International Journal of Engineering and Science Application
ISSN 2406-9833

IJEScA

Initial Model Development of an Integrated Shipbuilding Industry in Indonesia: a Case Study of Indonesian State Owned Enterprises (BUMN) Shipyards

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ABSTRACT

Capacities of the world shipbuilding industry have been dominated by three major countries which are South Korea, China and Japan. The ship tonnage proportion they have been built is approximately 90% of the total ship tonnage in the world. Indonesia with the rest of the shipbuilding countries only share the rest of the proportion which are far less than the total capacities of those three countries. Indonesia has its potency to increase its shipbuilding industry capacity significantly with the support of 250 shipyards in this country. The increasing capacities can be fulfilled if those shipyards are getting involved in collaboration. The increasing capacity of Indonesian shipyard is need to be actualized to prevent order of shipbuilding rejection from overseas as a consequence of shipyard insufficient capacity. In this paper, an initial model for shipyard collaboration in Indonesia is developed. The number of shipyards to get involved in this initial model is limited to 4 BUMN shipyards. The selection of those shipyards is based on the consideration that those shipyards are under central coordination of Indonesian BUMN Ministry. Some aspects related to the model development are discussed and in the end, an initial model of an integrated shipbuilding industry in Indonesia is proposed.

Keywords: Shipbuilding industry, BUMN shipyard, collaboration

1. INTRODUCTION

The capacities of the world shipbuilding industry have been dominated by three major countries which are South Korea, China and Japan. Those countries have approximately 90% of the world shipbuilding capacities [1]. These countries have integrated their shipyards and hence have increased significantly their shipbuilding production capacities respectively. South Korea as the current leading shipbuilding industry has since 2013 continuously increase the number of shipbuilding orders for vessels from the world customers and in 2016, has dominated the completion of the ship gross tonnage by 38% of the world total completion of the ship gross tonnage. The reason behind the dominance of the South Korea shipbuilding industry as well as the other China and Japan shipbuilding industry over the world is because of their shipyards capability of building technology intensive vessel, they

have reorganizing their-self led by their leading shipyard with technological competitiveness, competitive cost of labor and collaboration among shipyards and its shipbuilding components suppliers [2].

Indonesia shipbuilding industry as one of the world shipbuilding nation only share 1.6% of the total international market share. From this number, most of the proportion is contributed by PT PAL as the largest shipyard in Indonesia with its maximum 50.000 DWT of shipbuilding capacities [3].

Indonesia has its potency to increase its shipbuilding industry capacity significantly with the support of 250 shipyards in this country. Total number of the Indonesian shipyard production facilities for new shipbuilding is 160 units or equal to ± 1.2 million DWT/year [4].

One way to increase Indonesian shipbuilding capacities can be achieved if those shipyards are getting involved in collaboration. The increasing capacity of Indonesian shipyard is need to be actualized to prevent order of shipbuilding rejection from overseas as a consequence of shipyard insufficient capacity. In fact, the idea of collaboration between some shipyards and its supporting companies has been initiated in 2004 in the form of Indonesia Corporate Consortium. Unfortunately, up to now there is no further action following the initiation. [5].

2. THE NEED OF COLLABORATION NETWORK MODEL FOR INDONESIAN SHIPBUILDING INDUSTRY

Firmansyah and Djafar [3] has suggested Indonesian shipyard to get involved in a collaborative manufacturing network in order to be competitive in this current global environment. The Indonesian shipyards will get some benefits if they are to get involved in collaboration. Among them are to be competitive and at the same time increase their capacities and capability [6], [7] and [8]. The survivability of the industry as well as the competitiveness is very important as they are the main actors in supporting the current central government program of Tol Laut (Sea Bridge).

Unfortunately, there is no collaborative manufacturing model found in the literatures so far which is suitable with the current condition of the Indonesian Shipyards [3]. Hence, it is important to design a new and appropriate model for integrating shipbuilding industry in Indonesia. The model must be designed which consider their current characteristics, capability and conditions. The level of collaboration model can range from operational level to strategic level [9]. Support from the Indonesian research and educational institutions as well as central government play significant roles in supporting the industry to solve their problems.

3. MODEL REQUIREMENTS

There are some requirement needs for the model in order to enable the model to work.

The requirements must be fulfilled by each participant [10] and [11]. These requirements are described below:

- Each participant must conduct an audit technology in order to identify their level use of ship production technology
- Ship production technology must be on the same level
- They have agreed for the level of standardization and accuracy control.
- If needed, transfer of technology must be conducted from the shipyard with the highest level of ship production technology to the other shipyard with lower level of ship production technology [12].
- All participants must apply Just In Time method to make sure the product (components and ship blocks) delivery punctuality to the required participant
- They have the same and agreed standard of product as well as interim product.

Along with the above requirements, another important requirement for the implementation of the model is the determination of data and information type as well as the data format to be shared among participants [13]. As an addition, legal aspect of the collaboration must ease participants' integration [14].

4. MODEL DEVELOPMENT

Participants to get involved in the model consist of four BUMN shipyards which are PT PAL Shipyard and PT Dok dan Perkapalan Surabaya (PT DPS) shipyard which located in Surabaya (East Java), PT Dok Kodja Bahari (PT DKB) shipyard which located in Jakarta and PT Industri Kapal Indonesia (PT IKI) shipyard which located in Makassar (South Sulawesi). The shipbuilding capacity for each shipyard is different. The biggest capacity is PT PAL with 50.000 DWT for commercial shipbuilding. Following PT PAL is PT DKB with its shipbuilding capacity is up to 17.500 DWT. The third biggest capacity is PT DPS with up to 8.000 DWT while the smallest shipbuilding capacity is PT IKI with up to 4.000 DWT.

The main aim for the development of BUMN shipyards integration model is to increase the BUMN shipyards shipbuilding capacities. In this model, the BUMN shipyards are sharing their resources and facilities to build ship demands from the customers. The new BUMN shipyards building capacities will be the accumulation of those shipyards building capacities. Hence, their shipbuilding capacities will increase significantly. In this model, the main shipyards will control the shipbuilding process among those shipyards.

Connected to the model is a list of suppliers which supply components of ship construction to each member in the collaboration model. Hence, each shipyard will be supplied by the same ship construction component suppliers. These ship construction components will be used by the participants in the model to build block(s) of a ship. The graphical representation of the model is shown in Figure 1 below.

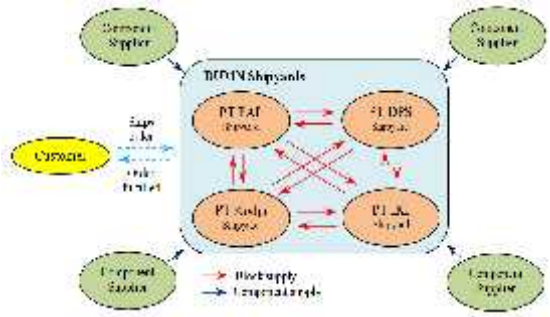

Fig 1. Model for BUMN Shipyards Integration.

As can be seen in the model, depend on which shipyard is to become the main shipyard, at least one participant will supply ship block or blocks to the main shipyard. At the same time, a list of component suppliers will supply the same required ship construction components to the respective participant.

There are four possible scenarios for building ship among those Indonesian BUMN shipyards. These scenarios will be elaborated further in the next section.

This scenario will only work if at least one shipyard gets a shipbuilding order from customer where the respective shipyard has insufficient capacity at that time. Hence the shipyard can benefit the integration model for fulfilling the order.

Scenarios for BUMN Shipyards integration model

For shipbuilding, a network will consist of two-stage multi-location production network where the two phases of the production processes are carried out at separate plants which are block assembly process and ship erection. The number of main shipyard for ship erection to be involved is depend on the ship size as each shipyard has their own shipbuilding capacities.

The scenarios for collaboration implementation of the four Indonesian State Owned Enterprises (BUMN) Shipyards are based on each shipyard building capacity and ship DWT to be built. As have been mention earlier, the four BUMN Shipyards have different shipbuilding capacity respectively. The biggest shipyard capacity is PT PAL with approximately 50.000 DWT of ship to be built while the smallest shipyard capacity is PT IKI with approximately 4.000 DWT.

The determination for being main shipyard (can be called main contractor) for building a ship will depend on the BUMN shipyard capacity. If more than one shipyard is capable to be the main contractor, then they will be joint main contractors. Based on the BUMN shipyard capacities, there are four possible scenarios for building new shipyards which cover scenario for being main contractors and or sub-contractor as in the following description.

If the new ship DWT demands for new shipbuilding is more than 17.500 DWT, then based on the shipyards shipbuilding capacity, there is only one feasible shipyard to be the main contractor which is PT PAL shipyard. The rest of the shipyards will be the sub-contractors for supporting the main shipyards by supplying ship blocks for final erection. If the new ship DWT demands to be built is between 8.000 DWT – 17.500 DWT, then two of the participants are feasible to be the main contractor which are PT PAL

shipyard and PT DKB shipyard. If the new ship DWT demands to be built is between 4.000 DWT – 8.000 DWT, then three of the participants are feasible to be the main contractor which are PT PAL shipyard, PT DKB shipyard and PT DPS shipyard. If the new ship DWT demands to be built is up to 4.000 DWT, then all the participants are feasible to be the main contractor.

Scenario 1. One main shipyard for ship erection (>17.500 DWT up to 50.000 DWT of ship to be built)

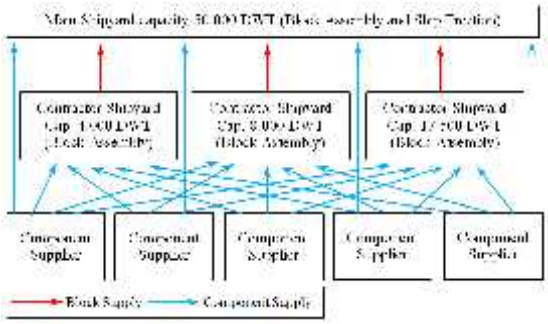

Fig 2. Scenario 1 for assembly works distribution in different shipyards and erection work in one main shipyard

In this scenario, ship to be built is more than 17.500 DWT and up to 50.000 DWT. As there is only one BUMN shipyard (PT PAL) is capable to build the ship, hence PT PAL will act as the main contractor for building the ship while other BUMN shipyards will act as a sub-contractor respectively. The main shipyard will do the final block assembly and block erection as well as interim block and semi block while the sub-contractors will built block assembly and deliver to the main shipyard for ship erection. For building the ship, some determined ship component suppliers have been selected for supplying ship components both to the main shipyards as well as to the sub-contractors shipyards.

Scenario 2. Two main shipyards for ship erection (>8.000 DWT up to 17.500 DWT of ship to be built)

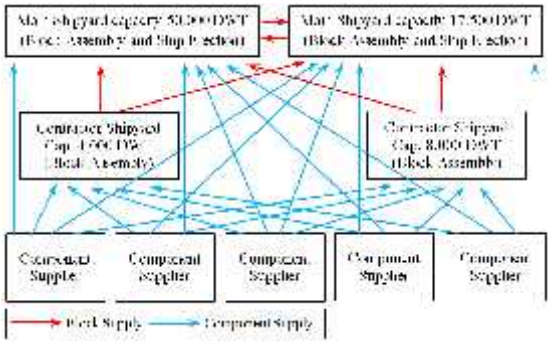

Fig 3. Scenario 2 for assembly works distribution in different shipyards and erection works in two main shipyards

In this scenario, ship to be built is between 8.000 DWT and up to 17.500 DWT. With this ship order, there are two possible shipyards to be the main contractor for building the ship which are PT PAL and PT DKB. The other two shipyards will act as the sub-contractors for supporting the construction of the ship. If the ship to be built is only one, the main shipyard which is the one who get the order will do the final block assembly and block erection as well as interim block and semi block while the other main shipyard and sub-contractors will built block assembly and deliver to the main shipyard for ship erection. If the ship to be built is more than one, then depends on the shipyard who get the order, the main shipyard will determine whether to do the erection process in one

shipyard or share the erection process with the other main shipyard. As being previously mention, the determined and selected ship component suppliers will supply ship components both to the main shipyards as well as to the sub-contractors shipyards as well.

Scenario 3. Three main shipyards for ship erection (>4.000 DWT up to 8.000 DWT of ship to be built)

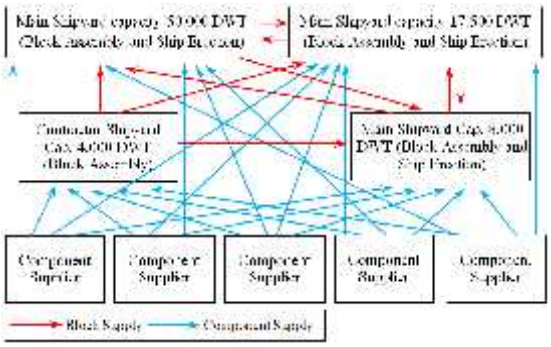

Fig 4. Scenario 3 for assembly works distribution in different shipyards and erection works in three main shipyards

In this scenario, ship to be built is between 4.000 DWT and up to 8.000 DWT. With this ship order, there are three possible shipyards to be the main contractor for building the ship which are PT PAL and PT DKB and PT DPS. The other shipyard will act as the sub-contractors for supporting the construction of the ship. If the ship to be built is only one, the main shipyard which is the one who get the order will do the final block assembly and block erection as well as interim block and semi block. The other shipyards will built block assembly and deliver to the main shipyard for erection processs. If the ship to be built is two or more, then is up to the previous main shipyard to determine whether to involve other shipyards as the main shipyards. The determination will be based on the some consideration which applies to the previous main shipyard. The ship component suppliers will supply the component of the ship construction as needed.

Scenario 4. Four main shipyards for ship erection (up to 4.000 DWT of ship to be built)

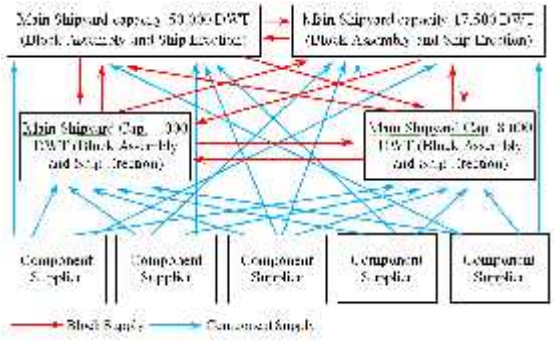

Fig 5. Scenario 4 for assembly and erection works distribution if all participants as the main shipyards

In this scenario, ship to be built is up to 4.000 DWT. All participants are possible to be the main shipyard and the one which being subcontractor will supply blocks to the other participants. As previously scenario, depend on what shipyard which gets the order will determine whether to involve other shipyards as the main shipyard based on its need. The ship component suppliers will supply the component of the ship construction as needed.

5. RULES OF THE GAME

To make it clear on how does the shipyard integration model works, some rules of the games to be obeyed and followed by participants have been determined and they

are:

- Each shipyard will continue to operate as usual, looking for their respective shipbuilding order.
- The collaboration will only work in case of one or more shipyard get shipbuilding order which is more than the respective shipyard capacity. It is mean that by agreeing to fulfil the shipbuilding order, the respective shipyard can utilize the collaboration among them for fulfilling the order.
- The shipbuilding planning and master schedule will be determined by the main shipyard which gets the shipbuilding order.
- The main shipyard can decide to utilize all the other shipyard facilities or only some of them depend on the respective main shipyard need.

6. CONCLUSIONS

Indonesia shipbuilding industry must be integrated in order to increase its capacity as well as increase its global competitiveness. An initial integration model of 4 BUMN shipyards have been developed and proposed in this paper with the aim of increase significantly their capacity and competitiveness without need to open new shipbuilding area for development. There are some requirements that the participants must fulfil and agree before the model can be implemented. Further, the rules of the game to be applied and must be obeyed and followed have been determined as well. In the model itself, there are four possible scenarios for building new ship among those shipyards and the selection of shipyard to be the main shipyard is depend on the size of the ship demand to be built and which shipyard is get the new shipbuilding order.

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