



Design of Hydraulic Folding Table to Minimize the Use of the Room

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Abstract:

The purpose of this research is to make a table that does not require a large space so that it can be used at home or a place that does not have a large room. The method used in this study is the Ulrich method. It is used in this study to explain the steps in designing a product. The results obtained in this study are five available concepts. The concepts are evaluated and filtered carefully so that two concepts are chosen to be developed. It is done by comparing the ranking value and weight of each concept to make it easier to use formulas to assist in the assessment process. The chosen concept will be used to design the product. With the framework specifications using hollow iron, hydraulic drive, and magnetic holder, as well as bearing as a player and wood as a table mat. In conclusion, several phases must be passed in designing a product so that the results obtained will be satisfactory.

Keywords: Hydraulic Folding Table, Product Design, Wood Material

INTRODUCTION

The limited land area in big cities makes the development of housing areas limited. Therefore, making residence verticals is one of the ways to overcome land tenacity. There are several categories of vertical dwellings ranging from flats, boarding houses, and others. In general, vertical dwellings provide many habitable living spaces and limited land can accommodate many residents (Green & Bonollo, 2002).

Limited land development also results in limited building area, so that the use of some household furniture such as study tables, sofas, and others is limited. In everyday life, learning or eating is done by almost everyone or all walks of life. Conducting these activities requires facilities that can be used for learning activities or others require a desk or another facility. For

some people who have limited space, a table can make a narrower space and it is an obstacle that needs to be solved. The demand for a responsive design is increasing rapidly, and it is becoming the face of future designs (Maher, 2021). Product Life Cycle in product design is very important (Rachmawati & Kurniawan, 2019). For product designers, tools and techniques are essential in driving the design cycle (Kondash et al, 2018). Research has been conducted by Green which confirms that the method for product design consists of the steps of product planning, concept design, concept generalization, and evaluation (Robecca & Putra, 2019).

Based on these conditions, we are inspired to create tables that can be placed in a narrow or limited space but do not reduce the function and comfort value. The ideas outlined were thought through in the design of the Hydraulic Folding Table product.

RESEARCH METHOD

This research activity was carried out by interviewing and giving questionnaires to residents of flats, housewives, and boarding houses. The data is processed and the results are obtained to design a product, which is a table that does not require large storage space. Designing a tool requires a method so that the desired product becomes appropriate. The method used is the product design and development book authored by Karl T. Ulrich and Steven D. Eppinger. The stages that must be passed to design a product according to Ulrich and Eppinger are from the mission statement namely identify customer needs, set target specifications, design product concepts, choose product concepts, test product concepts, set final specifications, and plan development paths to product manufacturing plans (Gupta et al., 2019). All of that can be called the concept development process. In addition, the resulting product must be ergonomic to be comfortable to wear (Yu, 2019). The following is a description of the product design flow that is shown in Figure 1.

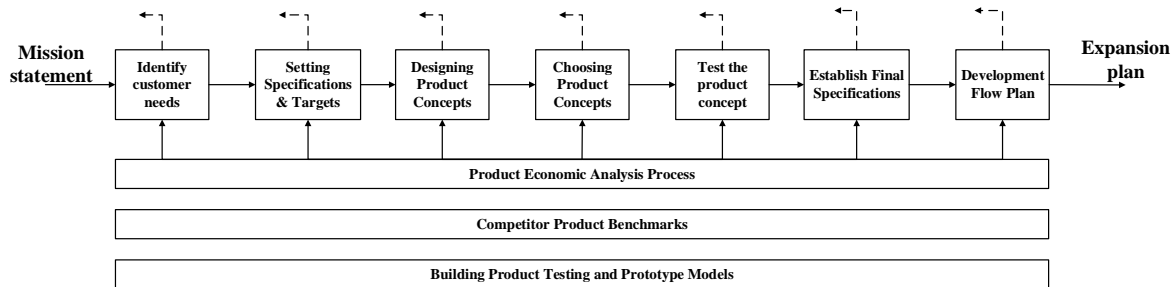


Figure 1. Concept development process

RESEARCH RESULTS AND DISCUSSION

In the concept selection stage consists of five sub-problems, namely the design framework with hollow iron or angle iron solutions, driving energy with iron or hydraulic solutions, anchors with iron angle solutions or magnets, the player with a solution of iron axles or bearings, and pedestal with a solution of wood or steel plate table combinations.

At the drafting stage, there are five concepts. We evaluate and filter out these five concepts to select the best concepts. The concept evaluation is carried out with several selection criteria that have been prepared and compared to the five existing concepts. After that, it is assessed with the +, -, and 0 which is seen as its final value and as a determiner of whether the concept will be continued or not.

The results of the concept evaluation produce two concepts that will be continued to the last step. The first is Concept 1 that is made as a reference and the second is Concept 2 that

is made to be compared. In evaluating the concept, there are selection criteria. The weighted value will be used multiplied by the assessment to be a weighted value, which is shown in Table 1.

Figure 2. Use case Diagram

Criteria Selection	Weight	Concept 1 (reference)		Concept 2	
		Rating	Weight Value	Rating	Weight Value
Easy to operate	15%	3	0,45	4	0,6
Strong	20%	3	0,6	3	0,6
Ergonomics	25%	3	0,75	3	0,75
Aesthetic	15%	3	0,45	4	0,6
Affordable	15%	3	0,45	3	0,45
Price					
Easy Assembled	10%	3	0,3	3	0,3
Total			3.00		3.33
Ranking			2		1
Continue?			No.		Yes.

The concept evaluation results were selected one concept from the two concepts that are being compared and the chosen one was concept 2 with a total value of 3.33. The following is a selected image from concept 2. The combination table combines the design frame with a hollow iron solution, driving energy with hydraulic solution, anchoring with a magnetic solution, the player with bearing solution, and a wood solution base.

Concept 2 has a design framework solution that is divided into two parts, namely upper and lower parts; the bottom framework has the following sizes:

- a) Length : 0.25 m
- b) Width : 0.5 m
- c) Height : 0.75 m

As for the upper frame, the measurements are as follows:

- a) Length : 1 m
- b) Width : 0.5 m
- c) Height : 1 m

Driving energy used a 30 cm hydraulic length. For anchoring using a magnet, it will use a bearing with a diameter of 5 cm, and the base of the product framework is made of wood material that has the following size:

- a) Length : 0.25 m
- b) Width : 0.5 m
- c) Height : 0.03 m

The product design is shown in Figure 2.

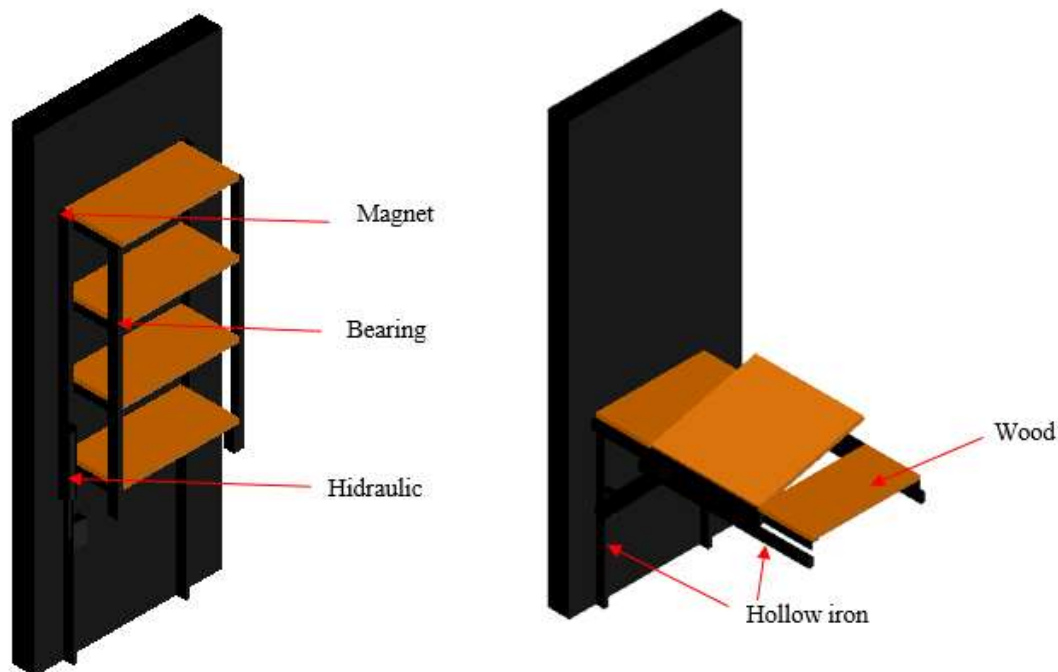


Figure 2. Selected Concept Design

This research was using the House of Quality method conducted confirms that the importance of product design is in accordance with user needs (Robecca & Putra, 2019). Unger's research confirms that the Product Development Process is needed to reduce product development time, minimize risk, and create better products (Shen et al., 2017). The study was conducted at IKEA companies in China to identify the success of IKEA in product design based on three aspects namely market position, design concepts, and consumer experience. The results obtained are the design concepts of IKEA products that can save space play an important role in IKEA products' success (Lyu et al., 2018). The product design must be based on several factors to get a good Product Life Cycle (Yu, 2019 & Zhang et al., 2018).

CONCLUSION

In conclusion, we proposed products that do not require extensive storage by making a table folded against a wall when it is not used. The process begins with the selection of five concepts given. After that, we filtered the two best concepts. The first concept is used as a reference along with the second concept. Meanwhile, the second concept that was chosen consisted of a hollow iron frame, hydraulic propeller, magnetic support, bearings, and a wooden base for rotating.

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