

Design tools multifunction equipment

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Abstract. Product design can be defined as idea generation, concept development, testing and implementation of manufacturing (physical objects) or services. Product designers create concepts and evaluate ideas, making ideas come true through products in a more systematic approach. The purpose of this research is to help farmers who are engaged in SMEs chips. Tool attributes are derived from results brainstorming by tool designers. Design size data is obtained from direct observation and survey market of sliced chips on the market and according to consumer tastes. This versatile slicer is used to increase the production of farmers. The data obtained for the specification of the tool is data from the results of answers on questionnaires distributed directly to entrepreneurs SMEs chips residing in some areas, Medan Tuntungan, Medan, Indonesia. Brainstorming is a method used to generate a large number of ideas that most of these ideas will be discarded. With QFD method, compared multifunction slicing tool with 3 other competitors with the same attribute. Sub solutions are generated from the completion of any emerging issues, including in selecting attributes for bird repellents using measures Nigel Cross to maintain excellence and improve product quality. From an alternative generation with a combination of attributes, the result is an alternative 1 as the basic criterion in making an orange-drawer. Evaluate alternatives using Pairwise Comparison and scales AHP to calculate the weighting of each attribute and determine the ranking of each alternative. Value engineering is the final step in the design process with the aim of increasing the value of the product to the consumer and lowering the costs that must be incurred by the manufacturer

1. Introduction

Design can be defined as idea generation, concept development, testing and the execution of manufacturing (physical objects) or services. Product designers create concepts and evaluate ideas, making ideas come true through products in a more systematic approach. In other words, product design is a complete step that can be done to get the design of a desired tool.

Improvement of tools in the field of agriculture to obtain increased production continues to be done .Both chemically and mechanically .One on the processing of agricultural products to supplement income and improve production quality. The production of chips from agriculture proceeds will increase in quality and quantity of yaan production gives farmers and UKM farmers an advantage in agriculture.

The farmers who are engaged in UKM chips perform their activities using a knife cutter. So, farmers take a long time to produce chips because it must be done manually. Therefore we created a multifunction slicer that can reduce the time and cost of production to farmers engaged in UKM. In addition to petrifying the farmers in terms of time and production costs

also helps in the worker's posture and deficiency while performing work that reduces the effects of the work on the panjag and results in the solid formation of the bones of the farmer's body. By using this slicer also workers do not need to measure with manual thickness of the slices of chips or bouquet, simply by adjusting the thickness of the bolts on the slicer tool then automatically the potato or chips that we slice will have the same thickness. In addition to the thickness of the chips that can be arranged we can also give a new innovation on the form of chips that we will make by changing the blades on the slicer with a jagged shape.

With these conditions it will greatly help farmers who have a weak economy in addition to helping in terms of quantity production also helps in providing new creations on the type of chips that will be marketed and help also in the field of product competitiveness in the market is now increasingly worldwide.

2. Methods

This study aims to show the importance of multipurpose knife tool that will be used by farmers engaged in the field of small and medium enterprises. By distributing questionnaires and surveys market, more detailed information about multifunction slicer is available.

The first step in product design is to brainstorm. Brainstorming methods are well known for generating ideas. There are eight steps of brain-storming : forming groups and selecting group leaders, informing the brainstorming rules, group leaders declare initial problems, each group member thinking up ideas within 30 minutes, then writing and giving an opinion on the ideas generated, and finally collecting all papers as a result of evaluation from brainstorming.

The sampling technique that will be used is purposive sampling because the population that will be the sample is the farmer engaged in small and medium business. After determining the number of samples, an open questionnaire, closed questionnaire, and AHP questionnaire were prepared. All types of questionnaires are used to determine what farmers expect from the design of the tools performed. With all the answers on the questionnaire, then tested the validity and reliability of the answers about the design of multifunctional slicer tool.

Furthermore, to determine the product characteristics used QFD method. QFD is a method to improve the quality of a product or service in order to understand what the customer needs and connect them with technical provisions to produce the product or service at every step of the product or service manufacture process.

In order to find solutions to any problem from making products, steps that generate alternatives, evaluate, and improve the details. From all these steps, it can be concluded that the product can be made with the right attributes and cost.

3. Result and Discussion

The results of this product design are efficient, effective, ergonomic and affordable lawn mowers that farmers can use to cut weeds on their farms. The design problems contained in the design of this lawn mower include cutting tool material, the maximum length of cutting tools, blade material, the length of the blade, the number of blades, the cutting toolmaker, the cutting tool colour, the handle material of the cutting tool, the length of the handle of the cutting tool , as well as fuel tools.

3.1. Classification of Objectives & Functions, Determination of Needs

To find the solution of the above problems, there are 3 steps needed so that the problem will be divided into sub- issues, namely the classification of purpose & function, and

determination of needs. The conclusions of the 3 steps in the design of multifunction slicer products are: The

1. List of the purpose of designing the multifunction slicer is:

- a. Material used i-steak
- b. Cut thickness can be adjusted up to 1mm
- c. Corrugated and flat
- d. Knife Number of cutter blade 1 can be changed
- e. Length of slice handles 12cm
- f. Tool height 6cm
- g. Tool length 45cm
- h. Length of knife
- i. Tool width 6cm
- j. Tool colour brown wood

Diagram can be seen in Figure 1.below this

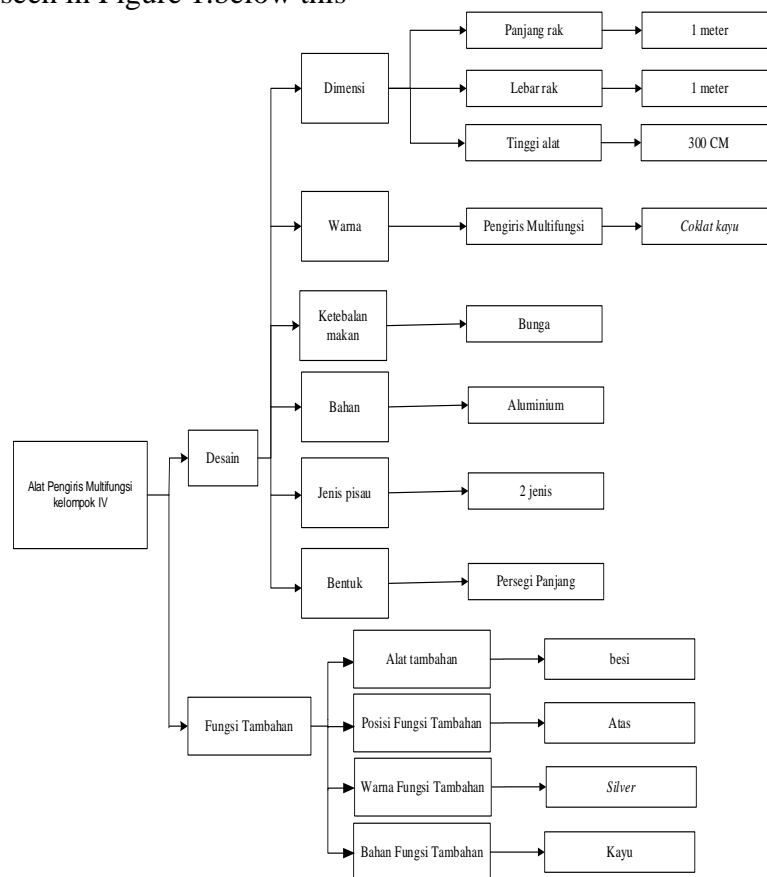


Figure 1.Tree Chart Objective

2. Division of functions into sub-sub functions Essential
 - a. Sub-main functions
 - b. Sub-additional functions
3. Determining the level of the main generalities:

- product has a comfortable and ergonomic design.
- product has a long life /endurance.

3.2. House of Quality

In this section, the *sub-problem* of the multifunction slicing tool specification will be found sub solution with steps from designing *Nigel Cross*, to determine the characteristics of the product. *House of Quality* multifunctional slicer tool can be seen in Figure 2.below this

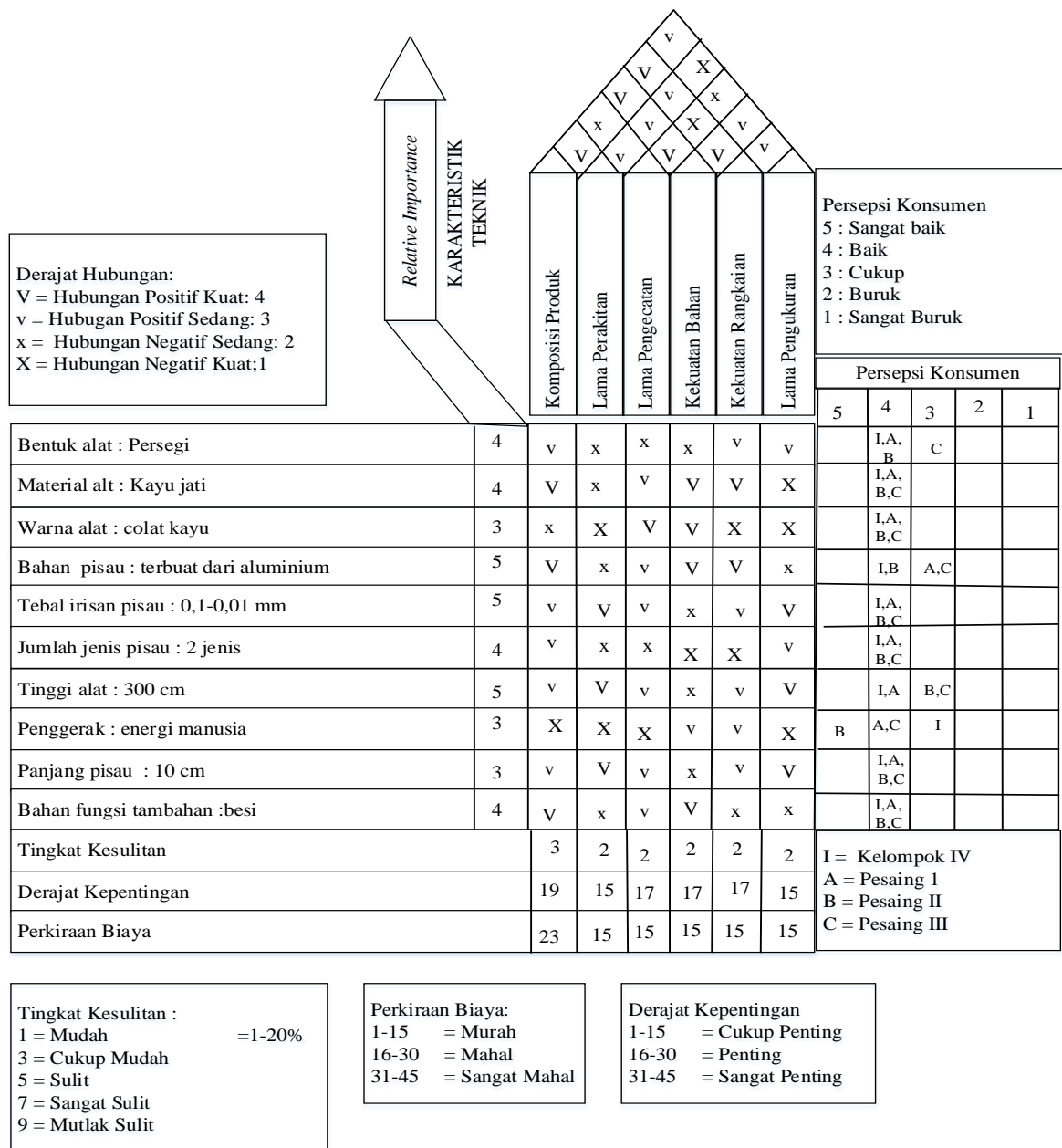


Figure 2.Quality Function Development Multifunctional Group Critical Device

Conclusion :

1. Bully Bird Attributes based on the results of the questionnaire according to the consumer's wishes are as follows:

- a. Tool shape : Square
- b. Material tool : Teakwood
- c. Tool Colour : Chocolate wood
- d. Material Knife : Aluminium
- e. Length of knife : 10cm
- f. Type of knife : 2pieces
- g. Tool height : 300cm.
- h. Drivers : human
- i. Iris thickness : 0.1-0.01mm
- j. Additional functional materials : iron

2. Comparison of multifunctional slicer products with competitors for the same attribute based on customer perception are as follows: For tool form: Group IV product, competitor 1, and competitor 2 is superior to the competitor's product3.

- a. For material Tool : Group IV is far superior
- b. For the tool colour : all products are equally superior.
- c. For blade materials : Group I and competitor 2 products are superior to competitor 1 and competitor products3.
- d. For propeller diameter : all products are equally superior.
- e. For blade types : Group IV has advantages compared to others
- f. For high tools : group I and competitor 1 products are superior to competitor 2 and competitor3.
- g. For propulsion : competitor 2 products are superior to other products.
- h. For Meat Thickness : group IV and competitor 3 are superior to other competitors.
- i. For additional functional materials: all products are equally superior.

3. Difficulty: all technical characteristics are quite easy.

4. Degrees of Interest: all technical characteristics are important except for the duration of the assembly and the length of the measurement is quite important.

5. Estimated Cost: all technical characteristics are cheap except the composition of the product.

3.3. Sub Solution

Sub solution comes from solving any problems that occur, including the selection of attributes for multifunctional slicing tools carried out with the use of measures Nigel Cross, while maintaining the advantages it already has and improving the quality of the product.

In this section, there are 3 steps done to sub solutions into solutions, namely alternative generation, alternative evaluation, and communication (improving details). Here are the conclusions of the three steps in the process of designing the birds repellent:

3.3.1. Alternative Generation

Some design solutions are applied as an alternative choice of orange-drawer and find solutions using the Morphological Chart. Morphological Chart is presented in the form of a

10 x 3 matrix in which 10 is a function to be completed and 3 is a possible alternative. The combination of bird repellent design solutions can be seen in Table 1.below this.

Table 1.Combination of Product Design Solution Multifunctional

No	Karakteristik	Cara Mencapai Fungsi		
		1	2	3
1	Bentuk Tiang	Silinder	Persegi	Persegi Panjang
2	Material Tiang	Besi	Plastik	PVC
3	Warna Alat	Biru	Merah	Hitam
4	Material Baling-Baling	Seng	Plastik	Seng
5	Diameter Baling-Baling	80	85	90
6	Banyaknya Tuas	2	3	4
7	Tinggi Alat	200	250	300
8	Fungsi Tambahan	Bambu	Kaleng	Kaleng
9	Alat Penggerak	Angin	Dinamo	Angin
10	Diameter Tiang	10	15	20

Sumber: Pengumpulan Data

Alternatif 1

Alternatif 2

Alternatif 3

3.3.2. Alternative Evaluation

Evaluation is conducted with the aim of comparing utility values of alternative tool designs created or made on the basis of performance on the basis of weighting purposes. In doing so, first a list of objectives is made of product design, then determines the ranking of all alternatives with the Pair Wise Comparison and AHP scale.

The result of the relative weights of each attribute on the other attributes can be seen in Figure 3 below this

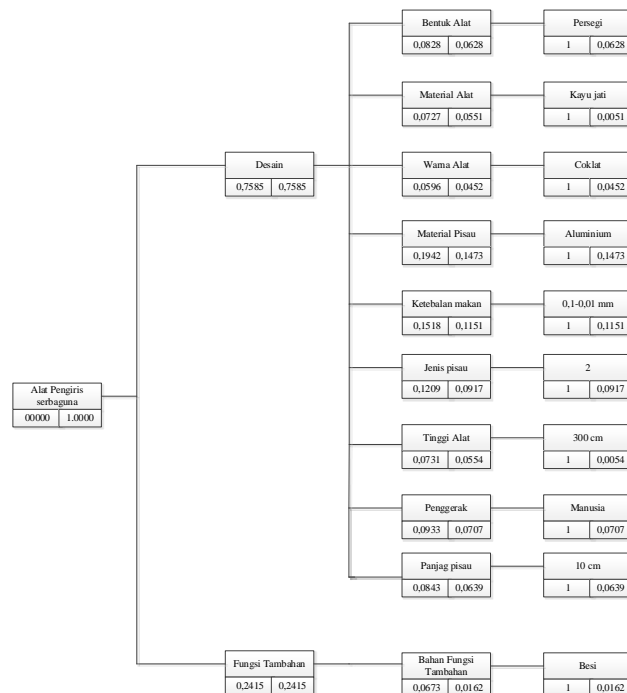


Figure 3. Relative Weight Value of Each Attribute Against Other Attributes

After that, determine the performance parameters of each attribute. Performance parameters can be seen in Table 2.below this.

Table 2.Performance Parameters Each Attribute

Characteristics	Parameter	Value				
		5	4	3	2	1
Shape Tool	Quality	Very Good	Good	Fair Good	Less Good	Not Good
Material Tools	Quality	Very Good	Good	Fair Good	Poor	Not Good
Color tool	Quality	Very Good	Good	Fair Good	Poor	Not Good
Material Knife	Quality	Excellent	Good	Fair Good	Less Good	Not Good
Knife length	Size	80	85	86	90	95
Knife Type	Quantity	2	3	4	5	6
Tool height	Size	300	250	200	150	100
Drivers	Quality	Very Good	Good	Fair Good	Less Good	Not Good
Cutting density	Size	20	15	10	8	5
Additional functional materials	Quality	Excellent	Good	Fair Good	Poor	Not Good

Then calculate and compare the relative weight value of each attribute for each alternative. The relative weight value of each attribute can be seen in Table 3.below this

Table 3. Value of Interest Relative Weight of Each Attribute for Each Alternative

Criteria Evaluation		Parameter	Alternative1			Alternative 2			Alternative 3		
Characteristics of	WT		Ket.	Value (v)	Wt. (v)	Ket.	Value (v)	Wt. (v)	Ket.	Value (v)	Wt. (v)
Shape Tool	0.0828	Quality	Excellent	5	0.414	Good	4	0.3312	Good Enough	3	0.2484
Tool Material	0.0727	Quality	Very Good	5	0.3635	Good	4	0.2908	Fairly Good	3	0.2181 Tool
Color	0.0596	Quality	Very Good	2	0.1192	Pretty Good	3	0.1788	Good	4	0.2384
blade Material	0.1942	Quality	Very Good	5	0.971	Good	4	0.7768	Very Good	5	0.971
blade length	0.1518	size	80 cm	5	0.759	85 cm	4	0.6072	90 cm	3	0.4554
Type Knife	0.1209	Quantity	2	5	0.6045	3	4	0.4836	4	3	0.3627 Tool
height	0.0731	Size	300 cm	5	0.3655	250 cm	4	0.2924	200 cm	3	0.2193
Activator	0.0933	Quality	Good	4	0.3732	Good Enough	3	0.2799	Good Enough	3	0.2799 Meal
thickness	0.0843	Dimension	10 cm	5	0.4215	15 cm	4	0.3372	20 cm	3	0.2529
Materials auxiliary functions	0.0673	Quality	Good	4	0.2692	Good	4	0.2692	Good	4	0.2692

3.4. Solution

Value engineering is the final stages of the design process aimed at increasing the value of the product for the consumer and reducing the cost to be incurred by the manufacturer. The steps are to list the product components and identify the function of each component, determine the value of the dominant function, calculate the cost of each component, find ways to lower costs without reducing its value, and finally evaluate the alternatives. The cost required to make a multifunctional slicer is Rp160, 000.00.

4. Conclusion

Conclusion that can be drawn from the design of the bird's repellent device is:

1. This multifunctional slicer is made with a square with the base material using teak and aluminium blade type, the thickness of the feed from 0, 1-0.01 mm, type of knife there are 2 types of blade length 10cm, and colour of wood brown tool
2. For the attributes of the multifunctional slicer can be divided into 2 parts. The primary attribute of a multifunction slicer product is additional design and functionality. Design attributes are divided into secondary attributes i.e. tool shape, tool material, tool colour, knife material, propeller diameter, multiple levers, tool height, drive, and feed thickness. Additional function attributes are additional functional materials.
3. For QFD it is found that all the characteristics of the technique are easy to do.
4. Based on engineering step, it is found that from the alternatives there is the best alternative with total cost IDR 160.000,00.

5. References

- [1] Ginting, Rosnani. 2013. *Product Design*. Yogyakarta: Graha Science
- [2] Saleh, Ardiyanto Modjo. 2012. *Design of Pest Control Equipment for Rice Bird Eating Pests (Oryza Sativa L.) Electrical Mechanical System*. Gorontalo: State University of Gorontalo