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Sustainable Lounge Chair Planning For Lounge And Living Room, Inspired By Anatomy

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Abstract. *Indonesia is a country that has tropical forests with abundant biodiversity of biological resources, but over time, the availability of raw materials is very crucial today for the forestry industry, which affects the sustainability of the forestry sector. To restore the sustainability of the forestry sector, especially the performance of the forest product processing industry into furniture, this research is expected to be able to produce a design of lounge chairs or lounge chairs by utilizing existing wood residues as best as possible so that it can help reduce the amount of wood waste that is just scattered. The general obstacle faced by the wood waste processing industry is the limited ability to design. It takes foresight in choosing wood waste to obtain the right chair design and suitable for use in the lounge area and living room. The design ideas chosen were inspired by the anatomy of the body, namely, pieces of human bones. The method used is through the design thinking process, including: empathize, define, ideate, prototype, to the test stage. The first step is to empathize through design observation and understand the problem to determine the type of wood waste material that can be used, then make a furniture plan in the form of lounge chairs. Based on the discussion, the results showed that wood waste, especially solid wood waste, can be used for the design of lounge chairs with the technique of laminating waste materials into new raw materials. The new raw material can be applied to the components of the chair. The results of the research are expected to be able to solve the problem of wood waste that has been left scattered, stacked, and burned, so that it has a negative impact on the environment to become a sustainable production product that has a unique and high selling value.*

Keywords: *Design, Furniture, Lounge Chairs, Sustainable.*

INTRODUCTION

Indonesia is a country that has tropical forests with all its abundant biodiversity of biological resources, but over time, the availability of raw materials is very crucial today for the forestry industry, so that it ultimately has an impact on the sustainability of the forestry sector. It is known that currently forest destruction or commonly referred to as deforestation has occurred almost all over the world, not only in Indonesia. The damage is mostly caused by human activity factors that cause climate change. According to the Food and Agriculture Organization of the United Nations (FAO), about 7.3 million hectares of forests worldwide are lost every year. This incident certainly threatens human life. According to research, the triggers for forest deforestation activities include: industrial activities, especially the furniture industry. Another factor is due to the conversion of forest into plantation land, and even used as residential land for residents.

The furniture industry is an industry that encompasses the processing of raw materials in the form of wood, rattan, and other raw materials that are processed to increase added value and higher benefits into finished furniture products (AMKRI, 2015). The furniture industry is one of the product sectors that encourages exports with the availability of abundant raw materials, both wood, bamboo, and rattan. The Ministry of Industry noted that the furniture industry's trade balance experienced a surplus in January 2019, with an export value of USD113.36 million (kemenperin.go.id, 2019).

This ultimately gave birth to public concern, especially among designers. According to a survey by the Sustainable Furnishing Council conducted in 2021, almost 97% of respondents showed interest in buying environmentally safe furniture, assuming that the style and budget are almost the

same. It is stated that the level of environmental friendliness of furniture can be assessed from the design, source, and form of the material, the manufacturing process, handling when the product is no longer used, to the origin of the furniture material.

Wood material itself is one of the environmentally friendly materials, because in addition to having low carbon emissions, processing is energy-efficient, wood is also known to be able to store carbon for a long time. With the right technology and design, wood can be a furniture material that is not only environmentally friendly but also strong, durable, and economical, therefore it is important for designers to design lounge chairs by making the best use of the wood remnants around so that it can help reduce the amount of wood waste that is just scattered. In addition, the results of design design by utilizing wood waste are believed to be able to make a unique design and have a high selling value.

The advantages of using waste as raw materials are briefly as follows: (1) Cost savings in extracting wood from forests/other places; (2) The moisture content of the material is relatively low so there is no need for drying costs; (3) The price of waste is relatively cheap; (4) Products can be claimed with raw materials from waste, so that from an environmental and marketing point of view it is profitable (Pramana, 2010).

Based on the description above, the problem of how to use wood waste for furniture design in the form of a lounge chair design so that it can function optimally, both aesthetically and functionally, and still feel comfortable for its users. The use of wood waste as the main material is expected to make the design of this lounge chair more economically valuable.

METHODS

The method used is a design method that goes through *a* Design thinking process, including: empathize, define, ideate, prototype, to the test stage. The Design Thinking method, according to the Interaction Design Foundation, is an iterative process that a person does to understand the user. In practice, there are also various processes, such as questioning assumptions, reinterpreting the context of the problem in an effort to create a strategy and turn it into a solution.

This Design thinking method includes context analysis in order to discover and framing problems. This stage will make a person question problems, assumptions, and also relationships. In terms of the relationship between researchers and participants, in this case the workshop place/craftsman is limited to consultative nature where the researcher tries to help in terms of innovative design using existing wood waste materials, so as to improve the aesthetic quality of the furniture made. As for this study, it is a case study in the Chair Design course regarding the design of chair design in learning, namely collaboration between lecturers and students. At this stage, students and lecturers experiment to make sketches, models or prototypes, test and evaluate. Later this prototype model will be tested and evaluated.

The following is a description of the design methods used as part of the design process, including:

a. Empathize

Conducting design observations and understanding the problems that are occurring in a lounge area or living room that is determined to be used as a product testing site to obtain problem formulation. In this stage, the research team found wood waste scattered in furniture workshops around Jakarta.

b. Define

The research team collected wood samples that had been selected and detailed, analyzed the results of the collected data to find the core problem of the research.

c. Ideate

The research team consisting of students and lecturers sketched several alternatives to design innovations that have been thought of to get answers to existing problems, namely inspired by the anatomy of the body, namely pieces of human bones.

d. Prototype

The research team made a 1:1 scale prototype and a 1:1 scale chair working drawing, complemented by photos during the process of making lounge chairs.

e. Test

At this stage, the team conducts tests on related designs by considering the comfort, strength, and durability factors of the product that has been designed based on ergonomics that have been made in the previous stage.

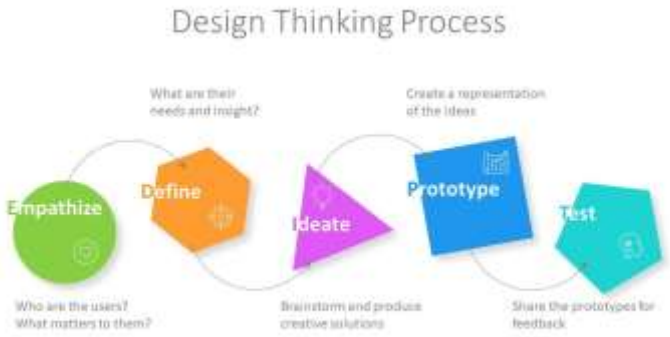

Figure 3. Design Method Chart, by PoweredTemplate (2004)

RESULTS AND DISCUSSION

Design Process

In this case, the author wants to create a single lounge chair that allows users to freely determine a comfortable sitting position with the relaxed sitting culture of its users. The harmony between the design of the chair and the layout will affect the human life of its users. Once a person is comfortable sitting in a room, either a living room or any lounge area, but it can also be that someone feels like leaving a room immediately because they feel tired and uncomfortable. After all, the function of the room is different, then the handling will be different. Placing a chair in the living room, of course, is not the same as placing a dining chair in the dining room. In addition to studying the nature of the room, what needs to be done is to consider the size, shape and proportion of the room to be occupied as shown in figure 4. The minimum area requirement is based on the need for movement space as a result of the 2011 research by the ICECRD, which is 47.46m2. The need for a building area for a simple residence based on the comfort of movement for the living room has an optimal area of 9.12 m2 with a plan approximately as follows:

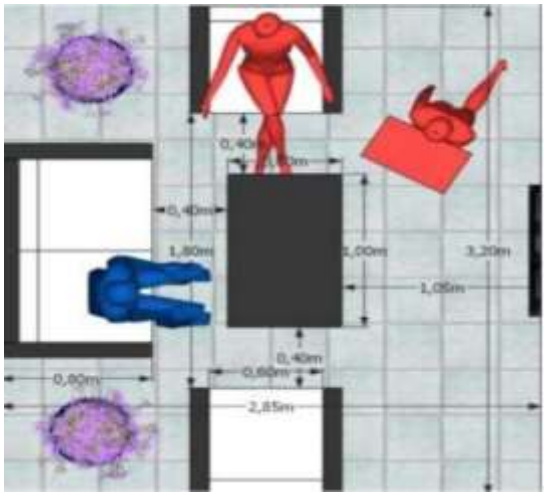

Figure 4. Living Room Requirements Plan, by E-Journal Graduate Unpar (2014)

The sustainability aspect is the main consideration in the selection of chair material, namely wood material. Wood is an environmentally friendly and sustainable material choice to be used as furniture material because the wood chosen is the rest of local wood waste by prioritizing solid wood waste found in the West Jakarta workshop. Solid wood waste can be used for the design of lounge chairs with the technique of relaminating waste materials into new raw materials. The new raw material can be applied into wooden components for chairs.

Figure 5. Solid Wood Pieces to be Used, by Zaky Ahmad (2024)

This research activity aims to produce a chair design made of residual solid wood that is not only environmentally friendly, but also aims to develop an innovative design by imitating and adopting innovations that have existed for a long time in the form of body anatomy. It is hoped that humans can develop products and technologies that are more environmentally friendly, sustainable, and answer technological challenges faced by humans.

In determining the initial idea, the author, in this case, lecturers and students jointly sought design ideas from the anatomical shape of the body, namely pieces of human bones in the hope of being able to develop different thinking skills (out of the box) in designing. By realizing how perfect and inspiring the anatomy of the human body is, one can also add to the general knowledge by understanding the structure of the body, in other words one can create a unique chair design by abstracting the anatomical design of the body and can produce a more aesthetic and effective design with appropriate proportions, systems and shapes. The initial stage in the design process is the initial conceptual design stage that goes through using ideas in the form of sketches of initial ideas that have gone through some changes, as shown in the following image:

Figure 6. Initial Idea Sketches, by Zaky Ahmad (2024)

The selection of design forms inspired by the anatomy of the body is in the form of human bone structures. The structure of human bones is made up of various tissues and bone cells. Each tissue and bone cell has a different role for human survival. In addition to maintaining shape and posture, there are other bone structural functions for humans. Bones are a major part of the *musculoskeletal* system. Together with the cartilage, ligaments, tendons, and muscles that make up the system, bones function to give shape and maintain the posture of the human body. The function of the bones is the basis for the idea to answer problems related to the difficulty of designing chairs from pieces of wood waste in order to obtain the right and suitable chair design for use in the lounge area and living room.

Overall, the philosophy of making chair designs that use the concept of bone shape is because the arrangement of bones displays a beautiful and orderly arrangement, so it is hoped that the selection of this design form can attract the attention of potential users and buyers. The design principles applied to the design of this chair are proportion, harmony, and balance. The principle of proportions applied to this chair is through a size that fits the standard lounge chair and is comfortable when seated. Meanwhile, in terms of harmony, this cannot be separated from the selection of materials, shapes and colors taken from the color of the original bones. The principle of balance in the design is applied through a symmetrical design, where the four legs of the chair are designed the same on both the left and right sides. After going through the process of making alternative designs and analysis, selected designs emerge whose development can be seen in Figure 7 in the form of working drawings and perspective drawings. The final sketch design is then made a prototype in a 1:1 scale by first making a draft of the size.

Figure 7. The Working Drawing of Chair design, by Zaky Ahmad (2024)

For the development and improvement of chair design from the initial idea stage, input was then given from several experts in the field of furniture, including lecturers and teaching teams, furniture sellers, and craftsmen as implementers. Based on the feedback given, it is known that the design of the chair is quite attractive in terms of design, coupled with the selection of materials and colors. The disadvantage is the need to change in terms of size because it is still not ergonomic to support user comfort. At the stage of the work, a proposal for the size is first made in accordance with the standard reference of the lounge chair that will be used for relaxation such as to straighten the legs and unwind, lean back, rest the legs, and also lean on the neck and back comfortably to restore strength, so that it can be concluded that in general the design of the lounge chair has armrests and has a backrest that can function to support the body when used.

After the design, size, material, color, and drawings are approved, a prototype chair is then made with a 1:1 scale. In a product design and development process, a prototype is a visualization

of a design concept. In other words, a prototype is a visualization to make it easier for designers to execute the finished design. The existence of this prototype can also make it easier for designers or other related parties to receive suggestions and input from outside parties.

Production Process

The final stage after going through the stages of designing is the production process. The process of making or producing this chair involves many parties, ranging from lecturers, students, to wood workshops and material suppliers. Through the design of this chair, it is hoped that it will be able to boost the economy of the surrounding community, because starting from the idea process to the realization of this chair, everything cannot be separated from Indonesia's own natural resources. Solid wood material was deliberately chosen because it has strong and durable wood characteristics, and is also easy to find in Indonesia.

In this case, the process of making chairs is carried out in the city of Jakarta to support the concept *of* sustainability itself. With this, if chairs inspired by the anatomical shape of the bones are in great demand by the public, then it is not impossible that the community's economy will also be able to increase, starting from handymen, material suppliers, to delivery couriers.

Technically, the process of making chairs begins first by measuring and cutting the remaining wood found, until it is formed according to the agreed design drawing. In addition to solid wood, MDF wood is also used as an additional material. The manufacture of chair frames in the process of making the frame uses iron pipe material. The second stage is a process that involves gluing between wood using iron pipes. Once perfectly glued, the third stage is the application of the base color to the chair. Dyeing is carried out gradually, not directly using the desired color until the dyeing and painting process is dry, then the production process is carried out until the final stage, namely the finishing process. The finishing process is a process that is the last stage in the chair-making process, where the process includes: sanding, which aims to remove wood fibers by means of manual sanding using sandpaper.

The chair production process will also be explained through the following figure:

Figure 8. The Process of Forming the Early Chair, by Zaky Ahmad (2024)

Figure 9. The Bonding Process between Wood and Iron Pipes, by Zaky Ahmad (2024)

Figure 10. Process of Giving the Finishing Color, by Zaky Ahmad (2024)

CONCLUSION

Based on the analysis and discussion of the research, it can be concluded that wood waste, especially solid wood waste, can be used for lounge chair design planning by looking for waste treatment techniques that involve recoating (laminating) waste materials so that they become new raw materials. The new raw materials can then be applied into the components of the chair to produce an attractive and ergonomic shape. In addition, wood waste from the surrounding workshop can also be used for lounge chair design planning by meeting certain requirements, namely material, production, and construction feasible. Materially feasible means that the wood waste can be made into new raw materials through various processes and is able to increase the use value and economic value of the waste. Production-feasible means that wood waste has been packaged into a new raw material so that it can create a context of innovation and construction strength that describes the use of wood waste left over from production. Meanwhile, feasible in construction means the use of a strong and safe connection system, which in this study is realized by using iron pipes as a support for the chair structure.

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