Available online at: http://proceeding.rsfpress.com/index.php/ebs/index
LPPM UPN "Veteran" Yogyakarta Conference Series
Proceeding on Economic and Business Series (EBS)
Volume 1 Number 1 (2020): 188-199

Information Technology Investment Justification Using the Information Economics Method

Fras Richard Kodong , Juwairiah , Vynska A. P., Riza P. A.

Universitas Pembangunan Nasional Veteran Yogyakarta,
E-mail address frkodong@gmail.com; E-mail address juwai_riah@yahoo.com; E-mail address vynspermadi@gmail.com; E-mail address riza.prapascatama@gmail.com

Abstract

Investment in information technology is an important aspect of organizational strategy today. Organizations must be able to make informed information technology investment decisions. However, the returns on information technology investments are difficult to determine because of the costs and benefits that are difficult to assess. This study aims to analyze the success of IT / IS (information technology/information system) investments that have been implemented in corporations using the Information Economics (IE) method. The research method used is literature, interviews, questionnaires, and the SDLC (System Development Life Cycle) system development method. From the results of the research, the investment that has been made by the company is very beneficial because the IT / IS that is currently running can support the company's strategic plan as well as improve the company's performance and has a good reputation in information technology investment.

Keywords: Information Economics, Investment, Cost, Benefit

I. INTRODUCTION

Investment justification for the implementation of information technology (IT) is carried out during the feasibility study because there are many IT projects with large investments but do not provide benefits and benefits that are in line with the investment invested/spent. Various classical economic methods have been tried to predict the economic value of IT operations in various organizations. One of the well-known methods is the return on investment (ROI), but the calculation is very limited in a traditional way, only taking into account the tangible benefits. Since 1988, Parker has introduced the information economics (I) method for calculating quasi-tangible and intangible. In this study, the EI method will be used in the economic feasibility study of IT implementation so that at the initial stage of IT work, it can be justified or predicted whether it is economically feasible or not.

IT work components include; personnel, application software, system software, and hardware. The personnel might include users who must receive technology training (and therefore represent an IT investment), the technical personnel that perform the input-output functions of the system, and run the operating computer systems and their managers. Other components include the application software (i.e., programming languages, Assembly language, C ++, etc.) and system software (i.e., operating systems, interpreters, compilers, utility programs to manage data, etc.). At the heart of all these personnel and software is the driving, interactive component of the IT hardwark (i.e., computers,

data storage disks and systems, communication systems, network systems, etc.). (Schniederjans, 2005)

The difference between classical economics and the concept of EI is that in IE, the justification is done by considering business domain factors and domain technology that consider quasi tangible and intangible benefits, so that decisions in IT investment can be made appropriately and quickly, especially by utilizing management IT Investment applications, which was developed in this research

II. LITERATURE REVIEW

The implementation of Information Technology needs to consider the economic feasibility factor so that at the beginning of the project, investment justification can be made on the benefits or benefits both tangible and intangible from the information technology project. This can be a problem, considering that many information technology projects fail because they do not justify economic viability.

The problem solving for the aforementioned matters can be done by using several methods of economic feasibility, one of which is used in this study is the information economics (IE) method. EI is developed from the calculation of CBA (Cost-Benefit Analysis) by calculating ROI (Return On Investment), which takes into account tangible, quasi tangible, and intangible values. The feasibility of investing in Information

Technology is carried out by considering two important domains, namely: the business domain and the technology domain, so that the combination of these two aspects can justify the feasibility of investing in information technology—one of the cost components in the development of software or information systems. There are several application/software models that can calculate the cost and quality of applications, including COCOMO, COCOTS, COSYSMO COSOSIMO (Barry Boehm, 2005). COCOMO (Constructive Cost Model) is a system or information technology implementation cost calculation model based on the regression method, with LOC (Lines of Code) calculation. Ali Indri, et al. (2000) have combined this COCOMO model with Fuzzy Logic. There are various COCOMO models have been proposed to predict cost estimates at different levels, based on the amount of accuracy and correctness required.

All of these models can be applied to various information technology projects, especially the implementation of software or information systems. However, in-field application, the above models, including COCOMO, still face problems, including the need for adjustments to the form and condition of the organization, the objectives, and the application of information technology itself. The cost of procuring COCOMO-based software or systems or the like that is already circulating in the global market, however, is relatively expensive.

1. Information Economics

Information economics (IE) was developed and introduced by Marilyn M. Parker and friends in 1985 to assist decision-makers in evaluating an Information Technology (IT) investment. Investment in information technology is so complex that an appropriate measurement tool is needed to determine the feasibility of the investment. Traditionally, the concept applied in the calculation of Simple Return On Investment (ROI) or Cost-Benefit Analysis (CBA) has not been able to describe the real economic feasibility of the information technology work. IE is a simple ROI calculation by adding value (value) as an expansion and benefits concept to get a more accurate feasibility evaluation result, including the effect of IT investment on the organization.

Some of the things that give IE the importance are:

1. Currently, the use of IT is a must and is very decisive in increasing competitiveness for a company or organization.
2. There are limited resources in investing in IT related to other business aspects or among IT project investments.
3. Companies need to make allocation decisions effectively by considering the results (both direct and indirect) compared to the costs incurred.
4. Traditional cost and benefit analysis (CBA) is not sufficient to take into account all aspects of the impact of IT, so other adequate tools are needed. IE can be used as a basic framework to assist IT investment decisions according to their feasibility.

According to IE, the feasibility of an investment can be seen from two domains, namely the business domain and the technology domain. The business domain is the technology and business attribute that is charged for the resources used to generate value, including the risk, while the technology domain is the actual costs incurred for resource use in providing services to the business domain.

2. Information Economics Framework

The methods used in information economics are generally divided into two types, namely, financial and non-financial. The initial stage of the research is aimed at identifying the components that are closely related to information technology investment. After that, a cost-benefit analysis is carried out to obtain ROI on the investment. Tangible benefits are obtained by using Traditional Cost-Benefit Analysis, while Value Linking, Value Acceleration, Value Restructuring, Innovation Valuation are used to measure quasi tangible benefits. The next step is to analyze the two domains of the company (two domain analysis), namely the technology domain and the business domain. This is done because the ROI calculation does not reflect certain values and risks. There are some that are unique in the business domain and in the technology domain. This analysis is carried out to the intangible benefits of investing in information technology. After weighing, the combined results of the ROI analysis, business domain, and technology domain provide a score that shows the magnitude of the economic impact of the application of technology on the company. In this model, benefits are determined through a combination of analyzes enhanced ROI, assessment in the field of business, and assessment in the field of technology.

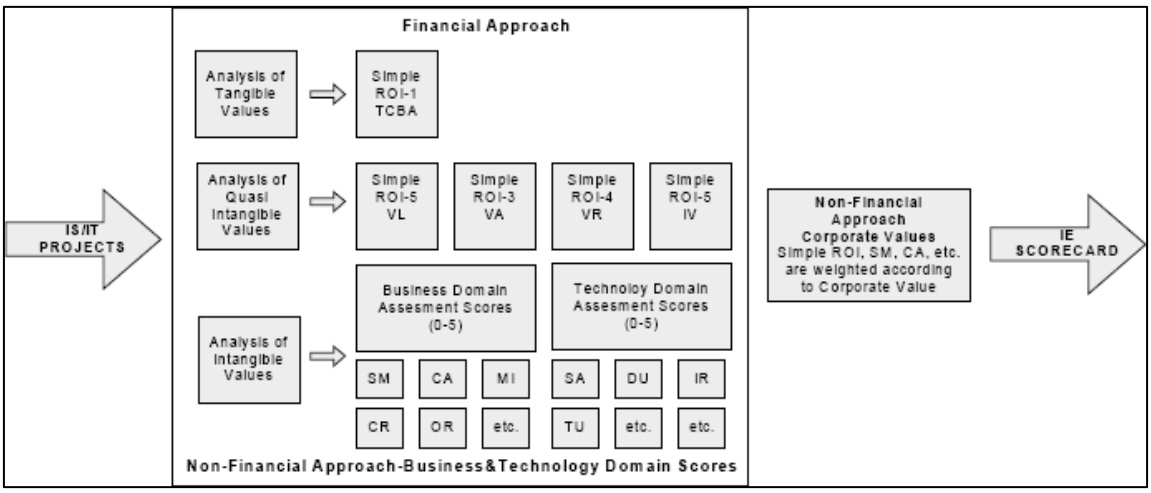


Figure 1. Information Economics Framework

There are two cost components associated with the project investment, namely fixed costs and variable costs. Besides the cost factor, other factors that must be taken into account in calculating the CBA are benefits. According to IE, there are three types of benefits, namely:

1. Tangible benefits are those that have a direct impact on company profits
2. Quasi-tangible benefits are benefits that focus on increasing the efficiency of the company and
3. Intangible benefits are benefits that focus on increasing the effectiveness of the company.

If these benefits are quantified in the form of cost savings (cost reduction) and cost avoidance
The calculation of these costs can be done using the technique of Value Linking, Value Acceleration, Value Restructuring, and Innovation Valuation. The IE method is developed by combining the simple ROI calculation results with the quantification of the benefits mentioned above.

3. Value Linking and Value Acceleration

Value linking is a value used to evaluate the cause and effect of an increase in the performance of a function against other separate functions. Value linking represents the fluctuation (ripple effect) that occurs as a result of changes in an organizational function or work process. Value acceleration is used to perform a financial evaluation of the benefits of time reduction due to a causal relationship between departments or organizational functions. Value acceleration has a close relationship with time and is only useful once.

4. Value Restructuring

Value restructuring is a technique used to measure the value of an increase in productivity as a result of the restructuring of a department's work or function as a result of the application of Information Technology.

5. Innovation Valuation

Innovation generates new functions that can change the way an organization does business. Innovation in the use of IT provides a vehicle for making changes to business strategy, core business products, and services. This technique focuses more on the organization than the costs and risks of technology. This technique is very useful for evaluating a new technology that has never been applied. Innovation Valuation considers the value of achievement or support for competitiveness, risks, and costs as the first party to apply the technology, risks, and costs due to failure or success. Innovation Valuation is applied to the business domain and added to the calculation of the economic impact.

6. Business Domain

There are five factors that must be considered to see the relationship between the business context and IT investment, which can be described as follows:

1. The Strategic Match factor focuses on the level of support for an IT project or SIM (management information system) towards the company's strategic objectives. The assessment is carried out by giving the numbers 0 to 5. The number 0 states that the IT project has a direct relationship to the achievement of the company's business goals. Number 5 states that the IT project has a direct relationship to the achievement of the company's strategic goals.
2. The Competitive Advantage factor focuses on how far the IT or SIM project will increase the company's competitiveness. The assessment is carried out by giving numbers 0 to 5. The number 0 states the IT project does not provide access to or exchange data between the company and its customers, suppliers, and cooperation units other. Number 5 states that the

IT project provides high data access and exchange and improves the company's competitiveness by providing a level of service that its competitors cannot achieve.

3. The Management Information factor focuses on how far the IT or SIM project will provide management information to the company's core activities or LOB (Line of Business), or often called MISCA (Management Information Support of Core Activities). The assessment is carried out by giving the numbers 0 to 5. The number 0 indicates that the project has no connection with MISCA. Number 5 states that the project is indispensable in providing the MISCA.
4. Competitive Response Factor measures how far the failure to implement the project is reduced in competitiveness with other organizations. The assessment is carried out by giving the numbers 0 to 5. The number 0 states that the project can be postponed for at least 12 months without affecting the competitiveness position, or the system that is still in effect can provide the same results and does not affect the competitive position of an organization. Number 5 states that the deletion of the project will cause a loss in competitiveness; at least it will cause a loss because it causes a loss of competitive opportunity.
5. Project or Organization Risk factors focus on how far the organization is able to provide the changes required by the project. The evaluation focuses on the business domain, not on technical dominance. The assessment is carried out by giving the numbers 0 to 5. The number 0 states that the business domain organization has a neatly structured plan to implement the proposed system. Management support is in place; processes and procedures are well documented. Projects are prepared to anticipate unforeseen circumstances. The number 5 represents the opposite of the number 0.

7. Technology Domain

There are four factors that must be considered to see the context of the information technology strategy on its investment. Broadly speaking, these four factors are as follows:

1. The Strategic Information System Architecture factor evaluates how far the project will follow the entire information system strategy, as outlined in the information system plan blueprint (IS plan). The assessment is carried out by giving the numbers 0 to 5. The number 0 states that the IT project has no relationship with the blueprint. Number 5 states that the IT project is part of the blueprint and is a project that must be implemented first.
2. The Definitional Uncertainty factor assesses whether the needs and specifications are well known, the project complexity, and the possibility of unusual changes. The assessment is carried out by giving the numbers 0 to 5. The number 0 states that the needs and specifications are clear and agreed upon. Number 5 states that the system requirements and specifications are unclear and unknown. The part being observed is too complex, and the possibility of change is very large.
3. Uncertainty technical factors assess the readiness of the technology domain to run the project, including the required expertise, dependence on special hardware capabilities, dependence on software, and also dependence on software development. The assessment is carried out by giving numbers 0 to 5. number 0 states The technology domain is ready to carry out projects, and there are no problems with expertise, hardware, software, or application development. The number 5 represents the opposite condition of the number 0.
4. The IS (Infrastructure Risk) factor assesses how far another investment (infrastructure) other than the projectile investment is needed to carry out the project. The assessment is carried out by giving the numbers 0 to 5. The number 0 states that projects using existing infrastructure have no facility requirements for other investments. Number 5 states that costs are needed to support the implementation of the project.

8. Corporate Weighting

Before weighing several of the factors that have been evaluated above, it is necessary to first identify the relationship between the level of organizational health and the support of its information system. What is meant by a healthy organization is an organization that is strong, profitable, competitive, and not easily affected by the economic crisis. Turmoil in consumer behavior, as well as deregulation from the government. Whereas what is meant by information system support is how strong the influence of the information system is in supporting and even determining the direction of organizational activities.

This is important because the value or weight of the business domain and technology domain is very different from one organization to another. As shown in Figure 2, quadrant A (Investment) describes a strong organization with a weak level of information system support to support it. The course of the business. Quadrant B (Strategic) describes a strong organization with system support.

Strong Information too. Quadrant C (Infrastructure) illustrates a weak organization with weak information system support. And the last is the D quadrant map (Breakthru or Management) depicting an organization going forward. Because of these four differences, each quadrant at having different corporate relative values.

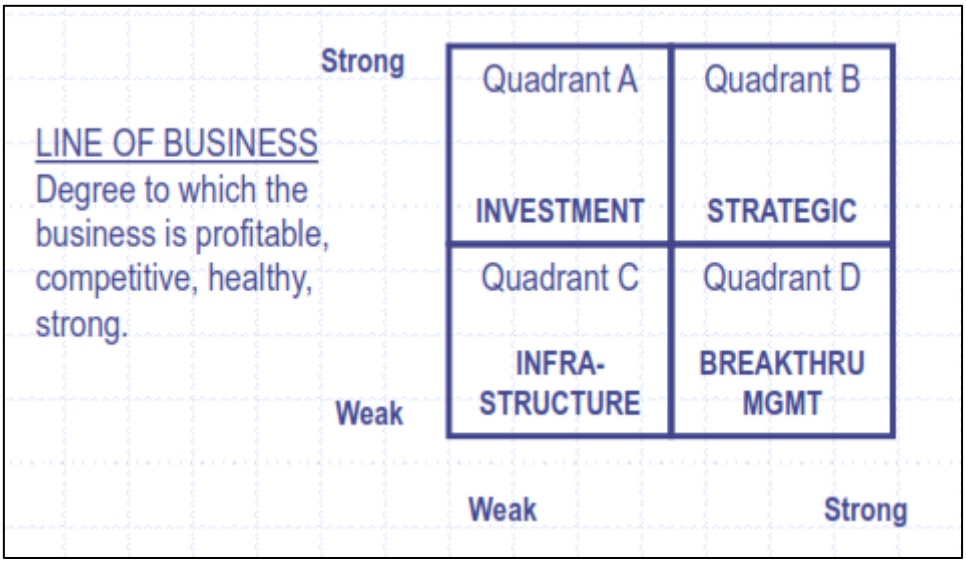


Figure 2. Computer Support

III. RESEARCH METHODOLOGY

The research method uses the following stages (Pressman, 2010):

- Literature review
- Stages of system development, SDLC (System Development Life Cycle). The stages include stages; communication, Planning, Modeling, Construction, and Deployment.

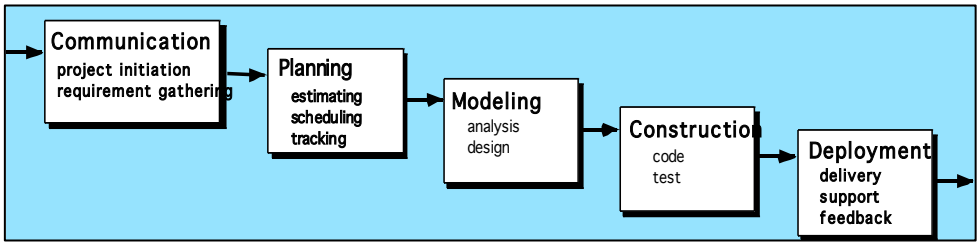
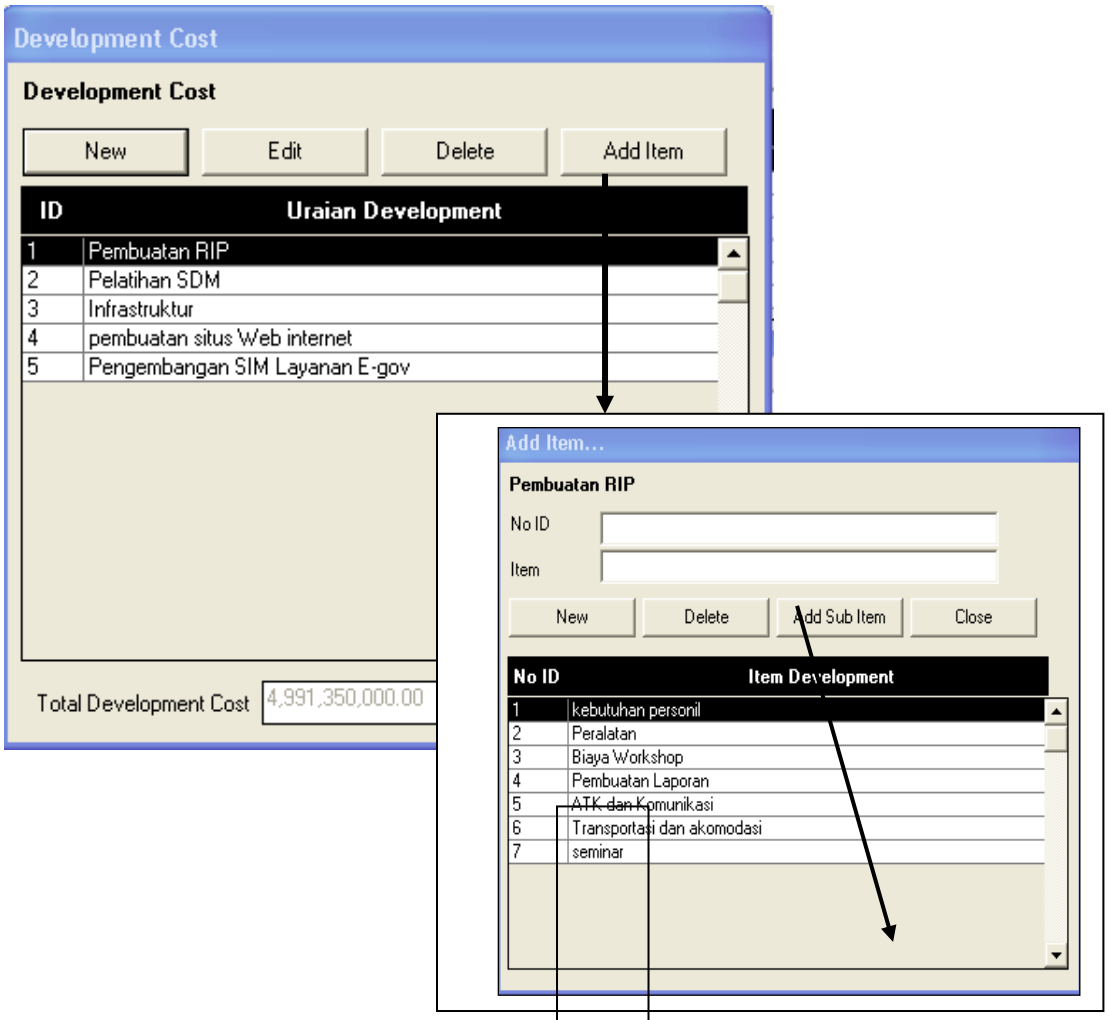


Figure 3. System Development Life Cycle

IV. FINDING AND DISCUSSION

The economic calculations below are carried out for local governments that will develop a computer-based government system (e-government). Analysis of the economic value of the information technology investment that has been issued can be assessed for its feasibility, as in the calculation below:

The data used in this development cost is taken from the detailing of the e-government development proposal for the South Sulawesi regional government. Which consists of 5 main items, and each of them has two sub-items. The total development cost is IDR 4,991,350,000.



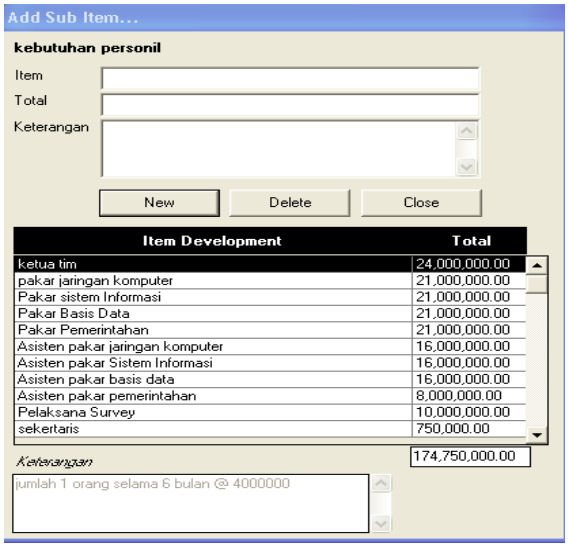
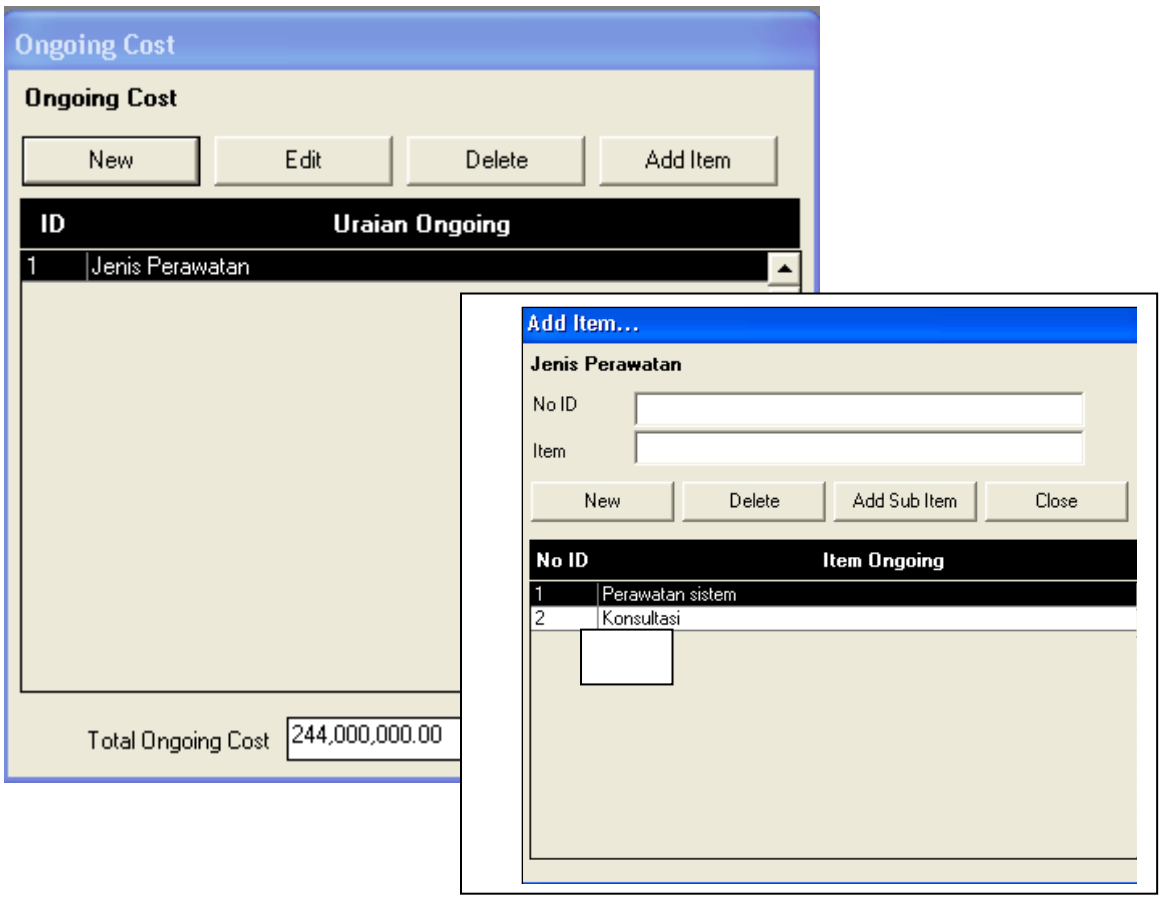


Figure 4. menu of development cost

Ongoing Cost



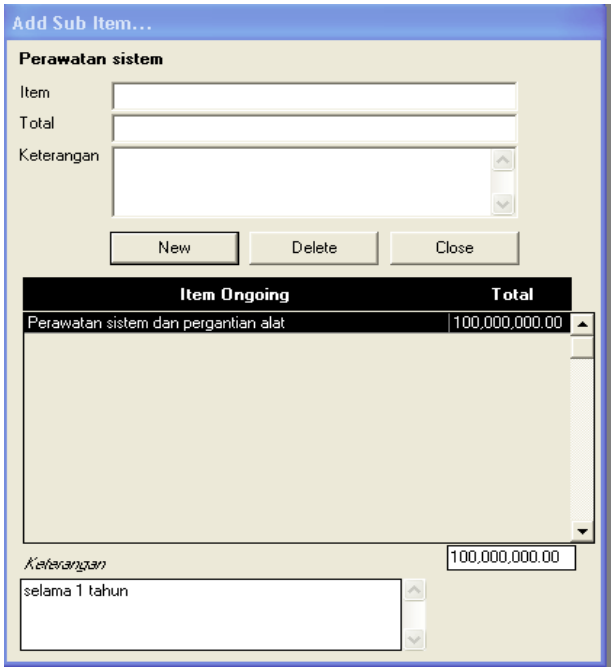


Figure 5. menu of ongoing cost

Consists of 1 main item and each of them has two sub-items. The total operational cost is IDR 244,000,000.

Operating Cost Reduction

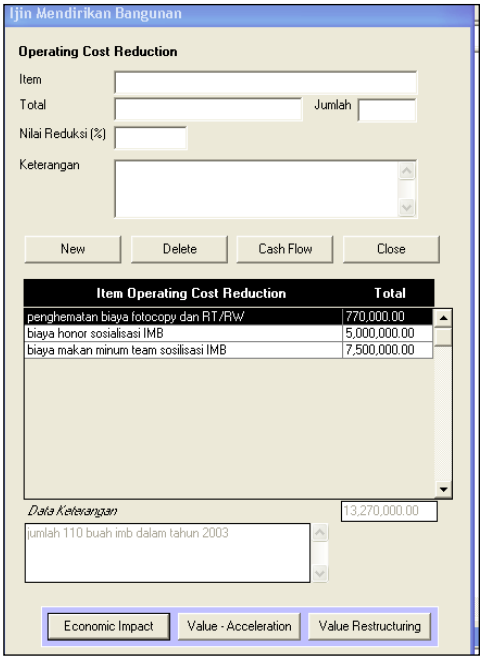


Figure 6. menu of reduction cost IMB

The explanation of the data above in managing one of the government services, namely IMB (building permit), a total of 20 government application services can be described as follows:

Table.1 IMB Application Impact

Sebelum terpadu	biaya	Setelah terpadu	Jumlah IMB	Dampak yang ditimbulkan
1. isi formulir 2. foko Gambar bangunan 3. foko KTP 4. foko Persetujuan Tetangga RT /RW dan lurah 5. foko Tanda bukti pelunasan PBB terakhir 6. foko sertifikat atau surat sewa tanah (jumlah 5 rangkap) 7. honorarium tim sosialisasi IMB 8. biaya makan minum sosialisasi IMB	1. Biaya foto copy sebesar Rp 2500 2. biaya RT/RW ,Lurah Rp 5000 (total Rp 7500) Rp 5.000.000 Rp 7.500.000	1. isi formulir 2. foko Gambar bangunan 3. foko KTP 4. Tanda bukti pelunasan PBB terakhir 5. foko sertifikat atau surat sewa tanah (jumlah 1 rangkap)	110 buah	1. Biaya foto copy dihemat Rp 2000 *110 = 220.000 2. Biaya RT/ RW dihemat Rp 5000 *110 =550.000 3. Honor di hemat Rp 5.000.000 4. Biaya makan minum hemat Rp 7.500.000 Total penghematan : **RP 13.270.000**

Complete data for the impact of government services for all services can be seen in the appendix.
The assumptions used in calculating the data above are:
1. Photocopy fee is IDR 100 / sheet
2. The fee for the RT / RW approval letter is IDR 5,000

Economy impact worksheet

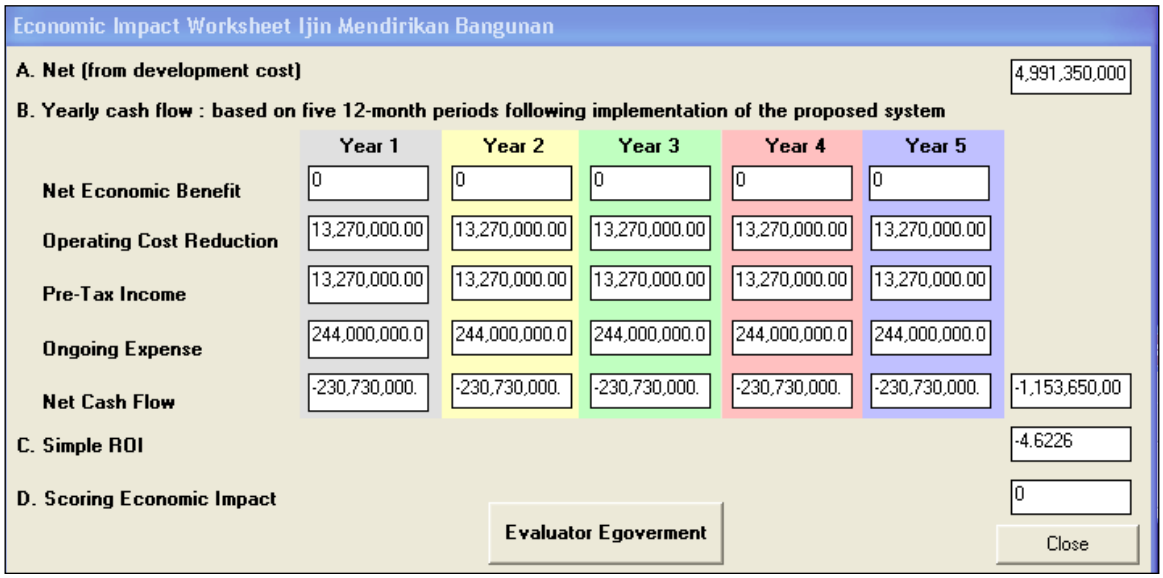


Figure 7. Economic Impact Worksheet for IMB Application

The economic analysis waorksheet displays the economic impact of getting a simple ROI score which will then be used for the evaluator. The explanation in more detail is described as follows:
- The total development cost is = 4,991,350,000
- There is no net economic benefit in conventional economic analysis so that it is still worth 0 for 5 years
  of the project life.
- Operating cost reduction is generated from the total cost savings generated from the integrated service
  unit for processing IMB totaling Rp. 13,270,000.00
- Pretax-income (income before tax)
- Ongoing expense is a total operating cost of Rp 1,200,000,000
- So we get net cash flow = 13,270,000 - 244,000,000 = -230,730,000 and total net cash flow for IMB
  = -230,730,000 x 5 = -1,153,650.00
- Simple ROI is generated = -1.153,650.00 / 5 / 4,991,350,000 = -4,6226
- Economic impact score at 0

V. CONCLUSION AND FURTHER RESEARCH

By using the IE (information economics) method, the investment can be justified against the benefits obtained, both tangible, quasy tangible, and intangible, so that the economic feasibility of implementing a system or information technology can be determined before the work is carried out. It can be seen from the economic calculations of the implementation of e-government on the island of Selayar, South Sulawesi, showing the ROI is below zero, which means that the e-government project is really not economically feasible.

REFERENCES

Ali Indri, 2000, COCOMO Cost Model using Fuzzy Logic, 7th International Conference a Fuzzy Logic Theory & Technology Atlantic City, New Jersey, 2000

Berry Bochm, 2005, COCOMO Suite Methodology and Evaluation, The Journal of Defense Software Engineering, 2005

Birowo, M Antonius. 2004. Metode Penelitian Komunikasi: Teori dan Aplikasi. Yogyakarta: Gitanyali.

Parker, Marilyn M., 1988. Information Economics, Linking Business Performance to information Technology, Prentice-Hall, Englewood Cliffs, New Jersey

Pressman, Roger S., 2010. Software Engineering, a Practitioner's Approach, Mc. Graw Hill, New York, USA.

Richardus, Indrajit, 2010, Analisa Cost Benefit Investasi Teknologi Informasi, Buku dan seminar virtual.

Schniederjans, 2005, "Information Technology Investment Decision Making Methodology," World Scientific publishing Co. Re. Ltd, Singapore

Scott, George M. 1986. Sistem Informasi Manajemen. PT Pustaka Binaman Pressindo

Turban, Efraim. 2003. Introduction to Information Technology, Second Edition. New York: John Wiley & Sons.