



Indonesia Wooden Furniture: Transition from the Socio-Cultural Value Leading to the Ecological Value

Arianti Ayu Puspita¹, Agus Sachari¹, Andar Bagus Sriwarno¹

ABSTRACT

Wooden furniture is a cultural product that evolved hundred years ago in Indonesia. There are many types of wood species with high quality grow in Indonesia. In the 21st century, the level of demands for furniture is getting higher, and affecting the availability of the amount of wood. These conditions encourage furniture industry to seek for a wide variety of solid wood, processed wood and wood waste. Wood furniture has a role in the dynamic cultural development of Java Island, Indonesia, from the aspect of spiritual, philosophical, aesthetic and economic. This study aims to describe the transition in social and cultural values that occur in the use of wood materials in furniture, especially in Java. The transition will be described through the eyes of Material Cultural Studies, to show ecological aspects as a new aesthetic value. The method of data analysis is done through a diachronic viewpoint, by dividing the viewpoints into three time dimensions, i.e., the interpolation dimension (the past), the present time and the extrapolation dimension (the future). The interpolation and extrapolation dimensions are the approaches to analyze a set of data. Social culture phenomenon, development of trend technologies, and availability of wooden resources influence the transition of furniture value. Relation between availability of wooden resources have impact on design development. The result of this research are aspects of ecological needed on furniture design and the supporting variables. Therefore, concept of sustainable furniture design in Indonesia would be seen as an opportunity to maintain the continuity of wood.

Keywords: Design character, furniture, sustainability, transition.

Available Online: 21st July, 2016.

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1.0 Introduction

In Indonesia, furniture becomes a valuable commodity because of the high demand and the amount of labor that can be absorbed in this industry. Based on the level of needs, the use of wood dominates the material of furniture products in Indonesia as many as 67.02% (according to the **Ministry of Industry and Trade of the Republic of Indonesia, 2014**). Due to the high use of wood in the furniture industry, the

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wood raw material is one of the factors that determine the comparative advantages of the furniture industry and give a major contribution in determining the cost of production. As a massive product, consideration in the furniture design is not only related to the marketing aspects, but also related to the availability of the raw materials and also the cultural aspect. Therefore, the raw material (wood) is one important factor to fulfil the human needs, such as the need of furniture products. In this era, people prefer to choose new products that make considerations on the environmental aspects and the natural resources. Designers must have considerations in determining the use of a material related to the growing environmental issues, the policy of using the natural materials, and also the market trends.

Ashby and Johnson (2010) mention that the shape of products can be affected by many things, but the material aspect and the design process are the most influential factors. The existence of material and the process of new design are influenced by the development of science and technology. According to Ashby and Johnson, the form of furniture can be determined by the selection of materials and the process of how the furniture is made. Different use of wood materials can result different characters of design. Ashby and Johnson (2010:12) also says that in the 20th century, the character of the material used is quite large and has three dimensions shape. It is different from the character of the material used in the 21st century, which has one surface, one layer, and may consist of one molecule alone and a new function that follows it. In this study, we discuss the relationship between the natural material (i.e., wood), the aesthetic value of the furniture and the socio-cultural dynamics, especially in Java, which is influenced by developments in technology and the global issues that occurred in the span of the 18th century to the 21st century. In the development of human life, human civilization becomes more modern as it is influenced by the knowledge of the human beings themselves. The effect also brings about changes in the condition of the human environment. With their culture, humans can process and affect the environmental conditions (Djajadiningrat, 2005: 17), as occurs in the use of natural materials in furniture processing. Modern society is currently experiencing many problems, including ecological problems, environmental problems, the problem of quality in urban life, and so forth. Thus, the study of sustainable design continues to evolve. The development of wooden furniture design in Indonesia cannot be separated from changes in socio-cultural values, economic value, and the environmental issues that follow. Therefore, this study will compile the synthesis between design changes in wooden furniture, with social and cultural values and the environmental issues that follow. The methodology used in this study is the historical method, with a phenomenological approach. Theory of material cultural studies and cultural transformation used in analyzing the socio-cultural phenomenon.

Indonesia has a rich variety of wood types which is supported by the geography and weather factors. Generally, the types of wood in Indonesia are divided into three. They are the major natural species, the major plantation species and the lesser used species (Indonesian Sawmill Woodworking Association, 2008). The potential of high quality wood began to decrease. However, its value increases as it becomes more and more expensive. With advances in technology, wood can be processed into various products, such as: paper, textile, furniture, etc. Wood has specific properties that cannot be replicated by any other man-made materials. For example, wood is elastic, resilient, and resistant to heavy loads. Wood also has various other properties that even concrete, steel and plastic do not have. The general characteristics of wood can be seen from its physical properties. Kasmudjo (2012) mentions that the characters on the physical properties of wood are related to what is seen by the eyes. This includes the color of the wood (including wood fiber), the smell, touch impression (texture), gloss, hardness and weight.

Since long ago, the people of Indonesia have an attachment and in-depth local knowledge on the wood materials. At first, wood is widely used to make boats and homes. However, after the Western culture came in the 16th century, the use of furniture, especially chairs, began to flourish. In addition to its application on the place of worship and houses, a strong attachment to the wood materials is also shown in the work of carvers in Jepara. One type of wood that is widely used in Indonesia is teak (*tectona grandis*). This type of wood is used for both domestic and export markets. Within a very long period, Indonesia experienced many changes and developments on the political, economic, social and

cultural aspects. These changes also affect the state of the environment and the natural forests in Indonesia. Therefore, the global issues concerning the environment and the changing of the design discourse, have also influenced changes in the design of wooden furniture. This study was conducted to describe the socio-cultural phenomenon that occurs in the development of wooden furniture. Allegedly, the development of wooden furniture design show Indonesian furniture industry strategies in adjusting to environmental issues. The anticipatory activity seen in the various changes of wooden furniture design. Thus, by reading the value changes occur, it can be seen character design of wooden furniture that will grow in the future. The research divided into three stages; The first phase of the study is the theory of cultural transformation. Second; explore socio-cultural phenomenon that occurs, accompanied by the emergence of environmental issues in forest conditions. Third, the analysis of the relationship between the change in the character design with wood conditions in each time frame. Then a fourth, the mapping of the main aspects that are needed in the development of furniture with ecological value, along with related variables.

2.0 Theoretical foundation

2.1 Material cultural studies

The travel history of an artifact can be studied through the perspective of cultural transformation and the Material Cultural Studies, with the external factors that influence it, such as the aspects of economic, industrial, political, etc. (Pickering, 2008: 62). The object on the Material Cultural Studies is something that plays a role; something that interacts and is used by humans. The limitation is that it is man-made or the result of human modification. Objects can have changes in time, forms and values but it is still the same type of object. Objects become the main source of data, and the material culture becomes the tool in the search for its cultural value. Prown (1982:1) states that the material cultural studies is a tool in the study of culture, but it has academic goals as a branch of cultural history or cultural anthropology. The main premise is that an object is the work of man, consciously or unconsciously, directly or indirectly. The object is also a form of human belief which affects the group of community to which it belongs. The belief which is related to the object has a wide range of different values. In addition to having the value of function, some objects have aesthetic value, spiritual value or they can even express feelings towards other humans. The main objective in this method is to trace the evolving system of values and the patterns of these values in the range of time and in a particular place.

Basically, the study of material culture explains how an object can affect humans in the surroundings, or how the object is influenced by man, by describing the social values and symbolic meanings on human activities. This study includes a multidisciplinary approach to the suppression of the relationship between people and objects, where there is a contribution from the value of anthropology, sociology, psychology, design and culture. The object can be used as a marker of value, identity and the outcome of cultural relation and political power. This is emphasized by the statement of Bourdieu (1984) as cited by Woodward (2007: 15) that the concept of an object can be a marker of aesthetic values, cultural values and self identity. Science and technology have an important role in the change of design patterns. The development of technology, will lead to the findings of new materials, which affects the production process and results new products.

This is related to the object of the research, that the developing concept of furniture with the ecological vision can be a marker for a new aesthetic value. The study of material culture can be attributed to "things", "object", "artefact", "commodity" and "actor". According to Featherstone (1992) in Woodward (2007), in cultural studies, commodities are associated with consumption and lifestyle concept. In this study, wooden furniture became the main object, to be assessed based on changes in socio-cultural values, technology and economy towards the use of materials and also changes in design patterns. The changes that occur are human efforts towards progress, with the accompaniment of the acculturation process. The process of change happens constantly as further action, as emphasized by Jenks (2013: 50):

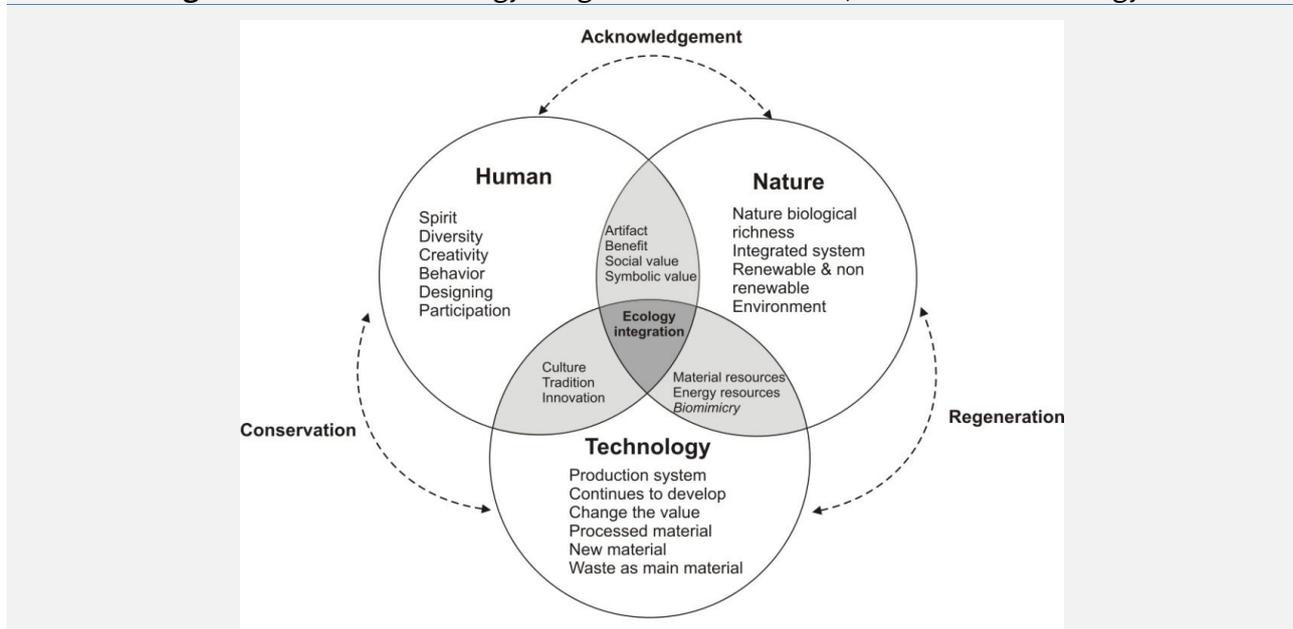
"Culture consists of patterns, both explicitly or implicitly; culture is about and for behavior; it is acquired and disseminated through symbols, forming a distinctive achievement of human groups, including manifestations in the form of various artefacts..."

2.2 Culture and ecology

Basically to adapt to the environment, people develop knowledge and ideas, combined with the cultural values and norms in managing and using the natural products. The adaptation process gave birth to the concept of ecology as a response of the human relationship with the environment in the form of different cultures (Steward, 1955). The adaptation process is the core of the cultural ecology. Adjustments to the environment will continue to be done by humans, in present and in the future by the next generation. The adaptation itself is an iterative process that occurs continuously, accompanied by technological developments and socio-cultural changes. The concept of the culture core from Steward (1955) was the one that led to the study of cultural ecology. According to Steward (1955), the core concept of culture is analyzed based on human adaptation to the environment, such as how man reacts to the development of technology; how people meet their needs; how humans maintain the continuity of the surroundings; and so on. Man, nature and technology are the three main starting points that form the ecological relationships.

Since long ago, the people and the environment in Indonesia have had a close relationship. This relationship has a meaning and an ecological value. In the past, it is applied through stronger bases, namely power, faith (confidence) and trust. The knowledge generated by the relationship between humans and the environment becomes local wisdom. Local wisdom is a form of environmental wisdom that exists in the life of the society in a place or region. It refers to the locality and a particular community (Suhartini, 2009: 206).

Figure 1: The form of ecology integration between man, nature and technology



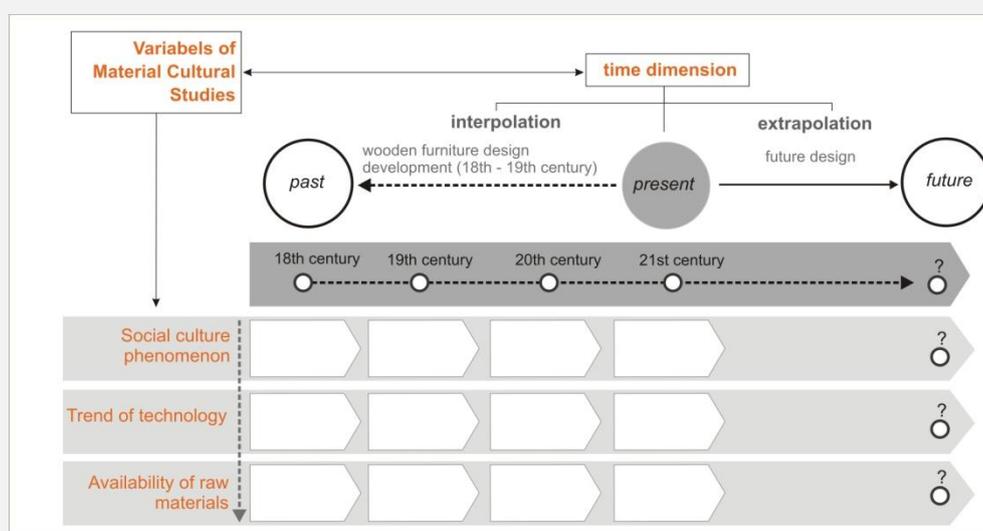
(Arianti Ayu Puspita, 2016)

3.0 Research method

The main approach of this research is the hermeneutic phenomenological approach towards a variety of wooden furniture design based on the phenomenon that occurs at the points of specified time range. Exposure to the data is compiled and explained using the historical method. The Material Cultural Studies becomes the main frame to explain the transition to the socio-cultural values in

Indonesian wooden furniture. The data is collected through a literature review of the development of wooden furniture before the 19th century and a collection of furniture design sample after the 20th century in Indonesia. The method of data analysis is done through a diachronic viewpoint, by dividing the viewpoints into three time dimensions, i.e., the interpolation dimension (the past), the present time and the extrapolation dimension (the future). The interpolation and extrapolation dimensions are the approaches to analyze a set of data. The aim of interpolation is to estimate the values between two points which are already known, using the straight-line approach. On the other hand, extrapolation is used to estimate the values of outside data. These data points will be read via variable of time range and variable of socio-cultural phenomenon, technology trends, global issues, availability of raw materials and the design patterns resulted. With reference to the three time dimension, i.e., the past, the present and the future, both the interpolation dimension between the past and the present and the extrapolation dimension between the present and the future can be seen.

Figure 2: The transition period towards the aspects of the material cultural studies on wooden furniture



3.1 The objective of the study

The object of the study in this research is limited to the design of furniture made from Indonesian wood. The aim is to direct the result of the research on the changes of design characters that appear from time to time, with reference to the needs of designs on wooden furniture. The furniture designs which are studied, are taken from various range of time, to represent the changes and the design development on those periods.

3.2 Literature data

In this study, the data of wooden furniture design on the interpolation dimension (the past) is required in order to know about the designs of wooden furniture before the 19th century. The literature data collected is a furniture book, the work of a Dutch author, which describes various furniture designs that entered Indonesia in the 18th century. In addition, the literature of scientific reports from the authors in Indonesia is also used as the primary source.

3.3 Interview data

Interviews were conducted to some of the wooden furniture designers in Indonesia, especially to get the data of the types of wood used and the characters of the wooden furniture designs in the 21st century. Moreover, they were also asked about the draft design which will be made in the future. This is done in order to get a description of the wooden furniture design in the interpolation dimension.

Therefore, the forecast on the development of wooden furniture design in the future, particularly in Indonesia, will be built through a qualitative approach, through a descriptive exposure.

3.4 Exhibition survey data

Development of furniture design is strongly influenced by the global trends. Therefore, the author also conducted a survey on furniture exhibitions with international scale in Indonesia, namely IFFINA (International Furniture & Craft Fair) and IFEX (Indonesia Furniture International Expo) in 2016, to determine the development of wooden furniture designs in the present time and in the future.

4.0 Results and discussion

4.1 Interpolation dimension towards wooden furniture design (The 18th – 19th Century)

Since the 17th century, the aim of the presence of furniture products in Indonesia is to fulfil the functional, social and aesthetic needs. The furniture used in the royal environment is associated with the philosophical values, which has a very beautiful form as it contains values of high culture. According to *Wiyancoko (2000)*, initially the Javanese used the floor to sit on. The word "chair" appeared and started to be used as a way of life since the arrival of the Portuguese and Europeans in the 16th century.

In addition to its functions to promote comfort, the chair is also used as a symbol of social status, supported by many types of designs and varieties of patterns on the chairs. Initially, the type of wood used for furniture in Java is Macassar Ebony (*Diospoyros celebica*), Red Ambon (*Pterocarpus indicus*), Sonokeling (*Dalbergia latifolia*) and teak (*Tectona grandis*) (*Veendaal: 1985*). Teak wood is famous as the wood has many advantages, but it takes a long time to grow. Because the price is quite high, only people with certain social status are able to buy and use them.

Figure 3: Various types of antique furniture

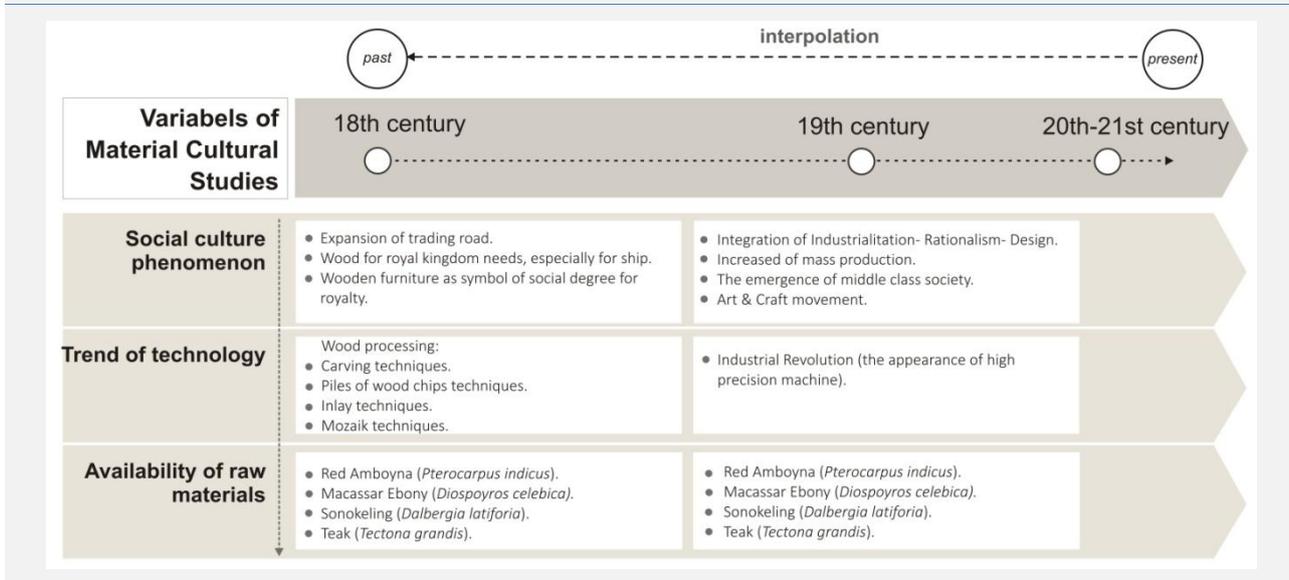


Source: *Veendaal, 1985*.

Wooden furniture also became a part of the diplomatic activity In Indonesia. Other nations such as China, Spain and the Netherlands provide wooden furniture for the royal family as a symbol of cooperation, such as those found in the collection of *Kraton Surakarta*, Central Java. Almost all of the wooden furniture in the kingdom used carving and shaving techniques. The influence of *Regence* style in Java arrived around the years of 1700-1811. In addition, there is also French style that has similar foot shape with the *Regence's raebel*, which is called the "*pie-de-Bitche*" (French), which means deer legs. The Java island in Indonesia has a well-known center of furniture industry since hundreds of years ago, i.e., the city of Jepara. Jepara has a special character in processing furniture, especially teak wooden furniture with carving techniques. The form of designs in Jepara's carved furniture is heavily influenced by the European styles, such as France and the UK with their Baroque and Rokoko art style. As time goes by, the use of wood materials is influenced by the technological developments of the 19th

century, particularly during the Industrial Revolution. During the industrial revolution in the UK, there was an effort to change the production techniques from the manual to the machine. With the event of the industrial revolution, many designs that prioritized efficiency factor and reduced the decorative elements were resulted. The emergence of the middle class who can afford to buy furniture with good design and reasonable price, had increased the demand for furniture. The high demand for furniture led to high rates of deforestation, either in Indonesia or worldwide.

Figure 4: Transition between 18th-19th century towards the aspects of the material cultural studies on Indonesia wooden furniture.



4.2 Interpolation dimension towards wooden furniture design (The 20th - 21st Century)

In the development of design paradigm in the 20th century, there were discourses that also influenced the changes on furniture designs, both in terms of design and also the use of the materials. Those various design paradigms were very influential on the development of art and crafts industry in general and the carved furniture industry, in particular, until the early 20th century. In 1928 in Indonesia, the interest in other types of wood was shown among others. This can be seen from the emergence of furniture made from mosaic of various kinds of wood, which include *sana* wood, *mentahos* wood, jackfruit wood, snake fruit wood and *secang* wood (Gustami, 2009: 216). The global issue that influences the changes of furniture design is the emergence of modernism style and the influence of Bauhaus on the design education. There were more alternatives for the types of wood used after the 20th century, not only high quality wood such as ebony, red Ambon, *sonokeling* and teak that are used, but also cheaper wood with lower quality. This is because high quality wood is difficult to find and the price is very high.

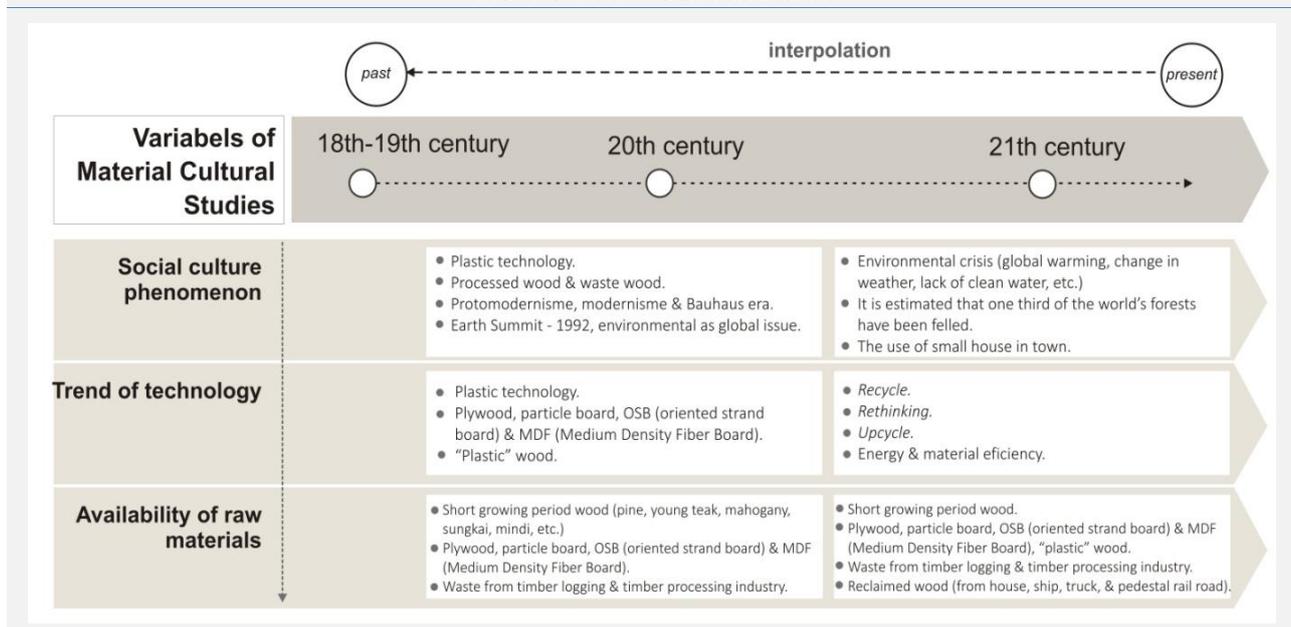
Later, the development of various types of new materials, such as plastics and processed wood expands the design repertoire. The various types of the processed wood are plywood and multiplex, wood particles (standard chipboard, veneered chipboard and OSB/Oriented Strand Board), fibre wood board (medium density fiber board) and "plastic wood." The emergence of new materials cannot be avoided. They become alternatives in designing furniture. This change gradually brings the system of furniture manufacture from the carpentry (craftmanship) to the industry. Jamaludin (2014: 87) mentions that until the 1960s, the major breakthrough in furniture in this century, in many ways, is highly dependent on technological advances. Developments that occur are not only on new machines, but also in the materials. The new material will give designers the motivation to innovate and create new construction. Technology innovation on plywood material has provided an alternative to the problem of raw materials supply. Plywood is a board or panel consisting of an artificial structure which has several veneer layers with fibers that perpendicularly intersect and are tied with special adhesives.

Additionally, the number of the veneer layers must be odd. Veneer is a thin sheet of wood obtained by peeling or slicing certain types of wood. Using plywood, wood can be made in larger sizes.

In the 20th century, furniture has become a commodity product that prioritizes functional aspects. Economic improvement is slowly marked by the emergence of various segments of society, such as the emergence of the middle class (Yuswohady, 2002). The change of illustration on the segmentation level became a division of new segments psychographically. Demographically, the segment is divided into three classes: the upper, the middle and the lower. Meanwhile, psychographically, it is divided into the brand-minded consumer in the upper segment; the value consumer in the middle segment; and price-minded consumer in the lower segment. Various alternatives of materials used for furniture today have also provided the consumers various price options. Thus, the use of furniture no longer shows differences in a person's social class. However, it shows differences in a person's economic level. Until the 21st century, the demand for furniture from abroad continues to increase.

The high demand for wood affects the environmental issues which continue to grow. Moreover after the *Earth Summit (1992)* confirms that the environment is a major issue on the international political agenda. Slowly, various ideas concerning the environment appear, including in the field of design. Strong attention to the environmental crisis affects the way humans think that they continue to seek another alternative to replace wood materials, such as second-hand wood. The impact is the high demands of export market for recycle products or reclaimed teak. The materials used are of wood from demolished houses or ruined ships. The current concerns on the environmental issues has made the ecological view became a new philosophy, which is used as an ideal benchmark for people who pay attention on the ecology. Wood waste can be classified into two types, namely waste from logging and waste from wood processing industry (Sumarno et al., 2015). Sumarno et al., (2015) mentions that parts of the trees that are mostly unused are branches and twigs, i.e., branches 11.52% and twigs 0.62%. Thus, there is a new opportunity to utilize these unused parts of trees. In addition to the environmental issues, the development of designs is also influenced by the new technologies that are widely used in the wood industry, i.e., the CNC. CNC can produce designs that are decorative in a large number (massive). This technology can make a big difference, especially when compared to the decorative designs shown in the furniture before the 20th century. This furniture with carving technique can only be made in a limited number. The form of decorative designs resulted from the CNC is of course different from the designs made with carving techniques. The CNC technology can be applied to both raw wood and processed wood (plywood and MDF). This technology has not been widely applied to furniture, but it is mostly applied in the interior products (eg: a room divider and wall decoration).

Figure 5: Transition between 20th-21st century towards the aspects of the material cultural studies on Indonesia wooden furniture.

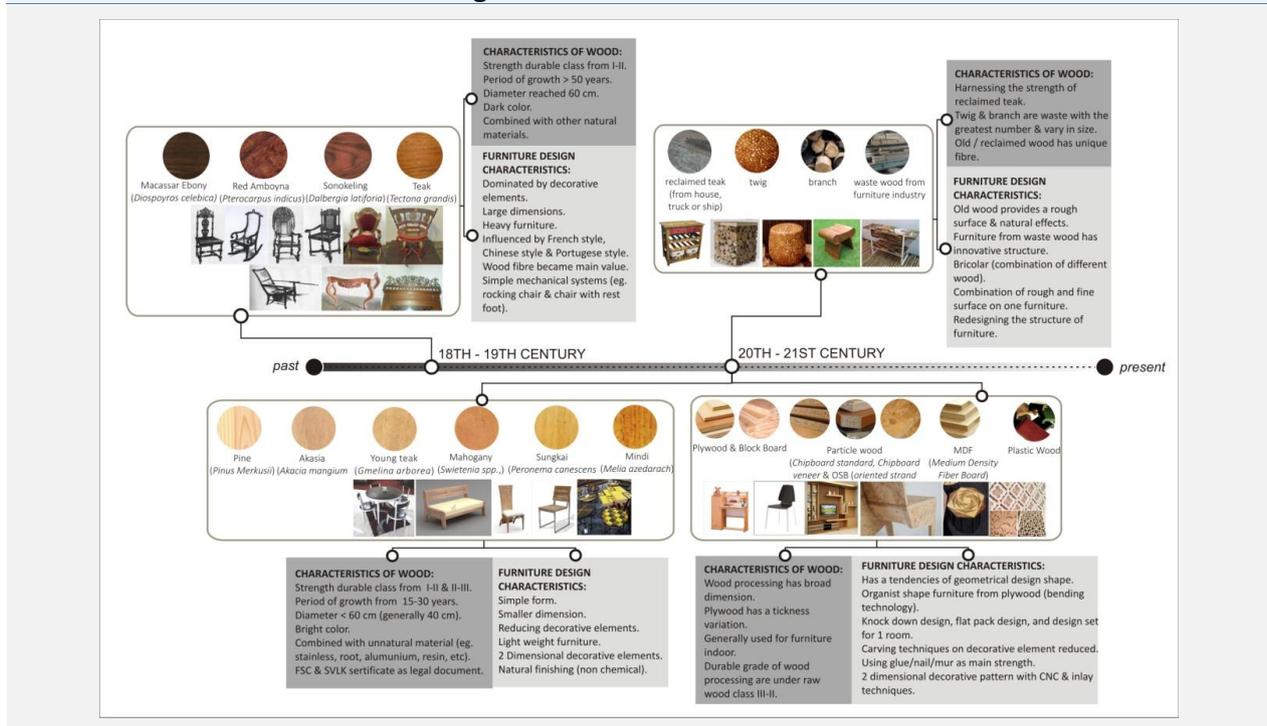


4.3 Changes of character on furniture designs in the interpolation dimension

Based on the analysis of the socio-cultural phenomenon, technology trends, and the availability of raw materials, there are changes on the characters of furniture designs in Indonesia from the 18th century to the 21st century. The changes are not only influenced by the styles of the design, but also by the availability of wood materials. The significant differences are the decorative aspect, the type of wood used, and the dimension of the furniture. Previously, carving techniques (two dimensions and three dimensions), were widely applied in furniture of the 18th century until the 19th century. However, today, there is more furniture with decorative aspects in the form of two dimensions (as if it consists of one layer with a flat surface).

However, there is actually a combination of two or more different types of wood that no longer uses carving techniques but a parquetry technique or inlay. Parquetry is the art of installing or setting up thin wooden planks (veneer) with a geometric pattern (Enget, 2008: 371). Initially, the method was used to seal the floor or wall. Parquetry has the same principle with inlay. The difference is that in inlay, before the patterns are placed, the surface of the wood is lowered a few millimetres. While in parquetry, the patterns are directly placed on the surface of the wood. The patterns are arranged, glued and then pressed to make the surface flat (Enget, 2008: 372). The emergence of furniture with function and economic considerations is also influenced by the high demands of today's society. The development of activities in furniture industry in Indonesia is influenced by the production aspects that consists of designs, materials, techniques, equipments, diversification and the product function (Gustami, 2009: 208). The demand of wood materials, especially teak wood, is increasing. Therefore, the craftsmen and the furniture industry began to look for other types of wood as an alternative.

Figure 6: Changes in the character of furniture design from the 18th century to the 21st century based on the changes of character on the wood materials used.



The types of solid wood used as alternatives since after the 20th century, continue to grow. Currently, not only high quality wood such as ebony, red Ambon, sonokeling and teak (the species of wood which are quite expensive and difficult to obtain) are used, but also other types of solid wood, such as Gmelina (*Gmelina arborea*), Mindi (*Melia azedarach*), Mahogany (*Swietenia spp.*), Acacia (*Acacia mangium will*), pine (*Pine merkusii*), and Sungkai (*Peronema canescens*). According to Mansur (2015), several alternatives of wood have shorter harvest periods. They can be harvested from the age of 10-15

years old. Nowadays, there are more varieties of styles in furniture design. This is influenced by several factors, such as the following:

1. Alternatives on the use of wood materials.

Material is highly associated with forms of design. Ashby and Johnson (2010: 12) says that in the 20th century, the characters of the material used are quite large and have three dimensions shape. On the other hand, the characters of the material used in the 21st century are: it has one surface, one layer and consists of one molecule only with the new functions that follows it.

Figure 7: Furniture made from twigs and waste of furniture industry in IFEX Exhibition 2016



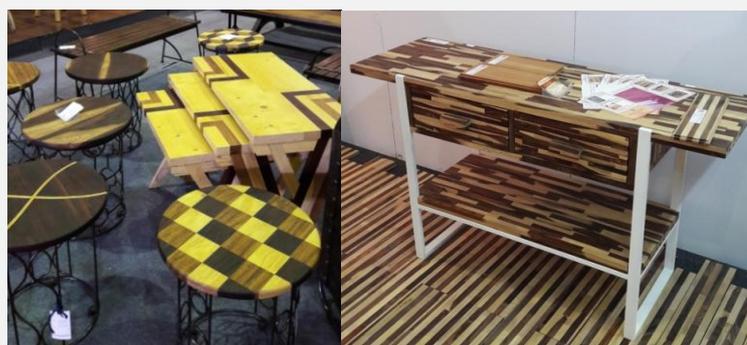
(Arianti Ayu Puspita, 2016)

The emergence of processed wood, waste wood and second-hand wood also plays an important role in the development of furniture design. Currently, the supply of wood with a large diameter (about 60 cm) has become rare. Thus, wood with a large diameter becomes very expensive. Therefore, the diameter of wood that is generally available is only 40 cm. This surely affects the width of wood that is normally used. Industrial waste such as pieces of wood is also used as an alternative material. These pieces of wood is used to make patterns on the surface of the furniture. In addition to the furniture industry waste, unused parts from the felling trees, like twigs, are also used as an alternative material for furniture products.

2. Factors of strength and durability of the products.

Indirectly, the selection of materials affects the power of the furniture structure. This is also due to the decline in the quality of wood diameter. Since the width of the wood is smaller, more pieces of wood are needed to support the structure of the furniture. Other than using new wood, a lot of furniture also uses second-hand wood. To support the strength of the second-hand wood, many furniture designs combine second-hand wood with iron material as the main structure.

Figure 8: The furniture combination from various types of wood and iron as the main structure in IFFINA 2016



(Arianti Ayu Puspita, 2016)

3. Energy efficiency and material.

Energy and materials in the production process need to be taken into account carefully as they make impact on the effectiveness and efficiency. Energy efficiency can be done by using the source of furniture materials from the nearby areas with the industrial locations. As a result, the use of local materials is very prominent in the wooden furniture industry in Indonesia. In addition to energy efficiency, another factor that gives influence is the efficiency of materials. The limited amount of wood is very influential in the dimension of the products. Strategy towards energy efficiency and material has also been emphasized by Tischner (2006) as one of the sustainable design methods. When there is less amount of wood, automatically, the furniture industry will find a way to make designs that can save the use of wood. The furniture industries which plan the concepts of their designs regularly, can affect the efficiency of materials and energy because they have calculated first. Thus, it is not necessary to prepare extra materials or materials that are not needed.

4. The need for the function.

As products that are made massively in a large number, a system is required in the process of delivery and purchase. Nowadays, competition in the furniture industry is also affected by the efficiency factor to save space in the room so that it can fit more goods. In addition, to reduce the cost of services in assembling the furniture, many furniture designs are made easy to be assembled. The development of the functions can also be done through a design that can be reversed and used for other functions (UNEP, 2006).

5. The use of modern technologies.

CNC (Computerized Numerical Control) is an additional technology in the development of furniture design. With this technology, the products resulted can have great precision so that the process of making one piece of furniture can be done automatically, fast and scalable (Jamaludin, 2014: 117). In addition, the CNC can produce decorative designs in small sizes. Other than the CNC, another additional technology that is also used, is vacuum press veneer. Vacuum press veneer can combine the remnants of veneer that are not wasted, as decorative aspects of the furniture by using parquetry technique or inlay.

Figure 9: A stool with veneer remnants on the surface, made by using vacuum technology press veneer, IFFINA 2016



(Arianti Ayu Puspita, 2016)

Various factors above explain that materials have a strong influence towards a product. Meanwhile, the environmental conditions cannot support the supply of wood material as fast as the development of the economic value of the furniture. Thus, there is an imbalance situation between the high demand for furniture, the time needed for the trees (wood) to grow, and the economic value generated by the furniture industry. Alternative wood materials, furniture needs, efficiency and technological factors, have shown the human efforts to balance the needs and the environmental conditions. Development in

furniture design emphasizes the importance of ecological aspects in furniture, namely the materials, the product, the need for function, the efficiency and the technological aspect.

Public interest in a design is also influenced by the social factors of the consumers, such as educational background, age and lifestyle differences (Khalaj & Pedgley, 2014). According to Khalaj & Pedgley (2014), there are five styles of design analysed from the public interest. They are the sporty style, the strong style, the geometric style, the moderate style and the authentic style. These five styles of design became the design characters that emerged in the 21st century. The weakness of this study is these five styles of design are still categorized as general. They do not refer to specific problems such as environmental issues.

4.4 Ecological value as the main approach to the extrapolation dimension

The production process through hands skill (crafts) in Indonesia is still the primary value in the manufacture of a product, including furniture. The change that occurred in the 21st century is the form of design which still require hands skill of the craftsmen. However, in the process, machine and technology are also applied to result more products and to support production efficiency. Thus, the craft and technology aspects in furniture design will continue to evolve in the future. The aspect of wood legality is emphasized by the Government to support the use of wood which is official, secure, and has measurable standardization. The SVLK (Wood Legality Verification Letter) is a marker that the act of conservation, appreciation and regeneration of trees (wood) are required. According to the UNEP (United Nations Environment Programme Division of Technology, Industry and Economics) in collaboration with the Delft University of Technology in 2006, there are several other strategies that become important factors in designing products for sustainable purpose. This collection of strategies is called D4S (Design for Sustainability) and it consists of seven factors, namely: (1) the material is not hazardous (low impact material), (2) the material use, (3) the production techniques; whether it uses efficient production technique or high technology technique (4) the distribution system, (5) the impact during use, (6) the life of the product; related to the durability of the product (initial lifetime), (7) the end of the product cycle (end of life system). Based on the dynamic changes of furniture designs in the interpolation dimension (the 18th century to the 21st century), there are symptoms that show the need for ecological values in wooden furniture. Here is an analysis of the relationship between the ecological aspects of furniture and the supporting variables that support these aspects.

Table 1: Aspects of ecology and supporting variables in wooden furniture	
Aspect of Ecology in Wooden Furniture	Supporting Variables
Material	Local materials, fast-growing, light weight, limited size, legality, alternative materials (waste and unused parts of trees).
Product	Structure innovation, combined with other materials (natural and unnatural), non-chemicals, unfinished surface, product lifecycle, originality of designs.
The need for function	The system of delivery and purchase, saving space, multifunctional, durability, longevity.
Efficiency	Industrial location, the location of the source of the wood, the planned design (research & development), quality control.
Technology	Innovative, easy access, multiply, speed.

Ecological aspects are composed of materials, products, need for function, efficiency and technology. These aspects are important considerations, which based on the illustration in interpolation dimension, continue to change to a better direction. Thus, for the development of furniture design, especially wood materials, ecological considerations will become the primary approach in the future.

5.0 Conclusion

It is expected that the availability of various types of wood in Indonesia will continue to multiply. Based on the data from ISWA (Indonesian Sawmill and Woodworking Association), there are 10 types of commercial wood from the natural forests, 10 species of wood from the plantation and 23 kinds of underused wood (ISWA, 2008). Nowadays, wood from demolished houses, ruined ships, trucks, and rail lines are also used as the main materials for the furniture industry. The CNC technology and vacuum press veneer give additional alternatives to the designers and the furniture industries to use processed wood, so that the use of raw wood can be reduced. The change in environmental conditions affects the consideration in the process of designing wooden furniture. In the future, designers must continue to pay attention to the environmental conditions. Other than the materials, the shape of the design is influenced by the availability of the material and the technology to process it. Apart from the materials, the finishing on furniture will look more natural without the use of chemicals. This is also due to safety and regulation factors.

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