

Issue in Design of Indonesian Traditional Ships

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ABSTRACT

Traditional ship-building is still widely practiced in Indonesia, Indonesia. Every province and regions has different characteristics in the design of ships in the traditional ships. The procedure to build traditional ships is far from the influence of technology. These provide a weakness on the safety for the design and operation. Current research seeks to promote a better understanding on design process in traditional shipbuilding in Bintan Island, Indonesia. The result is a comparison to current concept of design process in modern shipbuilding and recommendation for the traditional shipbuilding and local government.

KEY WORDS: *Ship Design; Traditional Shipbuilding.*

1.0 INTRODUCTION

Indonesia is a maritime country that most of its territory consists of the waters stretching from Sabang to Merauke. With large Indonesian waters will require a means of transportation form of the ship. Ship is a floating building used by humans as a means to carry out activities in the waters, both as a means of marine transport and fishing effort. Materials used for the construction from the wooden the ship began then continued with the iron after the discovery of iron ore, and the use of composite materials such as fiberglass.

Construction of the ship are very diverse, starting from those that are traditional to modern, utilizing advanced technology in

line with the development of the technology itself. Wooden ship is one of the ships building construction that most of the material derived from wood and traditionally made. Wooden boat building techniques are different with modern shipbuilding techniques. The construction of wooden ship, do not use the latest technology. Use special expertise that exists in wooden shipbuilding. Until now the traditional ship-building is still widely practiced in Indonesia and in fact the ships that are made traditionally can be used as a means of transportation and fishing as well as all modern ships constructed.

Current research seeks to promote a better understanding on design process in traditional shipbuilding are on the Bintan island, Riau Archipelago, Indonesia (Fig 1.). Research carried out by coming directly to the wooden shipbuilding, with data collection through interviews and documentation. The result is used as a comparison to current concept of design process in modern shipbuilding and recommendation. This article will be of interest to academic readers, professionals and practitioners alike, even across policy domains.

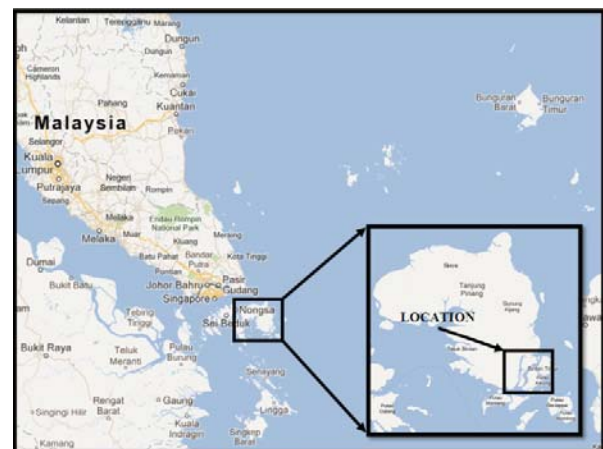


Figure 1: Location of Research at Bintan Island, Indonesia.

2.0 METHODOLOGY

This research uses descriptive method with the technique of semi-structural interviews and direct observation in the field. Research conducted at the Bintan Island, Riau Archipelago Province, Indonesia. Subject of this study is a traditional shipyard worker. The observed object is the process of design and construction in traditional boat building. Observed variable is the knowledge worker in a traditional shipbuilding in making traditional boats, which include: (i) models of traditional boats and function and (ii) the process of making traditional boats. The result is used as a comparison to current concept of design process in modern shipbuilding and recommendation.

3.0 TRADITIONAL SHIPBUILDING

Research in the field of traditional shipbuilding is very rarely found in journals and conferences. There are several institutions of higher education, particularly in Indonesia, doing research on traditional shipbuilding, such as the Bogor Agricultural Institute. The research conducted by undergraduate students such as Arofik (2007) and Umam (2007). Both conduct research on traditional shipbuilding with redesigning the ship and analyze the process of traditional ship construction.

There are also some researchers from higher education institutions in Indonesia which conducted the study in the same field such as Aji (2000) conduct research on local knowledge of traditional boat building by Biak tribe in the warsa district Biak Numfor regency with descriptive methods of data collection through a structural interview technique. Putri (2009) has conducted risk management of Phinisi shipbuilding on project implementation. This study used descriptive research methods and approaches based on risk analysis through surveys, observations and interviews.

Maidin (2003) studies the institution of boat-building by covering the way Malay boat-builders acquire knowledge, polish skills, organize their work, and the differences they show in their work, based on an in-situ observation and on interviews with boat-builders in Terengganu. Salam and Katsuya (2008) analyzed the transformation process of wooden boats in the second half of the twentieth century, in which modern technology played an important role, in order to understand the technological adaptation of the local people to the changing situation.

Current study seeks to promote a better understanding on design process in traditional shipbuilding are on the Bintan island, Riau Archipelago, Indonesia. Research carried out by coming directly to the wooden shipbuilding, with data collection through interviews and documentation. In this study the design process in traditional shipbuilding is divided into two section, (i) method and (ii) tools.

3.1 Method

Existing traditional boats and have been built on traditional shipbuilding rely on a particular techniques which is inherited skill from generation to generation. Working patterns which rely more on "instinct" a builder is tends to result product inherent with the features culture-based rather than technology-based product. The result of the ship design in traditional shipbuilding provides weakness on the safety. There is no consideration of the safety factor based on the numerical approach or rule.

3.2 Tools

The process of building traditional ships is far from the influence of technology. They do not know the numerical formulations and aids of computer. In the process, possessed only includes expertise of instinct, learned from the experience and expertise of derived from precursor workers.

With the use of simple tools and by instinct, the shipbuilder can build a ship appropriate with the orders of the owner of the vessel. In this process, the shipyard has a tool that is functioned as a drawing tool. The tools called "mal" show in the Fig.1. This mal functioned as a master or in the modern shipbuilding as database. They draw the pattern of the ship using this mal. To define the small and big the pattern is based on the instinct from the worker. Another tool used is the "meter" show in Fig. 2, function to determine the shape of the hull. Determination of the hull form is also based on the instinct of the workers. the bigger the ship, hull shape will tend to U form. The smaller the vessel, hull shape will tend to V form. Fig. 4 shows the traditional ship in the development process.



Figure 2: "Mal"



Figure 3: "Rule"



Figure 4: Traditional Ship on development process

4.0 MODERN SHIPBUILDING

The tools and techniques used to design ship structures have

evolved over the last forty years, from producing blueprints on the drafting board to the digital design of today (Karr et al, 2009). Blue print made using a numerical approach and translated in the form of two-dimensional image. This numerical approach of the scientists obtained through natural phenomena translated into mathematical equations. From the mathematical equations can be specified the design safety factor.

Digital design begins with the discovery of the computer as a tool for ease of manual design work. Use of computers as a tool in the design actually comes from a mathematical equation in the form of two-dimensional images and three dimensional. The latest technology used in the ship design is proposed by Shin et al (2012), which is develop a prototype of ship basic planning system for the small and medium sized shipyards based on the internet technology and concurrent engineering concept.

4.1 Method

There are 5 type methods that used for the comparison with the traditional ship design as follow:

a. Conventional

The conventional method for ship design is use numerical approach provide from many book, literature and reference nowadays. The design using a equation such as weight equation and volume equation. Make a calculation of the resistance of the ship, then draw two-dimensional ship to be a lines plan. From the lines plan then calculate the seakeeping and manouvrring the ship. Then design the structure of the ship and then make a general arrangement. From the general arrangement can start with shipbuilding process.

b. Memory based learning method

Lee and Lee (1999) proposed on the use of case-based reasoning for selecting reference ships in conceptual design stage. They developed a memory based learning method that can build an effective indexing scheme for retrieving good reference cases from a case base of previous ship designs as design candidates. Of the design candidates obtained by indexing process, their priorities are determined according to similarity assessment derived through the nearest neighbor matching algorithm. As a result of this work, a reliable design support system is now available which greatly helps ship designers perform the conceptual design using existing mother ship data.

c. Case based reasoning approach

Turan, Aksu, and Cui (2006) propose a case based reasoning decision support system for ship design by using of the existing designs. The case based approach provides a very quick determination of dimensions and ship characteristics, which are suitable for the new design requirements.

d. Ruled based approach

Rule-based approach at each stage of model development is cross all disciplines, from early design to manufacturing output. By using the same properties and geometry throughout each stage of the design, the rules can make consistent selections, and can be used to automatically update those selections due to design modifications. (Cochran, 2007).

e. Knowledge-base engineering method

Wu and Shaw (2011) propose a basic ship design process using knowledge-based engineering methods. The main benefit of the KBE system is its extensibility and highly editable rules. Thus, when we modify the design logic, design parameters, and formulas, complex system program revisions are unnecessary; all of the tasks may be performed through the rule editor interface, where users add or modify rules. Generally, this mode efficiently reduces the program development skills needed by the engineer and the development work by program developers.

4.2 Tools

The tools for each 5 method are following:

a. Conventional

In the numerical approach the tool for design a ship is use drawing tool and computer-aids design. This is the conventional way on the design of the ship. For computer-aids design, nowadays there are many software for ship design. The function of the computer-aids design is as a tool to simplify the work in ship design. Special skills required in designing the ship using computer-aids design.

b. Memory based learning method

Computing the degree of match by using the algorithm is straightforward and easy. Indexing and retrieving processes are suitable tools to assist a designer in conceptual design process and as the interactive intelligent conceptual design system is integrated with case base, database, and interactive conceptual design program by API module, it is possible to support the process of design intelligently.

c. Case based reasoning approach

Using a software tool developed for the application of case based reasoning (CBR). The software is developed in a flexible fashion in order to implement different similarity functions and adaptation algorithms of CBR.

d. Ruled base approach

Using a computer-aided ship modeling SmartMarine 3D. SmartMarine 3D relies on a series of connections that are created between model objects in the early and detailed design stages. The connections drive user-customizable code, and the code uses model geometry, properties, and user input to make decisions about feature placement and manufacturing output.

e. Knowledge-base engineering method

The design information is managed a document-based approach, which requires the conversion of the original documents into the XML (eXtensible Markup Language) format, and compiles rules for the basic design process. With process store the design information using a document-based approach, which analyzes document formats and data and uses the XML format to manage the documents for delivery to the sales department and ship owners after applying the modules. Furthermore, the documents ontology structure allows data to flow down stream to provide later design reviews such as with the KBE inference system or design tool output. (Wu and Shaw, 2011).

5.0 DISCUSSION

As described in the previous section on how to design a ship from traditional shipbuilding and modern shipbuilding, this section conducted a comparison between traditional and modern shipbuilding by looking at two aspects, as follow (i) method and (ii) tools. Comparison design between traditional and modern shipbuilding are shown in Table.1 and Table.2.

Table 1: Comparison of Ship Design between Traditional and Modern Shipbuilding

No	Aspect	Traditional	Modern	
			Conventional	Lee and Lee (1999)
1	Method	Instinct	Numerical	Memory based learning method
2	Tools	Mal	Drawing Tool and CAD	Indexing and retrieving processes

There is some research on the traditional ship that currently use a modern shipbuilding approach. The research conducted by undergraduate students of Bogor Agricultural University, Indonesia. one of which is research conducted by Arofik (2007) and Umam (2007). Both conduct research on traditional shipbuilding with redesigning the ship and analyze the process of traditional ship construction. process Redesign carried out by numerical calculations approach based on the calculation is common in ship design. The results obtained in the form of a line plan show on Figs 5-6.

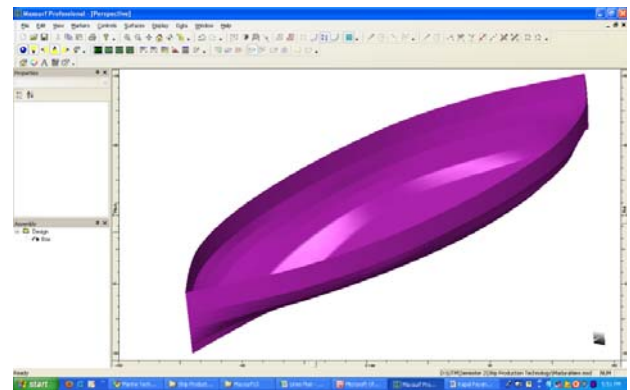


Figure 5: Payang Ship Model on Maxsurf Software.

One issue on traditional Shipbuilding is the use of technology as a design tool. In the traditional Shipbuilding there is no use of computer-aided design tools. One of the functions of computer aids design is as a store of data. By using the line plan of Figs. 5-6, then conducted modeling in Maxsurf software for the collection ship as shown on Figs 7-8.

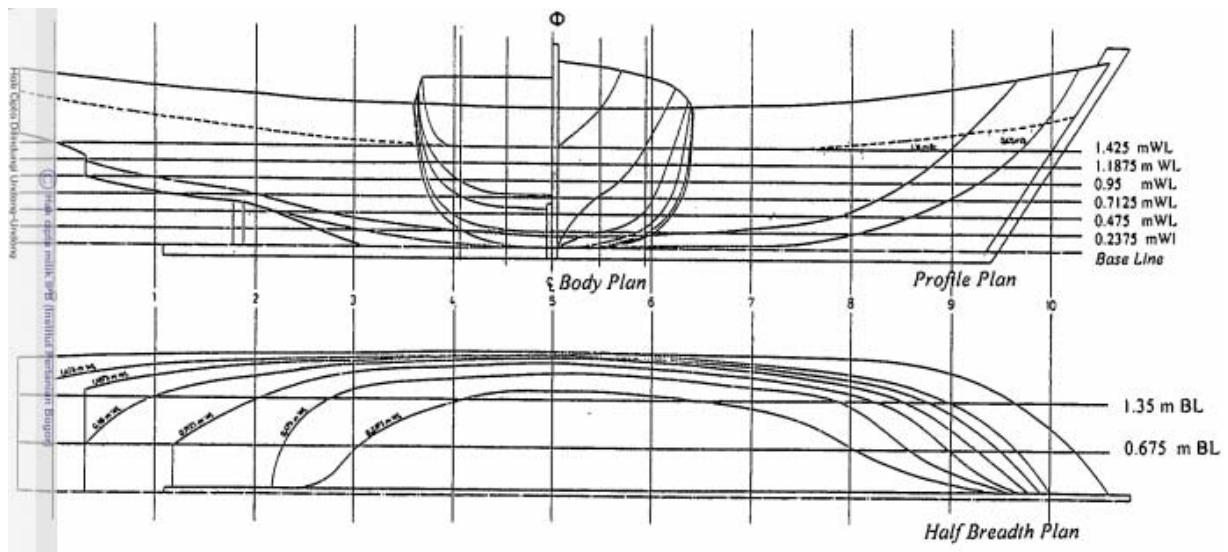


Figure 6: Lines Plan of Payang Ship on Pamekasan, Madura, Indonesia (Arofik, 2007).

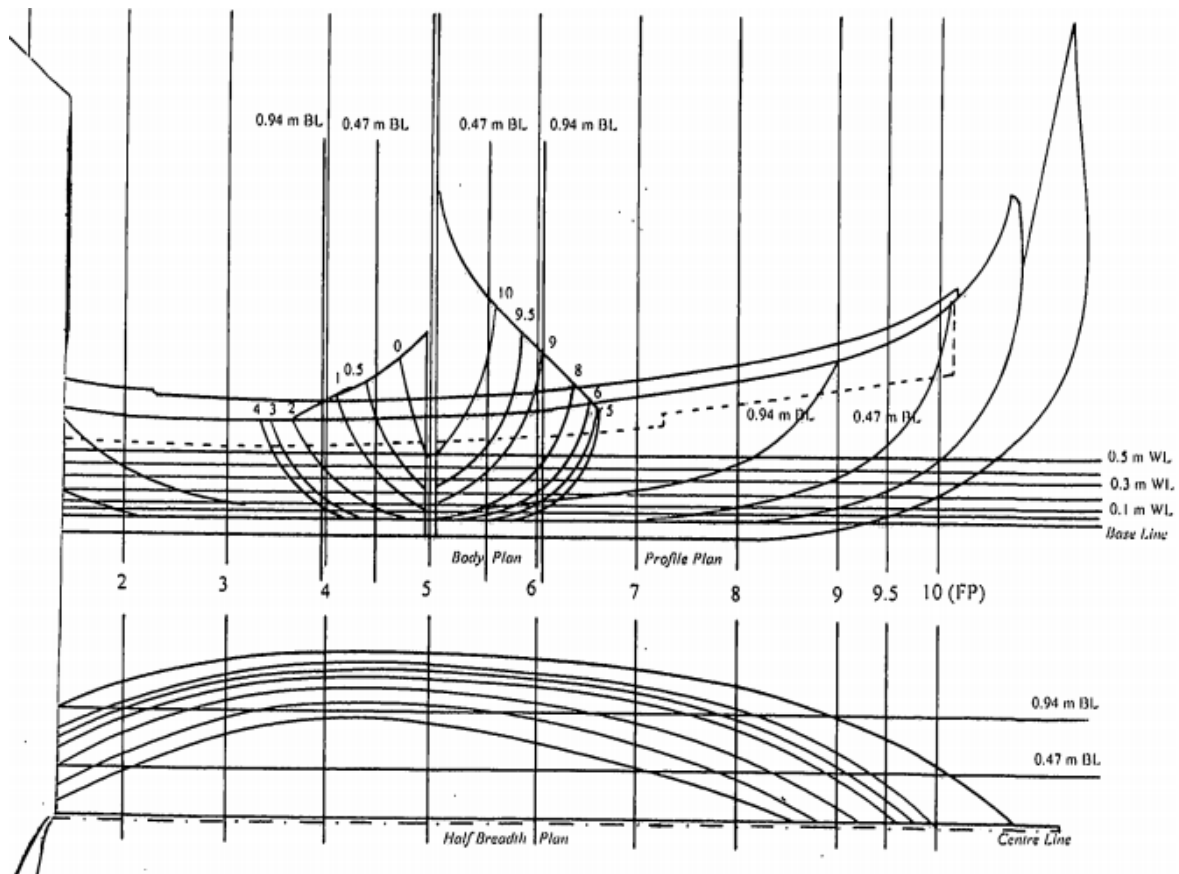


Figure 7: Lines Plan of "Semangat Baru" Purse Seine Ship on Tidung Island Shipbuilding (Umam, 2007).

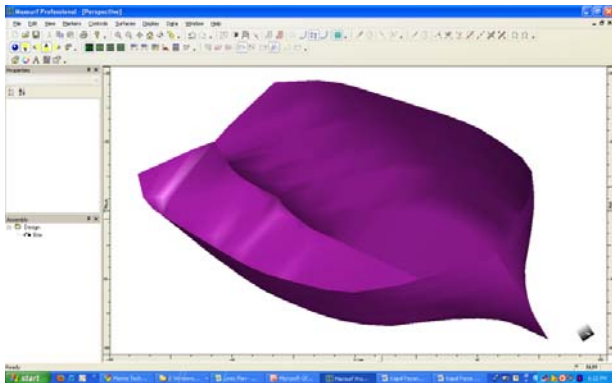


Figure 8: “Semangat Baru” Ship Model on Maxsurf Software.

The different between the traditional and modern shipbuilding is obvious. The difference is the technology used from each of the shipbuilding. In the traditional shipbuilding is very far from the use of technology. Technology used to build the ship is use a special expertise in the form of instinct gained from experience and its predecessor workers. Disadvantages of this method are the safety factor is not taken into consideration in designing the ship. In another side, the modern shipbuilding uses the latest technology where safety factor is included into consideration in designing the ship.

Table 2: Comparison of Ship Design between Traditional and Modern Shipbuilding (contd.)

No	Aspect	Modern		
		Turan, Aksui, and Cui (2006)	Cochran (2007)	Wu and Shaw (2011)
1	Method	Cased based reasoning approach	Ruled based approach	knowledge-based engineering methods
2	Tools	Software	SmartMarine 3D	document-based approach

Weakness owned by of traditional design should be given priority improvements, leaving the side of the revolutionary tradition. To improve safety factor, it can be recommended to use one of the four ways on the modern shipbuilding. Can also be combined from the four ways in order traditional shipbuilding can compete.

5.0 CONCLUSION

The procedure of building ships at traditional shipbuilders is far from the influence of technology. These provide a weakness on the safety for the design and operation. Current research provides the design process in the traditional shipbuilding in Bintan Island, Riau Archipelago Province, Indonesia. The result is a comparison to current concept of design process in modern shipbuilding and recommendation for the traditional shipbuilding and local government. The recommendation is use one of the four ways on the modern shipbuilding or combined from the four ways in order

traditional shipbuilding can compete.

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