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ERGONOMIC ADJUSTABLE CHAIR AS AN INNOVATIVE PRODUCT MODIFICATION USING WATER HYCINTH WASTE

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ABSTRACT

This research aims to determine the use of water hyacinth waste for handicrafts. Water hyacinth waste is also considered an unprofitable pest plant. The problem faced actually has a solution, namely by utilizing water hyacinth in various fields, one of which is product materials. This design aims to help reduce water pollution while creating a design that combines traditional and modern minimalist with water hyacinth waste materials and carbon steel.

1. Introduction

In Indonesia, water hyacinth or known by the Latin name Eichornia crassipes is a type of plant whose roots have no growing medium except water. This wild water hyacinth plant is usually found in calm streams such as rivers, streams or lakes which has a negative impact such as disrupting mobility in the waters. For fishermen, the wild water hyacinth plant really disturbs fishing boats and this wild water hyacinth plant can damage the environment because the water hyacinth is The dead will accumulate little by little to the surface so that over time the waters will become shallow and can disrupt the ecosystem in the waters [1].

Below is a form of documentation, where the wild growth of water hyacinth is very fast causing the surface flow of the river to be blocked, which can be seen in Figure 1 below.

Figure 1. Wild growth of water hyacinth

Therefore, with the large growth of wild water hyacinth waste, it can be used as a raw material for the craft industry because water hyacinth waste contains natural fibers which have a natural texture that is distinctive, unique and attractive and environmentally friendly. Water hyacinth material is a new

alternative material that is currently being developed on the market as another alternative raw material for making furniture to support activities [2].

The application of this potential material, water hyacinth waste, is expected to provide aesthetic value which of course brings an atmosphere of comfort to the room. By utilizing water hyacinth waste, it can be used as a business opportunity for creative industries by turning products from water hyacinth waste into woven material that can have high commercial value.

Water hyacinth waste crafts are enough to provide several changes to the environment and even create new jobs for the community at CV. TASHINDA which is located on Jl. Bibis Raya, Kasihan District, Bantul Regency, Special Region of Yogyakarta, Central Java which has managed water hyacinth plant waste as a basic material for crafts.

In designing this adjustable chair product, namely a lounge chair which aims to help reduce water pollution while creating a design that combines traditional and modern minimalist with a strong carbon steel frame material using water hyacinth waste, this product can help the effectiveness of the body and leg rests. with a slope of up to 60° according to comfort combined with water hyacinth waste that has been woven or twisted in the seat, body support, wrist rest and legs, by utilizing a small portion of the currently available water hyacinth waste, we have participated in maintain environmental sustainability and ecosystems that influence each other.

2. Literature study

2.1 Product Design and Development

Product Design is an initial process in the product manufacturing process. In the design stage, a decision is made that will influence other activities that follow. Among these important decisions include decisions that have consequences on whether domestic industry can participate or not in a development project [3]. According to (Ulrich-Eppinger 2001), the product development process is divided into six stages (phases) of product development [4]. Below the author includes pictures related to the six phases which can be seen in Figure 2 below:

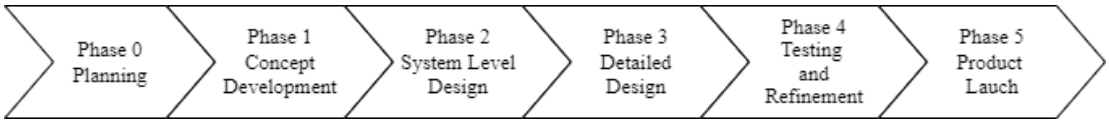


Figure 2. Product Development Phases (Ulrich-Epingger 2012)

2.2 Market Research

Market researchor known as market research is research carried out systematically starting from problem formulation, formulation of research objectives, data collection, data processing to research results. The objectives of market research include understanding consumer needs, identifying market potential, predicting business opportunities, minimizing business risks [5].

2.3 Drying OvenWater hyacinth

Drying ovenWater hyacinth is a practical, efficient and effective drying tool that is really needed for drying water hyacinth waste because the conventional water hyacinth drying process only uses heat from solar energy which takes quite a long time, namely around 7-10 days. and still depends on weather conditions. Problems will arise when the weather experiences changes, cloudy and rainy because the

drying of water hyacinth waste cannot be done optimally so it takes a long time, up to 3 weeks [6]. The following is documentation of dried water hyacinth waste which can be seen in figure 3 below.

Figure 3. Dried water hyacinth waste

This is an example of water hyacinth waste that is used to make crafts, but some of the water hyacinth waste is dried using sunlight, which takes days. It can be seen in the documentation that each year's water hyacinth waste has striking differences ranging from color to texture due to its natural fibers in table 1 below.

Table 1. Finished Water Hyacinth Waste Products

Product Documentation		
		
1 Years	7 Years	11 Years

2.4 Ergonomics

Ergonomics is a systematic science for utilizing information about human characteristics, abilities and limitations in designing a good work system to achieve the desired goals through effective, efficient, safe and comfortable work [7]. In the world of work, ergonomics plays a big role and all areas of work require ergonomics. Ergonomics applied in the world of work makes workers feel comfortable when doing their work. Having this feeling of comfort will be beneficial to the expected work productivity and can increase it [8].

The aim of ergonomics is to create the most harmonious combination between work equipment sub-systems and humans as workers. The following are the main objectives of ergonomics, including: [9].

a. Improving physical and mental well-being through efforts to prevent work-related diseases, reducing physical and mental workload, seeking promotions and job satisfaction.
b. Improving social welfare through improving the quality of social contacts, managing and coordinating work effectively and increasing social security both during the productive age period and after being productive.

c. Creating a rational balance between various technical, economic and cultural aspects of each work system carried out so as to create a high quality of work and quality of life

2.5 Anthropometrics

Anthropometry comes from "anthro" which means human and "metri" which comes from the word measure. By definition, anthropometry is a field that studies the size or calibration of the human body. Anthropometry is one of the branches of ergonomics which has a connection or connection with measuring a person's body dimensions which can be used to carry out ergonomic designs. Data on the sizes of all human body parts from certain ethnic groups is presented in percentage form. [10].

2.6 Tensile Test

Tensile test is a method used to test the strength of a material by applying a force load along the same axis (Askeland, 1985). The results that will be obtained from tensile testing are very important in engineering and product design because they produce material strength data. Tensile testing is used to measure the resistance of a material to static forces applied slowly. The purpose of the tensile test is to determine the ability to withstand tension at a certain power level.

2.7 Benchmarking Method

Benchmarkingis an activity to set standards and targets to be achieved in a certain period. Benchmarking can be applied to individuals, groups, organizations or institutions. Testing or comparing the quality standards that have been set against the quality standards of other parties, so that the term quality reference also appears. In general, benchmarking is used to regulate and improve the quality of education and academic standards [12]. The benchmarking method is an effort made to compare and measure the performance of a company with other companies, which ultimately can be used as information (Tatterson 1996) [13]. The following is benchmarking that will be used as a reference in table 2.

Table 1. Benchmarking Product

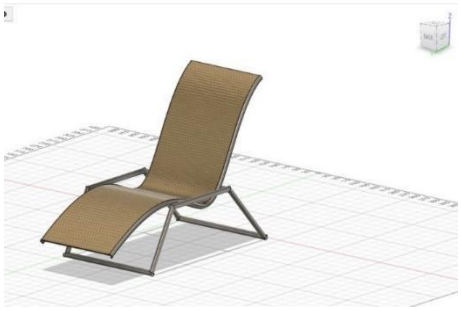
Benchmarking Product	
	
Bamboo lounge chair	Aluminum chair

	
Teak Wood lounge chair	Reclining chair

2.8 Product Concept

The following are several concepts for designing an innovative "adjustable chair" product using ergonomic water hyacinth waste and using a carbon steel frame. Using the Fusion 360 application. It can be seen in table 2.

Product Design

Concept 1

Concept 2

Concept 3

3. Research methodology

The research methodology consists of steps in the research process in the form of a flowchart. The following is a flowchart for the research methodology that will be used in " Egonomic Adjustable Chair Innovation Modification by utilizing water hyacinth waste" which can be seen in Figure 4.

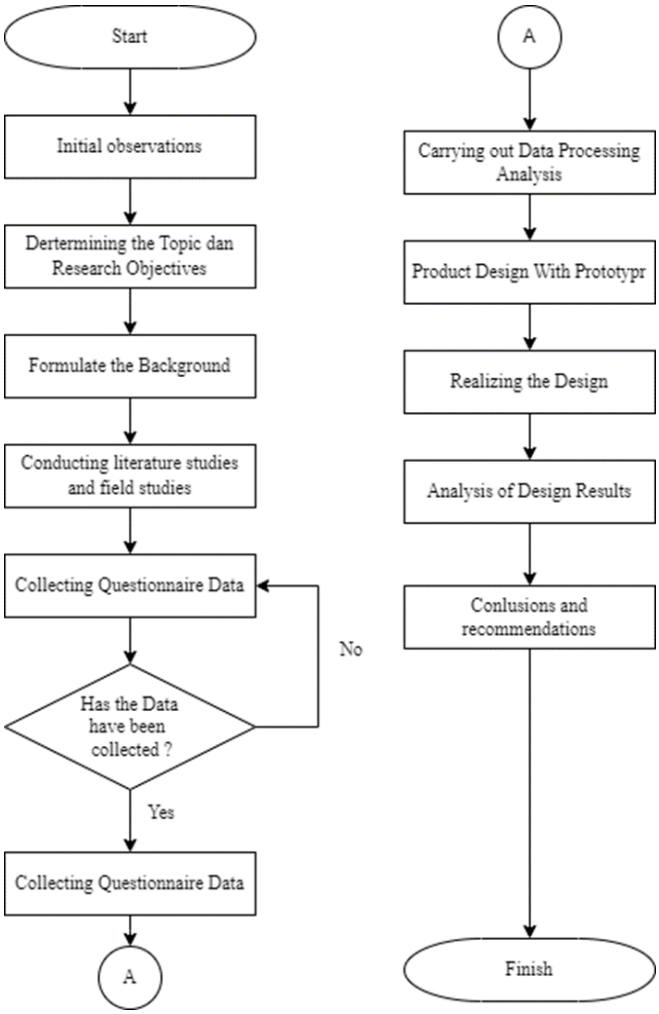


Figure 4. Research Methodology Flowchart

4. Conlusion

This research will continue with product development methods that suit consumer needs using questionnaires and anthropometric measurements in the field of ergonomics. The application of the potential results of water hyacinth waste is expected to provide aesthetic value which of course brings a comfortable atmosphere to the room. By utilizing water hyacinth waste, it can be used as a creative industry business opportunity by utilizing water hyacinth waste.

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