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Characteristic and factors of competitive maritime industry clusters in Indonesia

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Abstract. Indonesia is situated in the strategic position between two oceans therefore is identified as a maritime state. The fact opens big opportunity to build a competitive maritime industry. However, potential factors to boost the competitive maritime industry still need to be explored. The objective of this paper is then to determine the main characteristics and potential factors of competitive maritime industry cluster. Qualitative analysis based on literature review has been carried out in two aspects. First, benchmarking analysis conducted to distinguish the most relevant factors of maritime clusters in several countries in Europe (Norway, Spain, South West of England) and Asia (China, South Korea, Malaysia). Seven key dimensions are used for this benchmarking. Secondly, the competitiveness of maritime clusters in Indonesia was diagnosed through a reconceptualization of Porter's Diamond model. There were four interlinked of advanced factors in and between companies within clusters, which can be influenced in a pro-active way by government.
Keywords: maritime industry, clusters, competitive, Indonesia

1. Introduction

A cluster is a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities [1]. Maritime clusters can be defined as a network of firm, research, development and innovation units and training organizations, sometimes supported by national or local authorities, which cooperate with the aim of technology innovation and of increasing maritime industry's performance [2]. Maritime industries in broadest terms include all enterprises engaged in the business of designing, constructing, manufacturing, acquiring, operating, supplying, repairing and/or maintaining vessels, or component parts thereof: of managing and/or operating shipping lines, stevedoring and customs brokerage services, shipyards, dry docks, marine railways, marine repair shops, shipping and freight forwarding services and similar enterprises.

President Joko Widodo suggested the creation of a Global Maritime Axis (or Fulcrum) with Indonesia playing a key role as a maritime power [3]. It rests on two respects: geographical situation placing Indonesia as a maritime country and Indonesia's strategic situation prioritizing maritime economic development. Indonesia's strategic location between two continents, Asia and Australia, and between two oceans, the Indian Ocean and the Pacific Ocean, contributes to excellence, at the same time high dependency on such fields as marine and marine economy for national economic development [4].

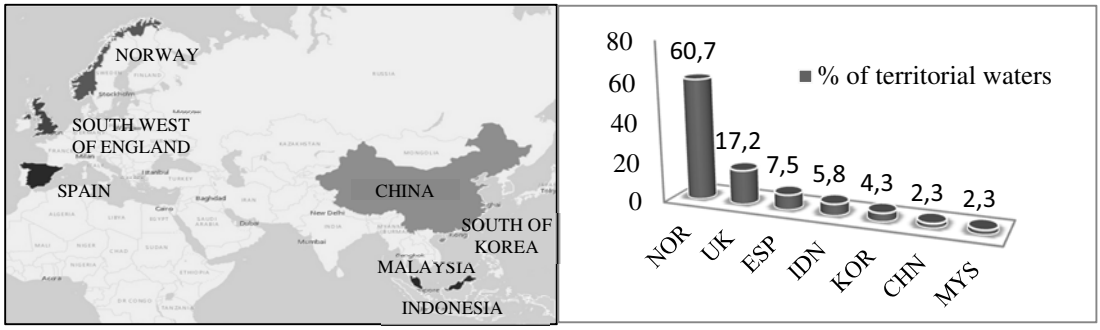
The major challenge which national (Indonesia) industries are encountering at present is the low industrial competitiveness in international markets [5]. Porter defines international industrial competitiveness as the ability of certain industry of a country, under free international trade conditions (on conditions of non-tariff barriers to trade), to provide more products with higher productivity to consumers (including productive consumption) in international markets compared to that of other countries, as well as to continuously yield more profits [6].

One of factors leading to the Indonesia's low industrial competitiveness is structural weakness of industrial sector. The other factors include weak correlation between industries, either between upstream industries and downstream industries, or between large scale industries and small and medium-scale industries, and underdevelopment of mutually supportive industrial clusters [5]. Porter in [7] points out that the problems with which Indonesia deals in marine and fishery sectors involve weak innovation and low level of cluster-based development.

The article will discuss the characteristics and factors to develop Indonesia's maritime industries with competitiveness through qualitative analysis based on literature review. The first step is analyzing the benchmarking to differentiate the most relevant aspects of maritime industrial cluster among the following countries: Norway, Spain, South West of England, China, South Korea, and Malaysia. The second step is diagnosing the competitiveness of the maritime clusters through the conceptualization of Porter's Diamond to determine the characteristics and factors of the competitiveness of Indonesia's maritime industries.

2. Methods

Qualitative analysis based on literature review has been carried out in two things. Firstly, benchmarking analysis was intended to distinguish the most relevant factors of maritime clusters in several countries in Europe (Norway, Spain, South West of England) and Asia (China, South Korea, Malaysia). Figure as shown below displays the map of those countries. The datas from World Development Indicators in www.worldbank.org explained that Norway (NOR) have the biggest % of territorial waters (60.7%) among the other countries which benchmarked in this paper. Indonesia have 5.8% of territorial waters.



(a) (b)

Figure 1. (a) The map and (b) % of territorial waters[a] of the countries (www.worldbank.org)

[a] % of territorial waters areas are areas of intertidal or subtidal terrain--and overlying water and associated flora and fauna and historical and cultural features--that have been reserved by law or other effective means to protect part or all of the enclosed environment

Benchmarking analysis carried out by 7 (seven) driven factors of the cluster. This mentioned by [8]. The driving factors and decisive points for successes clusters are:

- Geographical concentration— is a key driver of the appearance of the clusters. Industry in a concentrated area will be able to increase efficiency, productivity, and innovation, as a result of the ease of access to knowledge, ideas and skills.
- Specialization—referred to as specialization in core activities that carried out have same markets or processes objectives among the actors who participate in the cluster
- The cluster actors— clusters is seen as a building which consists of several industry, not the relationship between a single industry with other industries as subcontractors or clients.

- Cluster dynamics and linkages: This element related to competition and cooperation relationship among the actors in the cluster. Competition conducted to produce improvement and benefit. Cooperation carried out in terms of using resources and services together to complement each other.
- Critical mass—the critical mass intend that cluster achieve inner dynamics. Critical mass is used to make cluster withstand exogenous shocks or other types of pressures, such as the company's losses.
- The cluster lifecycle—each cluster involves several stages that are not the same and the rate of their evolution is also different. Understanding the patterns of certain cluster characteristics is the logic inherent to the way of developing clusters.
- Innovation—combining changes in technical, commercial and / or organization in a broad sense.

Secondly, the competitiveness of maritime clusters in Indonesia was diagnosed through a reconceptualization of Porter's Diamond model. To understand the dynamics of maritime clusters, a conceptual model is proposed, which highlights the main forces driving a maritime cluster as well as its underlying mechanism. A reconceptualised model for the case of maritime clusters [9], inspired by the Porter Diamond, is shown in Figure 2.

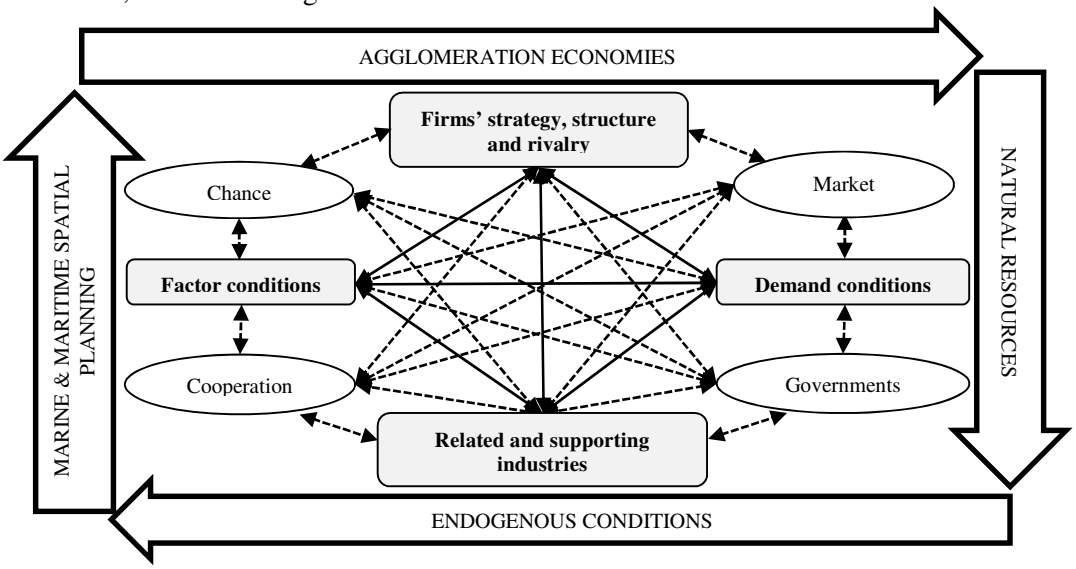


Figure 2. Reconceptualization of Porter's Diamond Model: the case of Maritime Clusters [9]

This paper describes new methodology techniques for analyzing the competitiveness of maritime clusters, using a modification of the Porter Diamond Model. There were four interlinked of advanced factors in and between companies within clusters, which can be influenced in a pro-active way by government. Porter's Competitive Advantage of Nations introduces his diamond model of competitiveness through four broad drivers that shape the environment in which firms and regions compete for business:

- Factor conditions, which include the skills, resources, technology, and infrastructure necessary to create competition in a given industry or cluster;
- Demand conditions, which include the nature of local and overseas demand for industry products and services;
- Related and supporting industries, where the presence or absence of suppliers and distributors in support of industry sectors or clusters will determine competitiveness;
- Firm strategy, structure, and rivalry, which relate to conditions in a nation governing how companies are created, organized, and managed and the nature of domestic rivalry.

3. Result and Discussion

3.1. Benchmarking Analysis

Benchmarking analysis carried out by 7 (seven) driven factors of the cluster in several countries in Europe (Norway, Spain, South West of England) and Asia (China, South Korea, Malaysia). Table 1 (a - g) shown as below:

Table 1 (a – g). Key Cluster Element. Sources: [2], [9], [10], [11], [12], [13], [14], [15]

(a)

Countries	1st Cluster key elements : Geographical concentration
Norway	The maritime cluster in Norway is not based in one region of the country. It is concentrated in different regions along the coastline.
Spain	Focus on one of the seven major seaports located in Spain, is the Port of Bilbao, located in Basque Country. This port is a driver for the development of other auxiliary sectors.
South West of England	The largest concentration of resource based industries, operations and shipping sub-sector, and equipment and service provider sub-sector is in the Devon sub-region. The largest concentration of design and construction businesses is located in Cornwall, closely followed by Devon.
China	China's largest shipbuilding cluster is located in the Yangtze River Delta region. The Yangtze River is the longest river in China. Another cluster of shipbuilding facilities is located in the area extending from the Yellow River (China's second longest river) to the Heilong River in northern China.
South Korea	The Korean shipbuilding industry is heavily concentrated in the south-eastern region of Korea and plays a very important role in the country's economy. The major cluster established in the south-eastern region is composed of four major city-regions, centred on Busan, Ulsan, Changwon and Geoje.
Malaysia	In the shipping services category; the moderately high concentration group is located in Labuan, Penang, Pahang, and Sabah region. For the category of ship building industry, high representation group is situated in Kuala Lumpur, Perak, Johor, Negeri Sembilan and Sarawak region. Ports and terminals category, the high concentration of this industry is clearly distributed in eight states, i.e. Melaka, Penang, Negeri Sembilan, Terengganu, Kedah, Pahang, Perak and Sarawak region.

(b)

Countries	2nd Cluster key elements : Specialisation
Norway	The shipping companies are the most central actors in the maritime industry. They are strongly related to most of the industries within the sector. The classification services, shipping consultants, and shipbuilding have many strong and medium strong links to the rest of the maritime sector.
Spain	The maritime cluster of the Basque Country comprises two anchor areas: ports and shipbuilding. The Port of Bilbao is included within the service sector linked to the internationalization of industrial companies, both in his role as an importer and exporter.
South West of England	Maritime cluster in South West focused in Port activities, including: coastal shipping, short sea shipping, waterborne transport and tourist travelling (e.g cruise liners, visiting pleasure craft).
China	Marine industries are classified as primary (marine agriculture), secondary (all others), and tertiary (marine services). Marine primary industries are include marine fisheries, aquaculture, and tideland farming. Marine secondary industries are offshore oil industry, ocean mining, marine shipbuilding, etc. Marine tertiary industries are include marine transportation, marine tourism, marine information service, etc.
South Korea	Maritime industry in South Korea classified in: marine transportation, harbor, fishery and marine products, and shipbuilding and other marine sectors.
Malaysia	Malaysian maritime industry cluster comprising three main sectors: shipping, ship building, ports and terminals.

(c)

Countries	3rd Cluster key elements : Multiple actors
Norway	The maritime industry in Norway constitutes a complete cluster, composed of three main groups; shipping, maritime services and ship industry. These three main groups surrounded by facilitating associations, educational & research institutions and political bodies.

Spain	The Basque Maritime Forum (BMF) is made up of a heterogeneous group of members, representing different sectors, such as: Institutions, Technology Centres, Associations in the Maritime Sector, Financial entities, Basque State University, Companies, Chambers of Commerce, Port Authorities, Museums.
South West of England	There are three official organisations which deal with marine affairs. They are: Marine South West, Marine Science and Technology and the Advanced Composites Manufacturing Centre, and University of Plymouth.
China	The China shipbuilding industry cluster composed of: associations, financial institution, educational & research institutions, other industries and governance.
South Korea	The shipbuilding industry cluster in South Korea are including: large shipbuilding company, R&D institution, university, and government.
Malaysia	The maritime industry cluster in Malaysia are including: shipping agents, forwarders, governments, associations, universities and R&D institutions

(d)

Countries	4th Cluster key elements : Competition and cooperation
Norway	Half of the Norwegian companies cooperate with other firms around R&D and the supplier-buyer cooperation to improve innovation is particularly strong. The relationships between the industries in the same sector are strong and there are strong relationships between what is traditionally labelled as shipping and the shipping supply industry.
Spain	BMF organises workshops and work groups to foster cooperation and knowledge sharing among marine industry actors and they provide them with tools to tackle issues that wouldn't be possible to deal with in an individual basis. One of the main future objectives are the creation of the network of cooperative research centres and centres of excellence research.
South West of England	The Marine South West networks are a powerful local force for the maritime industry, offering a collective voice to organisations with an interest in the sector. Members include local business personnel and related firms, who meet regularly to share best practice and develop collective knowledge.
China	The Chinese government generally supports the shipbuilding industry by exempting it from tariffs applicable to imports for key components necessary for the production of some kinds of high-tech ships, and by providing incentives for investment in R&D and innovation. The four most common types of cooperation between Chinese and foreign companies are joint ventures, partnerships, Chinese owned companies and Chinese holding companies.
South Korea	Local dynamic relationships are also found among small and medium-sized companies supplying inputs to the shipbuilding companies of the cluster. Among the former, a few large shipbuilders, with local government's assistance, have developed industrial parks close to the shipbuilders to provide cheap land with easy access.
Malaysia	Integration between maritime sectors and supply chain is crucial especially in ship building sector. The support industries shall be promoted in Malaysia by the government and finance institutions such as incentives and tax breaks.

(e)

Countries	5th Cluster key elements : Critical mass
Norway	The Norwegian maritime cluster represents the entire maritime value chain, from ship design to shipping, as well as all relevant ancillary industries. Thus, it can be argued that the Norwegian maritime cluster is one of the most complete maritime clusters in the world.
Spain	The Basque maritime companies are classed into these lines of activity: shipbuilding, fishing and merchant vessel operators and auxiliary industry (equipment manufacturers and subcontractors. The main products exported by the Basque maritime sector, some of whom are first-order global benchmarks, are FORAN Software design, equipment such as motors, pumps, tuna vessels, suction dredgers, offshore vessels, etc.
South West of England	Port cities in South West contribute 45% of the regional total business. The estimated workforces in maritime field makes up 56.7% of the overall estimate of employees. This indicates that each South West port provides a hub to develop a small maritime cluster.
China	Chinese shipyards delivered just 0.9% of all ships in 1985. The proportion increased to 4.7% in 2000 (based on dwt).

South Korea	Korea possesses territorial waters under its jurisdiction five times the size of its land, and produces 3 million tons of fish per annum, while 99.7% of its trade cargo is transported by sea. Its maritime industry has achieved phenomenal growth with international competitiveness in shipbuilding and port industry, and its fisheries sectors ranking around the 10th largest in the world.
Malaysia	The shipbuilding industry has been identified by the Third Industrial Master Plan 2006-2020 (IMP3) as a strategic industry. The IMP 3 focuses on the development of ship building and ship repairing activities to increase the capacity to build and maintain Malaysian ships.

(f)

Countries	6th Cluster key elements : Cluster life cycle
Norway	For three decades the Norwegian continental shelf has been an attractive location due to large and profitable oil fields. The recent decline in investments indicates that the Norwegian sector may be losing its attractiveness. This reveals that many Norwegian offshore suppliers, although they are technologically advanced, lack international competitiveness.
Spain	The maritime cluster association is integrated within the cluster program of the Basque Government (since 1997). Industrial reconversion of the large shipyards in the 1980s and of the small & medium shipyards in the 1990s. The current situation is becoming worse and new challenges are arising when it comes to the future of shipbuilding. The global crisis that started in 2008 has accentuated the economic recession that the shipbuilding sector was suffering due to the introduction in the offer of countries like South Korea and China with an increasing strength and a rapid demand of the ships.
South West of England	In the 1990s, the strong bilateral relationship that involves maritime sectors emerged different. As the delivery port; delivery by ship and marine equipment; maritime legal and financial services the City of London. At the beginning of the 21st century a more multi-lateral approach began to emerge, in recognizing the value of different maritime sectors working together toward better outcomes. In recent years, the integration of marine environmental law and the policy has been introduced as a new approach to the problem of fragmentation.
China	China's marine industry began to develop in the 1950s, with fisheries, transportation, shipping and salt as its commercial focus. China has actively developed its marine resources and made marine development a national economic strategy. China have a strategy to implement ocean development in 2002, the National Marine Economy Development Plan in 2003, the 11th Five-Year Plan (2006–2010), a strategy to develop China's marine industry in 2007, the National Marine Development Plan in 2008, the 12th Five-Year Plan (2011–2015), and improvement to develop marine resources to become a maritime power in 2012.
South Korea	The geographic concentration of firms through the life cycle of the cluster, there has been a strong tendency of geographic concentration of the cluster in the past, but recently the cluster disperses and even internationalizes. The Korean shipbuilding cluster continues to expand its linkages with other countries to acquire advanced skills and know-how, not simply cheap.
Malaysia	For centuries, the maritime areas have always been important to Malaysia and economic activities have blossomed based on the maritime sector which have contributed significantly to Malaysia’s economic growth. The challenges to sustain economic growth for the Malaysian economy are clearly laid out in the Seventh Malaysian Plan.

(g)

Countries	7th Cluster key elements : Innovation
Norway	The Norwegian maritime industry is the source of many important innovations in for example ship design, navigation, and advanced equipment. The innovation level is, however, quite high. This seems to imply that Norwegian companies get higher returns from their R&D investments than companies in the other countries do.
Spain	The Basque government cluster program put forward policies to support research. These included the creation of generic technological centres that carry out research in several areas and, specifically, the establishment of Azti-Tecnalia, a technological centre specialized in marine technologies. Specialized education has also been supported both by the regional government and the EU. The Basque government also subsidizes private R&D projects.
South West of England	The application of information and communications technology (ICT) required, in order to achieve the optimisation of the region’s transport network, since the utilisation of ICT may

	improve the overall business performance. This may also provide potentially significant spin-off benefits for the ICT sector in the region.
China	China has built up a Marine Economic Accounting System, the Industrial classification for Ocean industries and their related activities, and the Gross Ocean Product Accounting. In order to accelerate its technical capability, China has been importing advanced production methods and key equipment including complete production lines, as well as using foreign sourced hardware and software for computer-aided design and computer- aided manufacturing (CAD/CAM).
South Korea	The Korea Electronics and Telecommunications Research Institute (ETRI), a major government-supported research centre maintaining international levels of technology specializing in semiconductors, telecommunications and information technology, is another example of an institution that is active in advancing shipbuilding technology, especially in relation to electronic devices.
Malaysia	The best fast track option is emulating the world best shipbuilders through joint venture or technical packages or setup satellite suppliers for ship equipment in Malaysia. Through this strategy, the Malaysian entity is able to follow the production system established by ship building nations to build the ships efficiently.

3.2. Reconceptualization of Porter's Diamond model

The modification of the Porter Diamond Model is used to analyze the competitiveness of maritime clusters in Indonesia. The result of the analysis consists of:

- Factor conditions: Indonesia's marine area covers 70% of the total area of the archipelago [16], thus it will be in a superior position to utilize maritime assets [17]. The state policy establish Indonesia as the World Maritime Axis Country [3]. Utilization of shipbuilding industry capacity is under 50% [16].
- Demand conditions: Domestic demands improve the maritime infrastructure to support the transportation of goods and improve economic development across the archipelago [3].
- Related and supporting industries: The structure of national industry in Indonesia is dominated by Small and Medium Industry (SME) [18,19].
- Firm strategy, structure, and rivalry: The cluster of shipping industry in Indonesia has long existed although not all value chains have been filled by domestic industry, as in the upstream industry, there are still many shipbuilding industries using imported raw materials, such as machinery, instrument equipment, electrical equipment, etc. [16].
- Government: The development of strategic sector in maritime transportation is on shipbuilding industry. Establishment of shipbuilding industry clusters based on Presidential Regulation of the Republic of Indonesia (Perpres RI) No 28/2008 on National Industrial Policy and Ministerial Decree of Industry of the Republic of Indonesia (Permenperin RI) No 124/M-IND/PER/10/2009 on the Development of Shipbuilding Industry Cluster [16].
- Cooperation: To accelarate the growth of shipbuilding industries, the cluster of shipbuilding industry may be needed to be developed in some regions. This cluster consists of core industries, supporting industries and related industries [16].
- Chance: the maritime connectivity in future becomes very essential for the economy, trade, food and energy security in the region, mainly when interconnectivity within ASEAN is also crucial for creating a political, economic, and social community. Global economic competition of the 21st century will be about securing resources and markets but competition in the next decade will shift to the oceans [3]. The deployment of the shipbuilding industry is concentrated in West Area of Indonesia. However, East Area of Indonesia has the potential to be developed as it has abundant maritime potential [16].
- Market: Indonesia has a strategic position between two oceans and has the formulation of a maritime state identity, its will expand the opportunities to build a modern maritime industry and for maritime security [3].

4. Conclusion

To conclude, we present a set of important characteristic and factors that can create a framework for the success and sustainable competitive maritime industry clusters in Indonesia. Indonesia has large marine areas such as Norway. The recent potential maritime industry developed in Indonesia is the shipbuilding industry as in the Norway, Spain, South West of England, China, South Korea and Malaysia. Involvement of multiple actors began to be built like in other countries. Competition and cooperation can occur especially between domestic industries and foreign industries as is the case in all countries. And competition in the next decade will shift to the oceans. Government policies exist to promote cluster growth. While innovation should continue to be developed, especially related to shipbuilding technology.

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