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AN APPLICATION OF VALUE ENGINEERING TO INCREASE VALUE OF SME'S PRODUCT (A STUDY ON SME PRODUCES SCHOOL HAT)

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A B S T R A C T

Value engineering is an approach that can be used to increase value of a product. This study employed value engineering approach to improve value of school's hat that is produced by small companies located in the Sidoarjo area. Through the application of value engineering, there are four alternatives considered as new idea generation by analyzing and substituting raw materials. Value of the existing product is 1,000 and it costs Rp.11.830,-. After made some analysis of new product alternatives and assessing the score of each options, the result is that alternative 1 has the highest value by 1,396. It means that alternative 1 serves as the best alternative with the smallest production cost as well (Rp.7.930).

Keywords: value engineering, school's hat, product value, production cost.

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1. Introduction

Small and Medium Enterprises (SMEs) have different characteristics from its large companies (Berisha & Pula, 2015). In general, it can be said that SMEs have limited resources as comparison with big enterprises in many aspects such as number of employee, production and technology facilities, funding, market network and other factors. Nevertheless, SMEs have to be able to survive and be able to increase their performance in order to win business competition (Herman dkk, 2018).

According to Suhaeni (2018) study, it is said that efficiency in production cost and maximizing product's value can be an effective approach to survive and succeed in business competition. Value engineering is a systematic and structured approach used to analyze and improve the value of a product, process, or system. It focuses on identifying and eliminating unnecessary costs while maintaining or improving performance, quality, and functionality (Rane & Attarde, 2016).

The goal of value engineering is to achieve the optimal balance between cost, quality, and performance by examining the various components, materials, processes, and functions involved in the development or production of a product. It involves a multidisciplinary team of experts who analyze and evaluate the design, specifications, and functionality to identify opportunities for cost reduction or performance enhancement (Younker, 2003).

Value engineering is commonly used in various industries, including construction, manufacturing, software development, and project management. It can be applied to different stages of a product's life cycle, from conceptual design to production, to identify cost-saving measures, enhance performance, or address specific challenges (Gohil & Patel, 2018) . Value engineering can be beneficial for SMEs as well (Ilham dkk, 2018). While SMES may have limited resources compared to larger organizations, implementing value engineering principles can still help them achieve cost savings, improve performance, and enhance their competitiveness in the market.

Implementation of value engineering technique in the lens of scale and complexity may vary for SMEs compared to larger businesses. It may takes different efforts for different size of companies, but the core principles remain relevant. Implementing value engineering practices can contribute to the success and sustainability of SMEs by maximizing their resources, reducing costs, improving products or services, risk mitigation, fostering innovation and adaptation, scalability and growth, project feasibility and decision making (Tao & Yu, 2018).

This study examines the application of value engineering in a small company located in Sidoarjo regency, East Java Province which produces

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school's hat. This business specializes in manufacturing and supplying hats specifically designed for students in schools. Based on data collected from the business owner, it says the business is getting less competitive. It showed that within the last 2 years ago, the number of product sales of school's hat has fluctuated and getting decreased in volume. The SME owner expect could reduce production cost and can increase product's value. This his research aims to improve the company's business competitiveness by making production cost efficiencies and increasing product's value using a value engineering approach.

2. Methods

The value engineering process typically involves the following steps (Ibusuki & Kaminski, 2007):

1. Information gathering: Gathering all relevant data, including design specifications, cost information, component, manufacturing process and performance requirements.
2. Functional analysis: Examining the functions of the product or system and determining their importance to the overall objectives. This step helps identify the critical functions and potential areas for improvement.
3. Creative idea generation: Brainstorming and generating creative ideas to improve value, reduce costs, or enhance performance. This step encourages thinking outside the box and exploring alternative approaches. Some possible ideas could include:
    a. Exploring alternative materials or components that offer similar performance but at a lower cost.
    b. Reducing the number of components or simplifying the design without affecting functionality.
    c. Streamlining the manufacturing process to increase efficiency and reduce production time.
    d. Improving the value and product quality to enhance the user satisfaction.
4. Evaluation and selection: Assessing the generated ideas based on their feasibility, potential benefits, and risks. Ideas are evaluated against the project's objectives and constraints, and the most promising ones are selected for further development.
5. Development and implementation: Developing the selected ideas into practical solutions or design changes. This involves detailed analysis, prototyping, testing, and validation to ensure the proposed changes meet the desired objectives.
6. Supplier evaluation: Review the existing suppliers and explore alternative suppliers for components or materials. This can help identify cost-effective options without compromising quality.
7. Monitoring and review: Continuously monitoring the implemented changes to assess their effectiveness and identify any further opportunities for improvement. Regular review and feedback help refine the value engineering process and drive ongoing optimization.

This study applied value engineering approach starts from information gathering stage until evaluation and selection. It will not employ stage implementation, supplier selection and monitoring due to budget and time limitation of research

3. Results and Discussion

Based on direct observation and interview conducted with some respondents, some information about school's hat produced by this SME are:

a) Product material. Material used to make a school's hat by this SME are various type of cloths, plastic, yarns, sponges, colouring materials.
b) Production process. This company uses conventional production facilities and techniques due to limited capital. General overview of the steps involved in the hat-making process in this firm are (1) design and pattern making, (2) material selection and cutting, (3) sewing and assembly, (4) finishing, (5) quality control and inspection, (6) packaging and labelling.
c) Production cost. The production costs consist of raw material costs (Rp.7.480,-), direct labor costs (Rp.2.250) and overhead costs (Rp.2.000). It has Rp.11.730 in total.
d) Limitation relating with the product. This product has some limitations which are price of raw materials is relatively expensive, raw material used is relatively less quality, packaging material uses thin plastic, high selling price.

In order to develop and to design alternatives product, there are four criteria used. It generated by interview with the owner and expert, namely production cost, quality of product, ease of new design implementation, convenience of use felt by customer. In addition, it is necessary to identify and to classify product part and its function as shown in table 1.

Table 1. Identification and functional classification of product.

No	Part	Function	Primary Function	Secondary Function
1	Hat	Head covering and uniform identity attributes	x	
2	Plastic (*pet*)	Protecting from sunlight	x	
3	Cloth	Head covering	x	
4	Plastic of *sliwer*	Make product looks tidy and neat		x
5	Cloth of *furing*	Inner part cover		x
6	Cloth of *peles*	Covering bottom part		x
7	Rope of *kur*	Decoration		x
8	Yarn	Combining parts		x
9	Sponge of *Eva*	Keep the hat upright		x
10	*Filkrow*	Back		x

No	Part	Function	Primary Function	Secondary Function
		adhesive		
11	Printing	Identity and decoration		x

In order to gain a comprehensive understanding of the functions and interactions within a product how it is made, FAST technique (Functional Analysis System Technique) (Borza, 2011) was used in this study. This facilitates the identification of opportunities for improvement and enables effective value engineering to enhance the overall performance and value of the system or product.

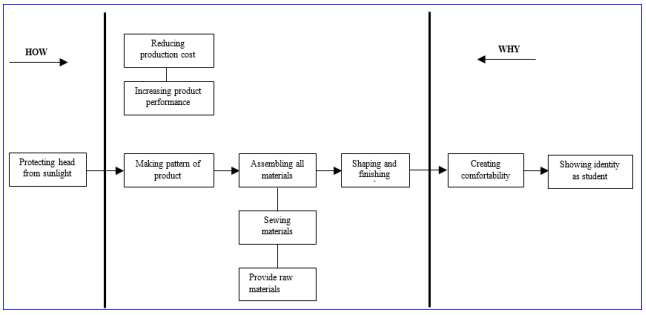

Figure 1. FAST Diagram of School Hat

According to FAST Diagram has constructed, there are four idea generating as alternative named as alternatif 1, 2, 3, 4. Alternative 0 is existing product detail.

Table 2. Various type of alternative considered

Component	Alternative 0	Alternative 1	Alternative 2	Alternative 3	Alternative 4
Raw material	Plastic (*pet*), *cloth of famatex*, cloth paper of *sliwer*, cloth of *furing* "*mitra anda*", cloth of *peles*, rope of *kur*, yarn of *yamalon*,	Plastic (*pet*), american drill, *sliwer* of twill cloth, cloth of *furing "baby"*, cloth P7, white rope of *kur*, yarn of *yamalon*,	Plastic (*pet*), *sliwer* of sponge cloth, cloth of *furing*, cloth of *peles*, rope of yellow *kur*, yarn of *yamalon*, black sponge eva, *strap*	Plastic (*pet*), cloth of *leken*, *sliwer* made from recycled imitation leather, cloth of *furing spund bond*, cloth of *peles*, yarn	Plastic (*pet*), cloth of *violetta*, *sliwer* made from recycled imitation leather, cloth of *furing*, cloth of *peles*, rope of
	black eva sponge, *velcrow* plastic.	white eva sponge, recycled waste of *velcrow*, painting.	*velcrow* made from plastic	of *yamalon*, white sponge eva, elastic rubber	white *kur*, yarn of *yamalon*, black sponge eva, plactic *velcrow*
Packaging	Thin plactic	Thick plastic	Thick plastic	Thick plastic	Thick plastic
Production Cost	Rp.11.830,-	Rp.7.930,-	Rp.10.105,-	Rp.8.805,-	Rp.9.030,-

Table 3. Alternative performance score based on certain criteria

Criteria	Weight	Alternative 0		Alternative 1		Alternative 2		Alternative 3	
		Score	Performance	Score	Performance	Score	Performance	Score	Performance
Production cost	0,264	1	0,264	5	1,319	2	0,528	4	1,055
Product quality	0,265	4	1,058	4	1,058	4	1,058	3	0,794
Ease of new design implementation	0,224	3	0,672	4	0,896	4	0,896	3	0,672
Convenience of use felt by customer	0,248	5	1,239	5	1,239	5	1,239	4	0,991
Total		3,233		4,511		3,720		3,511	

In the previous value engineering stage, performance value for each alternative and cost required have been obtained. From this performance, it is then used to calculate the value of each alternative using formula (1).

$$V = P/C \quad (1)$$

where:
V = Value
P = Performance
C = Cost

The value score obtained is then converted to financial value (Rp currency) using formula (2) as follow. The best alternative is an alternative with the highest value.

$$Pn' = (Pn \; . \; Co)/Po \quad (2)$$

Table 4. Performance value of each alternative and its rank

Alternative	Performance	Cost	Conversion value	Value	Rank
0	3,233	11.830	Rp. 11.830,00	1,000	4
1	4,511	7.930	Rp. 11.067,55	1,396	1
2	3,720	10.105	Rp. 11.692,62	1,151	2
3	3,511	9.030	Rp. 9.809,29	1,086	3

According to table 4, it can be seen that alternative 1 has the highest value by 1,396 compared to other alternatives value. This means that alternative 1 is the best recommended alternative to implement. This alternative also has the lowest production cost (Rp. 7.930,-) as opposed to other options available.

4. Conclusion

Value engineering can be used to get improvements in product's value produced by SMEs. The value of school hats produced by this SME can be increased by selecting and substituting raw materials and packaging used. This strategy results new product designs with lower production costs and better product value.

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