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BUILDING FRAMEWORK FOR ICT INVESTMENTS EVALUATION: VALUE ON INVESTMENT PERSPECTIVE

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ABSTRACT

Innovation in the field of information and communication technology (ICT) requires organizations to make prompt investments in providing customers with updated resources. Rapid growth in the field of ICT increases the responsibility of decision-makers in terms of whether to invest or not. This research aims to support such decision making by providing a comprehensive framework for the evaluation of ICT investment. Return on investment (ROI) is the common method used to assess the benefits generated from any type of investment using financial factors. However, this research primarily supports the importance of measuring value on investment (VOI) from ICT investments. This type of evaluation will provide more comprehensive results based on the influence of stakeholders through investments. The vast literature reviewed in this article discusses the limitations of ROI and evaluates ICT investment to present several practitioners' points of view regarding its limitations and importance. Finally, this research proposes a five-phased strategy of evaluation involving investments, exploring from the point of investment until impact is made on the stakeholder. A stepwise description of the framework is presented in the methodology section to guide decision-makers in the further implementation of this technique to protect their assets and evaluate the investments in an extensive way.

Keywords: ICT investment, ICT evaluation, measuring framework.

INTRODUCTION

ICT sponsors spend extensive resources on improving the quality of services for their customers. Investors allocate a large budget—whether to implement the new system or to enhance the existing system—to accelerate values and services from those investments. Several researchers have proposed methodologies and measured ICT investment to define returns on investment. For example, (Lucy, 2006) presented a detailed list of ROI and VOI models and discussed the purposes and uses of these measurements. The evaluation can be applied to any organization, both as a whole and based on individual projects. Evaluations based on individual projects are considered more appropriate for highlighting easy ways to execute a small task while considering the whole organization's work, as (Dede et al., 2011) presented in their project based the evaluation of optical wireless technologies in home networking using analytical hierarchical process (AHP). Their results indicated that the measurement process can easily apply to a single IT project.

Applying investments to buy or rent ICT resources has become a necessary custom of almost every organization seeking to provide consumers as well as employees with the latest technology. Moreover, the investment is not only for software and hardware resources, but also for human resources in terms of ICT professionals. Thus, investment not only serves to enhance technology, but is also used for upgrading all resources connected to running the project. (Schniederjans et al., 2010) argued that IT investment does not mean just one thing; several things must be thoroughly considered, such as application software, personnel, programming languages, system software, and hardware. In addition, (Byrd and Turner, 2000) pointed out a similar point in the way that shared and joint IT systems consist of ICT resources, data, software and hardware, several core applications, human skills, knowledge, standards, commitments, and values, where the combination of all these factors can improve the values and credibility of the organization.

Measuring ICT investment using ROI

The literature indicates that developing countries focusing on ICT investment incorporate three steps: implementation, adoption, and evaluation (Benny, 2006), (Elsie, 2009). ICT evaluation is not a recent development; it was initiated when the first commercial computer was put into use (Ricardo and Shaun, 2010). Since that time, several researchers and practitioners have proposed methodologies to evaluate the ICT investment (Karl, 2006), (Micheal, 2009), (Hurley, 2011). ROI is a technique often used to measure the benefits generated from investment based on financial factors. Many ROI techniques have been developed with improved factors to strengthen the measurement processes.ROI evaluation in IT/ICT is a method used to measure the consumption of the invested money, whether the overall project that is working well, and the results from the invested money. Although several ROI methods and models can be used to calculate ROI, some critics, such as (Benaroch and Kauffman, 2000) have argued that, because of uncertainty, invisibility, and difficult decisions in IT investment, traditional ROI models are not able to predict ROI correctly. Similarly, (Laudon and Laudon, 1999) pointed out that traditional ROI models are based on assumptions

where costs and reimbursement are always known and expressed in a common metric—namely, the dollar value. For the same reason, (Forrer and Anderson, 2001) stated that traditional ROI models and techniques cannot judge the political/societal position of the organization while measuring the return. (Thomas, 2003) argued that ROI models and methods do not provide a complete understanding about intangible information such as IT services, effect of employees' productivity on investment, and customer satisfaction. On the other hand (Lucy, 2006) claimed that sometimes ROI in IT occurs in both tangible and intangible resources, with successful benefits, costs, and risks. For intangible benefits, costs and risks are necessary factors that decision makers must consider, but this is a typical way to measure ROI. Considering all these limitations, the calculation of returns from ICT investment is intricate; this is one of several reasons that ROI has some drawbacks in finding a comprehensive evaluation.

Therefore, the idea to measure ICT investment has improved in terms of applying VOI, as discussed in the next section. Furthermore, this paper emphasizes ICT evaluation and its success factors. The methodology section presents ideas for an integrated framework, which consists of different factors affecting the utilization of ICT resources and measurement of ROI/VOI.

What is value on investment (VOI)

Gartner defined VOI as dealing with all measuring factors of the investment except financial aspects; this includes network performance, communities, and knowledge (Hurley, 2011). Companies develop investment strategies for ICT in a timely manner to improve services and satisfy customers. In any condition, the investment can be evaluated using different procedures. To determine the expected value generated by an invested amount, VOI is useful for understanding customers' feedback, knowledge and performance of the services.

Donald M. Norris described the differences between ROI and VOI.ROI measures are based on real things, such as money, in terms of loss or benefits whereas VOI measures are related to subjective factors that are difficult to measure accurately (Donald, 2003). Furthermore, (Hurley, 2011) mentioned five common areas VOI can be used to evaluate:

- Cultivation, management, and leveraging of knowledge assets;
- Business process invention and innovation;
- Collaboration and increased capabilities to learn and develop communities;
- Individual and organizational competencies; and
- New kinds and levels of leadership.

The discussion in this section highlights some important aspects of measuring ICT investment using VOI, which considers using non-financial factors more than financial factors. Therefore, it named value on investment as it evaluates generated value after investment.

EVALUATION OF ICT INVESTMENT

During the last two decades, several discussions and developments have been presented by various scholars and practitioners. Some evaluation models have been developed for a specific organization's structure (SROI, 2008), (VMM, 2002) while others have only considered limited factors for the evaluation process (ROIC, 2006), (ROIC, 2010) which are not suitable for the complete examination of ICT investment. ICT investments can involve different types and reasons, such as mandatory IT, strategic IT, transformational IT, and new infrastructure (Han, 2002), (Henry, 1999). (Haslinda et al., 2011) described several reasons for ICT project failure, including the lack of proper evaluation techniques being applied to measure ICT investment. Therefore, there is still a need for general purpose, comprehensive and easy-to-implement evaluation models and methodologies. (Anthony et al., 2006) explained that the extraction of a public value measurement (as depicted in Figure-1) is the combination of the stakeholders, the technology investment, and government programs and operations. Thus, the calculation of public value can provide a fundamentally measured investment based on stakeholders and government programs.

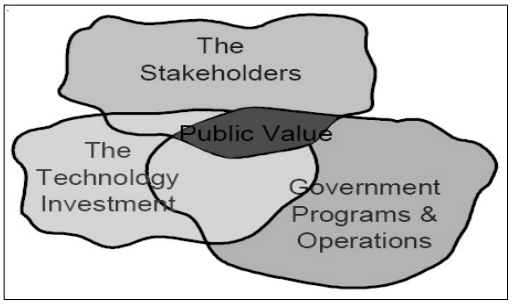

Figure-1. Public value extraction (Anthony et al., 2006).

ICT evaluation involves different factors, both financial and non-financial, that need to be considered concurrently. As discussed in the mentioned references, ICT investment evaluation can be performed on different transitional phases, such as on the IT transformation phase (Peter, 2009) and IT implementation and development phase (Richard and Bin, 2007). This shows the importance of using an investment evaluation technique that measures both types of return, financial and non-financial.

Based on the review of previous literature and research, the overall process of ICT evaluation and development is not an easy task because the field itself comprises several branches and thus might take a significant amount of time. As discussed by (Lucy, 2006), an organization measuring ROI on IT is complex and requires a thorough understanding and knowledge of both (i) processes involved in the business and (ii) the

environment in which they are running. Therefore, it is essential to know the relationships among the risks, benefits, and costs of IT investments as well as multidimensional environmental factors, including societal, organizational, and institutional issues (Lucy, 2006).

ICT evaluation involves several stages and branches to be evaluated simultaneously during the allocated evaluation span. In the working environment, investments in ICT comprise application software, system software, programming languages, communication, hardware (Weill and Olson, 1989) equipment, services, and other technologies (Keen, 1995). Although the technological aspect in the evaluation process is the major phase, it does not void the management and services aspects of the investment. It is easier to calculate and measure investments using variables like cost and expected financial return, but risks, benefits, services create many hurdles in the evaluation (Brynjolfsson, 1994).

Although it is significant to quantify IT assets' value, especially in IT service-related contexts (Micheal, 2009), to improve customer satisfaction, the measurement of ICT investments is still progressing by building and developing models and methodologies to support organizational decisions. The following complex factors are involved in measuring ICT investment, as illustrated by (George et al., 1999):

- In IT investment, there are lots of benefits of an intangible nature.
- IT investment sometimes leads to long-term benefits.
- Strategic and competitive advantages are naturally hard to quantify.
- Sometimes benefits of IT investment are indirect; these can be evaluated using several complex matrixes and factors.
- The theories and techniques available are somewhat unsuitable for understanding and capturing the value of IT.

Even with the several issues discussed above, there are obviously some successful stories supporting the likelihood of measurement of ICT investment and providing a scope for upholding this field. In conclusion, research has identified numerous techniques that can be used in the evaluation process.Table-1 (Elsie, 2009), representing Kenya's bank structure about using ICT investment evaluation techniques, shows that ICT investment measurement techniques can lead an organization to the top.

ICT INVESTMENT EVALUATION FRAMEWORK

Extensive development has occurred in building measuring techniques for ICT investment. As per the previous discussion in this research, the different combinations presented were chosen to enhance measurement in some ways, although some have been encouraged as well as criticized by practitioners and decision-makers. As [1] described, it is still difficult to determine the best technique for measuring the ICT investment—a technique that can address all possible aspects of measurement, including financial and non-financial factors. As organizations vary in amount, size, risks, and environmental and social values, the technique must consider the structure of the organization. In this paper, we present a model and its complete stepwise description in the following section.

Table-1. Usage and categorization of evaluation techniques (Elsie, 2009).

Classification	Appraisal technique	No. of banks using the technique	% of banks using the technique
Economic approaches (Ratio based)	Gut feeling	6	24
	Cost–benefit analysis (CBA)	23	92
	Payback Period	15	60
	Return on investment (ROI)	15	60
Discounting technique	Net present value (NPV)	2	8
	Internal rate of return (IRR)	0	0
Strategic approaches	Competitive advantage	16	64
	Critical success factor	13	52
	SWOT analysis	13	52
	Application portfolio approach	10	40
Analytical approaches	Risk analysis	19	76
	Value analysis	7	28
	Scoring models	4	16
	Computer-based techniques	1	4
Integrated approaches	Balanced scorecard	14	56
	Information economics	10	40
	Scenario planning and screening	8	32

Stepwise approach using framework

The evaluation framework, shown in Figure-2, illustrates the evaluation of ICT investment using financial and non-financial factors. The whole methodology can be performed by applying all steps in a sequence. Ideally, the model is divided based on two fundamental questions: (i) what to evaluate and (ii) how to evaluate it. It has been further defined in five phases described in Table2. Practically every step depends on the extracted

information from the previous steps. A brief description of the stepwise approach is presented in the next sections.

Table-2. Variable selection and extraction in each phase.

Phases	Name	Formulation
1st	ICT investment Circumstances(IC)	IC
2nd	Category of ICT Investment(C_ICT)	IC →C_ICT
3rd	Stakeholder's analysis (STA)	C_ICT →STA
4th	Influence factors depending on the Stakeholder (IF_STA)	STA →IF_STA
5th	Return value from Investment (RV_I)	IF_STA →RV_I

Phase-1: ICT investment circumstances

According to the discussion thus far, the proposed methodology has been divided into five steps for the evaluation of ICT investment. This is the first and main step to start the evaluation process. Failure in this step can lead to the whole process being unsuccessful. A major purpose of taking this step first is to understand the context of the investment. Knowing how the investment is being made helps to define list of stakeholders as well as the measuring factors. This phase is helpful for identifying the outcomes and constraints of the investment. At the end of this phase's investigation, the collected data are used in the next step.

Phase-2: Category of ICT investment

This phase tries to determine the exact category or environment in which the amount was invested, using data collected from the previous phase. The selected category then further guides the design for measuring ICT investment. The possible categories of ICT investment, such as strategic, political, or enhancement factors, all have different approaches to the assessment results. In addition, findings in this phase help extract the metrics for measurement as such metrics depend on the purpose and where the investment is made.

Phase-3: Stakeholders' analysis

Value receivers or stakeholders are the major participants during the presented evaluation strategy. Without them, the assessment is undone. Thus, according to this phase, we need to decide which beneficiaries and value receivers benefited from the investment. Investors, decision-makers, users, and partners are at the top of the list. For example, if the amount is invested in an educational institute, then the possible stakeholders can be students, faculty members, employees, and visiting peoples. The list of stakeholders depends on the type of investment. Investigation from these people—through focus groups, discussions, and interviews—will provide a complete analysis about influential factors.

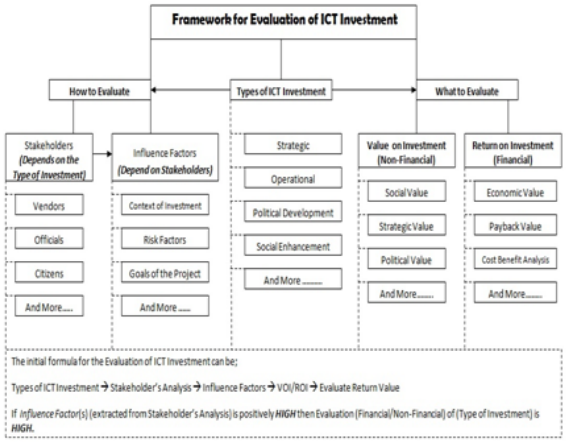

Figure-2. Framework for evaluation of ICT investment (Proposed by Author).

Phase-4: Influence factors depending on the stakeholders

During this phase, it is important to focus on the selection of the measuring factors according to the stakeholders' analysis, as the wrong selection can lead to incorrect results. Some factors directly correlate with participants while others indirectly do so. As discussed by (Anthony, 2004), measurement metrics fall into many types, such as efficiency measures and risk analysis. These measurement metrics can be extracted from the context of the ICT investment as well. Through this approach, the measurement process will ultimately be based on evidence in the form of return value.

Phase-5: Return value from investment

The final report and analysis will show the status of return value from both financial and non-financial aspects. A high rate of return means that the investment has positively influenced the stakeholders, while a low rate of return value means the investment amount has not positively impacted the stakeholders and, thus, the decision-makers need to re-build the investment strategy.

CHANGES IN ORGANIZATIONAL STRUCTURE OR BUSINESS PROCESS

The proposed framework stress more on measuring values generated through investment rather financial return on investment. The results of evaluation may requires several changes to be occurred in organizational structure and business processes as well. The major purpose after this investigation is to provide positive evidence to the organization for improvising their business processes if they are not valuable to the customers and users. For instance, a company's new strategy to provide internet facility for their in-house

customers through wireless internet during their stay in waiting lounge. Therefore the amount will invest to implement this strategy to buy routers and other wireless devices to provide uninterrupted internet facility. The company's thinking behind this strategy is to offer services to their respected customers while they are in queue. Organization is not intending to receive any financial response from the customers. According to the framework this service known as "Value" produced through investment. While, the value of investment will measures through the investigation of how many customers facilitated with this service at satisfactory level within selected period of time; high or low season. The last phase of the framework will guide the decision makers about incorporation level between investment and its generated values; which cannot be measured without analyzing and questioning from its stakeholders (phase-3). The results may require changing in the strategy due to some reasons whether every customer is not waiting for such a long span of time to use internet, or, if most of the customers are restricted to use this service due to traffic congestion. Further it will guide the ICT decision makers to change the business process either by up gradation of the particular facility or eliminate it. The proposed framework aimed to be discussed using case study in future.

CONCLUSIONS AND FUTURE WORK

This research elaborates a new strategy for helping ICT decision-makers incorporate their involvement in a proposed framework to make it even more striking. The fundamental approach of the study is to highlight the impact of ICT investment evaluation on an organization's decisions. The literature review highlighted that several methods have been proposed and applied in the evaluation of ICT investment, but a gap remains in measuring non-financial factors. Therefore, the proposed framework was especially designed based on non-financial factors to calculate VOI as the model's general idea is to measure the identification of stakeholders and value-measuring variables.

The proposed model has many phases to apply in continuous steps. In future, the implementation of the framework using the case study of an organization could improve the model. Furthermore, the collection of feedback could enhance the framework accordingly.

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