ISSN 2087-3336 (Print) | 2721-4729 (Online)

**TEKNOSAINS: Jurnal Sains, Teknologi dan Informatika** 

Vol. 11, No. 2, July 2024, page. 322-330 http://jurnal.sttmcileungsi.ac.id/index.php/tekno DOI: 10.37373

# Feasibility analysis of the veil convection business using value engineering for cost efficiency

## Dilla, Amri\*, Muhammad Zakaria

\* Industrial Engineering, Faculty of Engineering, University, Malikussaleh, 24352, Jln. Batam, Balng Pulo, Muara Satu – Lhokseumawe, Aceh, Indonesia

\*⊠ iramri@unimal.ac.id

Revised: 10/05/2024

Submitted: 13/03/2024

ABSTRACT

Accepted: 19/05/2024

The veil business is a business that operates in the veil manufacturing industry. The products produced vary according to consumer demand and the stock produced. This headscarf product has spread to several areas of Aceh, such as Banda Aceh, Lhokseumawe, and Langsa, especially the Bireuen City area, and has collaborated with several Islamic boarding schools. The headscarf models released by this company greatly influence consumer demand. The better the material, model, and quality, the more consumer demand for convection will increase. This research aims to analyze the feasibility of developing a veil convection business using a value engineering method and financial feasibility. The research results were obtained using the analytical hierarchy process method and vacuum engineering. The chosen alternative is model 1, with a weight of 0.53, a square hijab type, standard material, soft colors, and zipper accessories according to consumer demand. The results of the financial aspect calculations show that the Ita Hijab convection business has a positive NPV of IDR 29,373,042, with a BEP of 480 units. The payback period for investment capital is 5 months. If you look at the payback period calculation with a BCR value > 1, then the veil convection business is said to be worthy of investment.

Keywords: Analytical hierarchy process; feasibility; veil; net present value; value engineering

#### **1. INTRODUCTION**

Product development is a cross-disciplinary activity that requires contributions from almost all functions in the company but three functions are most important for the project, namely marketing, design, and manufacturing [1],[2]. The causes of product development include market pull, technology push, product platforms, and process-intensive products [3],[4]. As the research results show, the lower the quality of the market information collected, the greater the possibility of making unwise decisions, which in turn renders the company unviable [3],[5]. The four common marketing management policies that will be broken down are called (marketing mix), namely product, price, distribution, and promotion [6][7].

Layout is a process of determining the shape and placement of facilities which can determine production or operational efficiency [8]. A business feasibility study is an activity that studies in depth about a business activity for a business that will be carried out, in determining whether the business is feasible or not [9][8]. The benefit of conducting a business feasibility study is that the investment must provide a rate of return that is commensurate with the amount of capital spent [10]. The stages carried out in general are idea discovery, research after the idea is selected, evaluation after the idea is selected, measurement of the proposal, project implementation plan, and project implementation [11].



TEKNOSAINS: Jurnal Sains, Teknologi dan Informatika is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License. **ISSN** 2087-3336 (Print) | 2721-4729 (Online) The method used is the value engineering method. Value engineering is a creative and systematic approach eliminate unnecessary costs [12],[13]. The goal of value engineering is to distinguish between what meets the need and what is required so that alternatives can be developed that meet the need at the lowest cost but whose performance remains the same or even better [14]. There is also an analytical hierarchy process method used in this research to evaluate and make multi-criteria decisions [15]. And to evaluate various alternatives based on different criteria and assign a relative score to each alternative.

The problem raised in this research is the feasibility of developing a veil convection business, and what alternatives will be used in developing veil products. This research aims to determine the feasibility of developing a veil convection business and to find out the alternatives used in product development for veil convection.

## 2. METHOD

The data collected in this research was carried out at a veil convection located in Pante Gajah village, Peusangan District, Bireuen Regency. In this research, several data collection techniques were used, namely: 1) Literature study, namely by reading references, books, or literature that are related to the theoretical basis. 2) Observation, namely a data collection technique by observing directly in the field by taking data regarding variables related to the main problem. Documentation, namely the technique of retrieving data from the company's past. 3) Interview, namely a data collection technique using direct interviews to obtain an explanation of the place of business

#### Aspects of feasibility analysis

The aspects contained in a project or business feasibility study which consist of the various aspects mentioned above include (5): 1) Marketing and market aspects, 2) Human resources aspects, and 3) Technology management and operational aspects. 4) Financial aspect. 5) Competitor aspect. Several methods will be used in calculations to see the feasibility of financial aspects, including [16].

$$Payback \ period \ (PP) = \frac{investment \ value}{net \ cas} \times 1 \ year \tag{1}$$

a. If the payback period > economic life, the investment is rejected

b. If the payback period < economic life, the investment is accepted

Net Present Value (NPV) = 
$$\sum_{t=1}^{n} \frac{cft}{(1+k)} - 1$$
 (2)

Where:

Cft = Annual cash flow in period t = Initial investment in year 0 Io Κ = Discount rate PV kas masuk Profitability Index (P1) =(3)PV Kas keluar Where: Pi = Profitability index ΡV = *Present value* Internal rate of return (IRR) =  $i1 + \frac{NPV1}{NPV1 - NPV2} \times i1 - i2$ (4)Where: IRR = Internal rate of return

Cfn = Net cash flow

i1 = The discount rate that produces NPV +

i2 = The discount rate that produces NPV -

NPV 1 = Net present value is positive

NPV 2 = Net present value is negative

Feasibility analysis of the veil convection business using value engineering for cost efficiency

(5)

Calculating the break-even point (BEP) of product units = FC/(P-VC

Where:

P = Selling price per unit

$$FC = Fixed cost$$

- V = Variable costs per unit
- Q = Number of units or quality of product produced or sold.

Understanding value engineering

Value engineering is a systematic method for increasing the value of services and products or goods by using a test of function, while value engineering according to experts is Value Engineering is an effort that is systematically organized and applies a recognized technique, namely the identification technique. product or service function that aims to fulfill the required function at the lowest (most economical) price quoted from the Society of American Value Engineers) [13].

#### Analysis of the function of value engineering

Function is the main topic of discussion in value analysis. A functional approach is taken to reduce the costs of a project. In the functional approach, 3 discussions are related to each other (11), the information stage. creative stage, analysis stage, development stage, presentation/follow-up stage.

## AHP (analytic hierarchy process)

The analytical hierarchy process (AHP) method was developed by Prof. Thomas Lorie Saaty (1993) to find the ranking or priority order of various alternatives in solving a problem. In everyday life, a person is always faced with making choices from various alternatives. It is necessary to determine priorities and test the consistency of the choices that have been made.

#### 3. RESULTS AND DISCUSSION

#### Data collection.

The equipment and materials used in production and the costs incurred in the process of dissolving Kerudunlg can be seen in Table 1.

	Table 1. Types of equipment				
No	Jenlis Equipment	Amount	Unit Price (Rp)	Total (Rp)	
1	Sewing machine	5 unit	3.500.000	17.500.000	
2	Serger Machine	1	3.700.000	3.700.000	
3	Soursop Machine	1	3.700.000	3.700.000	
4	Scissors	5 unit	30.000	150.000	
5	Display Cabinet	1	3.500.000	3.500.000	
6	Iron	1	300.000	300.000	
7	Mannequin	5	47.000	235.000	
8	Veil Hanger	2	50.000	100.000	
9	Meter	5	3.000	15.000	

Table 1. Types of equipment

The raw and auxiliary materials used in the production of headscarves can be seen in Table 2

	Table 2. Raw materials and supplies				
No.	Raw material	Information	Cost (Rp)		
1	Diamond Fabric	100 m	3.000.000		
2	Wolfis fabric	200 m	6.000.000		
3	Crepe boarding cloth	200 m	4.800.000		
4	Arabian crepe fabric	200 m	4.000.000		
5	Sewing thread	3 box	60.000		
6	Overlock thread	1 box	84.000		
7	Knit lace	20 m	200.000		
8	Meter zipper	10 m	200.000		
9	Needle	1 pack	16.000		
10	Plastic packaging	1 pack	15.000		

Table 3. Variable costs			
No	Description	Monthly Fee (Rp)	
1	Employee salary	3.250.000	
2	Electricity	400.000	
3	Marketing	300.000	
4	Transportation costs	200.000	
5	Machine maintenance costs	600.000	

Expenditures for monthly variable costs in producing veils can be seen in Table 3.

The number of veil requests for one year can be seen in Table 4.

No	Month	<b>Production Quantity/Pcs</b>	Profit/Loss (Rp)
1	April 2022	170	5.100.000
2	May 2022	230	6.900.000
3	June 2022	210	6.300.000
4	July 2022	200	6.000.000
5	August 2022	100	3.000.000
6	September 2022	220	6.600.000
7	October 2022	200	6.000.000
8	November 2022	150	4.500.000
9	December 2022	185	5.550.000
10	January 2023	130	3.900.000
11	February 2023	200	6.000.000
12	Maret 2023	250	7.500.000

## Data processing

AHP calculations. The AHP method is a decision-making method that combines objectivity and subjectivity in this case because AHP emphasizes rationality and quantitative, such as systematic calculations. After calculating the weight of the criteria which was carried out by distributing questionnaires to 44 respondents from teenagers to adults, for each alternative the overall results were obtained as shown in *Figure 1*.



Model 1	Rectangle	Standard	Soft	Zipper
Model 2	Brackets	Standard	Dark	Lace
Model 3	Rectangle	Standard	Soft	Zipper

Feasibility analysis of the veil convection business using value engineering for cost efficiency

From the calculation results of the three models above, the highest average weight is in model 1. The range of alternatives. The range of alternatives is determined by looking at the number of highest weights, while the highest weight can be seen in the following calculation:

$\begin{bmatrix} 0.37 & 0.29 & 0.43 & 0.31 \\ 0.29 & 0.17 & 0.19 & 0.38 \\ 0.33 & 0.52 & 0.37 & 0.29 \end{bmatrix} X$	0.28 0.45 0.65 0.07	=	0.53 0.25 0.25
	_0.07		

In the ranking of alternatives, the highest weight is the chosen alternative or modal veil. So we can conclude that the alternative chosen is model 1 with the highest weight of 0.53. Investment and working capital requirements. From the calculations made, the amount of investment to develop the veil convection industry business is IDR. 21,830,000/month, and unexpected costs of 10% of the capital required. Unexpected costs = 10% x Rp. 21,830,000 = Rp. 2,183,000.

#### Value engineering process

The information phase is the initial stage in this final project report, which consists of consumer demand data, identification of consumer needs, and product benchmarking using the product function analysis system technique (FAST).

#### Request data

Data on demand for veil products for one year can be seen in Table 5

Table 5. Product demand data			
No	Month	<b>Production Quantity/Pcs</b>	
1	April	170	
2	May	230	
3	Juni	210	
4	July	200	
5	August	100	
6	September	220	
7	October	200	
8	November	150	
9	December	185	
10	January	130	
11	February	200	
12	Maret	250	

#### Creative phase

Veil criteria are obtained by brainstorming a list of consumer needs and benchmarking which have been grouped in the previous phase and depicted on the FAST diagram. The results of brainstorming criteria for veils can be seen in Table 6

14010 0. 7 mary 313 01	bioduct efficitit bused off th	lie list of requirements
Table 6 Analysis of	product criteria based on th	he list of requirements

No	Criteria	Remarks
1	Practical	Practical on a faceted veil using a multi-function zipper
2	Provides aesthetic value	Showing the beauty of the veil with a new design and attractive colors

### FAST method

FAST is an abbreviation for function analysis system technique. FAST is a tool that graphically depicts logical relationships, and functions of an element, subsystem, or facility. The results of

brainstorming consumer needs and product benchmarking can identify the functions needed for the headscarf, which can be seen in Figure 2.



Figure 2. FAST veil diagram

Analysis Phase

From the analytical hierarchy process calculation above, the alternatives that can be selected are as follows; The type of veil chosen is square, with this square model it can be formed instantly with dimensions of 130 cm x 130 cm, and 150 cm x 150 cm. The type of fabric used is material with standard thickness, but it is not transparent and also absorbs the environment, so the type of fabric that the researchers chose was Arabian scrape but for IDR 35,000/meter. As shown in Figure 3.



Figure 3. Designed hijab

Development phase

The development stage carried out is by adding alternatives to the latest veil models, such as The type of a fabric used is fabric with standard thickness. The accessories used are multifunctional zippers and lace. The veil colors that will be produced in large quantities are soft veils such as baby blue, broken white and others.

### Working capital

After calculating costs, the industrial manufacturing business requires a working capital of IDR. 24,013,000, from 50% of its capital, namely Rp. 14,407,800, while the loan is 50% amounting to Rp. 9,605,200, with an interest rate of 5%. The cumulative nlet present cash flow obtained can be seen in *Table 7*.

Table /. Cumulative net present cash flow			
Description	Investment	Cumulative Net Cash Flow (Rp)	
Initial	24.013.000	0	
Investment			
1st year		1.900.000	
2nd year		4.554.000	

Feasibility analysis of the veil convection business using value engineering for cost efficiency

Description	Investment	Cumulative Net Cash Flow (Rp)
3rd year		9.000.000
4th year		13.991.312
5th year		18.273.003
·		47.718.324

Payback Period

Calculation of payback period, loan repayment amount

payback period 
$$= \frac{investment value}{net \ cash \ inflow} x \ 1 \ year$$
$$= \frac{Rp.24.013.000}{Rp.47.718.324} x \ 12$$
$$= 5.0$$

From the calculation of the payback period, the amount of loan repayment is 5 months and days. Because the value of the payback period is below the investment return requirements (5 years), then based on PBP this investment is feasible to implement.

## Net present value

The net present value calculation to assess the potential and capabilities of a business within a certain period is as follows:

$$NPV = \Sigma_{t=1}^{n} \frac{cft}{(1+k)} - 1$$

$$NPV = (14.407.800)/(1+0.12) + (14.407.800)/(1+0.12)2 + (14.407.800)/(1+0.12)3) + (14.407.800)/(1+0.12)4) + (14.407.800)/(1+0.12)5)$$

$$= Rp.29.373.042$$

From these calculations, it can be concluded that NLPV > 0 or Rp. 29,373,042, then Veil's business is said to be feasible.

# Profitability index

Profitability index calculation for analysis that visualizes the relationship between costs and benefits of a proposed project

$$P1 = \frac{PV \ kas \ masuk}{PV \ Kas \ keluar}$$
$$P1 = \frac{Rp.29.373.7042}{Rp.24.013.000} = 1,22$$

Because the value 1.22 is >1, according to the criteria of this method, investment for business development is declared feasible.

## Internal rate of return

Calculation of the internal rate of return or internal rate of return, is a metric used in financial analysis to estimate the profitability of a potential investment

$$IRR = i1 + \frac{NPV1}{NPV1 - NPV2} x \ i1 - i2$$
$$IRR = 0,12 + \frac{8.792.056}{8.792.056 + 3.576.357} x \ 0,25 - 0,18$$
$$IRR = 16\%$$

The IRR obtained is 16%, because the IRR is >1 (15>12), then the Ita hijab business is worth developing.

Calculating the break-even point

Calculating the break-even point of profit and loss in a business is an option. Of course, every company wants a profitable profit.

- Product Unit BEP = FC/(P-VC)
- Product Unit BEP = (RP.24.013.000)/(Rp100.000-50.000)
- Product Unit BEP = 480 unit
- BEP Rupiah = Rp. 24.013.000/(Rp.50.000/Rp.100.000) BEP Rupiah = RP.48.026.000

The rupiah BEP from the example above is IDR 48,026,000. Based on the BEP calculation above, we can conclude that to achieve a break-even point with a sales price of IDR 100,000, the business must sell a total of 480 units.

#### Discussion

Based on the research results, if viewed in terms of aspects and alternatives it can be explained as follows: 1) Technical Aspects. Based on the results of research that has been carried out on the veil manufacturing business, technically it requires additional investment with additional raw materials and working capital of IDR 24,013,000, and which is planned through a bank loan of around IDR 14,407,800 with monthly installments of around IDR. 2,800. 000. 2) Marketing Aspects. This convection aspect has been around for more than five years. Because for some time the only convection has been working on a make-to-order basis and the income has fluctuated, therefore the development carried out in the only aspect is that production is carried out routinely every month. 3) Financial Aspect. Based on the results of research, financial aspects can be seen from the financial side, the initial business can be said to be feasible if can meet all its financial obligations. Where the NLPV is IDR 29,373,042 (greater than 0), IRR 16% (greater than D.F 12%) and PI>1. So it can be concluded that this business is feasible to run and seen from the ability to repay the loan costs for 5 months with installments of 2.8 million/month.

#### Alternative.

Based on the comparison results of the AHP and value engineering methods, the results obtained in model 1 for the weight of general criteria were 0.37, material criteria, 0.29, color criteria, 0.43 and accessories criteria, 0.32. In model 2, the weight of the general criteria is 0.29, the material criteria are 0.17, the color criteria are 0.19 and the accessories criteria are 0.38. In model 3, the weight of the general criteria is 0.33, the material criteria are 0.52, the color criteria are 0.37 and the accessories criteria are 0.29. The results obtained for value engineering are the type of veil, material type, veil color, and accessories that will be used, namely model 1 with the highest weight of 0.53 with a square hijab type, standard material with soft colors, and zipper accessories.

## 4. CONCLUSION

Based on the research that has been carried out, it can be concluded that the development of the veil convection business is considered to be economically feasible, according to the selected alternative, namely model one with a weight of 0.53 with a square hijab type, standard material, soft colors, and zipper accessories by consumer demand. As a result of calculating the financial aspects, the Veil convection business has a positive NPV of IDR 29,373,042, with a BEP of 480 units. The payback period for investment capital is 5 months. Look at the payback period calculation with a BCR value > 1, then the veil convection business is said to be worthy of investment.

## ACKNOWLEDGMENT

Feasibility analysis of the veil convection business using value engineering for cost efficiency

Thank you to Ita Hijab Bireuen City for allowing the research to be completed and also to Malikussaleh University for providing the opportunity to carry out this research.

# REFERENCES

- [1] Gahara Dwi Putra and Ade Momon, "Analisis lingkungan kerja pada area gudang garmen menggunakan metode 5S di PT XYZ," *JENIUS J. Terap. Tek. Ind.*, vol. 4, no. 1, pp. 131–142, 2023, doi: 10.37373/jenius.v4i1.531.
- [2] I. A. M. Karl T. Ulrich, Steven D. Eppinger; terj. Nora Azmi, Perancangan dan pengembangan produk. Jakarta Salemba Teknika. [Online]. Available: http://kin.perpusnas.go.id/DisplayData.aspx?pId=36721&pRegionCode=UKWMS&pClientId= 710
- [3] M. Imtihan, "Perancangan Produk Boneka Pada Unit Usaha Kecil Untuk Meningkatkan Kemandirian Dengan Metode LP Simpleks," *TEKNOSAINS J. Sains, Teknol. dan Inform.*, vol. 7, no. 1, pp. 08–17, 2020, doi: 10.37373/tekno.v7i1.1.
- [4] Roberta Heni, Solihin, Jasan Supratman, and R. Muhendra, "Pengembangan model peramalan penjualan menggunakan metode regresi linier dan polinomial pada industri makanan ringan (Studi Kasus: CV. Stanley Mandiri Snack)," *TEKNOSAINS J. Sains, Teknol. dan Inform.*, vol. 10, no. 2, pp. 185–192, 2023, doi: 10.37373/tekno.v10i2.456.
- [5] F. Hendra, S. Supriyono, R. Efendi, R. Rosalinda, and R. Indriyati, "a Business Feasibility Analysis of Small and Medium Enterprises for Product Strategy Determination," *Sci. J. Reflect. Econ. Accounting, Manag. Bus.*, vol. 4, no. 3, pp. 421–431, 2021, doi: 10.37481/sjr.v4i3.320.
- [6] M. A. Wijaya, S. Nugroho, M. Ali Pahmi, and Miftahul Imtihan, "PENGENDALIAN PERSEDIAN PRODUK DENGAN METODE EOQ MELALUI KONSEP SUPPLY CHAIN MANAGEMENT," JENIUS J. Terap. Tek. Ind., vol. 2, no. 1, 2021, doi: 10.37373/jenius.v2i1.92.
- [7] H. Umar, *Metose Penlelitianl Unltuk Skripsi danl Tesis Bisnlis*. PT. Raja Grafinldo Persada, Jakarta, 2007. [Online]. Available: https://opac.perpusnas.go.id/DetailOpac.aspx?id=586712
- [8] M. M. Dr. Kasmir, S.E., M.M., Jakfar, S.E., *Studi kelayakan bisnis*. Jakarta : Prenadamedia Group, 2020 © 2003, 2020. [Online]. Available: https://opac.perpusnas.go.id/DetailOpac.aspx?id=1307179
- [9] H. R. Development and N. L. Millikin, "O n t g u i d e".
- [10] F. Rangkuti, Studi kelayakan bisnis dan investasi : studi kasus / Freddy Rangkuti. Jakarta : Gramedia Pustaka Utama, 2012, 2012. [Online]. Available: https://opac.perpusnas.go.id/DetailOpac.aspx?id=857986
- [11] M. DRS. DANANG SUNYOTO, SH., SE., DASAR DASAR MANAJEMEN PEMASARAN: KONSEP,STRATEGI,DAN KASUS. YOGYAKARTA: CAPS, 2012. [Online]. Available: http://katalogdisperpusipkabgorontalo.perpusnas.go.id/detail-opac?id=17998
- [12] Kotler Philip & Amstrong, "Dasar Dasar Pemasaran Jilid 1 Edisi Kesembilan," *Basic Mark.*, 2003.
- [13] G. D. Zimmermanl, L.W danl Hart, A Practial Approach For Ownlers, Designlers and Conltractors. NLew York: Vanl NLostranld Reinlhold Inlc, 1982.
- [14] G. Ramadhon, "Analisis Faktor-Faktor Yang Mempengaruhi Perilaku Perpindahan Pelanggan," J. Manaj. dan Akunt., vol. 2, no. 3, pp. 1–16, 2013.
- [15] M. A. Pahmi, A. F. Ayob, and G. Suprayitno, Changes in Priority Scale Between Needs vs Wants in Customer Perspective During and After the Covid-19 Pandemic Using Fuzzy AHP, vol. 1. Atlantis Press SARL, 2024. doi: 10.2991/978-2-38476-118-0 59.
- [16] M. A. Pahmi and M. Imtihan, "Simulation to Optimized Logistic Model in Feasibility Assessment Dump Truck Investment," *PVJ-IS 2020 Conf.*, pp. 1–6, 2020.