Investment Feasibility Analysis Addition of Painting Machine CV. Creative 71 considering Taxable income and Price Changes

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Abstract

The tight competition in the industrial world has spurred companies to be fast and responsive in producing quality products. This article is a development and refinement of Asyifa & Sutopo's (2017) article in analyzing the feasibility of investing in a painting machine to solve the bottleneck problem at CV. Creative 71. The previous analysis was evaluated and recalculated using more comprehensive and accurate data. The choice of the depreciation method based on a combination of the straight-line method and the DL method can result in a significant depreciation amount being charged at the beginning of the investment. While the tax used is 1% of gross income by the provisions of Government Regulation of the Republic of Indonesia No 23 years 2018. This article considers the rupiah exchange rate changes and aspects of the relationship between each key parameter in the proposed investment. The results obtained are NPV of Rp.312,897,652, IRR value of 21.951%, PP value for 0.048 years, and PI value of 66.152%. And B/C ratio of 4,004. From a financial point of view, it shows the investment in adding a CV. Creative 71 painting machine can be considered feasible because the calculated values have met the proposed indicator limits.

Keywords

Depreciation and tax, feasibility analysis, price changes, sensitivity analysis, DL-Method

1. Introduction

competitive conditions in the world of the manufacturing industry trigger business units to be able to produce quality and value-added products in order to gain the trust of their consumers. Various efforts were made by business units to improve the quality and quantity of production through investment in purchasing more capable machines, such as what was done by CV. Creative 71. Various qualitative and quantitative criteria are considered in selecting the best alternative in investment. Consideration of the financial aspect of the investment is the basic point in the analysis of

investment feasibility. The step in determining the prospect of a project decision that is limited by time and based on cost estimates is the basic meaning of investment feasibility analysis (Sullivan et al., 2015). Investment analysis also estimates the consideration of the estimated costs with the benefits gained (Newnan et al., 2004). If the costs incurred are not in accordance with the benefits obtained, then the investment plan is said to be in vain.

CV. Creative 71 is a manufacturing business unit engaged in manufacturing bus seats. Based on the research of Susetyo et al. (2015), CV. Creative 71 has a weakness in its production system. First, the business unit lacks adequate facilities to support the production process, so there is *a bottleneck* in the production process. Second, the number of machines used is not proportional to the number of products being worked on, resulting in excessive queues at specific workstations. Susetyo et al. (2015) also discussed determining the optimal number of machines to reduce *bottlenecks* through the proposed investment for eight years with a MARR of 15%. In this discussion, a simulation is carried out using a pro model application and considering the financial factors of the proposed investment. Susetyo et al. (2015) consider the B/C Ratio, NPV, and IRR parameters to know the optimal number of machines and the feasibility of investing in financial factors on the proposed investment.

The research of Susetyo et al. (2015) has been developed by Arsyifa & Sutopo (2017) by recalculating the investment feasibility analysis by considering depreciation costs, income taxes, and *annual costs* to obtain a better feasibility analysis calculation. However, research conducted by Arsyifa & Sutopo (2017) in conducting a study of investment feasibility analysis still has weaknesses. First, income and expenses are not calculated with certainty. Second, it does not consider the fluctuating exchange rate factor in investment, so the investment assumption of constant prices is unrealistic. Third, there is no optimal comparison of depreciation calculations so that it has an impact on the present worth that will be borne by the business unit towards the payment of income tax charged. Fourth, there is no analysis of the relationship between variables that can be considered in decision-making.

Depreciation and taxes are interrelated attributes in the investment feasibility analysis. Depreciation is not a cash flow, but its value and timing will affect the taxes borne by the business unit (Newnan et al., 2004). Depreciation is the allocation of an asset's depreciation cost over its useful life (Sullivan et al., 2015). In line with that, Pujawan (2015) thinks depreciation is an annual expense aimed at covering the initial investment value minus the residual value over the economic life of the investment. While taxes are cash outflows that are regulated following applicable tax regulations and must be considered in assessing the overall economic feasibility of a project (Sullivan et al., 2015). Determining the suitable depreciation model will affect the value of taxes that will be borne by the business unit so that the depreciation value will directly affect the amount of taxable income (Newnan et al., 2004; Sullivan et al., 2015)

In addition to considering depreciation costs and taxes, investment feasibility analysis should also consider changes in exchange rates money because the exchange rate will constantly change from time to time (Gynther, 1965). Changes in the exchange power of money will cause the calculation of income flows to decrease in value from time to time, so it is necessary to consider the exchange power in calculating cash flows (Acunto et al., 2019). The consideration of the rupiah exchange rate is based on the rate of change in Indonesia's inflation and deflation in the hope of representing a more realistic exchange rate within a predetermined period. In line with the consideration of changes in exchange rates, many researchers argue that investment feasibility analysis needs to consider aspects of the relationship impact of each key parameter on the proposed investment using sensitivity analysis (Rezzouk & Mellit, 2015). Sensitivity analysis will explain the level of impact of changes in critical variables on investment feasibility (Sullivan et al., 2015); examples of investment feasibility using sensitivity analysis such as research by Berwanger & Ghisi (2014) which considers price changes on the feasibility of rainwater harvesting investments in south brazil, research by Sutopo et al., (2018) which uses sensitivity analysis to explain the model's ability to respond Uncontrolled input research by Acunto et al., (2019) which discusses investment design based on price changes expectations and various other researchers.

This article is a development and improvement of Asyifa & Sutopo's article (2017) regarding the feasibility of investing in adding a painting machine to CV. Creative. This article describes, pays attention to, and considers data and attributes that are more holistic and accurate. In addition, this article expands the calculations from the previous article by considering income taxes and price changes. The calculations also consider aspects of the relationship between changes in critical variables to investment feasibility using sensitivity analysis. The investment parameters from an economic point of view used in this article are Payback Period (PP), Net Present Value (NPV), Profitability Index (PI), Internal Rate of Return (IRR), and Benefit-Cost Ratio (B/C ratio). Also, conduct a sensitivity analysis on the characteristics of the investment to be carried out to a deeper understanding of the sensitivity of the decision effect to changes in the parameters used in determining the practical alternative. The urgency of this study aims to provide a more holistic and accurate perspective on the feasibility of investing in the addition of a painting machine component to minimize bottlenecks in CV. Creative 71.

1.1 Objectives

Based on the background description, this article aims to provide a perspective on the feasibility of adding a painting machine to CV. Creative 71 by considering income taxes and price changes in the feasibility calculation to provide a more accurate and actual calculation.

2. Literature Review

Investment feasibility is an action used in determining the prospect of an investment project within a predetermined period which will be the basis for a decision on whether an investment is feasible (Newnan et al., 2004; Sullivan et al., 2015). Consideration of various qualitative and quantitative criteria is significant in selecting the best alternative for investment. One of them is the consideration of financial factors, which are one of the essential references in the feasibility analysis (Mardikaningsih et al., 2016). Financial factors on investment feasibility are closely related to the planning horizon. The description of estimated future cash flows will be considered in the planning horizon (Pujawan, 2015). Cash flow estimation is not affected by technological age and depreciation age (Newnan et al., 2004). However, the calculation of the feasibility analysis must consider depreciation. Depreciation will affect the tax borne by the business unit, so depreciation and tax are interrelated attributes in investment feasibility analysis (Sullivan et al., 2015).

In addition to considering depreciation and taxes, consideration of the price change is also needed in determining calculations that provide a more realistic cash flow value in adjusting the impact of fluctuating rupiah exchange rates. The price change in question is the calculation between the income stream and the rate of inflation/deflation on investment feasibility. The following is a brief explanation of some of the methods used in this research.

a. Depreciation and taxes

   Depreciation and taxes are interrelated attributes in the investment feasibility analysis. Although depreciation is not included in the cash flow of income, the calculation of the feasibility analysis must consider the value of depreciation. Depreciation is a financial statement calculation that stipulates the annual deduction of asset value influenced by time and the pre-tax income stream *(tax-deductible)*. The value of assets calculated on the depreciation accountant comes from all use of production facilities that cause indirect expenses. Depreciation will affect the tax borne by the business unit so that depreciation and tax are interrelated attributes in the investment feasibility analysis. Five types of methods can be used to measure depreciation (Sullivan et al., 2015), namely: *straight-line* method, the sum of years digit method (SOYD), declining balance (DB) method, sinking fund method (SF), production unit method (UP).

   All the depreciation methods described have their characteristics. The *straight-line* method is the most used and easiest to calculate (Istiqomah and Sutopo, 2021). This method causes the book value of an asset to decrease at a constant rate of return. Meanwhile, the SOYD method and the DB method are accelerated depreciation charges in the early years of the depreciation period. Both methods are advantageous when viewed from the point of view of tax payments. Generally, the DB method is faster in deriving book value than the SOYD method. In contrast to the SOYD and DB methods, the SF method will have more of a pattern of depreciation expense at the end of

the depreciation period, so this method is less profitable in terms of taxation. The last depreciation method is the UP method, which is a depreciation method based on the unit of product produced. Determining the suitable depreciation model will affect the *present worth* of taxes borne by the business unit so that the depreciation value will directly affect the amount of taxable income (Newnan et al., 2004; Sullivan et al., 2015). The amount of *present worth* of taxes borne is strongly influenced by the method of depreciation charged. *Tax* is a cash outflow based on gross income minus expenses and depreciation expenses (Sullivan et al., 2015). The following formula can denote the formulation of tax provisions:

Income tax = (gross income - (expenses + depreciation expense)) x percentage of income tax

b. Net present value (NPV)

The NPV method is based on discounting all future cash flows during the investment period to determine the amount of benefit or deficit. The investment will be accepted if it has a positive NPV value (NPV > 0) and rejected otherwise (Sullivan et al., 2015). The NPV method is well known as a method often used in making decisions about the feasibility of an investment that has a definite cash flow value. This method is based on discounting all future cash flows within a predetermined investment time limit to determine the benefit or deficit (Žižlavský, 2014). The investment will be accepted if it has a positive NPV value (NPV > 0) and rejected otherwise. The following formula can denote the NPV method:

$$NPV = \sum_{k=0}^{N} F_k(1+i)^{-k}$$

Notes:

i	= interest rate
k	= index of the kth period (0 k N)
F_k	= cash flow at the end of period k
N	= number of periods in the analysis horizon

c. Sensitivity

The effect of the relationship parameters with several variations that have been tested on investment is a sensitivity analysis (Daellenbach & Mcnickle, 2005; Rezzouk & Mellit, 2015; Sullivan et al., 2015). Sensitivity analysis is also used to explore what happens to project profitability when the estimated values of several research variables are varied (Sullivan et al., 2015).

3. Methods

This article is the result of criticizing and developing Asyifa & Sutopo's (2017) article regarding the analysis of the investment feasibility of adding a painting machine to the CV. Creative. This article describes, pays attention to, and considers data and attributes that are more holistic and accurate. The data and information obtained in the previous article are used, such as maintenance costs, operating costs, and gross income. The assumptions used in this study consist of the selling price of the product and the objectives of the CV stakeholders. Elements of business politics do not influence creativity, and there is no shift in business. In addition, this article expands the calculations from the previous article by considering income taxes and price changes to obtain a more realistic income stream. The consideration of the proposed income taxes is based on the calculation of depreciation expense using a combination of straight line and DB methods in the hope of obtaining the right present worth value. Meanwhile, the consideration of price change is based on changes in Indonesia's average annual inflation rate from 2010-to 2020. In addition to considering these two factors, this article also calculates the impact of the relationship of each key parameter on the proposed investment using sensitivity analysis. This article uses a flow chart as a reference for regular and structured work, which can be illustrated in the following Figure 1:

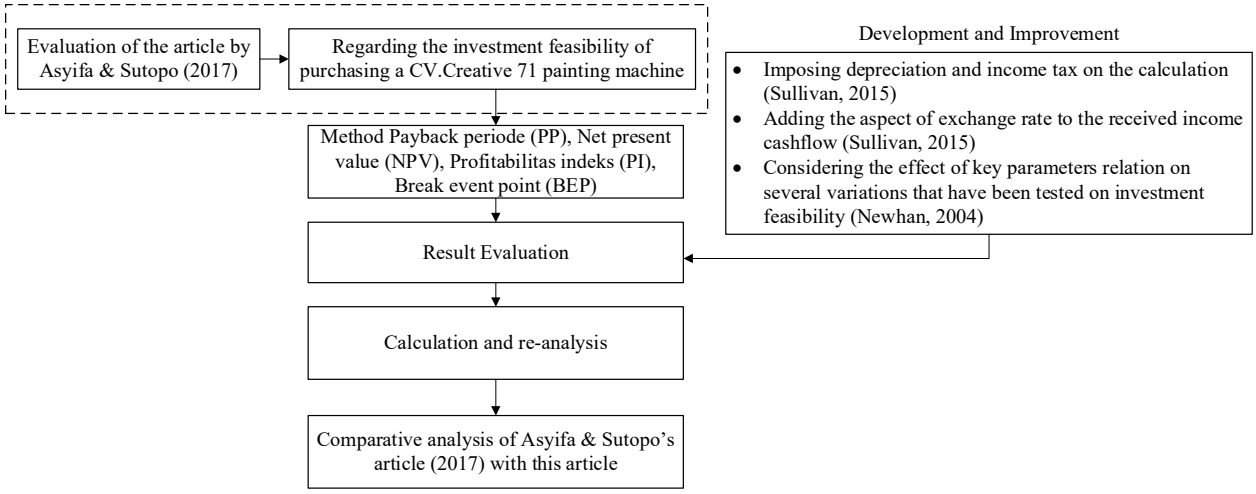

Figure 1. Research flow chart

4. Data Collection

In developing and improving the previous article, several data on financial aspects are needed to support the recalculation and analysis process, derived from previous research and other supporting sources. The following is the assumptions used in the study. (Table 1)

Table.1 Assumptions used

Assumption	Value
Product selling price	IDR 20,000
MARR	12%
PPh	*1% x Gross Income for*
period	of 8 years

Source: Asyifa & Sutopo (2017)

Asyifa & Sutopo (2017) research obtained some data information, such as the investment period of 8 years. The year with a MARR value of 12%. In addition, it is stated that information on PPh tax data of 25% is based on Law Number 36 of 2008. In the previous article, there was no provision for the selling price of the product, so the author assumes the selling price of the product is Rp. 20,000. In addition to using data information from previous articles and the assumptions used, there is data on investment plans and annual costs, which are described in the Table.2

Table 2. Investment Plan and Annual cost

Investment and expenditure	Value (IDR)
Initial	4,730,000
Investment Remaining Value	3,020,000
Electricity operations	2,403,404
Maintenance	473,000
Labor costs	22,090,980

Source: Asyifa & Sutopo (2017)

In the previous article, the allocation of depreciation costs was obtained using the straight-line method. Meanwhile, in this article, a combination of the straight-line method with the DB method will be used to obtain the best

depreciation cost. In line with that, information on data on operational electricity costs and maintenance of investment value is obtained from the previous article. Meanwhile, labor costs are based on one year's 2020 UMR Yogyakarta salary. Meanwhile, the details of the value and remaining investment assets will be presented in the Table. 3

Table 3. Details of Investment Plan and Remaining Asset Value

No.	Name	Price (IDR)	Market Value (IDR)
1	Air Compressor	4,000,000	2,800,000
2	Spray Gun	450,000	120,000
3	Spray Hose	200,000	80,000
4	Table	80,000	20,000
	Total	4,730,000	3,020,000

Source: Asyifa & Sutopo (2017)

Gross income data obtained from previous research is the primary basis for determining the number of products produced. Explanation of data on the number of products and income of CV. Creative 17 is presented in Tabel.4

Table 4. Data on Income Quantity Product

End of Year	Quantity (Unit)	Gross Income (IDR)
0	-	-
1	6762	135,235,448
2	6025	120,493,680
3	5368	107,361,545
4	4783	95,651,513
5	4261	85,222,944
6	3797	75,935,165
7	3383	67,663,183
8	3016	60,313,223

Source: (Asyifa & Sutopo, 2017)

In addition to using the data above, this article also uses Indonesia's inflation rate from 2016 to 2020 to consider price changes. The inflation rate increases the decline in the rupiah exchange rate that supports Indonesia's economic growth. The explanation of inflation rate can be explained in the Table.5

Table 5. Indonesia's Inflation Rate Indonesia

Inflation Growth Rate	
Year	Inflation Rate
2011	6.96%
2012	3.79%
2013	4.30%
2014	8.38%
2015	8.36%
2016	3.35%
2017	3.02%

2018	3.61%
2019	3.13%
2020	2.72%
2021	1.68%
Average	4.48%

Source: (BPS, 2021)

5. Results and Discussion

5.1. Value of Revenue, Depreciation and Tax Income

Efforts to obtain a good depreciation value were calculated using the *straight-line* and DB methods. Combining the two depreciation methods aims to obtain a large and fast depreciation charge in the early years of the depreciation period so that it is profitable from a tax payment perspective. Indirectly, combining these two methods will get the value of the tax burden of gross income below so that the company will profit. Explanation of the selected depreciation value can be explained in the Table.6

Table 6. Selected Depreciation Value

Depreciation			
End of Year	SL Method (IDR)	DB Method (IDR)	Selected Depreciation (IDR)
0	-	-	-
1	213,750	1,182,500	1,182,500
2	213,750	886,875	886.875
3	213,750	665,156	665,156
4	213,750	498,867	498,867
5	213,750	374,150	374,150
6	213,750	280,613	280,613
7	213,750	210,460	213,750
8	213,750	157,845	213,750

In line with the imposition of depreciation value, CV. Creative 71 also imposes income tax following the provisions of Government Regulation of the Republic of Indonesia Number 23 of 2018, which explains that tax subjects who have income from businesses with gross turnover below 4.8 billion in one tax year are mandatory and pays 1% of gross income. The value of taxes and depreciation charged by CV. Creative 71 can be explained in Figure 2

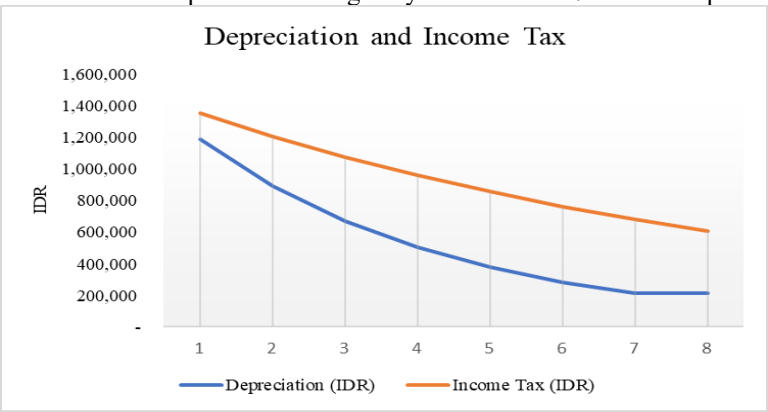

Figure.2 Value of Depreciation and Income Tax

The imposition of depreciation and income taxes aims to obtain an accurate gross income and the imposition of maintenance costs. Electricity and other additional costs are also considered in this article. The description of net income can be described in Table.7.

Table 7. Calculation of Net Income

End of Year	Quantity (IDR)	Price (IDR)	BTCF (IDR)	Depreciation (IDR)	Annual Cost (IDR)	Income Tax (IDR)	ATCF (IDR)
0	-	-	-	-	-	-	-
1	6762	20,000	135,235,448	1,182,500	24,967,384	1,352,354	107,733,209
2	6025	20,000	120,493,680	886,875	24,967,384	1,204,937	93,434,484
3	5368	20,000	107,361,545	665,156	24,967,384	1,073,615	80,655,389
4	4783	20,000	95,651,513	498,867	24,967,384	956,515	69,228,746
5	4261	20,000	85,222,944	374,150	24,967,384	852,229	59,029,180
6	3797	20,000	75,935,165	280,613	24,967,384	759,352	49,927,817
7	3383	20,000	67,663,183	213,750	24,967,384	676,632	41,805,417
8	3016	20,000	60,313,223	213,750	24,967,384	603,132	34,528,956

5.2. Investment Feasibility Analysis

a. Net Present Value Analysis

Earnings cash flow income will affect the value of the NPV for a certain period. This study carried out the imposition of annual costs, depreciation costs, and taxes on the cash flow of income. In addition, this article also considers the price change factor based on Indonesia's inflation (2011-2020) with an average of 4.48%. The results of the NPV calculation can be presented in the Table.8

Table. 8 Calculation of NPV

End of Year	ATCF (IDR)	Adjustment Real Value [1/(1+f)]k	ATCF (Real)	Adjustment (P/F, 15%, N)	PW (NPV)
0	(4,730,000)	1	(4,730,000)	1	(4,730,000)
1	107,733,209	0.957	103,111,920	0.893	92,064,214
2	93,434,484	0.916	85,590,537	0.797	68,232,252
3	80,655,389	0.877	70,714,948	0.712	50,333,503
4	69,228,746	0.839	58,092,970	0.636	36,919,133
5	59,029,180	47,409,256	0.803	0.567	26,901,285
6	49,927,817	0.769	38,379,406	0.507	19,444,201
7	41,805,417	0.736	30,757,250	0.452	13,913,018
8	34,528,956	0.704	24,314,071	0.404	9,820,045
NPV					312,897,652

The calculation of NPV is determined by discounting all future cash flows to the present value within a predetermined investment time limit. Table 7 shows that the NPV value is Rp.312.879.652. The results of the NPV calculation are said to be feasible because they have a positive value so that investment policies are carried out to the next stage. The calculation results are slightly different from the calculations of the Asyifa & Sutopo article (2017). This difference is based on the imposition of a tax of 1% on gross income and the selection of a depreciation value. In addition, the fluctuating factor of the rupiah exchange rate is also considered in this study to produce a

realistic constant price. The analysis obtained is more accurate because minimizing the unrealistic constant price caused by the growth of the inflation rate.

b. B/C Rasio, IRR, PI, and PP

PP is the initial payback period. The faster the return, the more attractive the alternative compared to other alternatives, and the IRR, the smaller, the better. Meanwhile, analysis of PI, B/C Ratio > one, then the proposed investment can be run (feasible). The results of calculating the value of B/C Rasio, IRR, PI, and PP can be seen in Table 9.

Table 9. Calculation of B/C Ratio, IRR, PI and PP

Parameter	Value	Eligibility Indicator
IRR	21.951 %	>12%
BCR	4.004	>1
PI	66.152 %	>1
PP	0.048	< 8 Years

Based on the analysis of financial projections using the existing IRR, B/C Rasio, PP, and PI methods, it was found that the investment was considered feasible. The IRR value obtained is 21.951% greater than the investment interest expense (12%). The PP value has a reasonably short payback period of 0.048 years, which is faster than the investment period of 8 years. Meanwhile, the PI value is 66.152%, and the B/C Ratio is 4.04 compared to the proposed alternative.

c. Break Even Point (BEP)

So that the business unit does not suffer losses, the project implemented must produce and distribute its products greater than or equal to the break-even amount. The target information must be generated by CV. Creative 71 in obtaining the break-even point can be explained in Figure 3.

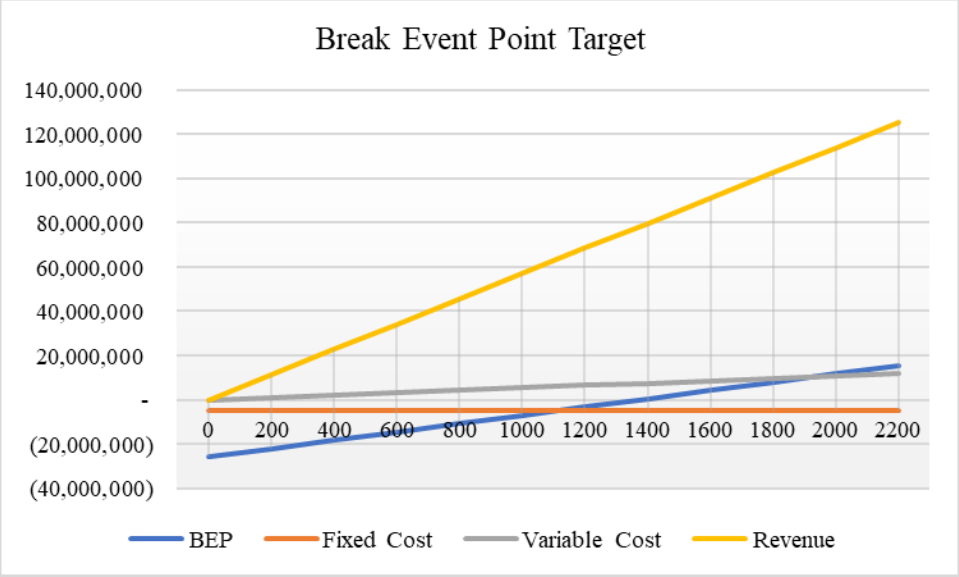

Figure.3 BEP Value obtained

This figure will explain the comparison between related variables, such as fixed cost, variable cost, revenue, and BEP. A total of 1296 products as the break-even point for the first year's target must be met by CV. Creative 71 so

as not to suffer losses. The BEP value is perpendicular to the revenue value, so you have to increase your production if you want to get a significant revenue value.

d. Proposed Improvement

The result is that the calculation of the article that we propose is slightly different from the article because of Asyifa & Sutopo's article (2017). This article pays attention to selecting the optimal depreciation value and taxes following the provisions of the Government Regulation of the Republic of Indonesia Number 23 of 2018, which imposes a tax value of 1% of gross income. Determining the fair value of depreciation and taxes will affect the level of net income of CV. Creative 71. In addition, this article also considers the value of rupiah exchange fluctuations based on the average inflation rate of Indonesia (2010-2020) to obtain realistic constant prices. In addition, several methods complement the previous article. The results of comparing the articles that we propose with the articles Asyifa & Sutopo (2017) can be seen in the Table.10

Table 10. Comparison of the proposed article with Asyifa & Sutopo, (2017)

Aspects	Asyifa & Sutopo (2017)	Proposed
Net Present Value (NPV)	Rp360,340,397.27	Rp 312.897.652
Payback Period (PP)	-	0.48 years
Profitability Index (PI)	-	66.15 %
Internal Rate of Return (IRR)	51.332%	21.95%
Benefit Cost Ratio (BCR)	1.650	4.004
Inflation Rate (2010-2020)	-	4.43%
Income Tax (PPh)	*25% x net cost*	*1% x gross income*
Depreciation	Rp213,750.00	Rp 213,750.00
Electricity Operation	Rp2,403,404.64	Rp 2,403,404.64
Maintenance	Rp473,000.00	Rp 473,000.00
Labor cost	-	*Rp.1,840,915 x 12 month*

5.2 Validation

The validation in this article was carried out using sensitivity analysis which can be seen in Figure 4. Sensitivity analysis will show the effect on the characteristics of the investment to be made to know the relationship of specific variables to changes in the percentage used. Several variables will be discussed in the sensitivity analysis in this article, such as Capital Investment, annual investment, and MARR.

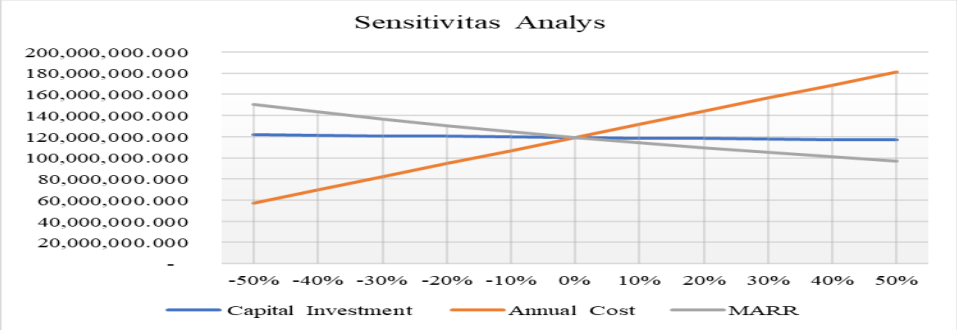

Figure. 4 Spider Plot Table for Sensitivity Analysis

From the spider plot above, it can be concluded that the value of capital investment tends to experience a steady decline if the percentage of interest value is increased. Likewise, the MARR value will decrease if the percentage of interest charged to the investment increases. The annual cost is inversely proportional to the MARR value and the value of the capital investment. The value of the annual cost will increase if there is an additional percentage of interest charged. Overall, the investment is feasible even though the related variables (capital investment, annual cost, MARR) have increased or decreased the interest charged by the investment because the results of the comparison are positive. (Figure 4)

6. Conclusion

The conclusions were obtained from the investment feasibility analysis of adding a CV. Creative 71 painting machines are:

1. From a financial point of view, it shows the investment in adding a CV. Creative 71 painting machine can be said to be very feasible. The feasibility is based on the calculation results of the NPV of Rp.312,897,652, the IRR value of 21.951%, the PP value for 0.048 years, the PI value of 66.152%, and the B/C ratio of 4,004. The calculated values are considered feasible because they have met the proposed indicator limits. This result is slightly different from the article Asyifa & Sutopo, (2017) because this article considers data and information that is more holistic and accurate. The choice of the depreciation method based on a combination of the straight-line method and the DL method can result in a significant depreciation amount being charged at the beginning of the investment. Meanwhile, the tax used is 1% of gross income following the provisions of Government Regulation of the Republic of Indonesia Number 23 of 2018. In addition, price change and sensitivity analysis are also considered in this article.
2. Calculation of the relationship between capital investment, annual cost, and MARR to the interest percentage product is considered in this article. The value of the painted product is susceptible to the annual cost and MARR. Adding the percentage value of interest to the annual cost causes the business unit to suffer losses because the annual cost is higher. In line with the annual cost, the MARR value also suffers the same fate, experiencing a decrease in income if the interest rate increases.

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