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# Economic Analysis of the Information System Investment Using Cost and Benefit Analysis (CBA) Method

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**Abstract**— Nowadays, the development of technology is very fast. It makes people tend to follow the development of the technology. There are some elements to be fulfilled in order to apply the technology. Those are funds, mental ability of the organization, and other needs to make it smoothly work. However, it is important to calculate the benefits compare to the technology expenses. To help the organization in solving that problem, it needs a method as a tool to calculate the benefits and the investment.

Based on that problem, there must be an analysis on the investment. That analysis can be done by calculating the ROI. Then, the result can be a consideration whether the investment worth to be applied or not. To do that calculation, there are some early steps to be done, such as doing the survey to the money spend for the investment, doing the survey to the cash flow, and the quantification.

Because of the complexity calculation process, a calculating tool which can help the organization easily get the result of ROI was developed. The web based application is developed using php language and Mysql as its database. It will make the user easily access the application everywhere and every time.

**Keywords**— IT Investment Analysis, ROI, payback period.

## I. INTRODUCTION

In the era of globalization, technology is growing rapidly. Almost all activities that occur in everyday life can not be separated with existing information technology. The activities of business process technology has exploited not only in industry but also in other fields such as banking, health, education, and others. Therefore, an agency or company has now believes that information technology can help to develop and advance operations at the agency or the company. The agency is willing to provide a budget specifically for technology investments to gain added value to the institution or company.

In terms of investment costs for Administrative Information Systems (AIS) would be required and the cost is not small when viewed in terms of benefit not all is felt immediately, there is also a need of time in a certain period. However, many agencies or companies that uses IT investment only to compete with competitors without knowing the value of the balance of spending and benefits. Many agencies or companies who feel

confused to calculate the value of the benefits of IT investments that will be or are being implemented. Therefore, the analysis conducted research on the application of IT investments, whether the costs incurred are in accordance with the benefits that will be received later.

Cost is one of the key IT investments, the most important thing is how much benefit is obtained, how great Return on Investment (ROI), and how long it takes to achieve ROI [1]. IT investment consists of two benefits are counted (tangible) and are not counted (intangible) which will be used as a variable ROI calculation [2], [3]. From the results of these calculations can be seen the value of profits earned.

In this research conducted a case study on distributor X where the distributor is a distributor of HPL layer material that is commonly used for furniture that served the purchase in the area of Java. Due to the vast sales target and reach thousands of pages each month that can be sold to make Distributor X felt sorrow for the recapitulation of the monthly report, report the stock of goods, financial recaps, and so on. So it will take time and lower costs. Therefore Distributor X decides to use information systems that can help and support the operations of its business processes. It has just been developed in recent months and its use had not been used optimally. However, Distributor X must compare the economic value and the benefits derived from the results of this investment applied AIS. The problems in this research are: What benefits are obtained in the presence of applied information systems?, How to calculate the amount of benefits obtained and when the Return on Investment (ROI)?, Do Distributor X has done the right thing by investing funds to Information System in the operational activities of its business processes? And is the applied information system is already quite feasible to be developed and implemented at the Distributor X?

The purpose of this paper is to analyse investments, measuring the economic value of the investment cost, knowing the benefits, as well as determine whether the costs in proportion to the benefits derived from the AIS in the operational field distributor has been done by the Distributor X.

II. COST AND BENEFIT ANALYSIS

Cost Benefit Analysis (CBA) is a technique used to obtain a quantitative value of cost and benefits of an IT project. The first thing to do is to determine the costs and benefits will be calculated, how the weighting of costs, benefits and any barriers that would arise. The calculations are discussed in this method is Net Present Value Method (NPV), Payback Period Method, Return on Investment (ROI), and Internal Rate of Return (IRR).

Calculation of the ROI can be done by using three types of worksheets [4], namely:

- Development Cost Worksheet, a list of all components in the first year or the cost required to start and build a project, as shown in Fig 1.
- Ongoing Expenses Worksheet, which lists all components or costs required to maintain the project from the first year until the final year of the project, as shown in Fig 2.
- Economic Impact Worksheet, a calculation sheet costs and economic benefits that have been quantified (Value Linking, Value Acceleration, Value Restructuring and Innovation Valuation) which show the calculation of annual cash flow to generate ROI, as shown in Fig 3.

		Year 1
A.	Development effort	
	1. Incremental systems dan programming (e.g., estimated days times \$xxx/day)	_____
	2. Incremental staff support (e.g., data administration at \$xxx/day)	_____
B.	New Hardware	
	1. Terminals, printers, communications	_____
	2. Other	_____
C.	New (purchased) software, if any	
	1. Packaged applications software	_____
	2. Other	_____
D.	User training	_____
E.	Other	_____
TOTAL		_____

Fig. 1. Development worksheet.

		Year 1-x
A.	Application software maintenance	
	Development effort days	_____
	Ratio of Maintenance to development (based on experience, e.g., 10 to 1)	_____
	Resulting annual maintenance days	_____
	Daily maintenance rate	_____
	TOTAL application software maintenance	_____
B.	Incremental data storage required : _____ MB x _____	_____
C.	Incremental communications (lines, messages, etc)	_____
D.	New software leases or hardware leases	_____
E.	Supplies	_____
F.	Other	_____
TOTAL ONGOING EXPENSES		_____

Fig. 2. Ongoing expenses worksheet.

A. Net Investment Required (From Development Cost Worksheets)						TOTAL
B. Yearly cash flows : based on five 12-month periods following implementation of the proposed System. Cash flow can be negative						
	YEARS					
	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	
Net economic benefit	0	0	0	0	0	
Operation Cost Reduction	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	
= Pre-tax income	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	
(-) On-going expense						
From worksheet	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	
=Net cash flow	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX	XXXXXXXX
C. Simple ROI, calculated as B / # YRS / A						XXX%
D. Scoring, Economic impact						
Score	Simple Return of Investment					
0	Zero or less					
1	1% to 299%					
2	300% to 499%					
3	500% to 699%					
4	700% to 899%					
5	Over					

Fig. 3. Economic impact worksheet.

III. DISCUSSION AND ANALYSIS

This information system project development certainly require no small cost, and certainly after the implementation will be followed by other costs such as the development cost and maintenance costs, or so-called ongoing expenses.

The Calculation of the development cost can be calculated using the development cost worksheet, whereas for the calculation of the ongoing expenses using the ongoing expenses worksheet which can then be converted economic impact into an impact economics worksheet.

The investment costs are incurred as a capital to an SI project can be implemented in an organization. The investment costs include among other things the cost of the provision of hardware and software used in order to invest SI can run well. The total investment cost incurred for the implementation of AIS on Distributor X until in 2014 was Rp. 96,391,495,

Investment costs required for AIS is not only the initial cost but also takes the running costs are calculated for the next 5 years, commencing from 2014 to 2018. The running costs will be calculated cover maintenance costs for applications that are used as feature updates, electricity costs and expenses internet.

The cost to update the feature each year is 10% of the price of developing, the amount is Rp. 2.500.000, -. These costs are derived from 10% multiplied by Rp. 25.000.000, - (total investment applications) = Rp. 2.500.000, -. This price applies to the addition of one feature in each year as well as the handling of error handling.

Implementation of AIS in Distributor X uses a main server, two PCs and two laptops for branch A, while for branch B using 3 PCs and one laptop.

Distributor X uses the Internet to connect to the server. Internet costs incurred every month is Rp. 380.000, for each branch. So that in one month, it spends Rp. 1.14 million, -. So in one year is Rp. 13.68 million, - For the first year counted from May to December.

TABLE I ONGOING EXPENSES

Expense	1 <sup>st</sup> Year	2 <sup>nd</sup> Year	3 <sup>rd</sup> Year
A	2.500.000	2.500.000	2.500.000
B	14.363.106	26.441.355	29.614.317
C	9.120.000	13.680.000	13.680.000

Expense	4 <sup>th</sup> Year	5 <sup>th</sup> Year	Total
A	2.500.000	2.500.000	12.500.000
B	33.168.035	37.148.199	140.735.012
C	13.680.000	13.680.000	63.840.000

Notes:  
 A = Maintenance fee  
 B = Electricity costs  
 C = Internet charges

It will discuss the programs created with the aim of helping the calculation of ROI, NPV, PP, IRR and IE Score. Web-based programs that are created using a MySQL database and PHP programming language.

Before developing a program, Entity Relationship Diagram (ERD) was created. It aims to be aware of the tables in the database and the relationships between tables. Entity Relationship Diagrams in the physical model can be seen in Fig 4.

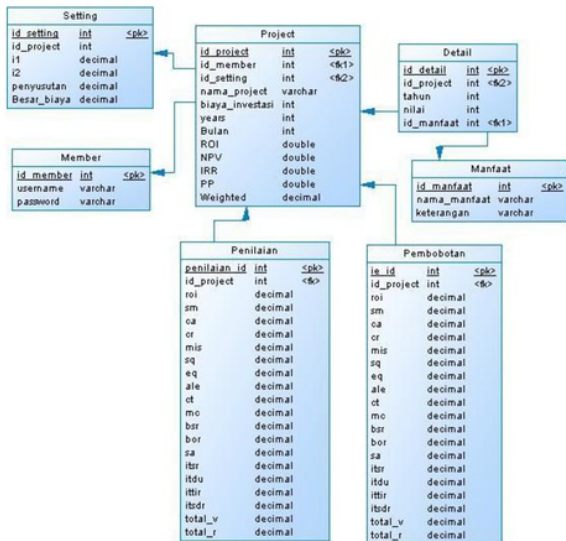


Fig. 4. Entity relationship diagram.

This login form is used to access the main page of this website. Login Form can be seen in Fig 5. Users can only perform if username login and password in accordance with the existing data in the table member.

Fig. 5. Login page.

Fig. 6. Signup page.

Fig. 7. New project page.



2  
This signup page is used to register as a new member so that it can log in to access this website. Sign up page can be seen in Fig. 6. The data entered will be stored in the table member.

Form add project serves to add to the project along with details of the project. In this form there are three parts: project inserts, inserts the weighting and insert assessment. On the form add project all existing field has to be filled. Data will be stored in two tables of the project and detail tables. The first field means the value for the first year and beyond. Field accordance with the number of input years. Form add project can be seen in Fig. 7.

Setting form serves to adjust the value of the interest rate, a large depreciation and the cost of the wish depreciated. Such data will be used to calculate ROI, NPV, IRR, and PP. Form settings can be seen in Fig. 8.

Form report serves to show detail project including value of ROI, NPV, IRR, PP. Form reports can be seen in Fig. 9.

Fig. 8. Setting page.

Business Domain	Weighted Score
Business	4.7
Technology	4.4
Weighted Value	82.86

Fig. 9. Report page.

- several benefits that do not impact directly but affect the existing savings. Once added to these benefits, the values obtained ROI of 26.37%. This suggests that the benefit of an IT project is not only seen by any tangible benefits. With the ROI of 26.37%, the AIS projects classified in categories 1 and deserve to be developed.
- The obtained NPV for IT project is Rp. 21,834,842. From the results obtained and adapted to the requirements of the NPV calculation, it states that value NPV > 0 so that the IT project is feasible to be implemented.
- IRR AIS acquired for the project is estimated at 27.63%. Terms feasibility of the calculation of IRR is if IRR > from I (the interest rate). The interest rate used to use bank deposit interest rate is 7.5%. According to the results there can be said that the SIA meets the eligibility requirements IRR.
- Payback Period obtained for AIS is 1.43 year is 1 year and 5 months 7 days. From the results of the payback period in accordance with what the Distributor estimates X so that the investment is feasible to be implemented.

REFERENCES

[1] Santoso, L., and Yulia. Analysis of the impact of information technology investments – a survey of Indonesian universities. *ARPN Journal of Engineering and Applied Sciences*. December 2014. Vol.9. No. 12, 2014.

[2] Remenyi, Dan, Arthur Money, and Michael Sherwood-Smith with Zahir Irani. (1995). *The Effective Measurement and Management of IT Costs and Benefits*, 2nd Edition. Butterworth-Heinemann, Britain.

[3] Sheniederjans, M., Hamaker, J., & Schniederjans, A. (2005). *Information Technology Investment, Decision-Making Methodology*. Singapore: World Scientific Publishing Co. Pte. Ltd.

[4] Parker, Marilyn, Robert J. Benson, H.E. Trainor. (1988). *Information Economics: Linking Business Performance to Information Technology*. New Jersey: Prentice Hall.

IV. CONCLUSIONS

From the analysis of investment, the following conclusion was reached:

- The value of obtained ROI for IT projects is -37.20%. By looking at the negative value of ROI, it can be considered not feasible to develop. On the other hand there are

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