

## “FEASIBILITY STUDY OF EXPANSION PLANNING OF SAKILA ADVERTISING – JEMBER UNDER UNCERTAINTY CONDITION USING NPV SIMULATION APPROACH AND MODIFIED IRR METHOD”

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### ABSTRACT

CV Sakila Advertising- Jember is a company which operates in the field of service to serve consumer's need (for both private institute and government institute and also others). This company serves especially in the field of printing which has been built since 2001. In last recent years, the trends of demand from various market segments are good enough, so existing production capacity goes falling short. Expansion in the form of production capacity improvement represents one of company efforts to cover the significance and not sporadic and instant demand growth. The expansion choice considered by CV Sakila Advertising is new machine investment with estimated cost of Rp. 918.500.000,-. The selection decision for this investment alternatives require complicated consideration, subject to various possible conditions in the future which will happen. The development of investment of feasibility models have fast enough, depends on factors or variables change possibilities which considered at the time of expansion decision is made. For that reason, a study has to conduct using the investment feasibility models: (1) *net present value method* (NPV), (2) *internal rate of return method* (IRR), (3) *rate of rereturn method* (RoR), (4) *pay back period method*, and (5) *profitability index method* (PI). Investment feasibility conclude that the new machine investment alternative, yielding  $NPV_{\infty} = \text{Rp. } 79.080.121, 00$ ,  $IRR=27, 8\%$ , Payback period = 3 years+3 months+10 days, and profitability Index= 1, 81. This result concludes that the investment proposal is suitable to be done is fea. Hereafter, subject to uncertainty condition in the future, hence through a 100 times of Monte Carlo simulation to that investment feasibility of  $NPV_{\infty}$  is calculated ( 50,80%). Suggestions which can be recommended are: (1) although the new machine investment alternative is feasible categorized, but the opportunity to achieve such as these which calculated at deterministic condition cause company have to take care, especially in raw material management. (2) In this research, competitor factor is not concluded to income component because this factor influences the service income. (3) The seasonal frequency toward many kinds of things also influences the company's profit. (4) The fluctuation of uncertain price and the condition of global economics which goes falling short have the effect to the decreasing of material price which influence the sell value of product in market.

**Key Word** : Financial Ratio, NPV, MIRR, Payback Period, PI, Sakila Jember Printing

### 1. INTRODUCTION

The picture that can be obtained from business expansion, one of which is expansion in the form of increased production capacity which is one of the efforts in addressing a significant increase in demand. The significant increase in demand in question is that there is a consistent increasing trend from year to year, not sporadic or instant. A consistent demand trend shows that companies must immediately increase their production capacity to meet additional demand.

However, the development of the investment feasibility assessment model has been quite rapid, involving various possible changes in the variables or factors considered when making decisions about expansion. Weston and Copeland (1995) state that investment feasibility assessment models are: (1) net present value method (NPV), (2) internal rate of return method (IRR), (3) rate of return method (RoR),

(4) pay back period method, and (5) profitability index method (PI). Jember Sakila Printing is a company engaged in the service to serve the needs of consumers (companies, state and private institutions etc.) especially in the field of printing.

Procurement of company needs here includes a planned production process from the process of processing raw materials into finished goods or on demand, this is because the printing is a company engaged in services that serve consumer demand, especially in the field of printing. In recent years, demand trends from various market segments have improved considerably, so that the estimated production capacity is insufficient. This printing is considering increasing the production capacity of equipment or machinery with the aim of increasing production capacity to meet consumer demand for better service.

Based on the data that has been collected, it can be seen that there is a trend of increasing sales from

2009 to 2013, so that in the coming year it is estimated that there will be a doubling in the use of raw materials. Sakila printing has only been able to reach a market share of ± 3.55% from the former residency of Besuki. This indicates that the company still has the opportunity to increase its market share beyond 3.55%. However, efforts to increase market share do require marketing strategies that are better than the strategies that have been carried out, let alone see conditions of economic uncertainty.

From the research background that has been stated, the problems faced by Sakila Printing can be formulated, namely as follows:

- a. How feasible are the two alternative investment proposals expanding production capacity, namely: (1) expansion of business capacity through the purchase of new printing machines and repro (film) machines and equipment / machinery to support the completeness of new types of machines; (2) expansion of business capacity through acquisition of other similar companies, in terms of financial aspects?
- b. How big is the opportunity for the feasibility of each alternative investment proposal to expand production given the uncertain future conditions?
- c. Of the two alternatives to capacity expansion, which company is more feasible?

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## 2. LITERATURE REVIEW

### 2.1 The Role of Capital Budgeting

Capital budgeting involves the entire expenditure planning process with the expected results in a period of more than one year. Examples of such expenditures are: the purchase of land, buildings and equipment and permanent working capital to support its operations (Wetson and Copeland, 1987: 98).

### 2.2 Investment Decision Making

The cash flow components that need to be considered are:

- a. opportunity cost  
Is an opportunity for acceptance that may be obtained if the source concerned is sold because the project that uses the source is not feasible or deferred.
- b. net working capital  
Is a net working capital for the needs of the company in operating the business in the short term.

There are several cases that might occur in connection with the interaction between investment proposals, namely: the accuracy of investment scheduling, the selection between long-lived and short-lived assets, the decision to replace the

machine, and the excessive capacity costs and load factor fluctuations.

- a. The accuracy of investment scheduling
- b. The choice between assets is long-lived and short-lived
- c. Decision for machine replacement
- d. Lower capacity costs
- e. Load factor fluctuations

## 2.3 Methods of Financial Analysis in Capital Budgeting

### 2.3.1 Payback Period

Is the number of periods (years) needed to cover the initial investment of an investment proposal. The critical criteria used are: an investment proposal is declared feasible if the payback period is shorter than the maximum acceptable period (MAP).

### 2.3.2 Return on Asset (ROA) atau Return on Investment

ROA is the average rate of return of the asset used. The formula for calculating ROA is as follows (Weston and Copeland, 1987: 112):

$$ROA = \frac{\sum_{t=1}^n \text{cashflow}_t / n}{I_0} \dots\dots\dots (1)$$

Where,

- n = project economic life,
- I<sub>0</sub> = initial investment
- T = period, (t = 0, 1, 2, ... n)

### 2.3.3 Net Present Value (NPV)

NPV is the present value of the expected future cash flows, discounted by the appropriate and appropriate capital costs, reduced by initial investment (Brealy Myers, 2000: 138). The NPV formula for the horizon of planning time is limited to the economic life of the project:

NPVn=

$$\sum_{t=1}^n \frac{CF_t}{(1+k)^t} + \frac{WC_n}{(1+k)^n} + \frac{SV}{(1+k)^n} - WC_0 - I_0 \dots\dots\dots (2)$$

Where,

- NPVn = net present value until the economic life of the project
- I<sub>0</sub> = Initial investment in the purchase of machinery and initial working capital as an operational support, or an initial investment in the acquisition of other similar companies and initial working capital as an operational support.
- CF<sub>t</sub> = net cash flow in period -t
- CF<sub>t</sub> is calculated by: cash inflowst - cash outflowt
- k = discount factor, which is calculated as a weighted average project cost of capital
- WC<sub>0</sub> = initial working capital, and WC<sub>n</sub> = working capital at the end of age project,
- SV = estimated salvage value, estimated residual value.

There is a view among investors that a project should be judged that its feasibility is not limited to its economic age, and furthermore with the belief that the project continues to operate until an unknown and unlimited time, the NPV formula is modified to (Weston and Copeland, 1989: 118):

$$NPV_{\infty} = NPV_0 \left( \frac{(1+k)^n}{(1+k)^n - 1} \right) \dots \dots \dots (3)$$

Where,  
 $NPV_n$  = is NPV which is calculated by assuming that evaluation of cashflow projections is limited to the age of

the project.

$NPV_{\infty}$  = is NPV which is calculated by assuming that the evaluation of cashflow projections is not limited to the end of the project's economic life. At the end of each economic life renewal is carried out on the project components.

The simplest simulation approach is to use decision tree analysis, while the more complicated is the Monte Carlo simulation approach with the help of computers. NPV simulation with Monte Carlo approach is carried out n times for the nine NPV components, to produce NPVsim and PNPVsim. The ninth component of NPV is (Francis, 1996: 135):

- (1) Estimated sales quantity (or market share),
- (2) Estimated selling price,
- (3) Estimated production costs,
- (4) Estimated operational costs,
- (5) Estimated economic life,
- (6) Estimated discount factor,
- (7) Estimates of IO and WCO,
- (8) Estimated residual value (salvage value),
- (9) Estimated depreciation (adjusted for the estimated economic life selected when the simulation is carried out).

$P\{NPV\} = ZNPV = \text{probability } NPV = \text{the area under the normal curve for } ZNPV$ .

Where,

$$ZNPV = \frac{NPV_{\infty} - E\{NPV_{sim}\}}{\uparrow_{NPVsim}} \dots \dots \dots (4)$$

$E\{NPVsim\}$  = Average NPV generate simulation,

$\uparrow_{NPVsim}$  = standard deviation NPV generate simulation.

**2.3.4 The expected rate of return**

If we multiply every possible outcome that occurs with the probability level occurs, the rate of return expected to be received from an investment, a weighted average of the probability distribution of the possibilities that occur. The expected rate of return can be expressed in one equation which states:

$$\sum_{i=1}^n P_i K_i = \bar{k} = P_1 K_1 + P_2 K_2 + \dots + P_n K_n$$

Where,

$k$  = the possibility of an outcome occurring in the  $i$

$P_i$  = probability of the results of the results  $i$

$n$  = number of possible results

So far, we assume that there are only three possible situations that can occur: strong, normal and weak demand. Of course, in reality, demand can range from deep depreciation to fantastic boom times, and there are a number of possibilities that are immeasurable between these two things. Suppose we have the time and patience to provide a level of probability for each level of demand that might occur (with the sum of the probabilities still equal to 1.0). So that the criteria that need to be considered are the tighter or the higher, the probability distribution, the more likely the actual result will be to approach the estimated value, and consequently, the less likely the actual return will end far below the expected rate of return. So the tighter the probability distribution, the lower the risk given to a stock. So the percentage measure for probability is assuming the best case (25%), normal case (50%), and the worst case (-25%). (Brigham & Houston, 2006: 220,578)

**2.3.5 Modified Internal Return Rate (Modified IRR)**

A discount rate is where the present value of a project's cost is equal to the present value of its final value, where the final value is calculated as the sum of the future values of cash inflows, which are calculated at the level of the company's capital costs. MIRR is often used by managers to evaluate investments by looking at the percentage of returns rather than the dollar value in the NPV. We can also modify the IRR and make it an indicator with better relative profitability. The formula used is (Brigham and Houston, 2006: 535):

$$\sum_{t=0}^n \frac{COF_t}{(1+k)^t} = \frac{\sum_{t=0}^n CIF_t (1+k)^{n-t}}{(1+MIRR)^n} \dots (5)$$

$$PV \text{ Cost} = \frac{TV}{(1+MIRR)^n}$$

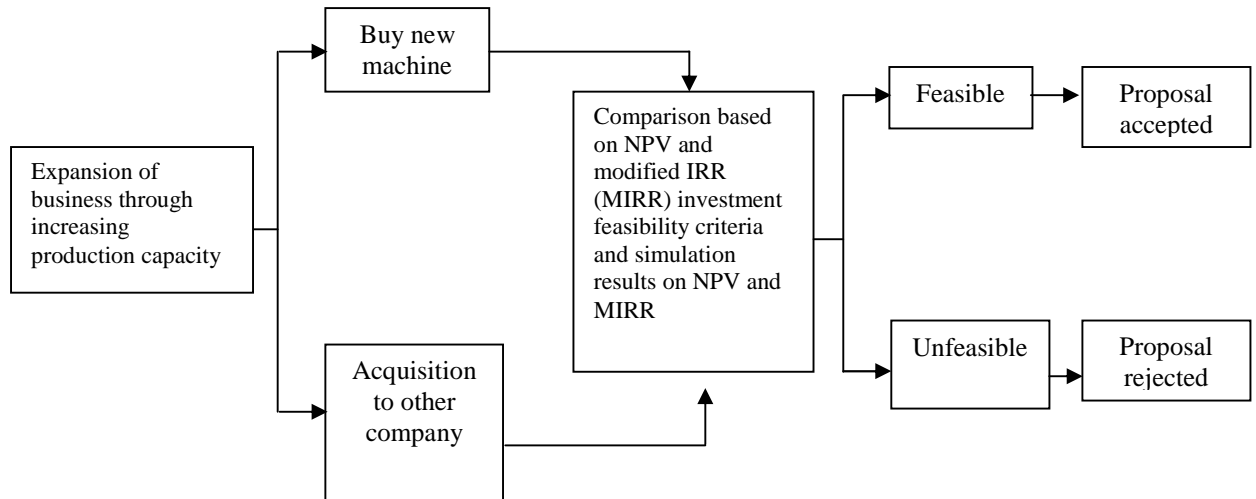
$COF$  = means cash outflow (negative number), or project cost

$CIF$  = means incoming cash flow (positive number)

TV = value of cash flow that is inflated or called the final value (terminal value)

### 3. CONCEPTUAL FRAMEWORK

The feasibility assessment method used is NPV and equipped with sensitivity analysis through Monte Carlo simulation, and using a modified IRR (modified IRR). We need to simulate 100 times for NPV, considering the uncertainty is quite high.



Graphic 1.2

According to the framework above, the company wants to expand its business through increasing production capacity through two alternative ways, namely, purchasing new machines that are in line with production needs and secondly by acquiring other similar companies, in the sense of having the same business line, namely services. In this case the plan for its acquisition is with Mitra Muda Advertising, where the company has a business unit on book cover hard cover and publishing. After the two alternatives have been selected, then do a comparison based on the criteria of investment feasibility with several appropriate methods. The method used in this criteria assessment uses NPV and modified IRR equipped with sensitivity analysis through monte carlo simulation. After calculating through the method, the results can be declared feasible or not, if the results are feasible, the proposal is accepted if it is not feasible, then the proposal is rejected.

## 4. REASERCH METHODS

### 4.1 Reaserch Design

This research is a case study which assesses the feasibility of an investment proposal using NPV and MIRR (Modified IRR) analysis tools on quantitative data.

3. capital (WACC).
4. Net working capital = WC, is the difference between current assets and current debt.
6. Uncertainty condition, which is a potential loss and asset and investment of an individual or a

### 4.2 Object of research

The object of research is SAKILA Printing in Jember, which is a company engaged in advertising services, especially in the production process of printing with paper media and the end result in accordance with what the consumer wants. The marketing area in all districts in Besuki, Jember, Banyuwangi, Lumajang, Situbondo, Bondowoso. The economic data observed are monthly empirical data relating to investments that have existed in the past five years to project economic data in the coming years. In this study do not need samples, because this type of research is a case study. The main objective of this research is to provide investment decision recommendations on alternative first or second proposals.

### 4.3 Operational Definition

The variables studied are the components involved in calculating NPV, are net cash flow, discount rate, working capital, residual value.

1. Net cash inflow = NCF cash flow for the purpose of capital budgeting is defined as cash flow after taxation for a company funded by its own capital and foreign capital.
2. Discount rate (discount factor) = k, the discount factor used to discount CF in each period during the economic life of the investment proposal is the average weight of
5. The residual value (SVV value) is the estimated value at the end of the economic life of the investment proposal.  
company, as a result of the fact that they operate in an uncertain economic environment.

#### 4.4 Analysis Methode

The analytical method used is comparing the two alternative expansion strategies in two feasibility criteria, namely:

- (1) NPV analysis simulated with a Monte Carlo approach

The formula for calculating NPV is referenced from the method of financial analysis in capital budgeting in section 5.6.2. Then simulating NPV with Monte Carlo approach because it was developed with mathematical concepts by integrating the sensitivity and probability distribution of input variables. In a simulation analysis, the computer will start by randomly selecting values for each variable of sales in units, selling prices, variable costs per unit, and so on. Then the values are combined, and the NPV is calculated. Then the collection of input values is chosen randomly and the second NPV is calculated. This process is carried out 1000 times and produces 1000 NPV. The average and standard deviation are then calculated. The mean or average NPV is used as a measure of the expected project profitability, and the standard deviation (coefficient of variation) is used as a measure of project risk. (Brigham and Houston, 2006: 578)

Kriteria from NPV analysis with the condition that if the NPV has a positive value, the project should be accepted, while if it is negative, the project should be rejected. If there are two projects with a positive NPV mutually exclusive, then what should be accepted is a project with a higher NPV value (Brigham and Houston, 2006: 521).

- (2) Modified IRR analysis

The method of using Modified IRR is an unusual cash flow flow that has more than one IRR. So the discount rate where the present value of a project's cost is equal to the present value and its final value, where the final value is calculated as the sum of the future values of cash inflows, which are calculated at the level of the company's capital costs. The formula used is (Brigham and Houston, 2006: 535):

$$\sum_{t=0}^n \frac{COF_t}{(1+k)^t} = \frac{\sum_{t=0}^n CIF_t (1+k)^{n-t}}{(1+MIRR)^n} \dots \quad (6)$$

$$PV \text{ Cost} = \frac{TV}{((1+MIRR)^n)}$$

COF = means cash outflow (negative number), or project cost

CIF = means incoming cash flow (positive number)

TV = value of cash flow that is inflated or called the final value (terminal value)

## 5. DISCUSSION AND RESULT

### 5.1 Calculation Of Net Cash Flow

Based on these provisions, annual cash flow (NCF) calculations for 2013 - 2017 can be made. NCF is calculated by NCF net cash flow formula = Earning After Tax + Depreciation + (1 - T) rD. In a period it can happen that earning after tax (EAT) is negative, but NCF is positive; This is because the value of the depression is quite large.

Table 4.7 Net cash flow estimation / year 2010 – 2014 (in Rp)

Element	Years					
	0	2013	2014	2015	2016	2017
Printing Services Sales		569.904.046	730.843.417	970.691.358	1.289.447.870	1.687.112.954
Production Cost :						
- Raw Material		121.660.645	141.631.123	170.697.080	209.451.523	258.524.016
- Direct Labor Wages		108.582.126	126.405.777	152.347.144	186.935.484	230.732.684
- Fabrication (FOH)		18.249.097	21.244.668	25.604.562	31.417.728	38.778.602
Gross Sales Profit		321.412.179	441.561.848	622.042.573	861.643.135	1.159.077.651
General & Administrative Costs:						
- Salary Expense		46.535.197	54.173.904	65.291.633	80.115.207	98.885.436
- Depretiation*)		367.400.000	220.440.000	132.264.000	79.358.400	119.037.600
- Bank Debt Interest Costs		12.859.000	12.859.000	12.859.000	12.859.000	12.859.000
Earning Before Tax		-105.382.018	154.088.944	411.627.940	689.310.528	928.295.615
Income Tax		0	16.797.424	143.819.779	241.008.685	324.653.465
Earning Before Tax		-105.382.018	137.291.520	267.808.161	448.301.843	603.642.150
Depretiation		367.400.000	220.440.000	132.264.000	79.358.400	119.037.600
Cash Flow	-918.500.000	262.017.982	357.731.520	400.072.161	527.660.243	722.679.750
Initial Working Capital	-337.608.290					337.608.290

Sourcer : Attachment 12 (Procces Data)

Explanation :

NCF in 2010 was calculated by the formula: EAT + Depreciation + (1 - 0.30) interest on bank debt = -Rp. 105,382,018 + Rp. 367,400,000 + (0,70) (Rp. 12,859,000) = Rp. 262,017,982, -;

so too for the following years.

\*) Includes a salvage value of 40%Printing Services Sales



## 5.2 Reliability measurement of investment proposals under certain conditions

The feasibility of investment projects in terms of methods that use the concept of present value of money, namely NPV, IRR, Payback Period and Profitability Index. The discount factor used is the WACC of financing funds for this alternative investment. On debt capital composition: own capital = 40.00%: 60.00% and income tax rate = 35.00%, can be calculated weighted average capital costs (WACC) = (1 - 30.00%) (40, 00%) (17.50%) + (60.00%) (25.00%) = 22.00% / year. Estimated economic age = 5 years.

### 5.2.1 Net Present Value (NPV)

NPV can be calculated during its economic life, as follows:

$$\begin{aligned} NPV_5 &= \frac{262.017.982}{(1+0,22)^1} + \\ &\frac{357.731.520}{(1+0,22)^2} + \frac{400.072.161}{(1+0,22)^3} + \\ &\frac{527.660.243}{(1+0,22)^4} + \\ &\frac{1.060288040}{(1+0,22)^5} - 1.256.108.290 = \\ &Rp. 49.820.535,00 \end{aligned}$$

The NPV value above is NPV<sub>n</sub> (n = 5), where the continuity concept is not taken into account, meaning that the analysis is only applied to the project's age, which is five years. Logically, the company has hope that the project continues until an unknown period (infinite). with the following adjustment formula: ∞ Thus NPV<sub>5</sub> is adjusted again to NPV

$$NPV_{\infty} = NPV_n \left( \frac{(1+k)^n}{(1+k)^n - 1} \right)$$

where,

$$NPV_n = NPV_5 = Rp. 49.820.535,00$$

$$k = WACC = 22,0 \%$$

$$NPV_{\infty} = Rp. 49.820.535,00$$

$$\left( \frac{(1 + 0,22)^5}{(1 + 0,22)^5 - 1} \right)$$

$$= Rp. 79.080.121,00$$

$$\text{so } NPV_{\infty} = Rp. 79.080.121,00$$

### 5.2.2 Payback Period

This method is used to determine the payback period embedded in the investment project. Based on calculations derived from appendix 14, the payback

period is 3 years + 3 months + 10 days. So this investment proposal is acceptable, considering that the criteria used in this investment proposal are declared feasible if the payback period is shorter than the maximum acceptable period (MAP), which is 5 years of economic age. Source: Attachment 14 (data processed)

### 5.2.3 IRR (Internal Rate of Return)

This method is used to find the desired discount rate, by trial and error, which is to find the present value of proceeds above zero (positive) and below zero (negative) at the discount rate, and can also be searched by interpolation. The results of calculations using the IRR method generate 27.8%, greater than the interest rate set at 17.5%, meaning that the investment proposal is accepted. Source: Attachment 14 (data processed)

### 5.2.4 Profitability Index (PI)

This Profitability Index method is to find a comparison between the present value of the planned net cash receipts in the future that will come with the present value of the investment that has been carried out. So the profitability index can be calculated by:

$$\begin{aligned} (PI) &= \frac{\sum PV NCF_t}{I_0} = \\ &= \frac{Rp. 2.270.161.656}{Rp. 1.256.108.290} = \\ &1,81 \end{aligned}$$

Source: Attachment 14 (data processed)

The results of the calculation with the profitability index method produce PI of 1.81 greater than the criteria for feasibility assessment, so that the investment proposal is feasible.

### 5.2.5 Pengukuran fisibilitas alternatif proposal investasi pada kondisi ketidakpastian

If it is associated with uncertainty conditions during the data collection, a Monte Carlo simulation can be done (in this study 100 times the simulation will be conducted). Here will be used random number (random number) to determine the choice of each NPV component in each simulation that is applied. There are three NPV components that will be simulated, namely:

(1) Estimated value of sales,

(2) Estimated production costs,

(3) Estimated administration and general costs,

With an average NPV = Rp. 83,480,804.00 and a standard deviation of Rp. 157,444,307.00, the probability of NPV in uncertainty conditions that have been determined in the previous stage, can be calculated as follows:

$$Z =$$

$$\frac{NPV_{\infty} - NPV_{\infty sim}}{\sigma NPV_{\infty sim}} = \frac{Rp.79.080.121 - Rp.83.480.804}{Rp.157.444.307}$$

$$= -0,027950726$$

In the Normal curve table, the value of  $Z = 0.02$  is equivalent to the probability under the normal curve = 0.5080 or = 50.80%. That is, the probability of achieving NPV which is calculated in uncertainty conditions is 50.80%; which means fifty-fifty. Viewed from the perspective of investors or companies, alternative proposals, replacement of new machines and supporting infrastructure facilities, although it is feasible to do the company, but in terms of the sizes of NPV, Payback and PI and the probability of the NPV ; still need to be aware of the

achievement of NPV considering the opportunity is not enough encouraging.

From the investment proposal parameters can be used to determine the feasibility of an investment proposal to be implemented. , Payback period, IRR and Profitability Index.∞The comparison is viewed from NPV The following is a comparison analysis of Printing investment proposals:

Table 4.17 Physical Investment Proposal for Sakila Printing - Jember

Parameter Visibilitas	Proposed Investment with Purchasing New Machines	Kriteria	Preferensi
NPV∞	Rp. 79.080.121,00	NPV∞ 0, Feasible Investasion NPV∞ 0, Unfeasible Investasion	Buy New Machine
Payback Period	3 tahun + 3 bulan + 10 hari	<i>payback period &lt; maximum acceptable period</i> , Feasible Investasion <i>payback period &gt; maximum acceptable period</i> , Unfeasible Investasion	Buy New Machine
IRR	33,8%	IRR <i>weight average cost of capital</i> , Feasible Investasion IRR <i>weight average cost of capital</i> , Unfeasible Investasion	Buy New Machine
PI	1,81	PI 1, Feasible Investasion PI 1, Unfeasible Investasion	Buy New Machine

Sumber : Attachment 14

years). The results of this measurement indicate that the alternative purchase of new machines is feasible, even though the payback period has approached its economic life.

## 6. CONCLUSION

From the results of the analysis of the feasibility of alternative investment proposals that have been described and have been examined, the conclusions drawn are as follows:

- Investment plans require funds of Rp. 918,000,000, - with a working capital cost (cost of capital) of 22.00%. Physical of Rp.∞accessibility in buying a new machine produces NPV 79,080,121.00, Payback period is 3 years + 3 months + 10 days, IRR is for∞33.8% and profitability index = 1.81, while the probability of NPV alternative purchase / replacement of new engines = 50.80%.
- The results of these technical calculations show that the feasibility alternatives in purchasing or replacing a feasible new machine to be carried out by the company, although in terms of the probability of are not satisfactory for Sakila - Jember Printing.∞achieving the NPV Project return period = 3 years + 3 months + 10 days, still shorter than the economic life of the project (= 5

## 7. SUGGESTION

Referring to the limitations of research results and the results of this conclusion relating to the investment plan for new machines in Sakila Printing there are several things that should be considered. So the author needs to provide the following suggestions:

- For as calculated in∞companies, the opportunity to be able to achieve NPV Uncertainty conditions causes the company to be careful. Especially in the management of raw materials. Raw material costs are the largest cost component (an average of ± 85.00% of sales) as well as the diverse types. The purchase price of raw materials cannot always be controlled by the company, so it is necessary to make an optimal inventory determination. Optimal inventory determination can be approached on the basis of Economic Order Quantity (EOQ), thus the working capital requirements needed to buy raw materials can be more optimal (not too large but sufficient). On the other hand, the emphasis on working capital requirements for purchasing raw materials can also be done if raw material turnover can be increased, for



example by improving payment receipt schemes from key customers.

b. For other researchers, the limitations experienced in this study should be probability level of  $\infty$  made improvements especially related to the NPV 50.80% with a higher chance of a little of fifty-fifty. This makes an investment proposal against these opportunities under Uncertainty conditions. causing companies to be careful and need to be aware of especially in the management of raw materials. Besides that, other things that need to be considered, namely competitor factors, seasonal frequency of certain products, and uncertain price fluctuations and impact on selling prices are components that have not been included in the factors that influence income. So that other researchers are expected to include these factors for the perfection of further research.

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