



The Concept of Sustainable Development towards Multifunctional Products

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ABSTRACT

This paper will explain more detail about the way to produce product which is designing and develop by concern the criteria of sustainable. Multipurpose Iron Board is one of the product with applied the concept of sustainability. Multipurpose Iron Board can perform a variety of uses other than iron board itself. In sustainable design, it's able to function as a ladder and chair too. This product is easy to store, easy to carry, lightweight and durable. In addition, the design of which was developed also emphasized aesthetic values. Ergonomic factors are also taken into account so that the user can use the product properly and safely. Anthropometric data is referenced to ensure product will be produce by full fill the ergonomic factors. This product is designed by considered consumer demand through market survey. The current issue such as limited space and less storage will be overcome through the use of this product.

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Introduction

Referred to dictionary, sustainable means unchangeable, eternal, permanent, i.e. a situation or environment has not changed or maintained as the original/genuine. Various products are designed on the concept of sustainability. Normally, to designing a consumer products, designer need to concern about the concept of sustainability such as cost savings, flexibility, easy storage, mobility, durable, green technology and so on.

Therefore, we have conduct the studies about the current design of iron board where existing in the market. The objective of the preliminary studies is to identify the characteristics of the current iron board which is exist in the market whether it's meets the sustainability concept of not. In this study, the iron board was selected because it's a common product and normally each family have one in their home. Through preliminary research was conducted towards 20 consumers of iron board in selected housing estates, it's shown that almost the majority of respondents mention that the iron board used by them unable to stand with a long time, easily damaged, hard to storage, limited functions, size is not suitable height and so on. Table 1 shown the results of a brief interview towards the user of iron board in a housing estate around Merlimau, Melaka.

No	Item	Percentage
My iron board have a particular characteristics such as		
1	Non-durable	95%
2	Hard to storage	90%
3	Do not have a multifunctional	95%
4	Less of Ergonomic	90%
5	Unsafe	80%
6	Uncomfort to use	75%

Table 1: Finding of brief interview towards the user of iron board in a housing estate around Merlimau, Melaka

In addition, various studies have been done towards the iron board where existing in the market. Through the preliminary study conducted either by observation of the existing iron board in the market or through an initial interview to identify the real needs of users. From several expectations of consumers to buy consumer homeware are as durable, rugged, beautiful,

reasonable cost and can be used in a variety of functions and is easy to store. Thus, based on preliminary studies and customer needs, the research have been conducted in order to plan, design and develop the iron board that can work in three functions such as iron board, ladders and chairs by concern the criteria of ergonomic and sustainability.

Planning, Design and Development of Multipurpose Iron Board

The development of iron board as crucial product for housewife needs to study carefully and properly so that the product was produce can meet the demand of users. High level of satisfaction among consumers to use the homeware product is very important. To ensure consumer products such as iron board could be produced perfectly and satisfies the consumer, there are several key factors such as ergonomics, sustainability, form which is shown the Malaysian identity and have a high aesthetic value. The findings of the study towards consumers demand, it was decided that the iron board be developed will have at least three major functions such as iron board, ladders and chairs.





According to an anthropometric data, it was decided that the iron board that will be developed must be follow a specific dimensions of 53cm x 17cm x 33cm. In addition, the product also need to design for limited space, flexibility, mobility, hardy and able to accommodate loads of up to 80kg.

The conceptual basic design of iron board

There have a various design of iron board in the market. The initial study about consumers demand toward iron board is emphasized on the parameters of design, ergonomics, sustainability, and aesthetic values. Based on the highlighted parameter, here are some observations towards a few design of iron board where exist in the current market.

The Research Development of Multipurpose Iron Board

The development of iron board is made anthropometric data were analyzed. In first phase of iron board development, sketched of the product need to do in order to set the concept of the product design.

No	Type of Design	Concept	Advantages	Disadvantages
1		Convenient storage space	Suitable and nice to be a home decoration	1. Requires a big space for storage 2. Expensive Cost 3. Limited function – for one function only 4. Iron board easy to broken because no support structure
2		The mobile concept	1. Lightweight and easily to lifted. 2. Cheap price.	1. The frame of the product is easily to broke 2. The support structure of iron board is not strong. 3. Unstable position. 4. Mirror fragile and may endanger the user
3		The concept of durable	1. Able to iron dress in large quantities 2. Hardy	1. Very Expensive 2. Need a big space. 3. Using high electricity 4. Surface of iron board is too small
4		Flexibility	1. Low price in the market 2. Able to save space for storage	1. The end point of the iron board is easy to bend when supply the over forces. 2. Didn't have a safety criteria 3. Iron easy to fall down when the storage door was be open from the outside and it's will be injured the consumer.

Sketched have be done by use AutoCAD software. In addition, the data obtained from the interviews was analyzed. The finding from the data analysis is then used to develop the multipurpose iron board. During the development process, the value of aesthetics and heritage identity was being concern too. Selection of a suitable material is very important that the products used have a high level of sustainability and meet the needs of users, such as durable, look beautiful and attractive as well as affordable prices. In addition, users also need a product that can be used in various functions of use.

The development process also needs to be well designed. Technical drawing needs to be provided in the product development process. Technical drawing is very crucial medium to be referred within product development process. Technical drawing is commonly applied in manufacturing process especially for mass production.

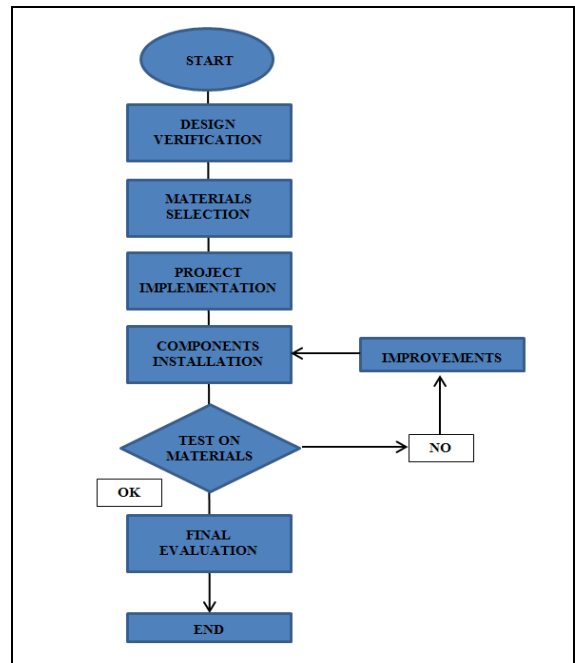
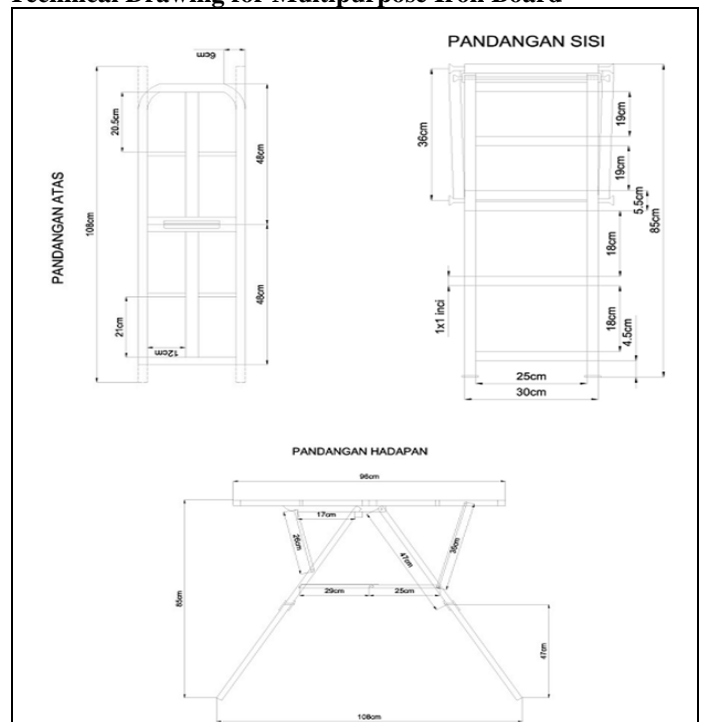
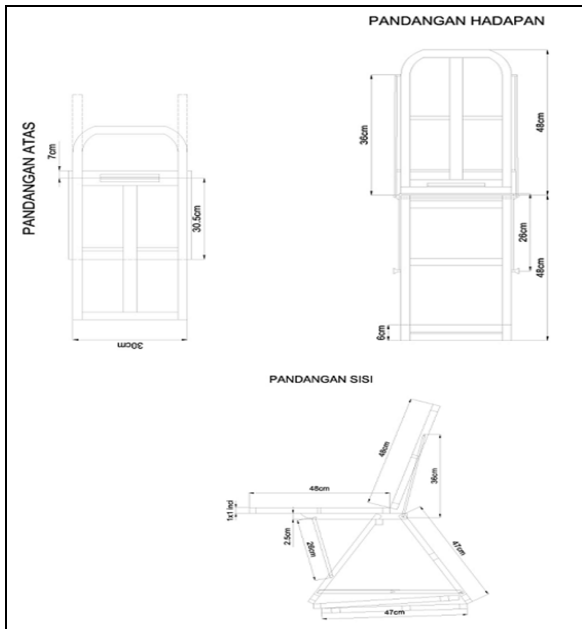


Fig 1: Flow of Research Development

The product development processes commonly begin from a several rough sketching and 3 dimensional illustrations. Appropriate sketches are then transferred to digital form by using appropriate software such as the "sketch up" and so on. Through this software, the anthropometric data were used to determine the actual size of the multipurpose iron board. In design and development process, the aspect of ergonomic is very concern and will realized by use the collected of anthropometrics data. The manufacturing process begins to run when all the components involved in multipurpose iron board have been illustrated in technical drawing with a specific dimension. In addition, the selection of appropriate materials and coinciding also play a very important role to ensure that the objectives to develop multipurpose iron board will be achieve.

Technical Drawing for Multipurpose Iron Board





The Selection of Material Iron Based

<p>Angle iron bar Angle iron bar was used to support the multipurpose iron board where used for the size of 1 inch x 1 inch. In addition, it's being function as supportive for the entire structure of multipurpose iron board. Angle iron bar is a solid iron and be able to bear the heavy load.</p>	
<p>Mild steel hollow bar Mild steel hollow bar is used to make the frame of the multipurpose iron board. It's quite lighter and durable. Mild steel hollow bar was used to develop a particular components where it's can be move and able to bear the high force. This material were selected regarding the to reduce the total weight of multipurpose iron board. The size need for mild steel hollow bar in project is 1 inch x 1 inch. For mild steel hollow bar with size 1/2 inch x 1/2 inch was used to create the frame of multipurpose iron board.</p>	
<p>Cylinder Iron For cylinder iron, we use 10 mm diameter of cylinder iron. This iron was chosen because it is the kind of solid iron. We also focused on the safety factor because when the force is too high attaching the multipurpose iron board frame, a 10 mm diameter of cylinder iron can bear and avoiding the broken of the frame.</p>	
<p>Mild steel bar. Mild steel bar is used to hold the stand of multipurpose iron board in order to avoid fractures and shaking. We use mild steel bar with size of 2 mm x 23 mm.</p>	

The Selection of Fabric Materials

<p>Velvet We choose the type of velvet fabric as the surface can withstand this type of clothing or material to be scrubbed from falling off the board. The size of fabrics is depend to the width of wood which is design to form the surface of multipurpose iron board</p>	
<p>Adhesive fabric types. The adhesive used to attach the board and iron so that it can be easily removed and cleaned later.</p>	
<p>Sponge We use a sponge-sized 1/2 inch thick and 2 meters wide. Sponge will be wrapped on the particular wood to create a cushion-like.</p>	

The Selection of Wood Materials

<p>Ply Wood The type of wood used is plywood with size 2 mm x 920 mm. The timber will be mounted on the frame of the project as a seat or even a clothes brush.</p>	
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The Selection of Others Raw Materials

<p>Hinge Hinge used to be a mover in multipurpose iron board. Hinge used is a type that is commonly used on the door.</p>	
<p>Rubber seats. Rubber seat size used was 1 inch x 1 inch. Rubber seats will be installed at the foot of the multipurpose iron board. The use of rubber is to maintain the position of the multipurpose iron board and will prevent the leg of multipurpose iron board broken.</p>	
<p>Glue type "plastic steel" This type of glue used to attach fabric-based materials to the metal frame and wood.</p>	
<p>Stickers reflective light. To beautify the project, we used the light reflection stickers 3 mm x 4 mm.</p>	

Cost & Materials

No.	Raw Materials	Dimension (inci) / (meter)	Price Per Unit (RM)	Quantity (m)	Total (RM)
1.	Mild steel hollow	1 inci x 1 inci	2	9	18.00
2.	Mild steel hollow	½ inci x ½ inci	0.40	2	2.00
3.	Angle bar	1 inci x 1 inci	2.90	1.70	5.00
4.	Cylinder Steel		2.00	3	6.00
5.	Mild steel bar	1 inci		0.5	2.00
6.	Velvet	1 meter	5.00	1	5.00
7.	Adhesive fabric types.	1 meter	2.50	1	2.50
8.	Sponge	1 meter	1.50	1 meter	1.50
9.	Plywood	11 inci x 18 inci			3.20
10.	Hinge		2.30	4	9.20
11.	Rubber Seat		1.00	4	4.00
12.	Glue type "plastic steel"		10.00	1	10.00
13.	Sticker	0.06 x 2	7.50	2	15.00
14.	Spray		5	3	15.00
Total					99.90

Recommendations and Conclusion

Research to develop the quality of multipurpose iron board with a several features like multifunctional, durable, meets the ergonomics criteria, raise the Malaysian identity and have a high level of aesthetic value need to go through the research process, every detail. Anthropometric data is very important to produce a quality product with ergonomic factors. The Emphasis on various parameters of ergonomics and heritage will generate a very attractive and quality of consumer products. In addition, the

multipurpose iron board needs to be enhanced by adding with a various functions, using lighter raw materials such as quality alloy and ensure the movement of each component can be done properly and efficiently.

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