small (Schumacker & Lomax, 2004) and subsequently, the Bollen-Stine bootstrap (p = 0.053; at $p > 0.05$) was measured to establish the model (Bollen & Stine, 1992; Hazen et al., 2015; Shee et al., 2018). Accordingly, the fit indices of this study are claimed to be acceptable and the model reached a satisfactory model fit.

Additionally, Kline (2010) recommends that at least two items are adequate to quantify one factor, whilst Anderson and Gerbing (1988) suggest three items. In support of this approach, Kenny (1979) advises a rule of thumb where two items are acceptable, three better, four excellent and above that superior. Henceforth, the measurement items used in this study are not problematic. The results of the final full measurement model are shown in Table 5.30 and Figure 5.10 below.

Table 5.30: Measurement scale, Cronbach Alpha, CR, AVE and factor loadings calculated from full measurement model

Construct		Scale Items Brief Description	Factor Loading	α	CR	AVE
Scale and factor loading of Government Support from CFA (N=216)						
Government Support	GS2	Government provision on policy, and regulation in identifying and implementing best practices in container transportation	0.887	0.941	0.942	0.804
	GS3	Government provision on policy, and regulation in container transportation ICT (e-Gate, tracking system, RFID)	0.947			
	GS4	Government provision on policy, and regulation in the logistics education system	0.892			
	GS7	Government provision on policy, and regulation to expedite import container logistics flow	0.858			
Scale and factor loading of Firm Resources from CFA (N=216)						
Personnel	TP2	Personnel with sufficient capability	0.821	0.793	0.803	0.585
	TP4	Key personnel are reliable	0.879			
	TP5	Key personnel are trustworthy	0.554			
Equipment	TE1	Sufficient quantity of terminal equipment	0.849	0.900	0.911	0.673
	TE2	Readiness of equipment	0.894			
	TE3	Reliability of equipment	0.912			
	TE4	Regular modernization of equipment	0.717			
	TE5	Regular maintenance of equipment	0.707			
Infrastructure-	IH3	Sufficient container handling capability	0.743	0.715	0.717	0.559

Construct		Scale Items Brief Description	Factor Loading	α	CR	AVE
Hinterland	IH5	Sufficient capability of exit gate operation	0.752			
Scale and factor loading of Terminal Logistics Processes from CFA (N=216)						
Lean Practices	LP5	Methods and tools implementation to reduce unnecessary movement of equipment or people	0.677	0.825	0.835	0.631
	LP7	Methods and tools implementation to calculate the time of container and document flows	0.870			
	LP8	Methods and tools implementation to standardize operational procedures regularly	0.823			
Managing Relationship	MR3	Collaboration with shipping lines, government agencies and inland transport operators to reduce cost and ensure a higher quality of service	0.772	0.888	0.891	0.732
	MR5	Customer requirements are effectively disseminated and understood by terminal personnel	0.910			
	MR6	Incorporate customers' need and requirements into company's services	0.879			
Integration Practices	IP1	Constant evaluation of performance of various transport modes available to link port/ terminal to its hinterland destinations	0.678	0.834	0.849	0.655
	IP3	Collaboration with other channel members (e.g., shipping lines, shippers, etc.) to plan for greater channel optimization	0.839			
	IP4	Identify other competing channels for cargo that might flow through company's port	0.896			
Information Sharing	IS1	Knowledge transfer system via workshop, conference and ICT systems that permits information to be widespread through terminal personnel	0.865	0.868	0.869	0.688
	IS2	Accommodate a specific team that have access to current information, continuously update their working knowledge and put into practice	0.819			
	IS3	Usage of formal mechanisms to share best practices amongst terminal personnel	0.803			
Scale and factor loading of Terminal Service Performance from CFA (N=216)						
Value-Added Services	VAS3	Lead time is appropriate to customer requirements	0.799	0.880	0.890	0.731
	VAS4	On time delivery services (minimize delays)	0.910			
	VAS5	Service performance delivers higher value for customers	0.852			
Responsive-ness	R1	Responsive services	0.877	0.857	0.869	0.689
	R3	The pioneer of new import container services	0.791			
	R4	Good response on customer demand for 'new' service features	0.819			
Customer Satisfaction	CS3	Customers are pleased with services provided	0.922	0.934	0.935	0.877
	CS4	Customers are pleased with company's responsiveness to their requirements	0.951			

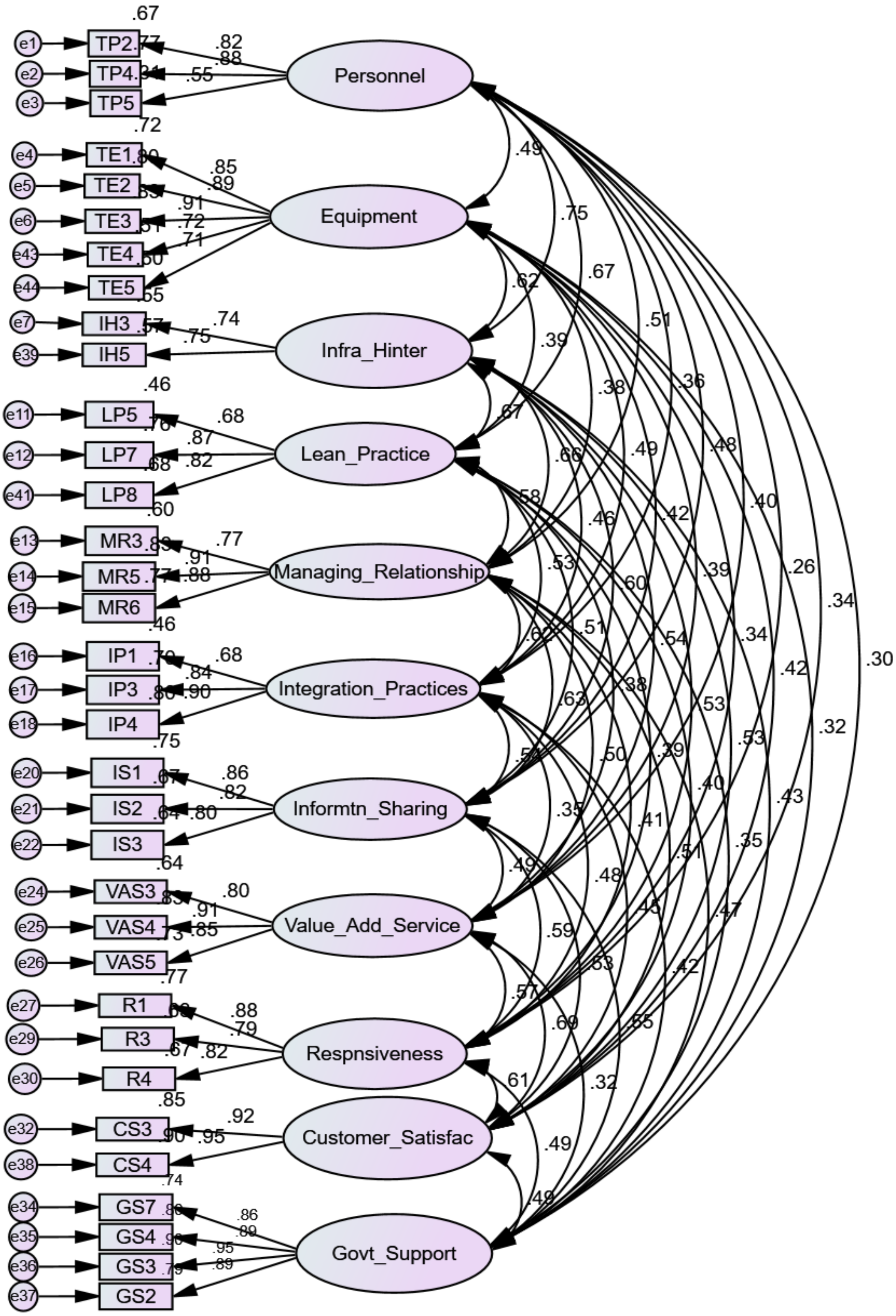


Figure 5.10: CFA full measurement model

5.9. Measurement model testing for psychometric assessment

Psychometric assessment consisting of reliability and validity assessment were performed for all perceptual items in CFA evaluation using AMOS 24.

A full measurement model of nine latent constructs encompassing 34 items was tested for its fitness with data. The parameters implied a fair model fit at χ^2 (472) = 870.995, χ^2/df = 1.845, p = 0.000, CFI = 0.927, TLI = 0.913, GFI = 0.817, RMSEA = 0.063, SRMR = 0.0503, and Bollen-Stine p = 0.053. The χ^2 with $p < 0.05$ is identified to be an inferior model data fit, however, $p < 0.05$ for a model with measurement items more than 30 and sample n < 250 is acceptable (Hair et al., 2014, p. 584). Therefore, the chi-square test is not the best fitted measure as the sample is multivariate non-normal and small (Schumacker & Lomax, 2004) and subsequently, the Bollen-Stine bootstrap (p = 0.053; at $p > 0.05$) was measured to establish the model (Bollen & Stine, 1992; Hazen et al., 2015; Shee et al., 2018). Accordingly, the fit indices of this study are claimed to be acceptable and the model reached a satisfactory model fit.

The model could have been developed further to get indices that satisfied threshold values for better fit; however, it was discontinued at this phase to retain a critical construct (i.e., infrastructure and hinterland). The construct of infrastructure and hinterland was retained as it is regarded to be vital resources in port operations; and therefore, compromising the model fit indices to fair level. This keeping of vital constructs is similar to the earlier studies presented by Banchuen et al. (2017); de Vass et al. (2018) and Shee et al. (2018). Rigorous assessment is performed in the path model to investigate the goodness-of-indices fulfilling corresponding indicated values; hence, fit indices at moderate level is acceptable (Shee et al., 2018). The assertion is supported further by the following reliability and validity tests.

5.9.1. Reliability check

Internal consistency can be measured either by Cronbach’s alpha value (Hair, Black, Babin, Anderson, & Tatham, 2010) or composite reliability (CR) (Fornell & Larcker, 1981). Cronbach’s alpha evaluates the degree to which the indicators measure the uni-dimensionality of a construct (Götz, Liehr-Gobbers, & Krafft, 2010). A low alpha value represents the multidimensionality of the constructs. In comparison to composite reliability, Cronbach’s alpha estimates reliability with lower-bound values (Hair et al., 2017). Composite reliability underlined by indicator loadings report an accurate measure of internal consistency (Fornell & Larcker, 1981).

The results show that all Cronbach's alpha value is > 0.7 where the minimum acceptable value is 0.7 (Hair et al., 2010) and all CR value is > 0.7, indicates constructs have good composite reliability (Fornell & Larcker, 1981) (See Table 5.30). Further, the measurement model was considered satisfactory due to the factor standardized loading for each indicator, well above the recommended value of 0.5 (Anderson & Gerbing, 1988) and AVE values above 0.5 indicated good convergent validity (Fornell & Larcker, 1981) (See Table 5.30 for AVE details).

5.9.2. Validity check

Validity test is an accuracy test on the measurement indicators used to capture a concept (Bentler & Bonett, 1980; Bryman, 2008; Sekaran, 2006). Type of validity measurements are content and construct validity. Content validity is verified using face validity where it makes sure indicators capture the concept and conducted by experienced experts (Sekaran, 2006). Further, construct validity is tested using convergent and discriminant validity.

Convergent validity estimates the correlation extent of variables within the same concept, whilst discriminant validity examines the distinctiveness degree of a construct by comparing it to other constructs within the model (Hair et al., 2010). The average variance extracted (AVE) value is used to examine convergent validity where AVE value surpassing 0.5 signifies the measurement's convergent validity (Fornell & Larcker, 1981; Hair et al., 2010), meaning that a construct explains more than 50% of variance among scale indicators (Götz et al., 2010; Hair et al., 2017).

Discriminant validity is the degree to which a construct is different from other constructs in the model (Chin, 2010). It tests the individual distinctiveness of construct in order to ensure its difference to another construct by contrasting the square root of the AVE value with the other constructs' inter correlation coefficients. The construct's square root of AVE should exceed the greatest correlations of the remaining constructs (Fornell & Larcker, 1981).

Satisfactory convergent validity is attained when the construct's AVE value is at a minimum of 0.5 (Fornell & Larcker, 1981). Table 5.30 demonstrates that AVEs from the full measurement calculation were in the range of 0.559 and 0.877 for all constructs, thus satisfying the 0.5 threshold, confirming the evidence of convergent validity of each construct.

Table 5.31: Coefficient correlation of sub-constructs and discriminant validity using values from full measurement model (n=216)

Variables	Mean	SD	1	2	3	4	5	6	7	8	9	10	11
Govt_ Support	5.443	1.056	**0.897**										
Lean_Practice	6.108	0.637	0.349	**0.794**									
Managing_Relationship	6.204	0.626	0.472	0.576	**0.856**								
Information_Sharing	5.869	0.767	0.549	0.511	0.632	**0.829**							
Integration_Practices	5.858	0.806	0.42	0.532	0.619	0.542	**0.810**						
Infra_Hinter	6.176	0.632	0.433	0.67	0.661	0.597	0.458	**0.748**					
Equipment	5.919	0.817	0.316	0.394	0.382	0.42	0.491	0.617	**0.820**				
Personnel	6.057	0.562	0.302	0.67	0.509	0.481	0.357	0.748	0.493	**0.765**			
Customer_Satisfaction	6.063	0.737	0.494	0.395	0.511	0.53	0.45	0.529	0.421	0.336	**0.937**		
Responsiveness	5.757	0.882	0.494	0.394	0.415	0.591	0.48	0.53	0.335	0.26	0.612	**0.830**	
Value_Added_Service	6.159	0.644	0.321	0.385	0.503	0.495	0.347	0.542	0.393	0.399	0.694	0.566	**0.855**

Diagonal values signify the square root of AVE. The correlation coefficients are located below the diagonal values.

The discriminant validity is then evaluated using the square root of AVEs compared to inter-construct correlation coefficients (Hair et al., 2014). The latent constructs are considered to explain more variance in its own groups than what it assigns with another construct when the value of the square root of AVE is greater than the correlations coefficient of the remaining constructs (Fornell & Larcker, 1981). Further, Table 5.31 shows the square root of AVE calculation along the diagonal and then compared to the coefficient correlation amongst other constructs, showing that the diagonal values are greater than the maximum inter-correlation. Except for the correlation coefficient between Personnel and Infrastructure_Hinterland (0.748) items, the value is equal to the diagonal value of the square root of AVE; however, it does not exceed the diagonal value. Thus, it can be concluded that the results verify the strength of its discriminant validity.

Finally, discriminant validity assessment using two factor CFA models with the correlation between the four constructs (government support, firm resources, terminal logistics processes and service performance) was first set as unconstrained and then constrained to one (Bagozzi & Yi, 1994). The first set as unconstrained χ^2 = 145.335 whilst the second set χ^2 = 172.640. The χ^2 difference was significantly lower for the unconstrained model compared to the constrained model, demonstrating discriminant validity of the model.

Further, Table 5.32 below shows Cronbach's alpha values for the four dimensions which are greater than 0.7, indicating a good internal consistency (Hair et al., 2014) and all CR values are higher than 0.7, indicating an acceptable composite reliability for path modeling (Fornell & Larcker, 1981). All AVE values exceeded 0.5 threshold, except for terminal resources (0.497). Nevertheless, these values are close to 0.5 and the AVE value of 0.4 is still acceptable (Nunnally & Bernstein, 1994). Similarly, AVE values close to 0.5 have also been reviewed and accepted by preceding studies in the supply chain area (Park, Hokey, & Min, 2016; Shee et al., 2018; Yu, 2015). Furthermore, the CR values for terminal resources is 0.746 and greater than 0.7 threshold, thus indicating the reliability of measurement items (Fornell & Larcker, 1981).

Table 5.32: Construct correlation and discriminant validity
Using Values from Path Model (n=216)

	1	**2**	**3**	**4**	**Mean**	**SD**	***α***	**CR**	**AVE**
Govtmt_ Supp	**0.897**				5.443	1.056	0.941	0.942	0.804
Firm_Resources	0.366	**0.705**			6.051	0.552	0.725	0.746	0.497
Term_Log_Processes	0.506	0.665	**0.708**		6.010	0.554	0.791	0.800	0.502
Service_Performance	0.490	0.525	0.621	**0.762**	5.993	0.643	0.789	0.805	0.581

Diagonal values signify the square root of AVE. The correlation coefficients are located below the diagonal values.

5.10. Structural model and hypothesis testing

The final path model confirmed the moderate model fit with χ^2 (39) = 91.106, χ^2/df = 2.336, p = 0.000, CFI = 0.946, TLI = 0.924, GFI = 0.931, SRMR = 0.0472, RMSEA = 0.079, Bollen-Stine *p* = 0.063 > 0.05. The normed Chi-square values (χ^2/df) are less than three which means a model demonstrates a reasonable fit (Iacobucci, 2010; Kline, 2010). As the p value is less than 0.05 (i.e., significant), the Bollen-Stine bootstrap was performed to support this model with p = 0.063 (p > 0.05) (Bollen & Stine, 1992). As the Comparative Fit Index (CFI) and Standardized Root Mean-square Residual (SRMR) are suggested for small samples (n <= 250) (Hu & Bentler, 1999), this model demonstrates a satisfactory model fit where CFI > 0.9 (Bentler & Bonett, 1980) and SRMR < 0.8 (Hu & Bentler, 1999). Considering the overall fit indices are within the specified limit, the model is acceptable as a satisfactory fit. The fit statistics are presented in Figure 5.11 and Table 5.33 below.

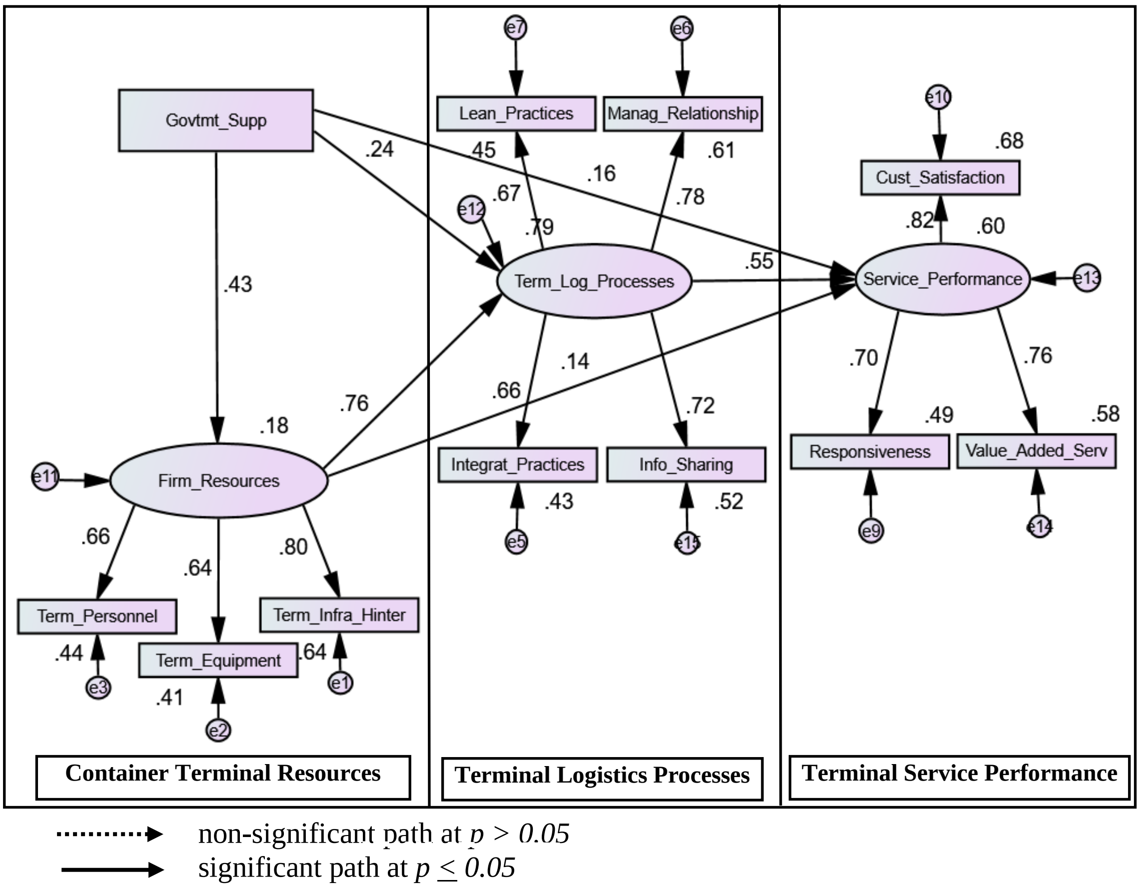


Figure 5.11: Structural path model

Table 5.33: Path analysis for structural model

Hypotheses	Path	Stdzd Reg	*p-value*	Conclusions
H1	Govtmt_ Supp → Firm_Resources	.425	***	Supported
H2	Govtmt_ Supp → Term_Log_Processes	.242	***	Supported
H3	Govtmt_ Supp → Service Performance	.164	.039**	Supported
H4	Firm_Resources → Term_Log_Processes	.758	***	Supported
H5	Firm_Resources → Service Performance	.139	.489	Not Supported
H6	Term_Log_Processes → Service Performance	.550	.015**	Supported

**p < 0.05, ***p<0.001

Further, path analysis was undertaken to test these six hypotheses simultaneously. The government support positively affected firm resources (β = 0.425 at $p < 0.001$), terminal logistics processes (β = 0.242 at $p < 0.001$) and service performance (β = 0.164 at $p < 0.05$); hence, supporting *H1*, *H2* and *H3* respectively. Further, firm resources significantly influenced terminal logistics processes (β = 0.758 at $p < 0.001$); therefore, *H4* is supported. In contrast, firm resources had no significant effect on service performance (β = 0.139 at $p > 0.05$); hence, *H5* is not supported. Terminal logistics processes influenced significantly terminal service performance (β = 0.550 at $p < 0.05$), supporting *H6*. The evidence is likely to suggest that terminal logistics processes mediate the relationship in improving service performance. The assertion is supported further in the following section.

5.11. Competing path model

Additional analysis was performed with a competing model where the direct paths from firm resources to service performance were deleted (See Figure 5.12). The model came out as a good fit with χ^2 (40) = 91.534, χ^2/df = 2.288, p = 0.000, CFI = 0.947, TLI = 0.927, GFI = 0.931, SRMR = 0.0474, RMSEA = 0.077, and Bollen-Stine $p = 0.063$. The process-performance regression path was improved from the initial β = 0.550 ($p < 0.05$) to β = 0.692 ($p < 0.001$). All path coefficients are significant (See Table 5.34). The χ^2 with $p < 0.05$ is identified to be an inferior model data fit, however, $p < 0.05$ for a model with measurement items more than 30 and sample n < 250 is acceptable (Hair et al., 2014, p. 584). Therefore, the chi-square test is not the best fitted measure as the sample is multivariate non-normal and small (Schumacker & Lomax, 2004) and subsequently, the Bollen-Stine bootstrap ($p = 0.063$; at $p > 0.05$) was measured to establish the model (Bollen & Stine, 1992; Hazen et al., 2015; Shee et al., 2018). Accordingly, the fit indices of this study are claimed to be acceptable and the model reached a satisfactory model fit.

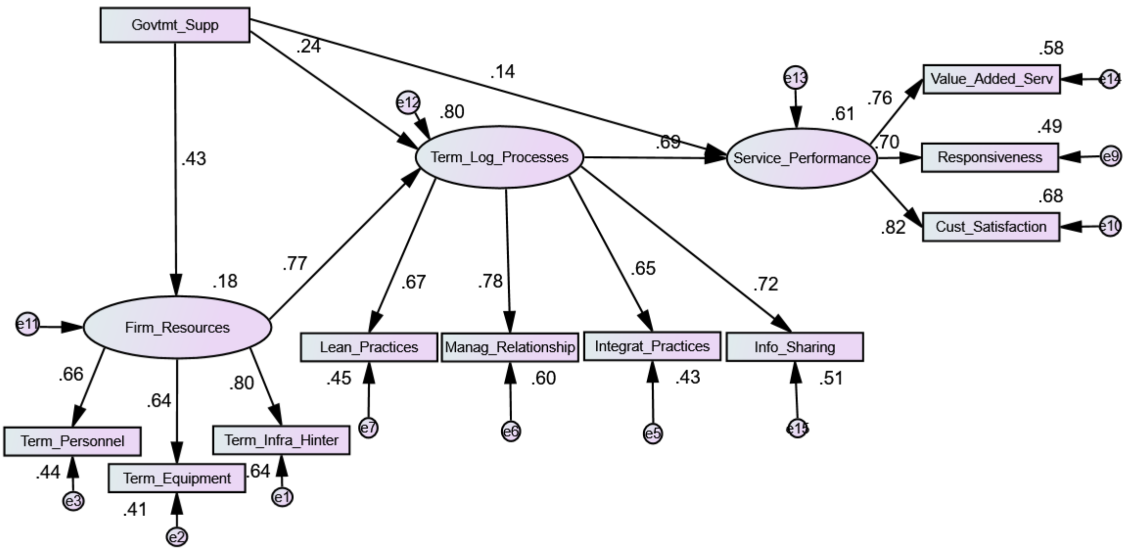


Figure 5.12: Competing structural model with path coefficients

Table 5.34: Path analysis for competing model

Path			Stdzd Reg	*p-value*	Conclusions
Govtmt_Support	--- >	Firm_Resources	.425	***	Supported
Govtmt_Support	--- >	Term_Log_Processes	.241	***	Supported
Govtmt_Support	--- >	Service Performance	.141	.060**	Supported
Firm_Resources	--- >	Term_Log_Processes	.767	***	Supported
Term_Log_Processes	--- >	Service Performance	.692	***	Supported

***p<0.001, **p < 0.1

Given the additional parameter, a Chi-square difference test (CDT) should be performed to choose the best model to be retained (Li et al., 2006). With changes in χ^2 ($\Delta\chi^2 = 0.428$) and $\Delta df = 2$, the function Chisq.Dist.RT in Microsoft Excel yielded a *p*-value = 0.807 (p > 0.05). It says that if the difference is non-significant, and the *p*-value is more than 0.05 ($|t| < 1{:}96$), the alternate model is preferred (Werner & Schermelleh-Engel, 2010). In this case the alternate model is preferred over the hypothesized model. This validates the fact that terminal logistics processes play an important role in fully mediating the effect of firm resources on service performance, whilst terminal logistics processes partially mediate the influence of government support on service performance. Unless efficient processes are in place, resources alone cannot improve the performance of the terminal. This supports the findings in the literature, where Yang et al. (2009) found no significant relationship between resources and firm performance in shipping services.

The competing model shows significant results for all path analysis where government support positively affected firm resources and terminal logistics processes at $p < 0.001$, whilst government support also impacted terminal service performance at $p < 0.1$ (See Table 5.32). Based on these results, it can be concluded that government support has a vital role as it provides incentive, policy and regulation in the procurement and allocation of firm resources, the development and improvement of logistics processes, and the enhancement of service performance in the container terminal environment.

Further, firm resources impacted terminal logistics processes significantly at $p < 0.001$, and terminal logistics processes affected terminal service performance significantly. The outcomes from the improved competing model confirmed that terminal logistics processes partially mediate the relationship of government support and service performance, whereas the impact of firm resources on terminal service performance is fully mediated by terminal logistics processes.

5.12. Statistical results on hypotheses

5.12.1. Government support and firm resources

As mentioned in Chapter 3, government support plays a crucial role in improving terminal operations, especially in infrastructure funding, regulatory and policy reforms. The state is proposed in the following hypothesis:

H1: *Government support has a positive effect on firm resources in container terminals*

In order to address H1, the identified mechanisms were examined using the measurement model evaluation with an AMOS SEM. Based on the findings in section 5.10, the hypothesized path model analysis demonstrated that government support and policy intervention was found to be a significant predictor of firm resources ($\beta = 0.425$, $p < 0.001$). In the initial model, the construct of firm resources was comprised of terminal personnel with $\beta = 0.662$, terminal equipment with $\beta = 0.643$ and infrastructure and hinterland with $\beta = 0.799$, all at significant level $p < 0.001$.

Contrasted to the competing improved model in section 5.11, the results validated government support influence on firm resources, resulting in a gain of $\beta = 0.665$ for terminal personnel, $\beta = 0.642$ for terminal equipment, and $\beta = 0.797$ for infrastructure and hinterland, and all are significant at level $p < 0.001$. The importance infrastructure and hinterland in relation to receiving support from government is clear, as the factor contributed the largest statistical significance. In sum, the first hypothesis is supported. From an RBV perspective, the results have shown that the availability of firm resources is vital, and it is likely to have originated mainly from government policies enforcement and support. The results from Lee and Flynn (2011) study show that government support acts as an antecedent to firm resources and characterized as a strategic development initiative of the Asian container port.

5.12.2. Government support and terminal logistics processes

As explained in Chapter 3, achieving streamlined administrative processes and service integration is necessary to improve logistics performance (World Bank, 2007) and such an environment can be attained via the establishment of government regulation and policy (Ng & Gujar, 2009). Therefore, Hypotheses H2 (developed in Chapter 3) addresses is addressing the positive relationship between government support and terminal logistics processes as follows:

H2: *Government support has a positive effect on logistics processes of container terminals*

In this study, government support is developed as a second-order reflective construct composed of first-order constructs. Based on results in section 5.8., government support in the first-order is possible in the form of container transportation best practices (GS2 $\lambda = 0.887$), container transportation ICT (GS3 $\lambda = 0.947$), logistics and the education system (GS4 $\lambda = 0.892$) and the support and policy to expedite import container flow (GS7 $\lambda = 0.858$). Weights of path loadings confirmed that support of container transportation ICT was the most critical variable in measuring government support. Therefore, the results indicate that modernization of container transportation ICT is likely to be the focal point of government support in Indonesian port development.

The hypothesized path model analysis in section 5.10 demonstrated that government support is found to be a significant predictor of terminal logistics processes ($\beta = 0.242$, $p < 0.001$). In the initial model, the construct of terminal logistics processes comprised lean practices with $\beta = 0.672$, managing relationship with $\beta = 0.780$, integration practices with $\beta = 0.658$, and information sharing with $\beta = 0.718$, all at significant level $p < 0.001$.

The result is similar when compared to the competing model in section 5.11 ($\beta = 0.241$, $p < 0.001$). The results demonstrated a gain of $\beta = 0.671$ for lean practices, $\beta = 0.776$ for managing relationship, $\beta = 0.655$ for integration practices and $\beta = 0.717$ for information sharing (all are significant at level $p < 0.001$). Hence, outcomes strengthen and validate the proposed model, that is, the implementation of government support via policy and regulation and its impact on terminal operations and logistics processes. In sum, hypothesis H2 *Government support has a positive effect on the logistics processes of container terminals* is supported.

5.12.3. Government supports terminal service performance

Logistics performance is improved via implementation of regulation and policy set by government in the port environment and logistics chains (Ng & Gujar, 2009). The situation was summarized in Chapter 3 and synthesized as a hypothesis as follows:

H3: *Government support has a positive effect on service performance of container terminals*

The outcomes in section 5.10 show that government support is significant as a direct predictor of service performance ($\beta = 0.164$ at $p < 0.05$). As the result shows a significant relationship, hence H_3 is supported. Additionally, as government support also significantly impacted terminal logistics processes, the author argues that government support influences terminal service performance indirectly, or partially, via regulation and policy that favors firm resources allocation and funding such as land acquisition and allocation, equipment and infrastructure funding schemes as well as hinterland connectivity development such as connecting roads and toll development. Another partial impact is government support via regulation that approves information sharing that enhances stakeholder collaboration and relationships as well as assisting lean and integration practices within the port environment. This leads to the improvement of logistics processes and business operations.

5.12.4. Firm resources and terminal logistics processes

Chapter 3 argued that port service provision is made possible by resources allocation, and this is the most efficient way (Talley et al., 2014) to maximize outputs (Talley & Ng, 2016). If resources are utilized effectively, it can be a competitive advantage (Porter, 1991; Ray et al., 2004). Accordingly, the relationship between resources and logistics processes is hypothesized as follows:

H4: *Firm resources have positive effects on logistics processes of container terminals*

Container ports require enormous infrastructure development comprising berths, storage yards, warehousing, trucks, tugboats, cranes, anchorage and other structures including well-trained human capital that control and operate equipment and infrastructure (Gordon et al., 2005). As outlined in Chapter 3, Firm Resources (FR) is developed as second-order reflective constructs composed of first-order constructs including Terminal Personnel (TP), Terminal Equipment (TE) and Infrastructure and Hinterland (IH). These three essential resources form the basis of container terminal operation. Further, based on results in section 5.8, terminal personnel resources in the first-order is made possible in the form of adequacy of capable personnel (TP2 $\lambda = 0.821$), adequacy of reliable personnel (TP4 $\lambda = 0.879$), and the support of trustworthy personnel along the terminal operation (TP5 $\lambda = 0.554$). Also, the terminal equipment construct in the first-order is possible in the form of adequacy (TE1 $\lambda = 0.849$), readiness (TE2 $\lambda = 0.894$) and reliability (TE3 $\lambda = 0.912$), as well as regular modernization (TE4 $\lambda = 0.717$) and maintenance (TE5 $\lambda = 0.707$) of equipment operated in the terminal. Finally, infrastructure and hinterland (IH) is determined by container handling capability in CY (IH3 $\lambda = 0.743$) and exit gate operation capability (IH5 $\lambda = 0.752$).

Further, measurement model evaluation confirmed the adequacy of reliable personnel (TP4 $\lambda = 0.879$) which is most important in terminal personnel, and the reliability of equipment operated in the terminal (TE3 $\lambda = 0.912$) is imperative to terminal equipment. And sufficiency of exit gate operation capability (IH5 $\lambda = 0.752$) is central to terminal equipment. The results from this chapter demonstrate that terminal resources construct has a positive effect on the improvement of terminal logistics processes.

The hypothesized path model analysis in section 5.10 demonstrate that the terminal resources construct is found to be a significant predictor of terminal logistics processes ($\beta = 0.758$, $p < 0.001$). In contrast to the competing model in section 5.11, the results validated a stronger significant relationship of terminal resources to terminal logistics processes ($\beta = 0.767$, $p < 0.001$). Henceforth, H_4 is supported.

5.12.5. Firm resources and terminal service performance

Resources is seen as the source of competitive advantage (Barney, 1991), and combined together, resources and firm capability are positively associated with performance (Yang et al., 2009). Based on this premise, this research proposes the extent of direct relationship effects between terminal resources and terminal service performance with the following hypothesis:

H5: *Firm resources have positive effects on service performance of container terminals*

The results of the hypothesized path model analysis in section 5.10 demonstrated that the terminal resources construct is not a significant predictor for service performance ($\beta = 0.139$ at $p > 0.05$). Although it possesses a positive effect, the relationship is insignificant. Henceforward, H_5 is not supported by the result. The outcomes have shown that terminal resources have a positive and significant effect on terminal logistics processes (H4 is supported) but not able to influence service performance (H5 is not supported). The result indicates that logistics processes mediate the relationship between both government support and firm resources as antecedents and terminal service performance as a criterion variable significantly.

5.12.6. Terminal logistics processes and service performance

Logistics processes is defined as the structured way of routinely scheduling operations logically, sequentially or concurrently, and accomplishing them in a cost-efficient manner for effective throughput while satisfying specified rules and regulations set by government. It is the synchronized process of flow of goods, documents and information internally within a firm, and externally with suppliers and consumers (Braziotis et al., 2013; Melnyk et al., 2009). The utilization and transformation process of firm resources in delivering value-added products to

consumers is vital (Liu & Lyons, 2011). Further, the improvement of logistics performance is achieved through integrating services, infrastructure development and streamlined administrative processes (World Bank, 2007). Therefore, efficient logistics processes, not capabilities, are perceived to have a positive relationship with performance. In other words, overall performance of container terminals relies on the net effect of terminal processes (Ray et al., 2004). Thus, the situation is proposed in the following hypothesis:
H6: *Terminal logistics processes have positive effects on terminal service performance of container terminals*

In this study, terminal logistics processes (TLP) is established as second-order reflective constructs composed of first-order constructs, consisting of lean practices (LP), managing stakeholder relationships (MR), integration practices (IP) and information sharing (IS). Results in section 5.8 show that LP in the first-order is possible in the form of implementation of methods to reduce unnecessary movement of equipment or people (LP5 $\lambda = 0.677$), calculates the time of container and document flow (LP7 $\lambda = 0.870$) and the regular standardization of operational procedures (LP8 $\lambda = 0.823$). The managing stakeholder relationships (MR) variable consists of cooperation with shipping lines, government agencies and inland transport operators to reduce costs and ensure higher quality service (MR3 $\lambda = 0.772$), dissemination of customer requirements and supported by terminal employee (MR5 $\lambda = 0.910$) and incorporation of customer needs and requirements into company's services (MR6 $\lambda = 0.879$). The integration practices (IP) variable consists of performance evaluation of transport modes connection from the terminal to hinterland (IP 1$\lambda = 0.678$), collaboration with other channel members to plan for greater channel optimization (IP3 $\lambda = 0.839$) and identification of competing channel cargo flow (IP4 $\lambda = 0.896$). Finally, the information sharing (IS) variable consists of knowledge transfer for employee (IS1 $\lambda = 0.869$), a dedicated team to update company's knowledge management (IS2 $\lambda = 0.818$), and the use of formal mechanisms to share best practices amongst terminal personnel (IS3 $\lambda = 0.803$).

The measurement model evaluation in this chapter has confirmed several predominate items such as the implementation of methods to calculate the timing of container and document flow (LP7 $\lambda = 0.870$) in the LP construct; dissemination of customer requirements and supported by terminal employee (MR5 $\lambda = 0.910$) in the MR construct; identification of competing channel cargo flow (IP4 $\lambda = 0.896$) in IP construct; and knowledge transfer for employee (IS1 $\lambda = 0.865$) in IS construct.

Terminal service performance (TSP) is established as second-order reflective constructs composed of first-order constructs, consisting of value-added services (VAS), responsiveness (R) and customer satisfaction (CS). Results in section 5.8 have shown that VAS in the first-order is likely to be a shorter lead time (VAS3 λ = 0.799), on-time delivery (VAS4 λ = 0.910) and the provision of service performance delivers higher value for customers (VAS5 λ = 0.852). Afterward, the R variable consists of responsive service (R1 λ = 0.877), pioneering of new import container services (R3 λ = 0.8791) and good response to new services and innovation to market (R3 λ = 0.877). Finally, CS consists of the provision of satisfactory client service (CS3 λ = 0.922); and satisfaction in company's responsiveness to client requirements (CS4 λ = 0.951).

Subsequently, as outlined in section 5.10, the hypothesized path model analysis demonstrated that terminal logistics processes construct is found to be a significant predictor of terminal service performance (β = 0.550, p < 0.001). Compared to the competing model in section 5.11, the results validated a stronger significant relationship of terminal logistics processes to terminal service performance (β = 0.692, p < 0.001). Therefore, H6 is supported.

5.13. Terminal logistics processes as mediator

This subsection analyses the mediating role of terminal logistics processes (TLP) on the relationship of government support (GS) and firm resources (FR) to terminal service performance (TSP). There are several ways to analyse the mediation effect of terminal logistics processes: 1) indirect and total effect analysis (Chen, Paulraj, & Lado, 2004); 2) SEM mediation modeling (Paulraj, 2011); and 3) path coefficients and t-values (Cao & Zhang, 2011).

The *first* mediation analysis is performed using indirect and total effect analysis with results shown in Table 5.35 below. The hypotheses (H1–H3) linking government support to the other three constructs (FR, TLP and TSP) were all statistically significant. Particularly, the paths connecting government support to: (1) firm resources (β = 0.425 at $p < 0.001$), (2), terminal logistics processes (β = 0.242 at $p < 0.001$); and (3) service performance (β = 0.164 at $p < 0.05$) were all statistically significant (Table 5.31). Further, significant parameter estimates were discovered for indirect effects of government support on: (a) terminal logistics processes (b = 0.131; P < 0.01); and (b) service performance (b = 0.212; P < 0.01). In addition to having direct effects, government support also has indirect effects on service performance through terminal logistics processes.

Table 5.35: Indirect and total effects analysis

Constructs	Govtmt_ Support		Firm_ Resources		Term_Log_ Processes		Service_ Performance	
	Indirect	Total	Indirect	Total	Indirect	Total	Indirect	Total
Firm_ Resources	.000	.425	.000	.000	.000	.000	.000	.000
Term_Log_ Processes	.131	.565	.000	.758	.000	.000	.000	.000
Service_ Performance	.212	.533	.480	.555	.000	.550	.000	.000

The next hypotheses group (H4–H6) proposes positive relations between firm resources, terminal logistics processes and terminal service performance. The parameter estimates for the path between firm resources (b = 0.758; P < 0.001), terminal logistics processes and terminal service performance was significant and in the projected path (b = 0.550; P < 0.001). The parameter estimates for the path connecting firm resources and terminal logistics processes was significant (b = 0.139; P < 0.10); however, the parameter estimates for the path between terminal resources and service performance was not statistically significant, even though it was in the projected path. Lastly, the path connecting terminal logistics processes to service performance (H6) was discovered to be significant and positive (b = 0.550; P < 0.01). Further, significant parameter estimates were found for indirect effects of firm resources on terminal service performance (b = 0.480; P < 0.01). The indirect effect of FR on TSP is likely to be channelled through terminal logistics processes.

The *second* mediation analysis is performed using SEM mediation modeling with results shown in Table 5.36 below.

Table 5.36: Structural Equation Mediation Modeling

Structural paths	Model 1[a]	Model 2[b]	Model 3[c]	Model 4[d]
Govtmt _Supp → Term_Log_Processes	.242*	.395*	.360*	–
Govtmt _Supp → Service Performance	.164**	–	.189[x]	.286*
Firm_Resources → Term_Log_Processes	.758*	.784*	.784*	–
Firm_Resources → Service Performance	.139[x]	–	.132[x]	.322*
Term_Log_Processes → Service Performance	.550**	.759*	.549**	.511*
Model fit statistics				
χ^2	91.106	126.776	123.061	284.949
df	39	42	40	42
CFI	0.946	0.912	0.914	0.749
RMSEA	0.079	0.097	0.098	0.164
TLI	0.924	0.885	0.882	0.671

[a]Hypothesized model.
[b]Full mediation model.
[c]Partial mediation model.
[d]Direct model.
[x]Insignificant result.
*p<0.01, **p < 0.05

The mediation effect of TLP was investigated by means of SEM method following Paulraj (2011). The hypothesized model (Model 1) was contrasted with two supplementary models to assess for the mediation effect of GS. The initial model was a full mediation model (Model 2) that encompassed paths from the antecedents (GS and FR) to and from terminal logistics processes to service performance (refer to Figure 5.13). All paths were positive and statistically significant. The Model 2 results empirically authenticate that terminal logistics processes mediate the relations between predictor variables and terminal service performance.

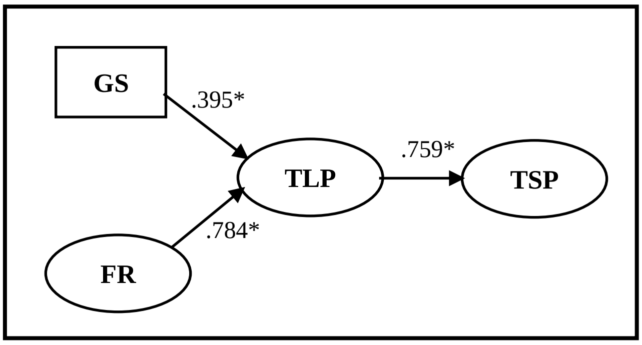


Figure 5.13: Full mediation model (Model 2)

The relations between the antecedents and performance was also analyzed using a partial mediation model (Model 3) to examine the extent to which terminal logistics processes partially or fully mediates (Paulraj et al., 2008). In addition to the paths in the hypothesized model (Model 1), this partial mediation model also adds a direct path from GS to TSP recommending that TLP partially mediates the relationship between GS and performance. However, the direct path from FR to TSP has shown an insignificant path, suggesting that TLP fully mediates the relationship between FR and performance (refer to Figure 5.14).

The model fit indices as presented in Table 5.36 above, mostly imply that the partial mediation model (Model 3) does not fit the data relatively well. All hypothesized relationships in the model were significant, except for the relationship between FR and TSP and GS and TSP.

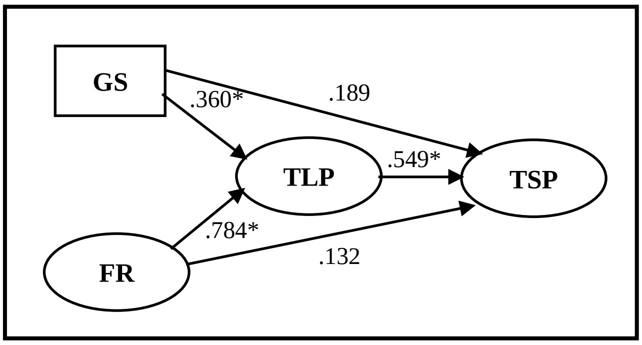


Figure 5.14: Partial mediation model (Model 3)

Furthermore, the path significance in Model 3 was examined to precisely assess the mediating role of TLP. The direct link between GS and TSP was found to be insignificant (b = 0.189; t = 1.937; p < 0.05), demonstrating that the effect of GS on TSP is fully mediated by TLP in Model 3. Correspondingly, as shown in Table 5.36, the direct linkage between FR and TSP was also discovered to be insignificant (b = 0.132; t = 0.677; p < 0.05), implying that the effect of FR on TSP is also fully mediated by TLP in this model.

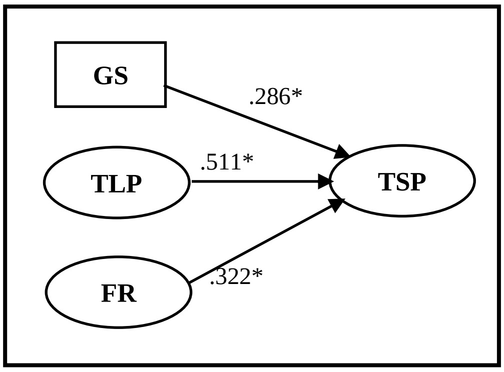


Figure 5.15: Direct mediation model (Model 4)

To further verify the crucial mediating role of TLP, a direct model (Model 4) was also examined (refer to Figure 5.15). This model directly arranged GS, FR and TLP to be correlated to TSP. Contrasted to the previous three models, the fit indices performance of the direct model were the worst across the overall fit indices. Additionally, the three paths were discovered to be significant at $p < 0.01$. In sum, these outcomes present sufficient confirmations to suggest that TLP mediates the relations between the antecedents and performance.

The *third* mediation analysis is performed using path coefficients and t-values analysis with results shown in Table 5.37 below. The outcomes demonstrated the role of terminal logistics processes in mediating the influence of government support and firm resources on terminal service performance. A rule of thumb for *t-value* >1.96 is for $p < 0.05$ and *t-value* >2.58 is for $p < 0.01$ (Kline, 2010).

Table 5.37: Path coefficient and t-values

Item	Path coefficient	t-value	Path coefficient	t-value	Path coefficient	t-value	Mediation of TLP on the relationship
GS	*H2* GS → TLP		*H3* GS → TSP		*H6* TLP → TSP		Partial mediation
	.242[a]	3.696*	.164	2.065**	.550	2.442**	
FR	*H4* FR → TLP		*H5* FR → TSP		*H6* TLP → TSP		Full mediation
	.758	6.780*	.139	0.692[b]	.550	2.442**	

a Value is a standardized structural coefficient
b Indicates a non-significant value at the level of 0.05
*p<0.01, **p < 0.05

For government support, all three direct relationships between GS → TLP (path coefficient = 0.242, t = 3.696), GS → TSP (path coefficient = 0.164, t = 2.050) and TLP → TSP (path coefficient = 0.550, t = 2.419) are significant. The results show that terminal logistics processes partially mediate the relationship between GS and TSP.

For FR, the direct relationship path coefficients for FR → TSP is insignificant (path coefficient = 0.139, t = 0.691), whilst both FR → TLP (path coefficient = 0.758, t = 6.780) and TLP → TSP (path coefficient = 0.550, t = 2.419) are significant. The results suggest that TLP fully mediate the relationship between FR and TSP. This supported the hypothesis H7. It can be concluded that resources alone cannot significantly influence service performance without the means of logistics processes. This result is also in line with the study of Yang et al. (2009) where resources are not significantly associated with performance. Henceforth, the effect of firm resources on terminal service performance is fully mediated by terminal logistics processes.

5.14. Summary

Preliminary examination and data analysis using EFA, CFA and SEM path modelling to investigate the conceptualized model and hypotheses were presented in this chapter. Respondents' profiles exhibited in the demographic profile displayed that participants had the capability to respond to survey enquiries. Subsequently, preliminary screening that related to missing value, normality, outliers, multicollinearity, non-response bias and common method bias test were outlined. Further, the evaluation of the conceptual model using EFA, CFA and SEM were explained as well as the on examination the testable hypotheses. The hypothesis investigation clarifies the significant influence of government support to firm resources and to terminal logistics processes, which in turn affects terminal service performance. In this regard, the relationship between government support and terminal service performance is partially mediated by terminal logistics processes, while the effect of firm resources on terminal service performance is fully mediated by terminal logistics processes.

The following chapter discusses the findings and results.

Chapter 6
Discussion and Implications

6.1. Introduction

This chapter evaluates the findings of the research by drawing from the earlier literature to undertake the research hypotheses presented in Chapter 3. Additionally, the investigation results in Chapter 5 are also discussed further in this chapter, which provides an outline of how terminal service performance is influenced by resource adequacy and logistics processes.

The chapter is organized into seven sections. Section 6.1 outlines the introduction and section 6.2 discusses the findings and the hypotheses testing. Section 6.3 outlines the implications and, section 6.4 summarizes the chapter.

6.2. Discussion

6.2.1. Government support

Government support (GS) and policy intervention are found to be a significant predictor of firm resources (FR), terminal logistics processes (TLP) and terminal service performance (TSP). The results indicate that government initiatives on policy development and intervention, provision of ICT infrastructure, followed up with best practice within the region, and training and professional development can be a precursor to resource deployment. This is in line with Dunning (2000) where government delivers location-based resources such as land, ICT, warehousing and road networks, human, financial and social capital, as well as ownership via privatization policy (Choi & Lim, 2016; Dunning & Lundan, 2008; Xu & Meyer, 2013). Given the context of the Indonesian port, the typical Asian container port development is overly supported by the central government that plays a vital role in designing, developing, operating, investing as well as determining cross-subsidization and controlling port pricing mechanism (Ray, 2008). The vested interest of government lies in the fact that the port plays a vital role in increasing national economic growth and enhancing its global competitiveness (Lee & Flynn, 2011). For example, in Indonesia, due to its national interest, the land purchase, allocation, design, investment, development and operation of port business is regulated by central government under the Law No.2 / 2012 regarding Land Procurement for Development in the Public Interest (BPN, 2012). As the port land is owned by the state, port regulations are also regulated by the state and the operators appointed to manage the port land also required to have the approval of the state. Therefore, central government is able to control the port pricing mechanism via its SOEs to ascertain the tariff balance in all port areas in Indonesia. This is due to the IPC (Indonesian Port Corporation) owns the majority of the port land and also controls the port operations (Ray, 2008). To enhance competition and efficiency, GOI induced privatization and invite foreign capitals to invest in the container port-SOEs with limited ownership (GOI, 2009). Local government, such as the major, governor, and city council contribute to the development of local hinterland connections i.e. electricity, water, gas networks and local road system.

As reviewed in Chapter 3, government support plays a crucial role in logistics sectors via regulation implementation and policy reforms, infrastructure, funding for training schemes and hinterland connectivity, as well as standardization and skill certification for investment in human capital development (Gordon et al., 2005; Ng & Gujar, 2009; Notteboom & Rodrigue, 2007; World Bank, 2016). In Indonesia, the port policy reform started with the introduction of the Indonesian Shipping Law 2008. In the past, entry of the private sector into the Indonesian port administration was restricted and monopolized by government agencies (GOI, 1969, 1992). The pioneering 2008 Shipping Law permits private entities to invest and play a constructive role in the Indonesian port management sector (GOI, 2008).

Additionally, the implementation of the 2008 Shipping Law is aimed to escalate intra-port competition and thereby improve efficiency and productivity. Moreover, Dick (2008) and Patunru and Rahardja (2015) discussed the continuous options disagreement in government between protectionism and profit from leasing and expansion. Further, Alfaraih et al. (2012) find that institutional investors play a role as a corporate governance mechanism which actually contributes positively to firm performance. Conversely, government ownership promotes a negative contribution to firm performance. The study implies that different types of ownership structures could benefit firm performance while others deteriorate the performance. These studies agree that the country's protectionism policy tends to discourage government strategy from advancing trade and logistics facilitation. Consequently, by involving the private sector, the application of the Shipping Law and privatization is expected to lower logistics costs and increase port performance through competition, thereby contributing to the country's economic growth (Choi & Lim, 2016; Venkita Subramanian & Thill, 2019; Wang et al., 2018). However, foreign ownership in the transport and logistics sectors is restricted to 49%, together with excessive bureaucracy and formalities in investment and business processes, causing inefficiencies in the sector (GOI, 2009; Mooney, 2016). Amongst the eight biggest container terminal operators taken as samples in this study, only two companies whose majority shares are controlled by private institutional investors, whilst the others are controlled by state-owned enterprises (SOEs) owned by the government. In this case, privatization policy has opened the possibility of private firms' ownership, however, Indonesia seems to be stationary with its 49% limited foreign ownership policy (Mooney, 2016). Furthermore, there are many earlier rules that are still used to benefit IPC as business monopoly holder that has not yet been adjusted to the enactment of 2008 Shipping Law (Annas, 2017). The aim to change the monopoly structure of Indonesian port industry to become a competition-based port industry by the enforcement of the 2008 Shipping Law has not yet been optimized (Ray, 2008). Therefore, the situation could explain why the GS influences TSP significantly in Indonesian container terminal operations.

In terms of expediting import container logistics flow, government efforts in revising policy and regulations have been ongoing since 2016, with the establishment of several Ministry of Finance Decrees and Customs regulations, amongst other things, such as instructions to reduce customs physical inspection process (DGCE, 2016b) and acceleration of submission of customs complementary documents from 3 days to 1 day finishing process (DGCE, 2016a), online import duty and tax payment 24/7 (DGCE, 2016b), fast-track container release for trusted importers/ exporters (Amin, 2018; Mabrori, 2018), and decentralization of decisions regarding prohibited goods and restrictions from Ministry to Director-General level (MOF, 2015). Some efforts have been made to reduce yard occupancy rates by limiting cargo stay at the container yards to just three days (Ministry of Transportation of The Republic of Indonesia, 2017). However, such measures are still ineffective with drawbacks such as prolonged dwelling time and higher logistics costs as described in Chapter 2 (section 2.3.4) (Febrianto, 2018; World Bank, 2015a, 2018a).

In terms of container transportation best practice, many government agencies have imposed regulations on container transport best routes and traffic arrangements. The similar treatment is enforced to the development of alternative transport modes for container transport to the hinterland, ranging from dry-ports, railways and waterways options (Jourdan, Harianto, & Hakim, 2018; Mokhtar, Redi, Krishnamoorthy, & Ernst, 2019). Various government agencies have encouraged ICT utilization in port operation, especially the push from customs and quarantine agencies in order to reduce dwelling time (Hilala & Lisnab, 2019). Further, the government has also introduced an Economic Policy Package II, which contains the Bonded Logistics Center (PLB) facility (DGCE, 2019), and Economic Policy Package XI (MOF, 2016), which reduced dwelling time in 2016 as a form of support and incentive for improvement in container transportation. Moreover, as a form of government support for maritime education, several institutes of port and maritime science and Indonesian port universities have been established (Armenia, 2015). From the RBV perspective, organizations should be equipped with these support services, given fierce competition, where these supports are mainly from government policies and provision of enforcing the usage of ICT in the port environment, passing regulations and laws on port ownership and establishing policy for infrastructure development to reduce logistics inefficiencies and transportation costs.

All in all, resources in the context of Indonesian container parks appear inadequate for the smooth flow of goods, documents and information within the terminal. Subsequently, the container movement within the terminal area causes congestion partly due to resources constraint (World Bank, 2018a). Therefore, government intervention and support are perceived to have a significant effect on terminal resources. The argument is consistent with the earlier study by Lee and Flynn (2011) who argue that cross-subsidization, and strategic and administered port pricing mechanisms can help port development, maritime infrastructure development and landside connections to the container port. However, it is unlikely for government support to influence terminal service performance directly without regulating logistics processes (Landau et al., 2016; Zhou, Gao, & Zhao, 2017). While ports are viewed as a development catalyst for nations, government investment in such areas can improve logistics flow through benchmarking with other successful ports in the region. Further, government support can positively influence terminal logistics processes which are measured on dimensions like lean practices, relationship management with other stakeholders, integration of inter-modal transport, and effective information sharing. In sum, the government in providing support, incentive, policy, and regulation likely to improve the logistics processes directly and via the provision of terminal resources.

6.2.2. Firm resources

This study conceptualizes a relationship between resources, processes and performance (RPP) in the context of container terminals based on RBV. While RBV focuses inherently on valuable, rare and costly-to-imitate resources (Barney, 1991), this study explores how conventional resources (e.g., facilities, equipment and labor) when appended judiciously to existing resources influence performance through a unique and efficient logistics processes.

From the RBV perspective (Barney, 1991; Wernerfelt, 1984), resources are deemed to be rare, valuable and costly-to-imitate. Then only a firm can develop a competitive advantage over others. Therefore, when the resources are very basic and conventional type, will that improve the competitive advantage? Ray et al. (2004) proposed that resources can help manage routine operations within the terminal. A shortage of resources creates a bottleneck in service delivery.

While resources are conceptualized mostly static in nature, it is the process that helps integrate and reconfigure those resources to develop a firm’s capability (Arend et al., 2014). In-terminal processes can exploit these resources into a bundle of skills and capabilities that drives performance. This set of skills and capabilities makes the terminal different from others and helps the container terminal creating a competitive advantage. Therefore, competitive advantage arises from resource synergies where resources interact each other through efficient processes that drive the performance (Yang et al., 2009). Further, equipment adequacy, readiness, reliability, modernization and maintenance of plant and equipment engaged in the terminal services operations are indispensable. They are the basic need of the terminal operations and shortage of any kind will create a bottleneck in the logistics flow within the terminal. Human capital and equipment capability are vital to back up capability of the firm for container handling and exit gate operations. The results presented in section 5.12 (chapter 5) on human capital requirement is in line with Thai (2012) and Thai et al. (2016) where port-related capability, reliability and integrity are essential to support terminal smooth operations. Most importantly, capability of container handling and exit gate operation is not only supported by human resources competency and equipment adequacy, but also sustained by the availability of the container yard and exit gate. Indonesian Ports are currently facing these challenges.

The positive influence of firm resources on terminal logistics processes indicates that adequate human capital, container handling equipment, and infrastructure and hinterland connectivity are associated with terminal logistics processes. Thus, skilled labor, in-terminal state-of-the-art equipment, and faster and easier connectivity with the mainland are likely to boost the logistics flow. The logistics processes is further operationalized by lean practices where the focus is to eliminate product and process waste. Collaboration and coordination among terminal partners, inter-modal transport integration for smooth transfer of goods, and effective and timely communication for faster decision making may also help in the flow efficiency. Therefore, optimum resource availability is likely to support and drive smooth logistics processes. While the literature supports a positive relationship between resources and capabilities (Kamasak, 2017; Lyu, Chen, & Huo, 2018), this thesis explores the relationship between resources and processes which is limited in the literature (Ray et al., 2004). Thus, its contribution is unique.

6.2.3. Terminal logistics processes

Terminal logistics processes (TLP) are likely to serve and facilitate service performance of the container terminal. Results show that multi-dimensional logistics processes have significant effect on terminal service performance. Specifically, lean methods and standardized operational procedures within the terminal are perceived to affect terminal operations significantly. Also, cooperation amongst port stakeholders is perceived to benefit and expedite logistics processes and thus enhances market responsiveness. Meanwhile, integrated transport modes that link terminals and hinterland destinations offer terminal channels a smooth cargo flow. Equally important is the dissemination of logistics information to operators and stakeholders for critical knowledge management that can add value for customers. These improved processes can create more added value while becoming more responsive, thus customers are satisfied.

The mediation analysis (refer section 5.12) demonstrates that terminal logistics processes (TLP) partially mediate the relationship between GS and TSP. This finding echoes the literature acknowledging the important role of government in port development and operations (De Borger & De Bruyne, 2011; Jansen et al., 2018; Lee & Flynn, 2011; Patunru & Rahardja, 2015; Tovar & Wall, 2015, 2019; Wu et al., 2016). Government supports not only the TLP, but also affects TSP significantly. The GS has drawn attention and is highlighted in the thesis as a source of external resources. The port operations being a regulated environment (Burns, 2015), government intervention in determining port operations and processes is not unusual. In the case of Asian ports, government regulates privatization and ownership (Cheon, Dowall, & Song, 2010; Hamzah et al., 2014; Pagano et al., 2013; Wang et al., 2013; Wanke & Barros, 2015), and sets cross-subsidization, standard performance for dwelling time, container yard stacking period, standard price and tariff mechanism (Lee & Flynn, 2011). This research reveals the partial mediation effect of TLP on the relationship between GS and TSP. It indicates that GS has no direct influence on TSP. The right choice of TLP can mediate this relationship that results in improved performance.

The results (section 5.12) also suggest that TLP fully mediates the relationship between firm resources and TSP. In establishing a relationship between resources, processes and performance, this research argues for the resources sourced from two sources: internally from terminal operator firms and externally from government support. While the terminal operator firms use their own resources, they appear quite inadequate. Therefore, the government support, as an external source, is argued to fill the resource gap in container terminal. Although, government support is expected to fulfil the infrastructure (e.g., terminal port, more space for container storage and handling, equipment, ICT backbone, and digitalization of services) that requires major investment. Aside, firm resources being the inputs, the performance could be realized only when these resources are exploited fully by appropriate business processes. Ray et al. (2004) argue that resources can be source of competitive performance (advantages) if they are fully exploited through business processes. The resources for the container terminal operations are argued to be conventional type in contrast to the resources that are valuable, rare and costly-to-imitate from RBV perspective. While the Indonesian ports are losing ground in the region, the research favors these conventional resources that would likely to improve the terminal performance. The conventional resources will, in fact, offer competitive parity with other neighboring ports. This is vital as the resource hungry Indonesian port needs basic resources to meet the day to day operations within the container terminal (container yard, dock and quay length, pool depth, cranes, truck, tugboat, etc). Arguably, it requires resources to overcome the process bottleneck within the terminal. However, these resources need not to be valuable, rare and inimitable. This is in contrast to the resource-based view (RBV) that posits a firm can use their own tangible and intangible resources to create a competitive advantage over others, only when these resources are valuable, rare, costly-to-imitate (Peteraf, 1993).

Different container terminal operators have varying degree of resource availability such as human resources, facilities, equipment, infrastructures and hinterland. Further, the operators use conventional container handling resources such as yard cranes, quay, gantry, tugboats, container yard and so on. However, these resources vary from one operator to another resulting in varying degree of service efficiency (Talley & Ng, 2016). Therefore, the operational efficiency results in different performance outcomes (Cho & Kim, 2015). In sum, resources alone cannot directly influence service performance without being processed. Hence, the impact of terminal resources on terminal service performance is completely mediated by terminal logistics processes.

6.2.4. Trade-offs for firm resources and terminal service performance

The relations between firm resources and service performance were discovered to be insignificant. As previously mentioned, firm resources were found to have a significant positive effect on terminal logistics processes. Logistics processes also have a significant positive relationship with service performance. The findings of this study, however, did not support a positive relationship between firm resources with terminal service performance. This indicates that terminal personnel, equipment, infrastructure and hinterland did not directly impact terminal service performance. It is anticipated that terminal service performance could be affected by domestic or international competition, global container route traffic and other external factors. Therefore, instead of a direct effect, firm resources had an indirect effect on service performance mediated by terminal logistics processes. The result, however, is similar to the findings of Yang et al. (2009) and Yang and Lirn (2017) who observed that there was no direct impact of resources on performance.

6.2.5. The importance of information technology in port

In practice during 2017 (when the research was conducted), most terminal operators had incorporated IT systems that calculated container flow, starting from the ship's unloading point, internal movement in the container yard by truck or crane, until the release point at the exit gate. Document flow, however, still lags due to hardcopy documents that require manual checking and sign off. For example, the completion of the delivery order document from shipping lines requires an original stamp and hardcopy signature. The process is the same for payment via several banks that still requires original stamp and hardcopy signatures on a hardcopy receipt. Digital signature and digital payment were not implemented during that time due to the high number of counterfeit documents that caused lack of trust in port users. Further, the standardization of operational procedures has been put into practice and disseminated to employees.

Also, to ensure higher service quality and reduce cost, terminal operators typically perform mutual collaboration with shipping lines, government agencies and inland transport operators. Some operators have a private IT system connected to several shipping lines to transfer manifest and cargo data as well as online delivery order data exchange. However, the investment and this type of cooperation are only adopted by big operators and their regular shipping lines customers as a form of innovative customized service delivery and fulfilment of customer requirements. At the national level, government agencies and operators realize the importance of mutual collaboration; thus both parties are proactively communicating current issues, and proposing solutions and inputs, which are then adopted in regulation and law by government agencies. Similarly, inland transporters or goods owners can access information about the container release time by entering the terminal operator system via the internet or intranet with the previously provided key code; therefore they can pick up their designated container in time. Additionally, the container release time information can be accessed as well via the customs system. There is still a loophole in this system, whereby after container notification is released in the customs/terminal operator system, the goods owner still has to complete Delivery Order (DO) to the shipping line office manually, with payment and signatures at the office shipping line that is not in the receiving port. In the case of Priok Port, shipping line offices are located in the CBD area, and it takes time to make the return trip through Jakarta's traffic. This bottleneck situation causes delays with container flow release time. Another issue is that not all stakeholders involved in the process operate 24/7 and such a state is causing additional dwelling time delays. The utilization of IT system in all operation lines will ease the bottleneck as all procedures will be automatically processed 24/7.

Likewise, most operators have done a performance evaluation of transport modes connection from terminal to hinterland; for example, an operator may consider using a truck or local ship to transport containers in Priok to Patimban port area in West Java, or using a truck or train to transport containers from Priok to Cikarang dry-port. Additionally, the identification of competing channel cargo flow also has been initiated. For example, around 70% of container throughput in Tanjung Priok was previously generated in eastern and southern areas of Jakarta and carried out by trucks. As road traffic of trucks has been bottlenecks in Tanjung Priok Port, a Cikarang-Bekasi Laut (CBL) waterway was proposed in 2014 but this has been delayed due to truck usage. Likewise, knowledge transfer and training development for employees has been established in the container port environment as well as the employment of a dedicated team to update company knowledge management, usually known as the intelligent business division.

Further, this study attempts to base the findings on the VRIN framework which proposes that a firm can develop a competitive advantage by deploying unique firm-specific resources that are valuable, rare, inimitable and non-substitutable (Amit & Schoemaker, 1993; Barney, 1991) as depicted in Table 6.1 below.

Table 6.1: Resources affecting Indonesian terminal container

Resource attribute	Valuable	Rare	Inimitable	Non-substitutable
Initial resources				
Indonesia's location	Affirmative, Asia–Europe high capacity shipping route	No, other nearby ports available for transhipping	No, other locations in SE Asia can expand its ports	No, nearby ports are capable of development (Singapore, Malaysia, Thailand)
The natural harbor	Affirmative	Affirmative	No, feasible to build with high investment	No, shippers in practice may utilize ports nearby
Additional resources				
Capital for infrastructure-foreign investment	Affirmative	Affirmative, relatively for South-East Asia	No, financing is viable from foreign organizations	No, investment is possible from other sources
IT and operations capabilities for a port	Affirmative	Affirmative, due to the scale and size of port operations	No, in practice, few ports have this scale	No, if other port provides satisfactory service
IT management skills	Affirmative	Affirmative	No, in general, nearby ports are capable (Singapore, Malaysia, Thailand)	No, foreign operators have experience with this scale
Combined resources				
Location, harbor, capital for infrastructure, foreign investment	Affirmative	Affirmative	No, Thailand, Vietnam and Malaysia develop bigger ports	No
Infrastructure, IT, operations and port equipment	Affirmative	Affirmative	Difficult	Difficult
IT management abilities, port technology and operations	Affirmative	Affirmative	No in general	No, foreign operators have experience with this scale

Source: Adapted from Gordon et al. (2005)

Based on the table above , we can see that the VRIN framework does not apply, as the uniqueness of Indonesian ports is replaceable. Indonesian ports have many comparable global port competitors in proximity that may perform better, i.e., Port Klang and Tanjung Pelepas in Malaysia, Cat Lain in Vietnam, Laem Chabang in Thailand and Port of Singapore in Singapore. As discussed in Chapter 3, resources are not necessarily rare, valuable and costly to imitate as they are inherently embedded in RBV theory, but they can be conventional and bundled up with other available resources to create unique capability and competitive advantage that others cannot imitate. From a resource-based perspective, logistics processes that utilize common resources may only serve as a basis for competitive equivalence (Ray et al., 2004). Therefore, this research argues that service performance improvement in terminal operators is achievable via resources and process enhancement. As Table 6.1 would suggest, resources that Indonesian operators use are basically common to container terminal operators and exchangeable. Similar results are also found in Gordon et al. (2005) when investigating the Port of Singapore key success factors. Although Singapore port as a natural harbor is rare and valuable, its location fails to be inimitable or non-substitutable, as ports in Malaysia, Thailand and Indonesia as competitors are located nearby. To develop and utilize these natural resources, Singapore has developed man-made resources including capital, information and operations technologies, and developed IT management skills.

Nevertheless, all operations, capital, IT competences and IT management skills are replicable. While these single resources alone are unable to create and maintain a competitive advantage, the distinctive amalgamation of interacting resources has demonstrated to be crucial to PSA’s ongoing competitive edge (Gordon et al., 2005). Therefore, the key to success lies in process and interaction of existing resources so that it can become a competitive advantage for the company.

Further, Kuo et al. (2017) find that dynamic capabilities positively influence both competitive advantage and service capabilities while these two latter variables were positively related to organizational performance. The RBV recommends that exceptional organizational performance is reliant on how shipping firms control their resources (Lai, 2004). Firm capabilities lie in the ability to use currently available resources to execute tasks (Gavronski, Klassen, Vachon, & Nascimento, 2011) and thus create competitive advantage (Wu, 2010). A firm’s efficiency is reflected on the organizational performance (Kuo et al., 2017). Hence, these study outcomes are aligned, and it can be concluded that competitive advantage can be achieved by the use of conventional resources coupled with management capability in leveraging resource deployment. Thus, common Indonesian terminal resources can be utilized to achieve a competitive advantage, temporary advantage or sustain current advantages based on resource leverage.

6.3. Contribution of the study

6.3.1. Theoretical contribution

Theoretically, this research contributes to and extends the maritime and container terminal literature in several ways.

First, the study supports the operationalization of resource-process- performance (RPP) relationship based on resource-based logic as theoretical lens. This relationship supports the argument that acquiring resources only can’t influence the performance unless these resources are exploited fully by processes. This supports the view of Ray et al. (2004) who acknowledge that resources, unless translated into routine processes, cannot develop competitive advantage. But there was no explicit mention of the effect of process on performance in their study. This study however has examined the effect of processes on performance while considering the simultaneous effect of conventional resources in contrast to valuable, rare and inimitable resources based on RBV perspective. The use of these valuable but common resources although offer the competitive parity (not advantage) which may not sustain for long (Ray et al. 2004). But currently it becomes a dare necessity of acquiring these common and valuable resources for the container terminal. Use of common resources, in contrast to rare and inimitable ones, in improving the performance is unique in its contribution.

Second, although, the earlier studies (Kamasak, 2017; Lyu et al., 2018) have investigated the resource-capability-performance relationship in the context of logistics, replacing capability with processes in container terminal context is new in this research. Processes are the activities or steps to accomplish a task, resources are used to finish the process. While differentiating the process from capability, Ray et al. (2004) state that ‘failure to exploit resources and capability through business processes may result in a deterioration of competitive advantage’. (p.26).

Third, the significant and direct effect of government support on terminal processes indicates the strong influence of government intervention as a source of external resources (i.e., developing infrastructure). This finding contributes to maritime literature and enriches the understanding of Asian port development policy which is in line with a study by Lee and Flynn (2011).

Fourth, the terminal logistics processes mediate the relationship between firm resources (and government support) on one hand, and service performance on the other. This strengthens the RBV theory in a sense that resources can be deployed to enhancing the firm performance, but it needs efficient processes. It also supports the earlier study of Yang et al. (2009) who find resources have no direct effect on firm performance. Also, this study contributes to the body of knowledge by extending the preceding study of Yang and Lirn (2017) who find the significant effect of intrafirm resources on logistics performance (LP) through logistics capability in context of Taiwanese container logistics.

The current study extends the preceding study by:; 1) making a distinct definition of resources by focusing on terminal-related internal physical resources (e.g., terminal personnel, equipment, infrastructure and surrounding hinterland); 2) positioning logistics processes, which contain lean practices, managing relationships, integration practices and information sharing as the main mechanism that determines the utilization of resources to provide output; 3) employing different output measures of terminal service performance, (i.e., value-added services, responsiveness and customer satisfaction); and 4) identifying government support as the antecedent for terminal resources.

6.3.2. Managerial contribution

This study has revealed that firm resources and government support perform not only as distinctive inputs that are vital to terminal logistics processes, but also as mechanisms through which container terminal firms cooperate with its affiliates and clients to improve the knowledge and procedures in order to enhance their service performance. Container terminal firms are recommended to assess their service performance as a system instead of assessing their resources-processes-service performance independently. From a managerial viewpoint, this research addresses implications and insights for both container terminal managers and policymakers as follows.

First, the study offers insight about the resource-process-performance relationship in the container terminal context. This relationship informs managers about essential resource requirements for improving service performance, even though resources as such have no direct effect on service performance. The development and investment of terminal resources is a crucial enabler of government support and logistics processes, which in turn, enhances terminal service performance. Terminal operator firms should be aware that capitalizing the firm's resources and conforming to government policy has a synergistic effect on logistics processes and the improvement of service performance significantly relies on the effectiveness of processes. This perspective provides a practical way for managers to develop analytical logistics processes by focusing on lean practices; relationship development with stakeholders; inter-modal connectivity; and timely sharing of information, internally and externally. Also, government support and policy intervention as such will have a direct effect on performance. Considering the findings on the importance of government support, a collective dialogue with the government needs to be carried out by senior management of terminal operators to secure their policies and obtain macro-level support for the port sector as a whole.

Second, the RBV perspective suggests that resources are limited and scarce, urging managers to optimally use available resources, no matter it may be conventional resources to run day-to-day operations. At the same time appending and judicious bundling up of conventional resources with existing resources will likely create a competitive advantage for short range but it will help for survival. Therefore, container terminal managers are required to exploit the resources (e.g., infrastructure, equipment and labor) optimally through efficient processes leading to improved service performance.

Third, this study offers an informative insight into how terminal operators recognize the firm's resource key attributes and logistics processes key attributes to improve service performance. Managers could engage this model to access the synergy of terminal resources and government policies, improve logistics processes, pinpoint and utilize comparative strengths, and operate better than competitors to achieve optimum service performance.

Fourth, based on the CFA coefficient of the four attributes of logistics processes constructs, information sharing is perceived as the most important logistics processes. The result signifies that managers should deliver accurate logistics information, reliable scheduling, precise price calculation, and consistent documentation with clients and partners to outperform competitors and achieve excellence in service performance.

Fifth, managers are required to pay more attention when managing relationships with their business partners (Shiraishi & Iijima, 2010). As several terminal operators are jointly owned and operated by institutional investors, thus terminal operator managers have the chance to choose the most beneficial partners for their future container terminal business development and collaborate thoroughly with their clients and partners to deliver low costs, responsive and flexible service (Zhao, Dröge, & Stank, 2001).

Sixth, as disclosed by this study, collaborative and competitive values are demonstrated in the factors of terminal resources, logistics processes, and service performance, thus allowing terminal operator managers to knowing the extent of their firm's advantage and disadvantages, and therefore, provide a pathway for a further development.

6.4. Summary

This chapter provided the discussions of the hypothesized relations of the conceptual framework, using quantitative outcomes to explain, support and justify validate the findings. GS is observed to have significant effect on FR, TLP and TSP.

The positive influence of FR on TLP indicates that adequate human capital, container handling equipment, and infrastructure and hinterland connectivity are associated with terminal logistics processes. The outcomes also demonstrate that multi-dimensional logistics processes provide significant contribute to on terminal service performance. Further, literature also appropriately validate the findings and compare it to the Indonesian current settings.

The essential theoretic contribution is the exploration of the relationship between resources and processes which is limited in the literature, as the extension of the relationship between resources and capabilities in the earlier studies. The chapter also highlighted the practical importance of IT utilization in all layers of port activities to expedite logistics processes, as well as managerial considerations of the resources optimum exploitation through efficient processes leading to improved service performance. Next chapter recapitulates the study and conveys the thesis' conclusion, recommendations, study limitations and future research directions.

Chapter 7
Conclusion

7.1. Introduction

This chapter provides a summary of the findings, implications, limitations and direction for future research. The discussion is organised into five sections. A summary of findings is presented in section 7.2. Recommendations for stakeholders are detailed out in section 7.3 and the study's limitations and directions for future research are outlined in section 7.4. Finally, concluding remarks are presented in section 7.5.

7.2. Summary of findings

A summary of hypotheses testing is provided in Table 7.1 below:

Table 7.1: Summary of findings

Hypotheses	Result	Comments
H1: *Government support has a positive effect on firm resources in container terminals*	Supported	The results have shown that the availability of firm resources is vital and is likely to have originated mainly from government policy enforcement and support, such as land provision as well as infrastructure and hinterland development. Government also plays a pivotal role in supporting firm resources as the firm's stakeholder and financial resources supporter.
H2: *Government support has a positive effect on logistics processes of container terminals*	Supported	The results have shown that the logistics processes of container terminals are significantly influenced by government policies and regulations, such as ICT integration and implementation enforcement in the port environment.
H3: *Government support has a positive effect on service performance of container terminals*	Supported	Government support improves terminal service performance significantly. It is argued that GS influences TSP directly via regulation enforcement; and indirectly via resources funding using its stakeholder function in operator ownership and affecting logistics business processes operations that influence terminal service performance.
H4: *Firm resources have a positive effect on logistics processes of container terminals*	Supported	The positive influence of firm resources on logistics processes indicates that adequate human capital, container handling equipment and hinterland connectivity are associated with terminal processes improvement.
H5: *Firm resources have positive effects on service*	Not Supported	The results indicate that firm resources do not have positive effect on service performance and

Hypotheses	Result	Comments
performance of container terminals		therefore is not a direct predictor of service performance.
H6: *Terminal logistics processes have positive effects on terminal service performance of container terminals*	Supported	. Results show that multi-dimensional logistics processes have a significant effect on terminal service performance.
H7: *Terminal logistics processes mediate the relationship between resources and service performance of container terminals.*	Supported	The results indicate that logistics processes partly mediate the relationship between government support and service performance and fully mediate the relationship between firm resources and service performance. Further, terminal logistics processes are likely to serve and facilitate service performance. It can be concluded that resources alone cannot significantly influence service performance without appropriate logistics processes.

A major contribution of this research is that its attempt to identify key container terminal resources and terminal logistics processes in the context of container terminal services. Although some earlier studies have investigated significant service attributes to meet customer requirements, limited studies have investigated the simultaneous effect of container terminal resources and logistics processes for improving terminal service performance from a resource-based view. Secondly, this study contributes by combining government support (i.e., external resource support) with firm resources (i.e., internal resource support) to examine their combined impact on service performance mediated by logistics processes. Finally, the research findings implied that logistics processes not only affect container terminal operator's performance, but also play a mediator role between government support and service performance as well as firm resources and service performance. Thus, container terminal operators have to efficiently allocate their resources and develop superior logistics processes to gain optimum service performance.

In sum, the conventional resources in the context of Indonesian container terminals indicate an inadequate streamlined flow of goods, documents and information within the terminal. Subsequently, resource constraints are deemed to be the cause of congestion and in turn slower container movement within the terminal area. Hence, government intervention and support are perceived to have a significant effect on terminal resources.

7.3. Recommendations for stakeholders

As previously stated in Chapter 2, Indonesian container terminals are facing many challenges, and these challenges are specific for each terminal. Nevertheless, this study makes general recommendations for all stakeholders such as terminal managers, industry association, and government agencies.

7.3.1 Terminal Managers

The results of the study can assist terminal managers with a clear understanding of resources-processes-performance relationship where resources may come from terminal operator firms internally and government support externally. In particular, these resources will have no impact on performance unless they are exploited through an effective process. Further, they need to understand the impact of government regulation on port operations and port performance.

The starting point is the recruitment process of capable, reliable and trustworthy human resources employed to control equipment, infrastructure and optimize hinterland connectivity. All departmental managers should be capable to comprehend the importance of lean practices in their own departments to eliminate product and process waste as well as collaborate, communicate and manage relations with other departmental managers to integrate overall logistics processes. Therefore, the terminal operator should adopt an effective information sharing mechanism to support information flow amongst its employees and external stakeholders. Such an information exchange enhances decision making, increases visibility, streamlines transport and logistics functions, and improves managers' ability to anticipate and prepare for future disruption. External information transfers can also drive managers to recognize the feasibility of value- added services they can provide in their own departmental sections.

On the other hand, the existence of external informal communication channels beyond IT systems should not be disregarded, as port supply chain partners may come from a small or medium enterprise that may not invest in costly integration of IT systems. Managers' participation in developing long-term relationships with shipping lines, government agencies and inland transport operators and keeping them well-informed, will enable industry partners to detect anomalies at an early stage and avoid operational disruptions. Additionally, these relationships will help managers to accumulate knowledge and create synergy to improve customer satisfaction and increase flexibility in providing terminal service performance.

Government support as a resource will improve the ability of terminal operators to meet the expectancies of shipping lines, especially to fulfill the strong bargaining power of the three strategic alliances. Therefore, in accordance with the results of this study, ensuring an effective and efficient logistics process, and combining it with government support, are very important for terminal operators to maintain their competitive parity. Due to intensive consolidation in the container shipping industry and competitive market environment, the bundling is imperative considering that minor shipping lines are likely to be secured by major lines lanes after the Covid-19 situation.

7.3.2 Industry associations

The research findings offer references for various industry associations involved in container terminal operations, import and export operations. In Indonesia, industry associations may include shipping lines, importers and exporters, trade and business, terminal container operators, customs brokers and 3PLs, labour unions, truck operators, forwarders, and stevedoring and warehouse companies.

First, industry unions provide important information about market change to its members to improve related business operations in the port environment. Such shared knowledge can be in the form of prediction and analysis of long-term impacts of a trend or policy to businesses and guidance to firms on a proper response. For example, Supply Chain Indonesia (SCI) owns a research department that conducts analysis on supply chain trends and offers problem solving ideas for its members, workshops, and training programs in any related supply chain matters in port, warehousing and transportation management. SCI is an independent institution engaged in education, training, consulting, research and development in logistics and supply chain sectors in Indonesia (SCI, 2019). Most industry associations emphasize a particular industry. For instance, the Association of Indonesian Port Business Entities focuses exclusively on national companies engaged in port services, namely Port Business Entities, Special Terminals and Terminals for Self-Interest (ABUPI, 2019). Another association such as ILFA (Indonesian Logistics and Forwarder Association) focuses on developing forwarding services and logistics as well as customs brokerage services, nationally or internationally (ILFA, 2019). Nevertheless, business associations assist members to develop logistics and supply chain capabilities in their programs and training. Additionally, these associations are capable of recognizing future hindrances and can offer solutions.

Second, port supply chain and logistics encompass various businesses ranging from shipping lines, forwarding, stevedoring, trucking, customs broker, terminal operators, gantry crane or forklift provider, logistics and transport suppliers, water and electricity producers, trucking, warehousing and storage providers. These skilled business associations are able to cooperatively recognize how each industry may contribute to enhancing service performance of a container terminal or port. Also, they are able to identify risk areas in supply chain links that have disruption potential caused by natural environmental factors and disseminate knowledge to their members.

Finally, industry associations together with government agencies can encourage port business entities to build relationships and integrate systems with their supply chain partners. These associations can offer forums and run meetings and workshops for members to interact and learn from other industry stakeholders. Hence, it is proposed that port-related business associations extend their agendas and programs to improve service performance of members in their own supply chains. Ultimately this is purposed to improve overall service performance of container terminal.

7.3.3 Government agencies

The study findings have underlined the importance of adequate conventional resources that are likely to support and improve terminal service performance. The development of roads and toll networks, terminal area expansion and ICT implementation facilitate the smooth flow of container freight and information flow. Previously, all permits for incoming and outgoing flow of goods must go through bureaucratic procedures in which the licensing process is issued by 18 ministries and institutions which have its own requirement standards and therefore, causing delays (BeritaSatu, 2016). However, the Government of Indonesia (GOI) has developed the port sector industry by deregulating docking procedures of port ships and improving port dwelling time via Economic Package Policy XI in 2016. The GOI planned to improve the procedure by creating a new Indonesia Single Risk Management system that accelerates container loading and unloading processes in port (Putranti, 2018). With Single Risk Management, various licensing standards are equated in order to accelerate dwelling time. Further, the GOI launched Economic Package Policy XV in 2017, namely Ease of Business and Reduction of Cost Expenses for National Logistics Service Provider Industries, with policies that include: reducing operational costs of transportation services, eliminating requirements for permit transportation of goods, alleviating the cost of port business investment, standardizing domestic goods flow documents, developing regional distribution centers, ease of procurement of ship's mechanism and return of container guarantee fees (Kemenko Ekonomi Republik Indonesia, 2017). Overall, the GOI's determination was to drive faster container and document flow at the port, decrease logistics costs and reduce bureaucratic red tape. However, it is imperative for the GOI to examine how these deregulations affect the overall terminal service performance where this thesis argues that effective processes may help achieving that performance which is likely to be at par with other ports in the region.

Further, to improve the acceleration of goods and document flow, it is important to establish collaboration with supply chain partners. However, this research has not covered the internal or external partnership for resource mobilization. Nevertheless, Indonesia has collaborated in several free trade agreements with ASEAN countries (ASEAN Trade in Goods Agreement/ATIGA) including Japan (Indonesia-Japan Economic Partnership Agreement/IJEPA), China (ASEAN-China FTA/ACFTA), Korea (ASEAN-Korea-FTA/AKFTA), India (ASEAN-India FTA/ AIFTA), Australia and New Zealand (ASEAN-Australia-New Zealand FTA/AANZFTA) and Pakistan (Pakistan-Indonesia FTA). This trade partnership of course deals with macro issues. That aims to decrease tariffs, arrange trade quotas and encourage product shipment in a more open and transparent regulatory setting. Henceforth, the GOI can further expand the current free trade agreement to escalate the trade volume via export and import that leads to increased container volume throughput. Therefore, the study offers an insight on business processes that ideally help in faster flow of containers through the terminal. Also, this research argues for adequacy of conventional resources which is required for this in-terminal processes to be efficient.

The findings of this study also consider how technologies can be further applied to improve efficiency and service performance. In fact, many government agencies have had adopted innovation in information technology to accelerate their business processes. For instance, Indonesian customs has implemented Information System Automation in all its core business (passenger, transport vehicle and export-import goods flow supervision), paperless import and export procedures in major ports, advancing supply chain efficiency via the development of the Bonded Logistics Center, pioneering the Indonesia Single Risk Management (ISRM) application and proposing an Online-Delivery Order application to the Ministry of Transportation. These programs have been positioned to improve competitiveness, and hence provide an incentive to improve terminal service performance. Indonesian quarantine has also renewed its import and export procedures on food and horticultural products, so it requires less time to finish checking license permits and conducting physical inspections. But in most of the cases the containers and related documents need further attention for faster processing that this thesis argues to enhance the performance. The latest development on the effort to solve the country’s logistics inefficiency is the introduction of National Logistics Ecosystem (NLE) by Indonesian Customs. NLE is a program that harmonize the flow of goods and international documents from the arrival of the transport facility until the goods arrive at the warehouse. NLE is oriented towards cooperation between government and private agencies, through data exchange, simplification of processes, elimination of repetition and duplication, and the use of a shared profile (single profile) and supported by information technology systems that covers the entire related logistics process and connecting the existing logistical systems.

7.4. Limitation and future research

Acknowledging the complexity of terminal operations, a case study approach will be able to investigate the current problem within its real-life context (Bryman & Bell, 2011; Gerring, 2007; Yin, 2014). Evidence can be gathered from numerous sources of information such as interviews, direct observations, participant-observation, documentation, archival records and physical artifacts (Yin, 2014; Zikmund et al., 2010). This research examines the services performance within the container import process chain. The influence of container services performance on port performance in Indonesia is a potential avenue for future research.

The survey involved only three major ports in Indonesia. So, the findings can be generalized to other ports in the region with caution. The cross-sectional nature of the study needs validation and verification over time through a longitudinal study in the future. Demographics such as age, experience, asset base, firm size and education level that serve as control variables are likely to moderate terminal performance. A future study with a larger sample may allow inter-group analysis of crane operations, yard operations, trucking and gate operations to explore how demographics could affect performance. This empirical model can be further tested under the moderating effect of environmental pressure (e.g., competition) to examine how the relationship can be affected by the moderator. Although terminals should be the focus of the study, Slack (2007) suggests that port-level tasks should not be overlooked. As the major container terminal operators are located in Tanjung Priok, Tanjung Emas and Tanjung Perak, the future study needs to include other small ports having process issues while improving their service performance.

7.5. Summary

Drawing on RBV perspective, this study investigated the relationship between government support, firm resources and logistics processes, and their simultaneous effect on service performance. Government support positively influences firm resources and terminal service performance. Thus, this study supports government intervention in providing resources externally that affect terminal service performance through terminal logistics process as mediator.

It is also found that firm resources have no direct effect on service performance, however, it indirectly affects via terminal logistics processes. It is argued that firm resources in itself cannot directly generate into service performance without being processed. Hence, the impact of firm resources on terminal service performance is completely mediated by terminal logistics processes. This chapter has offered recommendations based on overall findings of the research, discussed limitations of the research and proposed potential areas for future study.

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Appendices

Appendix 1: Importation TEUs based on Import Declaration 2010–2017

No	Customs Office	2010		2011		2012		2013		2014		2015		2016		2017		TOTAL	AVG 8 YRS
1	KPPBC Amamapare		0.00%		0.00%		0.00%	536	0.02%	6,739	0.26%	6,021	0.25%	6,510	0.25%	2,122	0.13%	**21,928**	0.11%
2	KPPBC Ambon		0.00%		0.00%	4	0.00%		0.00%	4	0.00%	23	0.00%	2	0.00%	4	0.00%	**37**	0.00%
3	KPPBC Balikpapan	2,299	0.11%	4,097	0.16%	4,424	0.16%	5,035	0.19%	3,946	0.15%	4,432	0.18%	3,152	0.12%	1,929	0.12%	**29,314**	0.15%
4	KPPBC Banda Aceh		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	-	0.00%
5	KPPBC Bandar Lampung	19,402	0.91%	24,830	0.98%	21,490	0.80%	20,995	0.78%	21,377	0.82%	21,186	0.88%	20,101	0.77%	13,904	0.86%	**163,285**	0.85%
6	KPPBC Bandung	5,101	0.24%	5,799	0.23%	5,557	0.21%	6,617	0.24%	5,104	0.20%	4,067	0.17%	3,324	0.13%	60	0.00%	**35,629**	0.18%
7	KPPBC Banjarmasin	949	0.04%	1,387	0.05%	1,497	0.06%	1,864	0.07%	2,464	0.09%	2,232	0.09%	2,223	0.09%	1,456	0.09%	**14,072**	0.07%
8	KPPBC Banyuwangi		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	-	0.00%
9	KPPBC Bekasi	17	0.00%	203	0.01%	4,604	0.17%	24,343	0.90%	34,688	1.33%	24,849	1.03%		0.00%		0.00%	**88,704**	0.43%
10	KPPBC Belawan	131,241	6.18%	157,001	6.21%	156,856	5.81%	160,691	5.93%	161,768	6.20%	149,786	6.22%	157,276	6.03%	97,965	6.04%	**1,172,584**	6.08%
11	KPPBC Bengkalis		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	7	0.00%		0.00%	**7**	0.00%
12	KPPBC Bengkulu		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	6	0.00%	**6**	0.00%
13	KPPBC Benoa		0.00%		0.00%		0.00%	213	0.01%	1,318	0.05%	182	0.01%		0.00%		0.00%	**1,713**	0.01%
14	KPPBC Bima		0.00%		0.00%	10	0.00%	2,201	0.08%	1,419	0.05%	1,953	0.08%	1,549	0.06%	730	0.05%	**7,862**	0.04%
15	KPPBC Bitung	382	0.02%	660	0.03%	649	0.02%	1,025	0.04%	1,052	0.04%	896	0.04%	1,193	0.05%	1,011	0.06%	**6,868**	0.04%
16	KPPBC Bojonegoro		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	-	0.00%
17	KPPBC Bontang		0.00%		0.00%		0.00%	166	0.01%	3	0.00%	179	0.01%		0.00%		0.00%	**348**	0.00%
18	KPPBC Cikarang		0.00%		0.00%		0.00%		0.00%		0.00%	22,412	0.93%	58,594	2.25%	31,968	1.97%	**112,974**	0.64%
19	KPPBC Cilacap		0.00%		0.00%		0.00%	71	0.00%	64	0.00%	10	0.00%	1	0.00%		0.00%	**146**	0.00%
20	KPPBC Cirebon		0.00%		0.00%		0.00%		0.00%	3	0.00%	2	0.00%		0.00%		0.00%	**5**	0.00%
21	KPPBC Dabo Singkep		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	-	0.00%
22	KPPBC Denpasar		0.00%		0.00%		0.00%		0.00%		0.00%	300	0.01%	410	0.02%	188	0.01%	**898**	0.00%
23	KPPBC Dumai	6	0.00%	22	0.00%	10	0.00%	223	0.01%	72	0.00%	38	0.00%	33	0.00%	1	0.00%	**405**	0.00%
24	KPPBC Entikong		0.00%		0.00%	7	0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	**7**	0.00%
25	KPPBC Gorontalo		0.00%		0.00%		0.00%		0.00%		0.00%	22	0.00%	2	0.00%		0.00%	**24**	0.00%
26	KPPBC Gresik	2,390	0.11%	3,267	0.13%	2,473	0.09%	2,126	0.08%	2,335	0.09%	1,084	0.05%		0.00%	7	0.00%	**13,682**	0.07%
27	KPPBC Jakarta (HALIM)	1	0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	**1**	0.00%
28	KPPBC Jambi	2,160	0.10%	2,151	0.09%	2,559	0.09%	4,555	0.17%	3,005	0.12%	4,039	0.17%	4,804	0.18%	2,252	0.14%	**25,525**	0.13%
29	KPPBC Jayapura		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	195	0.01%	**195**	0.00%
30	KPPBC Juanda		0.00%	3	0.00%		0.00%	1	0.00%	2	0.00%		0.00%		0.00%		0.00%	**6**	0.00%
31	KPPBC Kalianget		0.00%		0.00%	14	0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	**14**	0.00%
32	KPPBC Kantor Pos Pasar Baru		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	-	0.00%
33	KPPBC Kendari		0.00%		0.00%	4	0.00%	22	0.00%		0.00%	35	0.00%	44	0.00%	340	0.02%	**445**	0.00%
34	KPPBC Ketapang		0.00%		0.00%		0.00%	33	0.00%		0.00%		0.00%		0.00%		0.00%	**33**	0.00%
35	KPPBC Kotabaru		0.00%		0.00%	4	0.00%	18	0.00%	6	0.00%	22	0.00%	18	0.00%	7	0.00%	**75**	0.00%
36	KPPBC Kuala Langsa		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	-	0.00%
37	KPPBC Kuala Namu		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	-	0.00%
38	KPPBC Kuala Tanjung		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	-	0.00%
39	KPPBC Kupang		0.00%		0.00%		0.00%	19	0.00%	144	0.01%	17	0.00%		0.00%		0.00%	**180**	0.00%
40	KPPBC Lhok Seumawe		0.00%		0.00%	4	0.00%		0.00%		0.00%	731	0.03%		0.00%		0.00%	**735**	0.00%
41	KPPBC Luwuk		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	101	0.00%	171	0.01%	**272**	0.00%
42	KPPBC Makasar	2,811	0.13%	3,941	0.16%	4,710	0.17%	3,708	0.14%	5,713	0.22%	5,370	0.22%	6,730	0.26%	5,273	0.33%	**38,256**	0.20%
43	KPPBC Malili		0.00%		0.00%		0.00%		0.00%	135	0.01%	432	0.02%	269	0.01%	112	0.01%	**948**	0.01%
44	KPPBC Manado		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	50	0.00%	6	0.00%	**56**	0.00%
45	KPPBC Marunda		0.00%		0.00%		0.00%	4	0.00%		0.00%		0.00%		0.00%		0.00%	**4**	0.00%
46	KPPBC Mataram		0.00%		0.00%		0.00%	25	0.00%		0.00%	2	0.00%		0.00%		0.00%	**27**	0.00%
47	KPPBC Maumere		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	17	0.00%		0.00%	**17**	0.00%
48	KPPBC Medan		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	-	0.00%
49	KPPBC Merak	4,468	0.21%	4,310	0.17%	4,838	0.18%	6,638	0.25%	6,913	0.26%	8,337	0.35%	13,756	0.53%	7,585	0.47%	**56,845**	0.30%
50	KPPBC Meulaboh		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	-	0.00%
51	KPPBC Nangau Badau		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	-	0.00%
52	KPPBC Ngurah Rai		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	-	0.00%
53	KPPBC Nunukan		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	-	0.00%
54	KPPBC Palembang	11,868	0.56%	15,890	0.63%	16,419	0.61%	16,910	0.62%	21,510	0.82%	27,302	1.13%	23,763	0.91%	14,163	0.87%	**147,825**	0.77%
55	KPPBC Panarukan		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	-	0.00%
56	KPPBC Pangkal Pinang		0.00%		0.00%		0.00%	419	0.02%	399	0.02%	208	0.01%	176	0.01%	120	0.01%	**1,322**	0.01%
57	KPPBC Pangkalan Buun		0.00%		0.00%		0.00%	8	0.00%	29	0.00%	61	0.00%	45	0.00%	63	0.00%	**206**	0.00%
58	KPPBC Pangkalan Susu		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	-	0.00%
59	KPPBC Pantoloan		0.00%		0.00%		0.00%	4	0.00%	26	0.00%	28	0.00%	68	0.00%		0.00%	**126**	0.00%
60	KPPBC Pare-pare		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	29	0.00%	76	0.00%	**105**	0.00%
61	KPPBC Pekanbaru	17,714	0.83%	20,953	0.83%	29,968	1.11%	33,249	1.23%	35,668	1.37%	36,870	1.53%	35,236	1.35%	24,484	1.51%	**234,142**	1.22%
62	KPPBC Pomalaa		0.00%		0.00%		0.00%		0.00%	12	0.00%	97	0.00%	75	0.00%		0.00%	**184**	0.00%
63	KPPBC Pontianak	3,066	0.14%	3,754	0.15%	4,951	0.18%	4,232	0.16%	5,728	0.22%	4,445	0.18%	5,449	0.21%	3,963	0.24%	**35,588**	0.19%
64	KPPBC Poso		0.00%		0.00%		0.00%		0.00%	97	0.00%		0.00%		0.00%	1	0.00%	**98**	0.00%
65	KPPBC Pulang Pisau		0.00%		0.00%	4	0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	**4**	0.00%
66	KPPBC Samarinda	490	0.02%	631	0.02%	792	0.03%	643	0.02%	420	0.02%	493	0.02%	358	0.01%	242	0.01%	**4,069**	0.02%
67	KPPBC Sambu Belakang Padang		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	-	0.00%
68	KPPBC Sampit		0.00%		0.00%	7	0.00%	79	0.00%	96	0.00%	142	0.01%	40	0.00%	41	0.00%	**405**	0.00%
69	KPPBC Sangata		0.00%		0.00%	4	0.00%	519	0.02%	515	0.02%	161	0.01%	361	0.01%	760	0.05%	**2,320**	0.01%
70	KPPBC Selat Panjang		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	-	0.00%
71	KPPBC Siak Sri Indrapura		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	-	0.00%
72	KPPBC Sibolga		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	-	0.00%
73	KPPBC Sintete		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	-	0.00%
74	KPPBC Sorong		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	2	0.00%		0.00%	**2**	0.00%
75	KPPBC Surakarta		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	-	0.00%
76	KPPBC Tanjung Balai Karimun	5	0.00%		0.00%	22	0.00%	1	0.00%		0.00%		0.00%	4	0.00%		0.00%	**32**	0.00%
77	KPPBC Tanjung Emas	113,026	5.32%	142,034	5.62%	158,858	5.89%	166,141	6.14%	166,316	6.37%	175,903	7.31%	195,068	7.48%	116,571	7.19%	**1,233,917**	**6.41%**
78	KPPBC Tanjung Pandan		0.00%		0.00%		0.00%		0.00%		0.00%	6	0.00%	4	0.00%	22	0.00%	**32**	0.00%
79	KPPBC Tanjung Perak	441,396	20.79%	519,576	20.54%	549,000	20.35%	556,752	20.56%	560,386	21.47%	503,464	20.92%	559,860	21.46%	343,722	21.20%	**4,034,157**	**20.91%**
80	KPPBC Tanjung Pinang	60	0.00%	49	0.00%	72	0.00%	61	0.00%	43	0.00%	57	0.00%	102	0.00%	9	0.00%	**453**	0.00%
81	KPPBC Tarakan		0.00%		0.00%		0.00%		0.00%	98	0.00%	14	0.00%	3	0.00%	3	0.00%	**118**	0.00%
82	KPPBC Tarempa		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	-	0.00%
83	KPPBC Teluk Bayur	1,736	0.08%	2,936	0.12%	2,313	0.09%	2,272	0.08%	1,975	0.08%	1,016	0.04%	1,407	0.05%	846	0.05%	**14,501**	0.07%
84	KPPBC Teluk Nibung		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	-	0.00%
85	KPPBC Tembilahan		0.00%		0.00%	8	0.00%	64	0.00%	287	0.01%	91	0.00%	71	0.00%	63	0.00%	**584**	0.00%
86	KPPBC Ternate		0.00%		0.00%		0.00%	25	0.00%	97	0.00%	132	0.01%	159	0.01%	11	0.00%	**424**	0.00%
87	KPPBC Yogyakarta		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%		0.00%	-	0.00%
88	KPU Batam	49,370	2.33%	79,572	3.15%	84,199	3.12%	89,854	3.32%	3	0.00%	5,106	0.21%		0.00%		0.00%	**308,104**	1.52%
89	KPU Soekarno-Hatta		0.00%	2	0.00%	4	0.00%		0.00%	6	0.00%	4	0.00%	1	0.00%	2	0.00%	**19**	0.00%
90	KPU Tanjung Priok	1,312,741	61.84%	1,535,986	60.73%	1,641,771	60.85%	1,595,613	58.92%	1,558,580	59.70%	1,392,308	57.85%	1,505,821	57.73%	948,660	58.52%	**11,491,484**	**59.52%**
	GRAND TOTAL	**2,122,699**	**100%**	**2,529,054**	**100%**	**2,698,106**	**100%**	**2,707,975**	**100%**	**2,610,565**	**100%**	**2,406,567**	**100%**	**2,608,268**	**100%**	**1,621,114**	**100%**	**19,304,355**	**100%**

Source: Directorate General of Customs and Excise, Ministry of Finance of the Republic of Indonesia

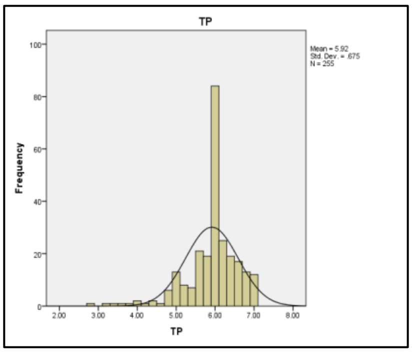
Data excluding transhipment, export and intra-port container cargo handling

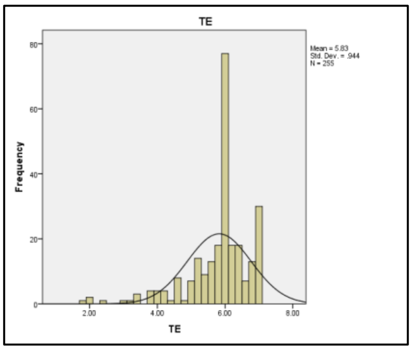
Appendix 2: Skewness and kurtosis

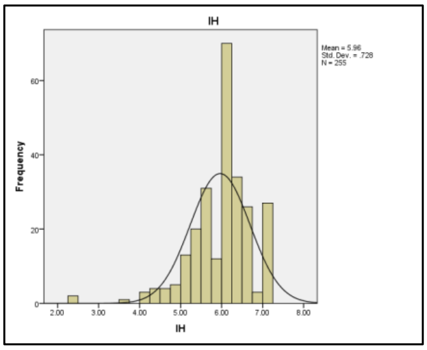
No	Item	Skewness	Kurtosis	No	Item	Skewness	Kurtosis
1	**TP1**	-1.888	4.349	37	**IP3**	-1.264	2.393
2	**TP2**	-1.447	5.034	38	**IP4**	-1.691	4.300
3	**TP3**	-1.648	2.871	39	**IP5**	-1.220	1.594
4	**TP4**	-2.044	7.889	40	**IP6**	-1.319	1.830
5	**TP5**	-1.806	7.127	41	**IS1**	-1.532	3.651
6	**TE1**	-1.733	3.319	42	**IS2**	-1.420	2.809
7	**TE2**	-1.753	3.623	43	**IS3**	-1.284	2.419
8	**TE3**	-1.482	2.353	44	**IS4**	-1.288	2.152
9	**TE4**	-1.309	1.078	45	**IS5**	-1.592	3.587
10	**TE5**	-2.019	8.145	46	**IS6**	-1.296	2.206
11	**IH1**	-1.927	5.550	47	**IS7**	-1.380	2.130
12	**IH2**	-1.630	2.386	48	**IS8**	-1.540	4.277
13	**IH3**	-1.745	6.087	49	**IS9**	-1.710	4.761
14	**IH4**	-2.242	6.777	50	**GS1**	-0.903	0.732
15	**IH5**	-1.823	5.312	51	**GS2**	-1.073	1.597
16	**IH6**	-2.094	5.923	52	**GS3**	-0.756	0.288
17	**IH7**	-1.821	4.074	53	**GS4**	-0.543	0.090
18	**LP1**	-1.378	5.087	54	**GS5**	-0.635	0.267
19	**LP2**	-1.007	1.637	55	**GS6**	-0.805	0.879
20	**LP3**	-0.809	0.993	56	**GS7**	-1.028	1.171
21	**LP4**	-2.160	9.172	57	**VAS1**	-1.879	6.387
22	**LP5**	-0.923	1.597	58	**VAS2**	-1.497	3.196
23	**LP6**	-1.429	3.722	59	**VAS3**	-1.177	1.836
24	**LP7**	-1.085	2.450	60	**VAS4**	-1.199	3.094
25	**LP8**	-1.934	6.386	61	**VAS5**	-1.471	4.146
26	**LP9**	-1.308	2.694	62	**VAS6**	-1.646	3.869
27	**MR1**	-1.952	8.236	63	**VAS7**	-1.506	3.946
28	**MR2**	-2.210	8.454	64	**VAS8**	-1.342	2.665
29	**MR3**	-2.053	7.671	65	**R1**	-1.067	1.250
30	**MR4**	-2.292	8.972	66	**R2**	-0.760	0.075
31	**MR5**	-2.286	8.898	67	**R3**	-0.819	0.245
32	**MR6**	-1.768	7.240	68	**R4**	-1.226	2.309
33	**MR7**	-1.913	5.584	69	**CS1**	-1.125	1.516
34	**MR8**	-2.709	11.532	70	**CS2**	-1.602	4.752
35	**IP1**	-1.505	2.975	71	**CS3**	-1.154	1.959
36	**IP2**	-1.350	1.896	72	**CS4**	-1.117	2.607

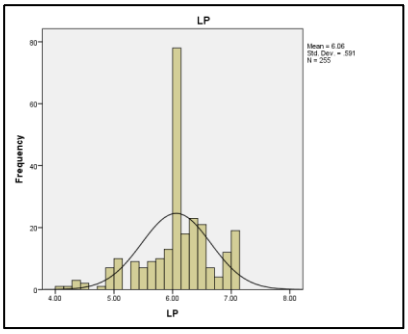
Source: Data processed by author

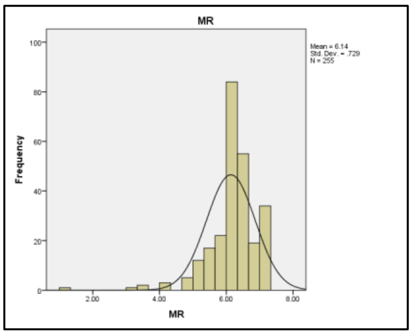
Appendix 3: Histogram and QQ-plot summary for each construct

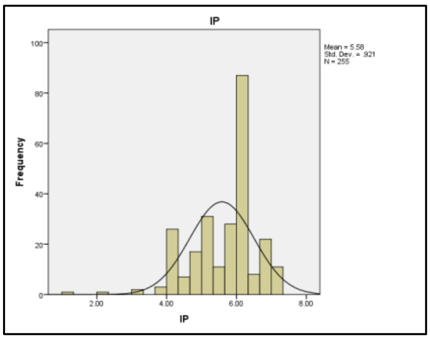


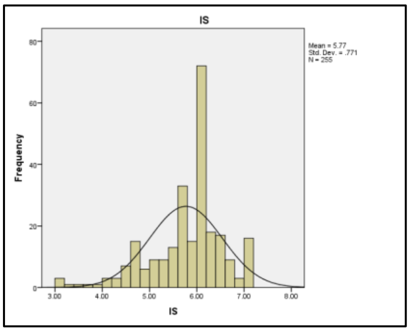


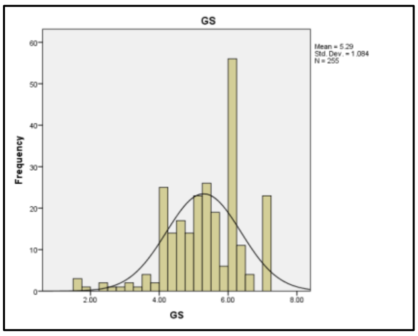


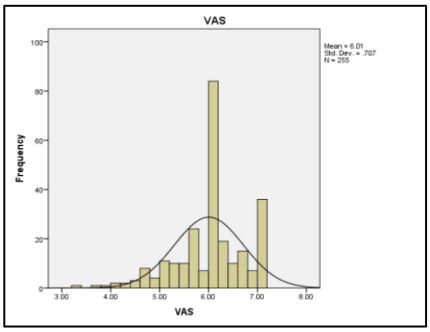


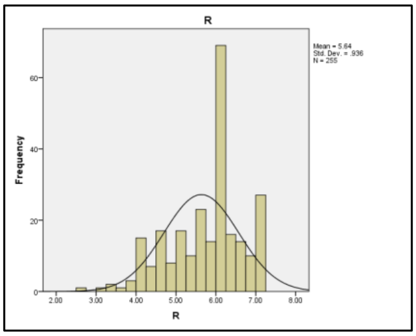


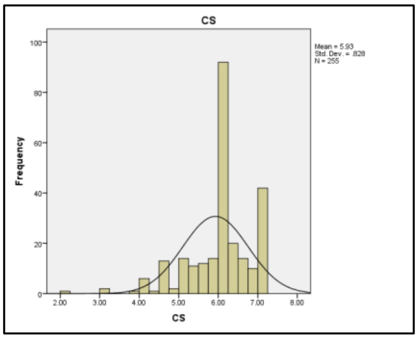












Appendix 4: Test of normality

Item	Shapiro-Wilk			Item	Shapiro-Wilk		
	Statistic	df	Sig.		Statistic	Statistic	Statistic
TP1	.704	255	.000	IS1	.795	255	.000
TP2	.719	255	.000	IS2	.807	255	.000
TP3	.765	255	.000	IS3	.799	255	.000
TP4	.692	255	.000	IS4	.806	255	.000
TP5	.739	255	.000	IS5	.771	255	.000
TE1	.729	255	.000	IS6	.793	255	.000
TE2	.744	255	.000	IS7	.816	255	.000
TE3	.777	255	.000	IS8	.781	255	.000
TE4	.795	255	.000	IS9	.783	255	.000
TE5	.728	255	.000	GS1	.863	255	.000
IH1	.728	255	.000	GS2	.861	255	.000
IH2	.758	255	.000	GS3	.876	255	.000
IH3	.722	255	.000	GS4	.894	255	.000
IH4	.709	255	.000	GS5	.896	255	.000
IH5	.727	255	.000	GS6	.888	255	.000
IH6	.728	255	.000	GS7	.857	255	.000
IH7	.768	255	.000	VAS1	.735	255	.000
LP1	.728	255	.000	VAS2	.769	255	.000
LP2	.777	255	.000	VAS3	.778	255	.000
LP3	.783	255	.000	VAS4	.764	255	.000
LP4	.720	255	.000	VAS5	.760	255	.000
LP5	.786	255	.000	VAS 6	.780	255	.000
LP6	.770	255	.000	VAS7	.784	255	.000
LP7	.770	255	.000	VAS8	.813	255	.000
LP8	.750	255	.000	R1	.823	255	.000
LP9	.790	255	.000	R2	.856	255	.000
MR1	.716	255	.000	R3	.880	255	.000
MR2	.704	255	.000	R4	.804	255	.000
MR3	.714	255	.000	CS1	.822	255	.000
MR4	.712	255	.000	CS2	.779	255	.000
MR5	.705	255	.000	CS3	.814	255	.000
MR6	.742	255	.000	CS4	.802	255	.000
MR7	.755	255	.000				
MR8	.655	255	.000				
IP1	.802	255	.000				
IP2	.816	255	.000				
IP3	.825	255	.000				
IP4	.769	255	.000				
IP5	.797	255	.000				
IP6	.805	255	.000				

Appendix 5: Multicollinearity Test

Correlations													
			TP1	TP2	TP3	TP4	TP5	TE1	TE2	TE3	TE4	TE5	IH1
Spearman's rho	TP1	Correlation Coefficient	1	.529**	.513**	.552**	.308**	.443**	.371**	.355**	.255**	.378**	.291**
		Sig. (2-tailed)	.	0	0	0	0	0	0	0	0	0	0
		N	216	216	216	216	216	216	216	216	216	216	216
	TP2	Correlation Coefficient	.529**	1	.480**	.694**	.549**	.369**	.356**	.356**	.270**	.426**	.305**
		Sig. (2-tailed)	0	.	0	0	0	0	0	0	0	0	0
		N	216	216	216	216	216	216	216	216	216	216	216
	TP3	Correlation Coefficient	.513**	.480**	1	.538**	.452**	.319**	.302**	.382**	.381**	.383**	.248**
		Sig. (2-tailed)	0	0	.	0	0	0	0	0	0	0	0
		N	216	216	216	216	216	216	216	216	216	216	216
	TP4	Correlation Coefficient	.552**	.694**	.538**	1	.477**	.343**	.326**	.426**	.282**	.398**	.357**
		Sig. (2-tailed)	0	0	0	.	0	0	0	0	0	0	0
		N	216	216	216	216	216	216	216	216	216	216	216
	TP5	Correlation Coefficient	.308**	.549**	.452**	.477**	1	.280**	.239**	.213**	.194**	.292**	.248**
		Sig. (2-tailed)	0	0	0	0	.	0	0	0.002	0.004	0	0
		N	216	216	216	216	216	216	216	216	216	216	216
	TE1	Correlation Coefficient	.443**	.369**	.319**	.343**	.280**	1	.791**	.771**	.619**	.568**	.337**
		Sig. (2-tailed)	0	0	0	0	0	.	0	0	0	0	0
		N	216	216	216	216	216	216	216	216	216	216	216
	TE2	Correlation Coefficient	.371**	.356**	.302**	.326**	.239**	.791**	1	.796**	.701**	.642**	.269**
		Sig. (2-tailed)	0	0	0	0	0	0	.	0	0	0	0
		N	216	216	216	216	216	216	216	216	216	216	216
	TE3	Correlation Coefficient	.355**	.356**	.382**	.426**	.213**	.771**	.796**	1	.662**	.626**	.267**
		Sig. (2-tailed)	0	0	0	0	0.002	0	0	.	0	0	0
		N	216	216	216	216	216	216	216	216	216	216	216
	TE4	Correlation Coefficient	.255**	.270**	.381**	.282**	.194**	.619**	.701**	.662**	1	.646**	.239**
		Sig. (2-tailed)	0	0	0	0	0.004	0	0	0	.	0	0
		N	216	216	216	216	216	216	216	216	216	216	216
	TE5	Correlation Coefficient	.378**	.426**	.383**	.398**	.292**	.568**	.642**	.626**	.646**	1	.299**

This table is a snapshot of the whole Spearman-rho table. The test has been performed for the whole items

Appendix 6: Terminal resources anti-image matrices

		TP1	TP2	TP3	TP4	TP5	TE1	TE2	TE3	TE4	TE5	IH1	IH2	IH3	IH4	IH5	IH6	IH7
Anti-image Correlation	TP1	.823[a]	-0.135	-0.127	-0.284	0.062	-0.382	-0.160	0.313	0.030	-0.042	0.071	-0.187	0.035	-0.110	0.012	0.100	-0.001
	TP2	-0.135	.897[a]	-0.044	-0.418	-0.281	-0.004	-0.021	0.011	0.020	-0.078	0.018	-0.058	-0.038	0.053	-0.029	-0.041	0.065
	TP3	-0.127	-0.044	.877[a]	-0.185	-0.114	0.030	0.160	-0.066	-0.342	0.031	0.019	-0.032	-0.075	-0.147	0.082	0.017	0.020
	TP4	-0.284	-0.418	-0.185	.861[a]	-0.135	0.174	0.102	-0.209	0.080	-0.069	-0.053	0.065	-0.152	0.042	-0.163	0.001	0.026
	TP5	0.062	-0.281	-0.114	-0.135	.849[a]	-0.111	-0.082	0.092	0.042	0.032	-0.036	0.154	-0.084	0.157	-0.023	0.034	-0.106
	TE1	-0.382	-0.004	0.030	0.174	-0.111	.848[a]	-0.237	-0.503	0.074	-0.094	-0.140	0.116	0.118	0.027	-0.091	0.005	-0.014
	TE2	-0.160	-0.021	0.160	0.102	-0.082	-0.237	.900[a]	-0.397	-0.188	-0.177	0.005	-0.123	0.048	0.021	-0.002	-0.056	0.093
	TE3	0.313	0.011	-0.066	-0.209	0.092	-0.503	-0.397	.846[a]	-0.190	0.000	0.161	-0.165	-0.167	-0.019	0.015	-0.035	0.021
	TE4	0.030	0.020	-0.342	0.080	0.042	0.074	-0.188	-0.190	.889[a]	-0.315	0.034	-0.097	0.095	0.060	-0.090	0.039	-0.126
	TE5	-0.042	-0.078	0.031	-0.069	0.032	-0.094	-0.177	0.000	-0.315	.923[a]	-0.177	0.138	-0.079	0.076	-0.022	0.058	-0.199
	IH1	0.071	0.018	0.019	-0.053	-0.036	-0.140	0.005	0.161	0.034	-0.177	.858[a]	-0.151	-0.330	-0.113	-0.058	0.144	-0.061
	IH2	-0.187	-0.058	-0.032	0.065	0.154	0.116	-0.123	-0.165	-0.097	0.138	-0.151	.901[a]	-0.236	0.054	-0.027	0.014	-0.188
	IH3	0.035	-0.038	-0.075	-0.152	-0.084	0.118	0.048	-0.167	0.095	-0.079	-0.330	-0.236	.901[a]	-0.137	-0.114	-0.204	0.012
	IH4	-0.110	0.053	-0.147	0.042	0.157	0.027	0.021	-0.019	0.060	0.076	-0.113	0.054	-0.137	.783[a]	-0.339	0.059	-0.142
	IH5	0.012	-0.029	0.082	-0.163	-0.023	-0.091	-0.002	0.015	-0.090	-0.022	-0.058	-0.027	-0.114	-0.339	.880[a]	-0.368	0.183
	IH6	0.100	-0.041	0.017	0.001	0.034	0.005	-0.056	-0.035	0.039	0.058	0.144	0.014	-0.204	0.059	-0.368	.801[a]	-0.516
	IH7	-0.001	0.065	0.020	0.026	-0.106	-0.014	0.093	0.021	-0.126	-0.199	-0.061	-0.188	0.012	-0.142	0.183	-0.516	.791[a]

Appendix 7: Terminal logistics processes anti-image matrices

		LP1	LP2	LP3	LP4	LP5	LP6	LP7	LP8	LP9	MR1	MR2	MR3	MR4	MR5	MR6	MR7
Anti-image Correlation	LP1	.906[a]	-0.498	-0.017	-0.119	0.150	-0.075	-0.088	-0.147	0.101	0.035	0.119	-0.216	0.086	-0.000	-0.090	0.153
	LP2	-0.498	.882[a]	-0.448	0.012	-0.124	0.013	0.043	0.157	-0.413	0.109	-0.036	0.082	0.002	0.060	-0.087	-0.193
	LP3	-0.017	-0.448	.937[a]	0.100	-0.217	0.093	0.001	-0.084	-0.011	0.048	-0.103	-0.087	0.006	-0.074	0.022	0.062
	LP4	-0.119	0.012	0.100	.902[a]	-0.610	0.101	-0.142	-0.083	-0.027	-0.127	0.168	0.022	-0.159	-0.149	0.039	0.058
	LP5	0.150	-0.124	-0.217	-0.610	.888[a]	-0.280	-0.043	-0.054	0.042	0.060	-0.164	-0.100	0.076	0.088	0.021	-0.045
	LP6	-0.075	0.013	0.093	0.101	-0.280	.940[a]	-0.087	-0.134	-0.124	0.074	-0.066	0.148	-0.148	0.039	-0.003	-0.128
	LP7	-0.088	0.043	0.001	-0.142	-0.043	-0.087	.908[a]	-0.479	-0.037	-0.025	-0.050	0.065	-0.011	0.070	-0.059	0.046
	LP8	-0.147	0.157	-0.084	-0.083	-0.054	-0.134	-0.479	.895[a]	-0.278	-0.010	0.099	-0.101	-0.008	-0.017	0.049	-0.075
	LP9	0.101	-0.413	-0.011	-0.027	0.042	-0.124	-0.037	-0.278	.915[a]	-0.116	-0.054	0.086	-0.022	-0.027	0.104	0.061
	MR1	0.035	0.109	0.048	-0.127	0.060	0.074	-0.025	-0.010	-0.116	.872[a]	-0.633	-0.090	0.021	0.046	0.005	-0.119
	MR2	0.119	-0.036	-0.103	0.168	-0.164	-0.066	-0.050	0.099	-0.054	-0.633	.890[a]	-0.281	-0.114	-0.036	-0.034	0.087
	MR3	-0.216	0.082	-0.087	0.022	-0.100	0.148	0.065	-0.101	0.086	-0.090	-0.281	.954[a]	-0.106	-0.099	-0.100	-0.016
	MR4	0.086	0.002	0.006	-0.159	0.076	-0.148	-0.011	-0.008	-0.022	0.021	-0.114	-0.106	.959[a]	-0.259	-0.181	-0.090
	MR5	-0.000	0.060	-0.074	-0.149	0.088	0.039	0.070	-0.017	-0.027	0.046	-0.036	-0.099	-0.259	.945[a]	-0.442	-0.220
	MR6	-0.090	-0.087	0.022	0.039	0.021	-0.003	-0.059	0.049	0.104	0.005	-0.034	-0.100	-0.181	-0.442	.947[a]	0.082
	MR7	0.153	-0.193	0.062	0.058	-0.045	-0.128	0.046	-0.075	0.061	-0.119	0.087	-0.016	-0.090	-0.220	0.082	.921[a]
	MR8	-0.105	0.093	-0.007	-0.039	0.066	0.007	-0.054	0.059	-0.112	0.027	-0.184	-0.052	0.073	0.039	-0.266	-0.515
	IP1	0.065	0.029	0.030	0.027	0.082	-0.178	-0.063	0.142	-0.234	0.036	0.038	-0.149	0.026	0.006	0.019	0.040
	IP2	-0.115	0.133	-0.062	-0.144	-0.026	-0.060	0.095	0.086	0.109	0.006	-0.025	0.064	-0.085	0.085	-0.011	-0.302
	IP3	0.069	-0.042	0.021	0.031	0.051	-0.111	-0.290	0.163	-0.082	-0.009	0.055	-0.061	0.169	-0.066	-0.088	-0.027
	IP4	-0.116	-0.003	-0.084	0.167	-0.146	-0.043	0.135	-0.150	0.157	-0.104	0.027	0.101	-0.212	-0.118	0.104	0.137
	IP5	-0.086	0.030	-0.002	-0.040	0.033	0.072	-0.166	0.153	-0.017	0.097	-0.075	-0.033	-0.082	0.103	0.007	-0.166
	IP6	0.106	-0.058	0.058	0.058	-0.049	0.007	0.139	-0.175	0.018	-0.060	0.035	0.028	0.084	-0.037	-0.108	0.091
	IS1	0.030	-0.073	0.084	0.056	-0.030	0.010	0.040	-0.072	-0.055	-0.075	0.080	-0.126	-0.064	-0.126	0.012	-0.007
	IS2	0.084	0.011	-0.045	-0.062	0.124	-0.036	0.013	-0.071	-0.064	0.016	0.094	0.009	-0.024	-0.031	0.001	0.068
	IS3	-0.001	-0.096	-0.035	-0.026	0.020	-0.026	-0.096	0.067	0.122	-0.196	-0.024	0.116	0.080	0.027	-0.104	0.142
	IS4	-0.012	-0.035	0.016	-0.004	0.090	0.059	0.007	-0.108	0.033	0.084	-0.138	0.108	0.088	0.003	-0.061	-0.122
	IS5	-0.043	0.143	-0.097	-0.102	-0.066	-0.069	0.184	0.069	-0.030	0.006	0.120	-0.014	-0.073	-0.090	0.057	0.022
	IS6	0.043	-0.016	-0.031	-0.027	0.129	0.118	-0.197	0.046	-0.029	0.036	-0.050	-0.104	-0.028	0.090	0.049	-0.039
	IS7	-0.003	-0.031	0.168	0.015	0.001	0.116	-0.134	0.073	-0.116	0.266	-0.149	-0.110	0.066	-0.003	0.116	-0.033
	IS8	0.041	-0.086	0.036	0.038	-0.103	-0.077	0.102	-0.074	0.194	-0.001	-0.007	-0.008	-0.021	-0.026	-0.063	-0.032
	IS9	-0.115	0.053	-0.041	0.015	-0.020	0.014	0.056	-0.045	-0.066	-0.060	0.074	0.036	-0.052	0.087	-0.003	-0.043

		MR8	IP1	IP2	IP3	IP4	IP5	IP6	IS1	IS2	IS3	IS4	IS5	IS6	IS7	IS8	IS9
Anti-image Correlation	LP1	-0.105	0.065	-0.115	0.069	-0.116	-0.086	0.106	0.030	0.084	-0.001	-0.012	-0.043	0.043	-0.003	0.041	-0.115
	LP2	0.093	0.029	0.133	-0.042	-0.003	0.030	-0.058	-0.073	0.011	-0.096	-0.035	0.143	-0.016	-0.031	-0.086	0.053
	LP3	-0.007	0.030	-0.062	0.021	-0.084	-0.002	0.058	0.084	-0.045	-0.035	0.016	-0.097	-0.031	0.168	0.036	-0.041
	LP4	-0.039	0.027	-0.144	0.031	0.167	-0.040	0.058	0.056	-0.062	-0.026	-0.004	-0.102	-0.027	0.015	0.038	0.015
	LP5	0.066	0.082	-0.026	0.051	-0.146	0.033	-0.049	-0.030	0.124	0.020	0.090	-0.066	0.129	0.001	-0.103	-0.020
	LP6	0.007	-0.178	-0.060	-0.111	-0.043	0.072	0.007	0.010	-0.036	-0.026	0.059	-0.069	0.118	0.116	-0.077	0.014
	LP7	-0.054	-0.063	0.095	-0.290	0.135	-0.166	0.139	0.040	0.013	-0.096	0.007	0.184	-0.197	-0.134	0.102	0.056
	LP8	0.059	0.142	0.086	0.163	-0.150	0.153	-0.175	-0.072	-0.071	0.067	-0.108	0.069	0.046	0.073	-0.074	-0.045
	LP9	-0.112	-0.234	0.109	-0.082	0.157	-0.017	0.018	-0.055	-0.064	0.122	0.033	-0.030	-0.029	-0.116	0.194	-0.066
	MR1	0.027	0.036	0.006	-0.009	-0.104	0.097	-0.060	-0.075	0.016	-0.196	0.084	0.006	0.036	0.266	-0.001	-0.060
	MR2	-0.184	0.038	-0.025	0.055	0.027	-0.075	0.035	0.080	0.094	-0.024	-0.138	0.120	-0.050	-0.149	-0.007	0.074
	MR3	-0.052	-0.149	0.064	-0.061	0.101	-0.033	0.028	-0.126	0.009	0.116	0.108	-0.014	-0.104	-0.110	-0.008	0.036
	MR4	0.073	0.026	-0.085	0.169	-0.212	-0.082	0.084	-0.064	-0.024	0.080	0.088	-0.073	-0.028	0.066	-0.021	-0.052
	MR5	0.039	0.006	0.085	-0.066	-0.118	0.103	-0.037	-0.126	-0.031	0.027	0.003	-0.090	0.090	-0.003	-0.026	0.087
	MR6	-0.266	0.019	-0.011	-0.088	0.104	0.007	-0.108	0.012	0.001	-0.104	-0.061	0.057	0.049	0.116	-0.063	-0.003
	MR7	-0.515	0.040	-0.302	-0.027	0.137	-0.166	0.091	-0.007	0.068	0.142	-0.122	0.022	-0.039	-0.033	-0.032	-0.043
	MR8	.925[a]	-0.094	0.142	0.075	-0.040	0.162	-0.109	0.105	-0.154	-0.062	0.130	-0.053	-0.021	-0.006	-0.037	-0.033
	IP1	-0.094	.889[a]	-0.373	0.128	-0.358	0.030	-0.044	-0.082	0.150	0.031	0.029	-0.094	0.169	0.024	-0.067	-0.166
	IP2	0.142	-0.373	.902[a]	-0.228	0.030	-0.060	-0.176	0.090	-0.082	-0.048	0.052	-0.015	-0.022	-0.224	0.075	0.136
	IP3	0.075	0.128	-0.228	.902[a]	-0.558	0.176	-0.153	-0.070	-0.047	-0.029	0.013	-0.047	0.022	0.154	-0.122	-0.102
	IP4	-0.040	-0.358	0.030	-0.558	.873[a]	-0.233	0.122	0.080	0.023	0.056	-0.056	0.043	-0.105	-0.185	0.172	0.032
	IP5	0.162	0.030	-0.060	0.176	-0.233	.872[a]	-0.673	-0.030	-0.130	-0.008	0.044	-0.017	0.072	0.052	-0.025	-0.132
	IP6	-0.109	-0.044	-0.176	-0.153	0.122	-0.673	.871[a]	-0.013	0.134	0.011	-0.159	0.012	-0.159	-0.029	0.104	0.058
	IS1	0.105	-0.082	0.090	-0.070	0.080	-0.030	-0.013	.949[a]	-0.352	-0.185	-0.002	-0.136	-0.090	-0.124	-0.165	0.192
	IS2	-0.154	0.150	-0.082	-0.047	0.023	-0.130	0.134	-0.352	.920[a]	-0.176	0.066	0.002	0.021	-0.290	0.153	-0.263
	IS3	-0.062	0.031	-0.048	-0.029	0.056	-0.008	0.011	-0.185	-0.176	.954[a]	-0.165	-0.071	-0.122	-0.139	0.076	-0.140
	IS4	0.130	0.029	0.052	0.013	-0.056	0.044	-0.159	-0.002	0.066	-0.165	.922[a]	-0.420	-0.072	-0.178	0.134	-0.142
	IS5	-0.053	-0.094	-0.015	-0.047	0.043	-0.017	0.012	-0.136	0.002	-0.071	-0.420	.925[a]	-0.420	0.035	0.030	-0.018
	IS6	-0.021	0.169	-0.022	0.022	-0.105	0.072	-0.159	-0.090	0.021	-0.122	-0.072	-0.420	.941[a]	-0.001	-0.162	-0.116
	IS7	-0.006	0.024	-0.224	0.154	-0.185	0.052	-0.029	-0.124	-0.290	-0.139	-0.178	0.035	-0.001	.903[a]	-0.306	0.077
	IS8	-0.037	-0.067	0.075	-0.122	0.172	-0.025	0.104	-0.165	0.153	0.076	0.134	0.030	-0.162	-0.306	.896[a]	-0.458
	IS9	-0.033	-0.166	0.136	-0.102	0.032	-0.132	0.058	0.192	-0.263	-0.140	-0.142	-0.018	-0.116	0.077	-0.458	.925[a]

Appendix 8: Terminal service performance anti-image matrices

		VAS1	VAS2	VAS3	VAS4	VAS5	VAS6	VAS7	VAS8
Anti-image Correlation	VAS1	.914[a]	-0.495	-0.196	-0.263	-0.063	0.036	-0.167	0.091
	VAS2	-0.495	.911[a]	-0.244	0.243	-0.090	0.019	-0.112	0.008
	VAS3	-0.196	-0.244	.939[a]	-0.334	0.031	-0.110	0.068	-0.146
	VAS4	-0.263	0.243	-0.334	.903[a]	-0.474	-0.102	0.098	-0.038
	VAS5	-0.063	-0.090	0.031	-0.474	.931[a]	-0.152	-0.302	-0.042
	VAS6	0.036	0.019	-0.110	-0.102	-0.152	.969[a]	-0.195	0.033
	VAS7	-0.167	-0.112	0.068	0.098	-0.302	-0.195	.930[a]	-0.340
	VAS8	0.091	0.008	-0.146	-0.038	-0.042	0.033	-0.340	.939[a]
	R1	0.066	-0.293	0.092	-0.067	0.063	0.074	0.103	-0.140
	R2	-0.042	0.111	-0.199	0.032	0.112	-0.027	-0.059	-0.074
	R3	-0.024	0.088	0.032	0.080	-0.074	-0.187	0.095	-0.219
	R4	0.055	-0.100	0.088	-0.057	-0.028	0.039	-0.224	0.151
	CS1	0.080	-0.129	0.064	-0.123	0.056	-0.005	-0.018	-0.106
	CS2	0.120	-0.101	-0.041	0.001	-0.021	-0.017	-0.135	0.122
	CS3	-0.035	-0.004	0.055	0.033	-0.009	-0.004	-0.109	-0.040
	CS4	0.009	-0.011	-0.076	-0.074	-0.015	-0.155	0.153	0.002

		R1	R2	R3	R4	CS1	CS2	CS3	CS4
Anti-image Correlation	VAS1	0.066	-0.042	-0.024	0.055	0.080	0.120	-0.035	0.009
	VAS2	-0.293	0.111	0.088	-0.100	-0.129	-0.101	-0.004	-0.011
	VAS3	0.092	-0.199	0.032	0.088	0.064	-0.041	0.055	-0.076
	VAS4	-0.067	0.032	0.080	-0.057	-0.123	0.001	0.033	-0.074
	VAS5	0.063	0.112	-0.074	-0.028	0.056	-0.021	-0.009	-0.015
	VAS6	0.074	-0.027	-0.187	0.039	-0.005	-0.017	-0.004	-0.155
	VAS7	0.103	-0.059	0.095	-0.224	-0.018	-0.135	-0.109	0.153
	VAS8	-0.140	-0.074	-0.219	0.151	-0.106	0.122	-0.040	0.002
	R1	.926[a]	-0.295	-0.182	-0.252	-0.015	0.051	-0.084	0.005
	R2	-0.295	.922[a]	-0.295	-0.357	0.028	0.054	-0.042	-0.051
	R3	-0.182	-0.295	.930[a]	-0.191	-0.028	0.023	-0.128	0.113
	R4	-0.252	-0.357	-0.191	.916[a]	-0.060	-0.125	0.238	-0.102
	CS1	-0.015	0.028	-0.028	-0.060	.952[a]	-0.362	-0.245	0.016
	CS2	0.051	0.054	0.023	-0.125	-0.362	.941[a]	-0.178	-0.290
	CS3	-0.084	-0.042	-0.128	0.238	-0.245	-0.178	.911[a]	-0.588
	CS4	0.005	-0.051	0.113	-0.102	0.016	-0.290	-0.588	.914[a]

Appendix 9: Information and invitation and to participants

INFORMATION TO PARTICIPANTS INVOLVED IN RESEARCH

You are invited to participate

You are invited to participate in a research project entitled "Reassessing the Resource-Process-Performance Relationship in Indonesian Container Terminal Operations: An Empirical Study".
This project is being conducted by a student researcher Teddy Laksmana as part of a Doctor of Philosophy (PhD) at Victoria University under the supervision of Dr. Himanshu Shee from The College of Business, Victoria University, Melbourne, Australia and Dr. Vinh Thai from the School of Business, Information Technology and Logistics, RMIT University, Melbourne, Australia.

Project explanation

This study explores the relationship between factors of container terminal operation resources, logistics process improvement practices and government support in affecting the terminal service performance in Indonesian ports.

What will I be asked to do?

You are kindly requested to fill the questionnaire that looking for your visions on the factors affecting the terminal service performance at Indonesian container terminals, which will take around 30 minutes of your time. In addition, please fill the general questions at the end of the questionnaire. This phase of the study consists of:

Part A : Description of you and your organization
Part B : Important factors to container firm resources
Part C : Important factors to logistics process improvement
Part D : Important factors to government support
Part E : Important factors to terminal service performance
Part F : Additional explanation (if any)

Once the questionnaire is completed, please return it back to researcher, post it using the self- addressed paid envelope provided or also can be sent to teddy.laksmana@live.vu.edu.au as attachment.

What will I gain from participating?

You will gain indirect benefit of the research's result on the increase of container terminal performance. The time and the information you provide for this study will be very useful to improve the understanding of the process of importation in the container terminal, identification of existing problems and what obstacles there are within the links, as well as contribution to the strategy for improvement and effective container terminal supply chain integration in order to improve the efficiency and streamline the import process within container terminals as a whole. Concerned respondents will be provided with a copy of the final report upon request. Due to funding limitation, no reimbursement to participants will be made.

How will the information I give be used?

Provided data and information are considered to be confidential and only be employed for academic journal articles and thesis requirement. There will be no data indications to any individual or their organizations. Statistic package will be used to code and encrypt survey questionnaire data as well as to recognize the correlation and regression on vital factors for import container terminal efficiency. The 7-point scale will be used to indicate the responses and some demographic and control information will be recapitulated without exposing identity of respondents or any other sensitive information.

What are the potential risks of participating in this project?

No legal, psychological, social or physical risks involved for the contribution in this study. The completed survey is guaranteed to be kept safe and all given materials information is treated as classified information. The findings of the study will not be associated to any organization or individual. The survey will be eliminated 5 years after the end of the project. In essence, no risk involved in your participation and no negative consequences involved in case you withdraw from the research.

How will this project be conducted?

This research will be performed using survey in a questionnaire format, which will be directly provided or mailed (paper/electronic) to the participants, together with a self-addressed return envelope. For direct questionnaire, researcher will assist and wait for the questionnaire to be filled by respondents. For mailed (paper/electronic) questionnaire, a phone (email) reminder will be sent one week after the first mailing. The provided return envelope is used to send the completed survey and the respondent consent form.

Who is conducting the study?

Dr. Himanshu Shee
College of Business
Victoria University
+61 9919 4077
himanshu.shee@vu.edu.au

Dr. Vinh Thai
School of Business IT & Logistics
RMIT University
vinh.thai@rmit.edu.au

Teddy Laksmana
College of Business
Victoria University
+62 81333 076 911/ +61 449 648 911
teddy.laksmana@live.vu.edu.au/ teddy.laksmana@gmail.com

Any queries about your participation in this project may be directed to the Chief Investigator listed above.
If you have any queries or complaints about the way you have been treated, you may contact the Ethics Secretary, Victoria University Human Research Ethics Committee, Office for Research, Victoria University, PO Box 14428, Melbourne, VIC, 8001, email researchethics@vu.edu.au or phone (03) 9919 4781 or 4461.

Appendix 10: Consent information for participants

CONSENT FORM FOR PARTICIPANTS INVOLVED IN RESEARCH

INFORMATION TO PARTICIPANTS:

We would like to invite you to be a part of a study to investigate relevant activities that are involved within the import process including a container being unloaded from a ship to its leaving the port gate. The aim of this study is to explore the relationship between factors of container terminal operation resources, logistics process improvement practices and government support in affecting the terminal service performance in Indonesian ports. The research therefore will assist decision makers in recognizing potential advantages of lean and efficiency management programs such as reduced importation lead-time and lower terminal handling charges.

This survey is proposed for people who possess the knowledge and capability in container port management and operations, shipping, import procedures, regulations and policies, such as field personnel, supervisors, managers, and directors. Your valuable experience and expertise in port management and operations is important for this study and you are requested to contribute in this study. I greatly appreciate if you could forward this request to your colleagues and staffs involved in the container port management and operations.

The questionnaire will take about 30-40 minutes of your time. No legal, psychological, social or physical risks involved for the contribution in this study. Entire data and info that you provide will be preserved as confidential within the research team. The finished survey will be removed five years after the research completion. You may decline to answer any queries in the survey. The completed and returned questionnaire survey is regarded as a consent to use the data for the purposed study.

CERTIFICATION BY SUBJECT

I, ... of .... certify that I am at least 18 years old* and that I am voluntarily giving my consent to participate in the study:
"Reassessing the Resource-Process-Performance Relationship in Indonesian Container Terminal Operations: An Empirical Study" being conducted at Victoria University by Dr. Himanshu Shee.

I certify that the objectives of the study, together with any risks and safeguards associated with the procedures listed hereunder to be carried out in the research, have been fully explained to me by Teddy Laksmana.

and that I freely consent to participation involving the below mentioned procedures:

- In part A, please fill the empty space and mark the option that best resembles you and your organization. In part B, C, D, E and F, please select one point on each option that best defines your view of the issues under examination. Please fill up all questions as many as possible.
- Part A searches general information about you and your organization
- Part B searches your view on issues that are important to firm resources
- Part C searches your view on issues that are important to logistics process improvement
- Part D searches your view on issues that are important to government support
- Part E searches your view on issues that are important to terminal service performance
- Any additional comments can be stated in Part F.

I certify that I have had the opportunity to have any questions answered and that I understand that I can withdraw from this study at any time and that this withdrawal will not jeopardise me in any way.
I have been informed that the information I provide will be kept confidential.

Signed : ………………………… Email : …………………………

Date : ………………………… Phone : …………………………

Any queries about your participation in this project may be directed to the chief researcher
Dr. Himanshu Shee
+61 9919 4077
himanshu.shee@vu.edu.au

If you have any queries or complaints about the way you have been treated, you may contact the Ethics Secretary, Victoria University Human Research Ethics Committee, Office for Research, Victoria University, PO Box 14428, Melbourne, VIC, 8001, email Researchethics@vu.edu.au or phone (03) 9919 4781 or 4461.

[*please note: Where the participant/s are aged under 18, separate parental consent is required; where the participant/s are unable to answer for themselves due to mental illness or disability, parental or guardian consent may be required.]

Appendix 11: Survey Questionnaire

"Reassessing the Resource-Process-Performance Relationship in Indonesian Container Terminal Operations: An Empirical Study"

This research investigates critical factors that influencing the nature of the relationship between container terminal operation resources - as a set of organizational input - and terminal service performance as output where logistics process improvement plays mediator and government support take part as moderating element. Thus, please consider the elements in container terminal operation resources, logistics process improvements and government support – which are believed as key factors affecting terminal service performance. This research is proposed for people who possess the knowledge and capability in container port management and operations, shipping, import procedures, regulations and policies, such as supervisors, managers, and directors. Your valuable experience and expertise in port management and operations is important for this research and you are invited to participate and respond to this questionnaire survey. I greatly appreciate if you could forward this request to your colleagues and staffs involved in the container port management and operations.

The implication of this study lies in the improvement of material and information flow by removing the process waste and recognizing the process improvement practices within the import supply chain, thereby, contributing to the practices of streamlined terminal service performance. Also, the research will be able to promote policy guidelines for government policy maker to construct an advance improvement in the sector, especially policy implications for container terminal operation resources, process improvement practices institutional support for terminal operators to improve their operational efficiencies within the port environment.

Please answer the following questions to the best of your knowledge and experience. There is no right or wrong answer. For sections A, please fill up the gap and circle the choice that best describes you and your organization. In sections B, C, D, E, and F please choose only one point on each scale that best describes your evaluation of the factor being judged. Please do not skip any questions if possible.

Thank you for your time.

Mr. Teddy Laksmana
Research Doctorate Student
Victoria University
Melbourne
Australia

Part A – About You and Your Organization

Please tick the box to indicate the best description of you and your organization.

1. In which container terminal do you work?
   - ☐ JICT, Jakarta
   - ☐ Terminal 3, Jakarta
   - ☐ TPK Koja, Jakarta
   - ☐ Mustika Alam Lestari (MAL), Jakarta
   - ☐ New Priok Container Terminal (NPCT)-1, Jakarta
   - ☐ Terminal Peti Kemas Semarang (TPKS), Semarang
   - ☐ Terminal Petikemas Surabaya (TPS), Surabaya
   - ☐ Terminal Teluk Lamong (TTL), Surabaya
   - ☐ Other ______________

2. Please indicate the role that your department plays in import container logistics processes (if applicable, multiple answers are accepted)
   - ☐ Department/ Directorate of Operation
   - ☐ Department/ Directorate of Finance
   - ☐ Department/ Directorate of Engineering
   - ☐ Department/ Directorate of ICT
   - ☐ Department/ Directorate of Legal and Commercial
   - ☐ Department/ Directorate of Human Resources
   - ☐ Department/ Directorate of General Affairs
   - ☐ Other ____

3. What is your current job title?

   [ ]

4. How long have you been actively working in the container terminal industry?

   [ ] years

5. How long have you been actively working for the current company?

   [ ] years

6. What is the highest level of education you have achieved?
   - ☐ High school
   - ☐ Certificate
   - ☐ Diploma
   - ☐ Bachelor Degree
   - ☐ Master Degree
   - ☐ Doctorate Degree

7. Have you or your company performed a measurement program or similar program in order to calculate the time/cost/ performance of your department?
   - ☐ Yes, namely ________________________
   - ☐ No

8. Is your department involved in the import container logistics processes? If your answer is “Yes”, please continue to question number 9. If your answer is “No”, you can forward to the last page and finish the questionnaire.
   - ☐ Yes
   - ☐ No

9. In which operation unit process are you usually involved in? (if applicable, multiple answers are accepted)
   - ☐ Berths allocation
   - ☐ Unloading/loading operation
   - ☐ Ship planning
   - ☐ Yard planning
   - ☐ Yard operation
   - ☐ Control Tower
   - ☐ Behandle yard operation (red channel)
   - ☐ Gate operation
   - ☐ Other ____________________

The next sections pursue your opinions on issues that are important for container terminal operation resources, logistics process improvement, government support and terminal service performance. Please highlight/circle the number in the box which best represents your opinion on the current practices at your terminal.

PART B GOVERNMENT SUPPORT								
Government Support (GS)		Strongly Disagree	Disagree	Partly Disagree	Neutral	Partly Agree	Agree	Strongly Agree
8.1.	Currently, the government provides support, incentive, policy and regulation in tolls and road network development	1	2	3	4	5	6	7
8.2.	Currently, the government provides support, incentive, policy and regulation in identifying and implementing best practices in container transportation	1	2	3	4	5	6	7
8.3.	Currently, the government provides support, incentive, policy and regulation in container transportation ICT (e-Gate, tracking system, RFID, etc.)	1	2	3	4	5	6	7
8.4.	Currently, the government provides support, incentive, policy and regulation in logistics education system	1	2	3	4	5	6	7
8.5.	Currently, the government provides support, incentive, policy and regulation in financial support to build new container facilities	1	2	3	4	5	6	7
8.6.	Currently, the government provides support, incentive, policy and regulation in container logistics warehousing and storage	1	2	3	4	5	6	7
8.7.	Currently, the government provides support, incentive, policy and regulation to expedite import container logistics flow	1	2	3	4	5	6	7

PART C CONTAINER TERMINAL OPERATION RESOURCES								
Terminal Personnel (TP)		Strongly Disagree	Disagree	Partly Disagree	Neutral	Partly Agree	Agree	Strongly Agree
1.1.	In general, we have sufficient personnel engaged along the import container flow	1	2	3	4	5	6	7
1.2.	In general, we have capable personnel engaged along the import container flow	1	2	3	4	5	6	7
1.3.	In general, we have certified personnel engaged along the import container flow	1	2	3	4	5	6	7
1.4.	In general, we have reliable personnel engaged along the import container flow	1	2	3	4	5	6	7
1.5.	In general, we have trustworthy personnel engaged along the import container flow	1	2	3	4	5	6	7
Terminal Equipment (TE)								
2.1.	We have sufficient quantity of terminal equipment engaged along the import container flow	1	2	3	4	5	6	7
2.2.	Our equipment is always ready to engage along the import container flow	1	2	3	4	5	6	7
2.3.	We have reliable equipment engaged along the import container flow	1	2	3	4	5	6	7
2.4.	We regularly modernize the equipment engaged along the import container flow	1	2	3	4	5	6	7
2.5.	We regularly maintain the equipment engaged along the import container flow	1	2	3	4	5	6	7

Infrastructure & Hinterland (IH)								
3.1.	Generally, we always have berths available when the ships arrive	1	2	3	4	5	6	7
3.2.	We have sufficient storage capacity of Container Yard (CY)	1	2	3	4	5	6	7
3.3.	We have sufficient container handling capability in our CY	1	2	3	4	5	6	7
3.4.	We have sufficient container handling capability in our *behandle* yard area (for red channel physical Customs inspection)	1	2	3	4	5	6	7
3.5.	We have sufficient capability of exit gate operation	1	2	3	4	5	6	7
3.6.	We have sufficient connectivity capability for the ship and inland transportation interface	1	2	3	4	5	6	7
3.7.	We regularly maintain our channel depth/ length/ width by extension/upgrading/dredging	1	2	3	4	5	6	7

PART D **LOGISTICS PROCESS IMPROVEMENT**								
Lean Practices (LP)		Strongly Disagree	Disagree	Partly Disagree	Neutral	Partly Agree	Agree	Strongly Agree
In the import container handling process,								
4.1.	We implement methods and tools to reduce errors	1	2	3	4	5	6	7
4.2.	We implement methods and tools to reduce irrelevant/ unnecessary steps	1	2	3	4	5	6	7
4.3.	We implement methods and tools to reduce waiting time for customers	1	2	3	4	5	6	7
4.4.	We implement methods and tools to reduce manual documentation	1	2	3	4	5	6	7
4.5.	We implement methods and tools to reduce unnecessary movement of equipment or people	1	2	3	4	5	6	7
4.6.	We have contingency/business plan to resume normal operations after system downtime	1	2	3	4	5	6	7
4.7.	We implement methods and tools to calculate the time of container and document flows	1	2	3	4	5	6	7
4.8.	We implement methods and tools to standardize our operational procedures regularly	1	2	3	4	5	6	7
4.9.	We take suggestions from staff to update our operational procedures	1	2	3	4	5	6	7
Managing Relationship (MR)								
5.1.	We view shipping lines, government agencies and inland transport operators as strategic partners in mutually designing the flow of goods and information	1	2	3	4	5	6	7
5.2.	We build mutual trust relationship with shipping lines, government agencies and inland transport operators	1	2	3	4	5	6	7
5.3.	We work together with shipping lines, government agencies and inland transport operators to reduce cost and ensure higher quality of service	1	2	3	4	5	6	7
5.4.	We diagnose our external customers' current and future requirements	1	2	3	4	5	6	7
5.5.	Customer requirements are effectively disseminated and understood by our terminal personnel	1	2	3	4	5	6	7

PART D LOGISTICS PROCESS IMPROVEMENT								
5.6.	We incorporate our customers' need and requirements into our services	1	2	3	4	5	6	7
5.7.	We have an effective process to record customers' complaints	1	2	3	4	5	6	7
5.8.	We incorporate our customers' complaints to improve current services	1	2	3	4	5	6	7
Integration Practices (IP)								
6.1.	We constantly evaluate the performance of various transport modes available for linking our port/ terminal to its hinterland destinations	1	2	3	4	5	6	7
6.2.	We evaluate alternative routes for more efficient transportation of cargoes via our port/ terminal	1	2	3	4	5	6	7
6.3.	We collaborate with other channel members (e.g., shipping lines, shippers, etc.) to plan for greater channel optimization	1	2	3	4	5	6	7
6.4.	We seek to identify other competing channels for cargoes that might flow through our port	1	2	3	4	5	6	7
6.5.	We benchmark the logistics/supply chain options available for cargoes that will flow through our port versus alternative routes via competing ports	1	2	3	4	5	6	7
6.6.	We seek to identify least cost options for the transport of cargoes to hinterland destinations	1	2	3	4	5	6	7
Knowledge Management (KM)								
7.1.	We have a knowledge transfer system via workshop, conference and ICT systems that permits information to widespread through our terminal personnel	1	2	3	4	5	6	7
7.2.	We have a particular team that continuously have access, put into practice and update their working knowledge	1	2	3	4	5	6	7
7.3.	We use all formal mechanisms in order to share best practices amongst our terminal personnel	1	2	3	4	5	6	7
7.4.	We are informed about issues that affect each other by our stakeholders	1	2	3	4	5	6	7
7.5.	We share business knowledge and processes with our stakeholders	1	2	3	4	5	6	7
7.6.	We exchange information with our stakeholders to assist the import container flow	1	2	3	4	5	6	7
7.7.	We have training and development courses related to the acceleration of import container flow	1	2	3	4	5	6	7
7.8.	Our directors and senior managers actively encourage personnel to change and apply best practices of the import container handling	1	2	3	4	5	6	7
7.9.	We have a problem-solving team to improve the import container processes and services	1	2	3	4	5	6	7

PART E TERMINAL SERVICE PERFORMANCE								
Value-Added Service (VAS)		Strongly Disagree	Disagree	Partly Disagree	Neutral/	Partly Agree	Agree	Strongly Agree
11.1.	Our terminal's import container service charges are competitive	1	2	3	4	5	6	7
11.2.	Customers view the value of our import container services comparable to money paid	1	2	3	4	5	6	7
11.3.	The lead time of import container flow in our terminal is appropriate to customer's requirement	1	2	3	4	5	6	7
11.4.	We deliver import container services on time (minimized delays)	1	2	3	4	5	6	7
11.5.	Our terminal's service performance delivers higher value for customers	1	2	3	4	5	6	7
11.6.	The import container services at our terminal are faster than those of competitors	1	2	3	4	5	6	7
11.7.	We provide customized import container services to our customers	1	2	3	4	5	6	7
11.8.	We adjust our import container service offerings to meet customers' need whenever and wherever required	1	2	3	4	5	6	7
Responsiveness (R)								
12.1.	We have a responsive import container services development division	1	2	3	4	5	6	7
12.2.	We deliver new import container related services to the market quickly	1	2	3	4	5	6	7
12.3.	We are first in the market in introducing new import container related services	1	2	3	4	5	6	7
12.4.	We respond well to customer demand for 'new' import container related service features	1	2	3	4	5	6	7
Customer Satisfaction (CS)								
13.1.	Our performance relating to import container related services exceeds our customers' requirements and expectation	1	2	3	4	5	6	7
13.2.	We always met customer standards of import container related services	1	2	3	4	5	6	7
13.3.	Our customers are pleased with the import container related services we provide them	1	2	3	4	5	6	7
13.4.	Our customers are pleased with our responsiveness to their requirements of import container related services	1	2	3	4	5	6	7

PART F –

Do you have any additional comments/critics/suggestions on how to advance the current practices related to container terminal operation resources, logistics process improvement practices and government support? Your comments/ critics/ suggestions can be specifically targeted into several import activities below, in which the final aim is to generate a streamlined terminal service performance in Indonesian ports.

No	Import Activities	Suggestions
1	Ship's arrival & berth	
2	Cargo unloading from ship	
3	Transport to container yard (CY)	
4	Cargo stacking and movement	
5	Container Yard Management	
6	Customs Clearance	
7	*Behandle (Red Line)* process and service	
8	Transport from CY to truck	
9	Truck Waiting & container loading to truck	
10	LCL container moving process from CY to Container Freight Station	
11	Exit Gate Operation	

Would you like to have the summary of the result of this research?

☐ Yes ☐ No

If yes, please provide your contact email:

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Thank you for your time and participation.