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Investigating the Problems of Indonesaia Sea Transportation for an Integrated Information System

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Abstract

The problems of Indonesian sea transportation are seriously need to reveal and solve. Eventhough, the government has a significant role managing the organisation at the executive, managerial, and operational level. They are needed performing of regulations, strategic policy, law arrangements, data and information management, company culture, business process supervision, and functional activities on-the-spot. This research used a system improvement objective that is causal effect analyses, system objectives, and constraints. The data are collected through document studies, interviews, meetings, and discussions. The confirmation and verifications of models were conducted using Focus Group Discussion. The results of analysis indicate that three main problems are structural organisation (executive, management, and operational level), regulations, and integrated of information system. Based on Critical Success Factors, the main barriers were regulations, policies, political will, bureaucracy, organisational governance, infrastructure, and an integrated system. Specifically, the model of value chain and an integrated of information system architecture are recommended.

Keywords*: sea transportation, information system*

1. Introduction

Sea transportation is part of the global economy (*enabler globalisation*) and a complementary mode of land and air transportation, especially for island countries. Marine transport activities include passenger transport (ferry and yacht), national defence (naval vessels), fishing and resource extraction, and navigation services (boat towing vessels, harbour maintenance vessels, etc.). Environmental impacts of the activity can be summarised in different contexts. One of them is categorised as episodic or routine. The episodic impact requires regulations and policies through international conventions or national regulations, while the routine impacts results from activities for safe vessel operations at sea or at ports. This rule should be understood as it will result in changed operational behaviour and/or the need for new technologies [1].

Marine transport should be a major topic in island countries like Indonesia. This area is considered a priority area by the maritime industry because it has added value that needs to be emphasised as well as opportunities that must be promoted so that greater understanding of the maritime sector will be achieved [2]. Marine Transportation Indonesia as an archipelagic country has been recognised by UNCLOS 1982. In addition, according to sea transportation strategy 2015-2019, and referring to Law No. 17 of 2008, national marine transportation must reach all areas and be developed potentially to enhance its role of being a bridge between regions (national and international including cross borders) and serve to support, encourage, and mobilise national development (Kusriyadi, 2016). This is especially for the outermost islands and eastern Indonesia that have not been served by proper transport networks. As a result, regional development is hampered so that people live in poverty and are left behind other regions. The Ministry of Transportation has prepared the construction of pioneer vessels from 2015 to 2017 with 53 ships of the pioneer ship units and three units of aircraft carriers to implement the Toll Sea Program. It is intended to support the acceleration of national economic growth through the guarantee of basic commodities availability, as well as the growth of the trade and industry centre [3].

Since the issuance of presidential instruction No. 5 of 2005 on the Empowerment of the National Shipping Industry, the application of the cabotage principle has been able to encourage the strengthening of the national shipping industry. This is evidenced by the data from 2005 to 2013 indicating the growth of the number of national sea transport companies to about 7.7% per year, the growth of the national fleet shipments of about 10% per year, and, in 2013, the share of cargo of domestic sea transport controlled by national ships has reached 99.7%. In the future, the challenge of national marine transportation will be even greater. The demand to provide efficient national connectivity in the framework of reducing national logistics costs will be a national agenda. The elected Presidential Plan 2015-2019 to realise the sea toll as the backbone of national connectivity and make Indonesia the world's maritime axis requires a major change in the pattern of sea transport during this time, in terms of port infrastructure provision, network arrangement, and in its business system. The global phenomenon shows the transformation of the world economy towards a knowledge-based economy, in which the world's pendulum will shift to East Asia. This has resulted in increasing sea-borne trade through the ALKI (Indonesian Archipelagic Sea Lane), which is mostly transported by the latest generation of container vessels according to the development of the world containerisation trend.

These global challenges, which hint at the implementation of national shipping in the next five years, must immediately comply with safety and security standards and services that apply internationally. Only in this way will the national shipping industry be able to compete in the global market and as well as optimally play a role in supporting the competitiveness of national economy. The missions of Directorate General of Sea Transportation are: 1) conducting transport activities in waters to facilitate the flow of people/and/or goods through waters safely, quickly, smoothly, orderly regularly, comfortably and efficiently; 2) carrying out port activities that are reliable and highly capable, ensuring efficiency and global competitiveness to support national and regional development with the insight of the archipelago; 3) organising the safety and security of water and port transportation; 4) carrying out the protection of the maritime environment in the waters of the archipelago; and 5) implementing consolidation of the roles of communities, businesses, and governments through restructuring and regulatory reform. The main tasks and functions are formulating and implementing technical policies and standardisation in the field of marine transportation. There should be running functions of policy formulation in the field of sea transportation and implementation of marine communications policy, preparation of norms, standards, procedures, and criteria in the field of sea transportation; implementation of technical guidance and evaluation in marine transportation; and implementation of the administration of the organisation. This study is aims to reveal the main problems of the sea transportation in marine country and give recommendations to solve these problems.

2. Related Studi

Globalisation has an impact on sea transport changes [2], such as maritime shipping and goods movement, the global economic role of maritime shipping, the response to globalisation, energy and environmental impacts of maritime shipping, energy and power trends in maritime freight transportation, energy data issues for characterising global maritime shipping, environmental impacts of maritime activity, creating a sustainable intermodal freight system.

In some maritime countries, sea transport also faces a variety of problems, for example, in India [4], with regulatory legislation (especially cabotage regulations), infrastructure and procedures in ports and centrally-centric areas, underdevelopment of small ports, and lack of collaborative culture among the various service providers involved in the logistics supply chain. Regulation is very important given that the rules of delivery of goods will have an impact on several environmental issues. For this issue, there needs to be regulation and advocacy through international and territorial policies as well as the continued development of environmental performance to reduce pollution [1]. They have identified three dimensions of globalisation and global economic structure: a) foreign direct investment (with respect to fleet records, ownership, and crew trends), b) international trade (global business), and c) the company's global network into vehicles for production, trade, and investment (promoting enterprise integration in international logistics).

According to Corbett and Winebrake (2008), regulations are established starting from national and regional levels as well as the global level to meet the needs of international supply chain processes, such as MARPOL (international maritime organisation), European Union (strict regional standard plan), and IMO group on air pollution from ships. In addition, problems for the global environment (biodiversity and climate change) can increase the interest of the international company industry. Fulfilment of expectations with market attention encourages new standards and practices throughout the international supply chain and becomes part of the global integration of environmental dimensions of product and service quality. Furthermore, marine transportation is needed to protect resources for the next generations, in addition to reducing the impact on ecosystems, global climate, marine processes, and human health. Therefore, policy instruments must be considered in the setting of standards, including international agreements, national regulations, industry-based standards, third party agreements (non-governmental organisations or NGOs), and industry associations. An intermodal transport system should be able to increase the movement of goods in all waters with principles on the environment, fair and efficient to work in harmony. Therefore, a sustainable and coordinated transport solution for intermodal transport is required between industry, government, and academia. Its needed to ensure that the marine transportation industry continues to improve and utilise renewable technologies (such as environmental control technologies for air emissions, ballast water, gastric coatings, etc.), energy systems (alternative fuels, generator efficiency, hull design and propellers, and even renewable energy concepts), and operational changes (including speed reductions, rebalancing modes, and route patterns) [1].

3. Research Method

The research approach used a system improvement objective that is causal effect analyses, system objectives, and constraints. The data is collected through document studies, meetings, and discussions. The confirmation and verifications of models was conducted using Focus Group Discussion. The data was collected using document and literature study, and some interviews with the expert of employees in the Directorate General of Sea Transportation. The analysed data used content analysis and confirmation in a discussion forum, and validation using focus group discussion in a formal meeting.

4. Results and Analysis

Success Factors of a business is an area where the organisation must achieve and maintain its success. The factors are to measure the relative importance of business processes and the services of sea transportation. These were constructed by the executive, managerial, and operational levels in FGD. The references use the website http://hubla.dephub.go.id, Strategic Directorate General of Sea Transportation 2015-2019, and Annual Performance Plan of Directorate General of Sea Transportation 2017 (Table 1). It was calibrated to four orientations (Goals, Strategies, Policies, and Programs) and three categories (organisation, business, and area).

Table 1. Representative of Success Indicator for Indonesian Sea Transportation

Orientation	Organisation:	Business:	Area:
GOALS	- Safety and security of sea transportation; Sea transport services; Transportation capacity; Supporting of related disaster, gender, and corruption prevention.	- Achieving Safety, Security of Sea Transportation; Sea Transportation Service; and Sea Transport Capacity and Supporting of related disaster, gender, and corruption protection	- The decline in the number of sea transport accidents - Increased market share transported by the national merchant fleet through regulatory - Increasing number of national commercial shipping - Implementation of shipping services which integrated with other

			modes - The linking of national connectivity with global connectivity through the implementation of cross border transportation services - Increased capacity of 24 ports to support sea tolls dwelling time port - Strengthening the regulation - Reduced greenhouse gas emissions - Requirement review/ regulatory structure Increased network system and rural transportation services - Support to disaster areas, climate mitigation, gender in mainstreaming and children with special needs and protection, and prevention of corruption
STRATEGIES	- Achieve reliable, competitive and value-added transportation in terms of safety and security, transportation services, transportation capacity	- Reliable is indicated the availability of safe, convenient, timely, sustained, sufficient and integrated services capable of connecting all the country; - Competitiveness is indicated by the availability of efficient, affordable, and competitive transportation services, served by an international, professional, self-sustaining and productive service provider and human resources; - Value added is indicated by the provision of communication that can promote the realisation of sovereignty, national security and sovereignty in all fields (ideology, politics, economy,	- Reduced number of transport accidents; - Reduced number of security disturbances in the provision of transportation; - Increased service performance of transportation facilities and infrastructure; - Increased competence of human resources transportation, increasing the quality and quantity of graduates of human resources training program; - Increasing the quality and quantity of research in supporting the development of transportation; - Improved performance of the good governance; - Increasing the determination and quality of regulations in the implementation of the policy; - Reduced greenhouse gas emissions and increased application of environmentally friendly

		environment, social, culture, defence and security) in sustainable development).	technology to the transportation sector; - Increased quality of supervisory performance to realise clean governance; - The increased capacity of transportation facilities and infrastructure and the integration of multimodal and intermodal transport systems - Increased production of passenger and freight transport; - Increased transportation services on state borders, outer islands and other non-commercial areas; - Improved urban mass public transport services; - Increased application of information technology and urban transportation management system scheme.
POLICIES	- Realising an effective and efficient sea transportation system, and helping to create a steady and dynamic national distribution pattern that is mandated by Law Number 17 Year 2008	- Ratification and formulation of legal basis for the government in supporting the financing of the provision of national shipping fleet - Implementation of arrangements on freight in irrigation, harbour, navigation, safety and security of shipping, and maritime environmental protection - Changes and preparation of regulations adapted to global, regional and national challenges - The completion and strengthening of regulation in every area of sea transportation - Review the necessary requirements/regulatory structures,	- The change from monopoly to multi-operator - Changes from dependence to independence in investment and technology - Function stabilisation by technical standardisation of facilities and infrastructure, as well as the competence of Marine Transportation HR - Standardisation of system and procedure of operation (development/procurement, operation, maintenance, operation) - Facilitate the role of the private sector and local governments - Facilitation to every level of society (physically, economically, and socially)

		completeness and up-date, and synchronisation between regulations to achieve regulatory harmonisation in the field of shipping.	
PROGRAMS	- Achieve the target in the strategic planning of Directorate General of Sea Transportation Year 2015-2019	- Measuring the Main Performance Indicators of the Directorate General of Sea Communications with outcome indicators grouped into three main aspects: safety and security, service, and capacity.	- Reduced numbers of sea transport accidents - Reduced number of security disorders in sea transport operations - Improved service performance of sea transportation facilities and infrastructure - Fulfilment of the needs of human resources sea transportation competency based on the increasing performance in achieving good governance - Increasing the stipulation and quality of regulation in implementation of marine transport policy - Reduced greenhouse gas emissions and increased application of environmentally friendly technology in marine transportation sector - Increased efforts to protect the maritime environment - Increased capacity of facilities and infrastructure of sea transport reducing backlog and bottleneck - Increased production of passenger and goods transportation - Increased transportation service on state borders, outlying islands and other non-commercial areas - Implementation of online licensing system based on information technology (IT) for passenger and freight transportation business with focus on crossing and sea transportation modes

Based on the analysis, Table 1 concluded the organisational objectives are 1) guaranteed safety and security of sea transportation, 2) realisation of sea transportation service, and 3) improvement of sea transportation capacity.

Next, the authors conducted the system improvement objective to analyse the organisational problems. It was elaborated by causation, with system objectives and system constraints, which is to determine the problems caused by the occurrence as well as viable solutions or recommendations (Table 2).

Table 2. The Analysis of System Improvement Objective Based on the Organisational Level

Executive Level	
CAUSE AND EFFECT ANALYSIS	
Problem or Opportunity	*Causes and Effects*
- Optimising the implementation of coordination, providing technical and administrative support services to all organisational units within the organisation	- The size of the organisational structure and the number of employees within the organisation require accurate information and reporting for the strategic plan, program, budget, price lists, evaluation, finance, external and internal functional apparatus, staff renewal, regulations, legislation, legal advocacy - Community complaints, legal documentation, LN cooperation, administration and household, state-owned goods, and information and communication technology
- Optimising the formulation and implementation of policies, drafting norms, standards, procedures and criteria, providing technical guidance and supervision as well as evaluation and reporting in the field - Optimising traffic and sea transport - Optimising port planning and development planning, design and development program of port facilities, dredging and reclamation of guidance and ship delays, port services, and business - Optimising capacity of ships, protection of the maritime environment, and seafloor - Optimising navigate unit - Optimising patrol and security, law enforcement and advocacy, order of shipping, disaster management, underwater work, facilities and infrastructure	- The complex problems faced by organisations within the organisation in following: - Extent of territorial sea, national, regional, ASEAN, and global - Diverse of data and information related to traffic and sea freight, port, environmental protection, navigation, and security - The dynamics of organisational development and world rules on marine
Executive Level	
SYSTEM IMPROVEMENT OBJECTIVES	
System Objective	*System Constraint*
- Information systems that can support the process of coordination, provision of technical and administrative support services to all organisational units within the organisation and become a reference in decision making and good strategy and planning for short, medium, and long term	- HR (competence, quality, capability, capacity, and availability) - The economy of the country and the world - Needs and institutional cooperation and partnerships - Legal and regulatory developments
- Information systems that can support the process of policy implementation, compilation of norms, standards, procedures and criteria, the	- Political, social, cultural, legal, and security dynamics - Local government

provision of technical guidance, supervision, evaluation, and reporting in accordance with its field with accuracy - Domestic and foreign transportation and special transportation policies, business and business development services, infrastructure, norms, standards, procedures, criteria, supervision, administration, by law, personnel, and administration	- Provincial government - Central government - Agreements and agreements (regional and global)
Managerial Level	
CAUSE AND EFFECT ANALYSIS	
Problem or Opportunity	*Causes and Effects*
- Optimising the preparation of formulation, implementation of policies, compilation of norms, standards, procedures and criteria, providing technical guidance and supervision as well as evaluation and reporting in the field - Domestic traffic and transport: traffic and sea freight abroad, special sea freight and transport as well as sea transport related services business, and development of sea transport business - Sea transport information system and sea transport facilities: the order and planning of port development - Design and program of port facility development - Dredging and reclamation: guide and ship delays; port services and business services and guidance on marine transportation infrastructure; design, stability, and ship load; measurement of ships, containers, non-convention ships and registrations, names of names, mortgages and nationalities of vessels; the safety of passenger ships, goods, and catchers; pollution prevention, pollution compensation, and ship safety management; ship building and standardisation, managerial and operational level maritime certificates; shop houses and workshops; shipping telecommunications; operational, fleet development and navigational base; flow surveys, crossings and marine surveillance equipment; development and management of navigation; patrolling and securing sea transport facilities at port, sea and beach. - Intelligence and civil service investigators: shipsmanship and inspection of ships; disaster management, pollution, and underwater work; facilities and infrastructure	- Good organisational governance in efficient, effective, transparent, and accountable information and reporting with reliable data, information, and reporting management from sea and sea transport, seaport, shipping and cultivation, navigation, and Coast Guard units
Managerial Level	
SYSTEM IMPROVEMENT OBJECTIVES	
System Objective	*System Constraint*
- Information systems that support the process of organisational governance in the preparation of the formulation, implementation of policies, compilation of norms, standards, procedures	- The dynamics of the development of information technology - Database application - Data architecture

and criteria, the provision of technical guidance, supervision, evaluation, and reporting according to its field by through the concept of up-to-date database	- Data security - Development, development and maintenance of data qualified human resources in accordance with the development of database technology - Cloud technology
Operational Level	
CAUSE AND EFFECT ANALYSIS	
Problem or Opportunity	*Causes and Effects*
- Optimising business processes and operational services in accordance with their fields to support managerial and executive levels	- Inappropriate process workflow processes can lead to redundant data, inaccuracies, and overlaps over the need for data and information and reporting at the managerial and executive levels
Operational Level	
SYSTEM IMPROVEMENT OBJECTIVES	
System Objective	*System Constraint*
- Standard Operating Procedure (SOP) is reliable (evaluated periodically) - Supervision of workflow processes to avoid decrease in data quality and network infrastructure - System and application maintenance and network infrastructure on a regular basis - Intensive data centre management - Systems and applications and networks capable of providing and supporting the process of operational activities in accordance with the needs of the field	- Adaptation of the old system environment to the new system environment requires time and care - -Reliable human resource availability in the process of migration or system transition

Indonesia has the same characteristics to India, the problems are (1) maritime regulations (especially cabotage regulations), (2) problems in infrastructure and procedures in port and port areas, (3) underdevelopment of small ports, and (4) lack of collaborative culture among the various service providers involved in the logistics supply chain [4]. In general, the problem faced by Indonesia is organisational structure (executive, management, and operational level), regulations, and integrated system. The major challenges to achieve the good governance in marine transportation services are regulations, policies, political will, bureaucracy, organisational governance, infrastructure, and system integrity (Table 3).

Table 3. The Resume of Sea Transportation Problems, Explanation, and Recommendations

The Problems	Explanation	Recommendation ICT
Structural organisation (executive, management, and operational level)	- According to Kallas (2011), people working in this sector aim to ensure the safety, security and protection of the marine environment. The lack of qualification according to European standards is expected to pose a threat to the entire maritime group. - Indonesia has a large and complex structure with six directorates and each has six sub-sections and 12 to 15 sections. In addition, there are eight technical implementation units spread across the territory of Indonesia.	- Availability of integrated application features to manage all employees across the region. - Features that enhance employee effectiveness and efficiency by monitoring, monitoring and evaluating every required competence and expertise, and ensuring the career and future career of employees. - Coordination features for executive, managerial, and operational levels to ensure the functionality and tasks of each

	The number of employees in 2014 reached 16,000/person.	unit can work well. - Features training and training for human resources for the quality of organisational knowledge in the future.
Regulations	- It is necessary to apply international standards related to the fate and work of seafarers to affect their profession, safety and performance. In addition, professional regulation, career, law, and seafarers' administration can also enhance the image of shipping in the community [5]. - As for Indonesia, it has developed various regulations in the field of sea transportation, not only for seafarers, but also on policies, fixed procedures, standardisation, institutions, agreements, and management built and implemented. The number of regulations enacted in 2016 is 28.	- Availability of regulatory update feature - Features of policy implementation control - Feature of process stages of regulatory drafting activities - Features to anticipate changes or ratifications of international conventions related to SOLAS (International Convention for the Safety of Life at Sea), MARPOL (Marine Pollution), and STWC (The International Convention on Standards of Training, Certification and Watch keeping for Seafarers)
An Integrated system	- E-Maritime will be a big step forward. This can improve communication between ships and ports as well as cargo handling, as well as in a multimodal perspective. In addition, this can facilitate coordination between all actors involved to produce work processes and efficiency in business and administration. The important point is the permission to send administrative data only once [5]. - In the North Sea countries to improve transport efficiency, a combination of transportation modes with the use of traffic management systems and information includes seamless integration of capital, transportation systems, smart tools and services for better e-Maritime and single window application [2]. - As for in Indonesia, it is still in development stage regarding an integrated system. The ICT consultation project has directed how to achieve the realisation of an integrated system. Some systems have been built in integration for ship licensing and traffic, like InaPortNet.	- Service system integration facility, especially for seaport and ship certification and seafarers, goods licensing, 24/7 service implementation, physical inspection, cargo manifest, quarantine and customs clearance). - Features of private integration and connectivity and commercial banking for national strategic project categories - An integrated service system needs to be developed to connect with other ports worldwide. The performance of services in the field of safety and security of shipping, as well as the protection of the maritime environment also needs to be improved. - Systems require integration to share data sources and information
Policies	- Looking at policy references in the North Sea that emphasise the	- Availability of a commercial port update feature for sea tolls

	need and challenge of dependence on fossil fuels without sacrificing efficiency and mobility. One way is a large volume of goods to be taken to the destination with the most efficient mode combinations [2]. - In Indonesia, marine toll road policy has been formulated for saving and traffic efficiency including the construction of commercial, pioneer and non-pioneer ports, rehabilitation and replacement of port facilities.	with the issuance of a letter of approval for development, and improvement of port facilities - Recommended update of pioneer and non-pioneering port development progress - Features of rehabilitation updates, and replacement of port facilities
Political will	- The condition of economic growth in the maritime business segment can be a priority of the business sector. Interpretation of competition rules, harmonisation of regulations and standardisation in data, licensing, planning, and geospatial information. Regulation can be regarded as an economic barrier and trade growth. The maritime business issues include business strategy, competition, innovation, and maritime financing [2]. - In Indonesia a more intensive dialogue should be built with people's representatives, who are closely related to the maritime transport sector when drafting new policies in maritime business. This could have an impact on further upgrading the industrial sector and other business segments such as cruise tours, offshore industry, and marine renewable energy.	- Availability of features that can detect overlapping regulation of business issues (strategy, competition, innovation, and financing) overlaps in the maritime business sector that impede economic growth and stockpiling. - Features that can support communication between people's representatives in deciding the right regulations in the maritime sector and other sectors closely linked to maritime business.
Bureaucracy	- The substantial number of business sectors involved in maritime business will require coordination from several ministries in Indonesia. The authority of regional access is divided into provinces and regions, just as the tourism business for regional development and regional management requires more effective bureaucracy, including licensing for investment.	- Features that support bureaucratic reform so that there is coordination among stakeholders in the government of Indonesia, as well as involving other parties such as stakeholders, shareholders, and service users.
Organisational governance	- Good organisational governance can provide excellent service on marine transportation. People can enjoy the convenience of travel, low cost, and security and safety in the business sector.	- Features that can monitor the implementation of good organisational governance with a fast service process, responsiveness, and responsiveness to public

	- International laws and organisations may not necessarily guarantee good governance, but can be the basis for responsible and effective management in each country. - Grip (2017) stated that competing national interests, due to organisational governance, consider bilateral and multilateral cooperation and coordination through international organisations. However, it is mentioned that integration of intergovernmental policies and programs is more difficult to achieve than cooperation and coordination between countries. Furthermore, in general, intergovernmental agreements, although legally binding, can sometimes not meet expectations or have effective law enforcement procedures affecting organisational governance. - Indonesia with a large and complex organisational structure certainly requires good governance to ensure effective and efficient business processes and the achievement of organisational goals.	complaints.
Infrastructure	- Optimising port infrastructure is often one of the most important topics as it is the key to sea transportation. - Indonesia as an archipelagic country with a vast territory will continue to require planning and oversight of the condition and revitalisation of port infrastructure. The existence of funds for infrastructure development and supporting facilities becomes vital for sea tolls in Indonesian waters. Until now, there were still ports that required development and revitalisation.	- Availability of features that can monitor development of various ports such as mains, pioneers, non-pioneers, commercial, and so on in Indonesia

Based on the results of problem analysis using system improvement objective categorised into eight big problem that is structural organisation (executive, management, and operational level), regulations, integrated system, policies, political will, bureaucracy, infrastructure, and organisational governance. Furthermore, the study recommends an integrated information system model as shown in Figure 1. The model refers to the results of business value chain analysis (Figure 2) of the Directorate General of Sea Transportation Indonesia organisation. The several recommendations are mentioned in Table 3.

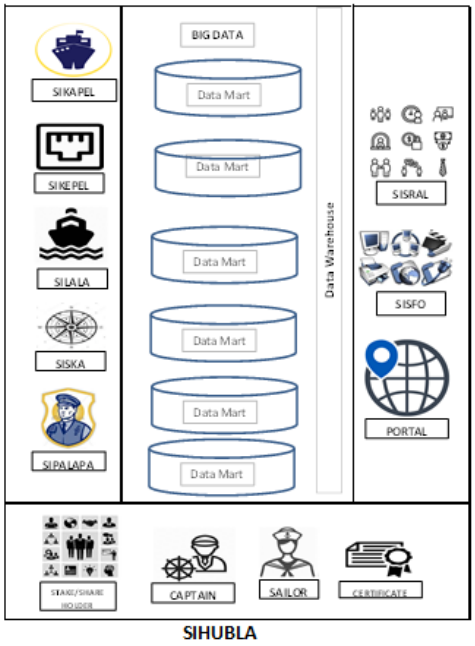

Figure 1. An Information System Integrated Model for Indonesian E-Maritime [source icon: google.co.id].

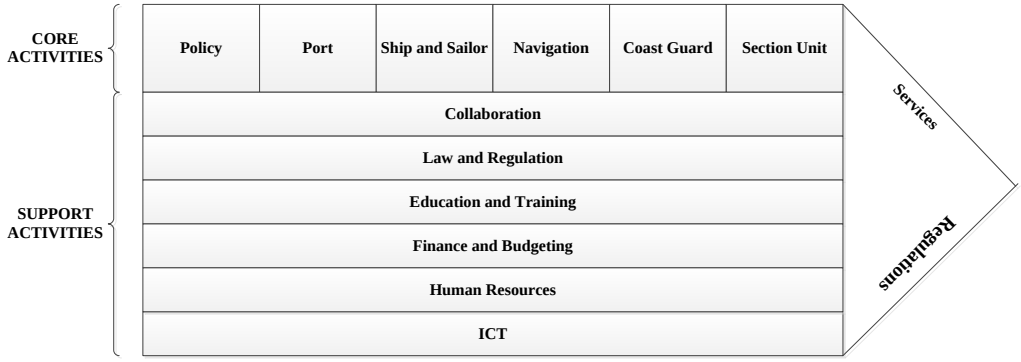

Figure 2. Value Chain of Indonesian E-Maritime Transportation Business

4. Conclusion

From the exposure presented, several prominent issues can be revealed in the field of marine transportation, especially in maritime countries like Indonesia. The economic dimension due to maritime sector business is broad enough concerning industry, tourism, security and safety, and environmental protection from pollution.

The results of this study have limitations, including through Indonesia's perspective; its findings may be more relevant to archipelagic countries as well as developing, on the development of seaports, coastal shipping, and growing economic conditions. It is therefore recommended that a more comprehensive study be related to the area with the methodology reported. The results of this study can be improved further with the results of recommendations and implementation of the given model.

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