

The Challenges of Applying Cost Benefit Analysis to IT in Developing Countries

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ABSTRACT

Investing in Information Technology (IT) has been considered a risky venture by the administrations of many developing countries. The high cost of IT, the lack of financial and technical resources, and the high rate of failure of many public-sector information systems are only few of the negative factors affecting top-level administration decisions regarding IT projects. However, applying an efficient and a systematic approach for cost-benefit analysis to IT projects can reduce the uncertainty and the risk involved. Unfortunately, experience shows that the application of such an important tool can be a difficult task which requires overcoming many problems and challenges present in the public sector.

This paper presents the application of CBA from a practical point of view, while focusing on identifying the sources of difficulties present in the public sector of developing countries.

Keywords: Cost Benefit Analysis, Developing Countries, Public Sector, Information Technology, Information Systems, Qualitative Relevance.

1. Introduction

Investment in Information Technology requires substantial financial resources as well as careful and comprehensive planning [5,7,15,18]. An important aspect of planning which plays an important role in the acceptance or rejection of a given IT project is Cost Benefit Analysis (CBA). It is a means by which decision makers and top administrative officials weigh the benefits against the cost of a given project. CBA is an important part of economic efficiency which focuses on quantitative information. It is the process of assessing the net value of a project and can be applied to justify the worth of proposed information system

projects, comparing and ranking different alternative solutions of a project, or can be used as an evaluation tool for existing systems [3,10,11,12,16,17].

In recent years, government institutions in many developing countries are paying great attention to the application of CBA to their proposed IT project. Such governments have realized inevitability of the integration of IT within their work environments [1,8,9], however, they are also well aware of the risk involved, the lack of financial resources, and the many failure stories of previously attempted information system projects [4,6,14,19].

Performing an effective CBA, however, can be a challenging task. The problems begin with identifying and locating the sources of cost and benefits, hence the visible costs may constitute only a small portion of the total cost of the project. The hidden or indirect costs if neglected will result in an inaccurate analysis of CBA. Benefits on the other hand, can be easily identified but are difficult to quantify and, therefore, are difficult to measure in monetary value.

Applying CBA to government institutions [2,3,12] especially in developing countries poses a great challenge for many reasons among of which are: the lack of documentation and resources, the unavailability of special budgets for IT, the lack of planning and the unavailability of a clear and unified set of objectives for IT, the misconceptions regarding CBA for IT, the lack of management commitment, the problems associated with public sector employees, and the centralized structure of the public institutions which makes it difficult to associate the cost and the benefits of a project to a given specific workplace or department. In addition to the mentioned problems, most of government IT projects in developing countries can be characterized as none-profit service oriented projects with benefits that are mainly qualitative in nature.

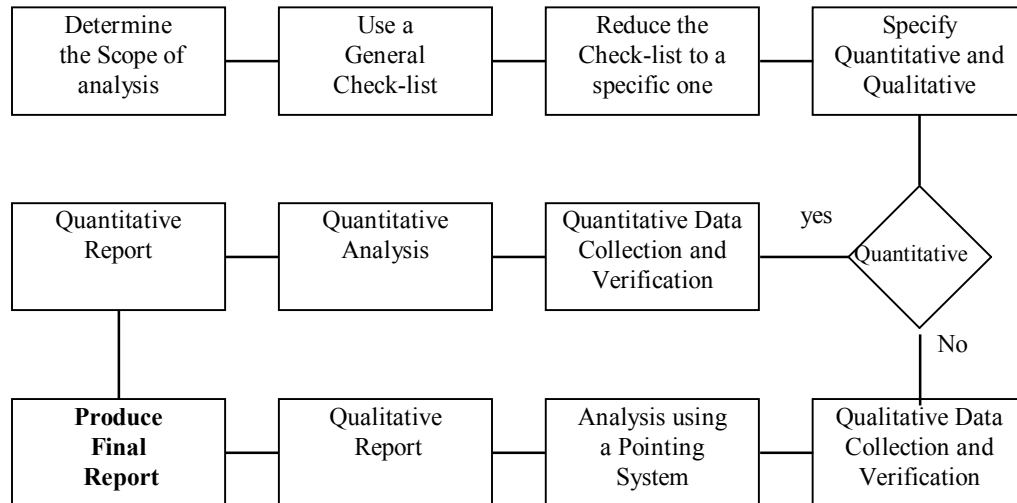


Figure 1. Cost/Benefit Analysis with Qualitative Component

In order to be aware of the existence of such mentioned problems, and to overcome them when possible, this paper attempts to present them from a practical point of view. Such problems have been experienced by the working team which was assigned the task of applying CBA to several case studies in the government of Jordan. The goal of this team, which was sponsored by the German Development Cooperation (GTZ), was to develop a systematic approach to CBA for IT, along with a set of well-defined steps for data collection which can be applied in the public sector of developing countries. These problems had complicated the initial task of applying CBA and had consumed double the time allotted for the project

2. Application of Cost-benefit Analysis

The Cost/Benefit Analysis procedure which was applied to the case-studies in the government of Jordan [12] consists of the following phases (refer to Figure 1):

1. Collection of all relevant documents, technical specifications of the IS/IT solution itself, to identify the solution and to determine the scope of the subject of analysis.
2. Use a general checklist consisting of all the possible attributes of IT related costs and benefits. This checklist is in the form of a questionnaire specifying the type of system

effects that should be considered and collected.

3. This general checklist is to be converted to a specific one by marking all the relevant attributes relating to the project under study.
4. Each attribute selected is then marked as a quantitative or as a qualitative attribute. Its location is also determined at this point (Work-place level, department -level, Institution-level, or External-level).
5. A plan is then set for data collection and data validation for both quantitative as well as qualitative attributes.
6. Quantitative data is then analyzed using methods such as Net Present Value, Return On Investment, pay back period, and so on. Qualitative data, on the other hand, is analyzed using methods such as the pointing system.
7. In a final step a report will be compiled containing the results of both quantitative and qualitative analysis:

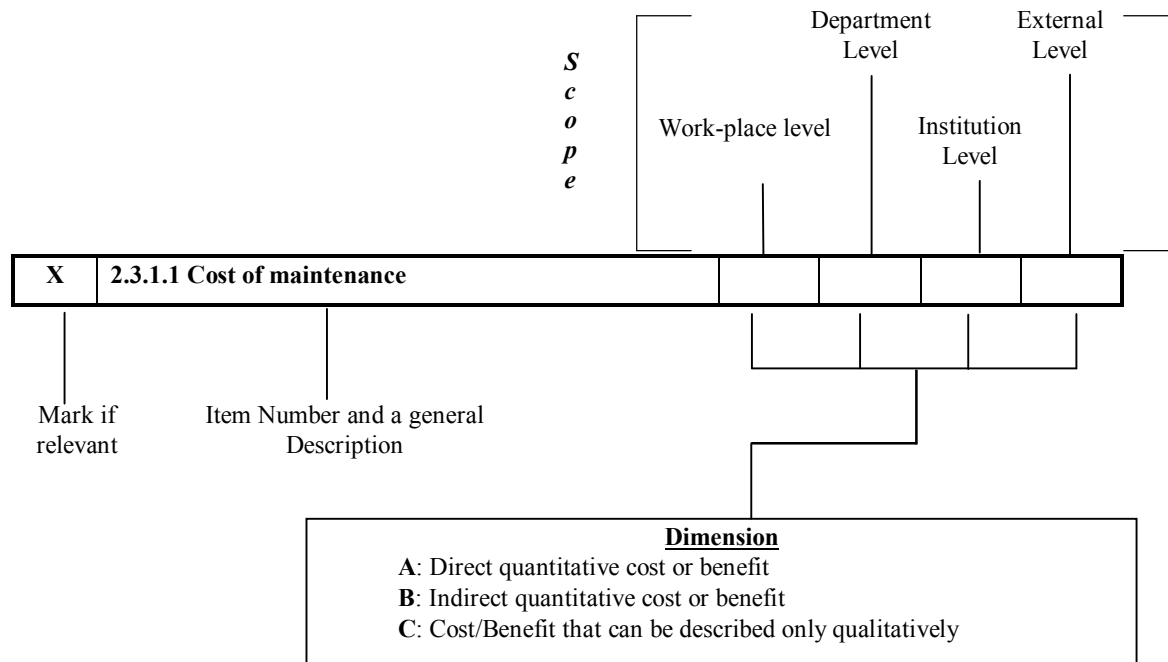


Figure 2. Explanation of one of the entries of the standard questionnaire

Considerations Used in The Application Of CBA to IT

In order to arrive at a systematic approach for CBA which can overcome many of the problems presented earlier, certain measures have been considered which include the following points:

- a) The introduction of IT has a varying influence at the different levels of the institution[5]. In particular, work at other places and in other departments as well as clients (companies, citizens) are affected by the use of new IT facilities.
- b) The difficulty of determining and measuring qualitative benefits such as the quality of the execution of administrative task and functions, the change in the motivation of employees, or effects on clients.
- c) Old systems in public institutions are being replaced through the use of IT, thus providing a basis for comparison between new projects and old applications using CBA.
- d) Cost and benefits do not appear at the same time and location. For instance, benefits appear after users have adjusted to the new facilities and have gathered experience to use them efficiently. Another example is the heterogeneous distribution of costs and

benefits over various departments (Computer unit, user, clients).

These consideration led to a CBA concept, which specifies explicitly:

- a) the scope of impact areas or levels where effects appear and can be located and measured as well as
- b) the dimensions of measurement, i.e. the question whether the impact can be reflected in specific quantitative monetary terms or whether important consequences of the IT-introduction can be expressed only with qualitative criteria.

The CBA model suggests to identify and measure effects of IT-facilities on four levels:

1. at one specific working place
2. the IT facilities may also effect the work in one or more department
3. or the organization as a whole is influenced
4. eventually external effects on other institutions, clients or citizens can appear.

3. The Challenges

There are several factors affecting the analysis of cost and benefits In the public sector of developing countries. These factors can either complicate the process of applying CBA or can affect its results

negatively. Inefficient planning, lack of documentation, lack of useful resources and statistics, misconceptions about CBA, the unavailability of special IT budgets, the unavailability of a well-defined set of IT objectives, and the centralized structure of most public institutions, are all factors that make the application of CBA a difficult task. In terms of negative CBA results, factors such as inefficient utilization of existing systems, lack of training, low wages of public employees, lack of continuous funding, and the qualitative nature of the benefits of using IT in the public sector, are only few examples.

In many of the cases studied in the government of Jordan, it was found that the accumulated cost of introducing and operating information Technology exceeded the accumulated benefits. This was evident by the negative Net Present Value for such cases.

1) The qualitative Nature of benefits

One of the first obstacles facing the application of CBA in public institutions is the qualitative nature of expected benefits from the use of IT. Given the non-profit nature of most public institutions, most of the expected benefits are found to be of qualitative type. The CBA team is immediately faced with the challenge of finding the proper formulas which enable them to measure some of these benefits in monetary terms. However, If that is not possible, such benefits must be evaluated separately using other techniques such as a pointing system. The final decision regarding the project would have to be based on both the quantitative (CBA) as well-as the qualitative evaluation. In such a case, the quantitative benefits would be the reduction of operation cost for the institution over some period of time as a result of introducing a new IT solution. Qualitative benefits such as enhancement of procedure performance, reduction of time for procedure execution, enhancement of information flow and its quality, enhancement of work conditions, transparency, enhancement of service quality for the citizens, are only few of the benefits that have to be considered in the analysis.

2) Utilization of Existing systems

The evaluation of existing systems is an important part of the CBA process which considers the existing system as a basis for comparison with the proposed project alternatives. In doing so, it was found that many of the existing systems studied were not fully utilized in the automation of the required procedures within the public institutions. Systems were installed in some cases before being completed or without even being tested. Existing systems lacked the required hardware, software, supporting staff, and training. Users in many cases were confused whether to use the computerized system or to stay manual. In some cases,

the work was duplicated both on the computer system and on the manual system.

Such a problem of course has contributed to the lack of benefits of existing systems, which interns, affected negatively the development of new information technology projects. According to top-level management, who probably had contributed in worsening this problem in the first place, this is considered as Information technology failure. Such failure is, of course, used to support their future decisions while rejecting new proposed information technology projects.

This problem can be easily avoided by proper planning for information systems.

3) Lack of planning for Information Systems

There is no doubt about the importance of comprehensive planning, including strategic as well as technical planning, for the success of information systems. Planning is probably the keyword which overcomes all the problems mentioned thus far and those to be mentioned later. However, our experience shows that systems were implemented in many cases without long term planning and without having a clear vision of the objectives of using information technology nor the objectives of the institutions themselves. improper planning is one of the major causes of information systems failures. Its negative effects can find their way to every part of the system making life more difficult to every one associated with such a system including those who wish to improve upon it.

4) Lack of documentation

Lack of documentation for existing system, which is probably caused by improper planning, can be a source of confusion for the cost-benefit analysis team. Without documentation, the data collection for CBA becomes a frustrating and a time consuming phase. It is, by all means, the worst problem which has been encountered by CBA working team. Accurate data and statistics regarding existing systems are essential to make a basis for comparison and to make the right decisions regarding new projects. The unavailability of such data prolongs the CBA process and makes it more complicated than expected. Missing data in many cases would have to be estimated and some times even guessed. Inaccurate or contradictory data can be a source of misleading cost/benefit analysis results. Proper documentation methods which are based on international standards must be enforced to produce efficient cost/benefit analysis.

4) Funding and Budgeting

The scarce financial resources is probably one of the key factors for rejecting many information technology projects disregarding the outcome of cost benefit analysis. While there is little to be done regarding this problem, many government institutions are relying on international financial aids to launch many of their IT projects. The problem which remains however, is the capability to continue the financial as well as the technical support required to maintain the operation of such systems. Many institutions can no longer provide the support for there existing systems.

Another problem which has been encountered in some public institutions is the unavailability of special budgets allocated for computer resources. Thus it was difficult to upgrade the existing systems in addition to the difficulty of controlling the operation cost of such systems.

6) Lack of commitment by top Management

Commitment of top administration officials towards IT showed to have great impact on the acceptance of new IT proposals, success of IT projects implementation, and on the utilization of existing information systems. Some officials unfortunately still believe that the old manual system is better and therefore are resisting any new advancements towards automation. Other officials still do not accept computer generated documents as legal documents. Work in such a case is duplicated both manually and on the computer.

There have been cases when computer systems had to be shutdown for several years, and only resume their work again with the change of administration. Other cases include systems which lacked proper equipment, and technical support and remained so for years until new administration was in place.

7) Organization and Wages of Government employees

The introduction of IT to the government institutions did not appear to have any effect on the reduction or reorganization of employees. This is of course due to the fact that government jobs are usually permanent and are guaranteed until retirement. On the other hand, the number of employees increased because of the addition of the system support staff. The cost of employees therefore appeared to be much greater than those benefits expected as a result of IT. Now, if we work with assumption that it is possible to downsize the number of employees as a result of introducing IT, we will be faced with dilemma of the low wages of government employees. The savings resulting from downsizing the employees will be much lower than the cost of the use of IT. Such a problem would not have existed in a more developed country such as the United States, a government employee receives a salary that is probably ten times that in Jordan. With this in mind, a new system maybe considered as not feasible or economically inefficient in for an institution in a

country like Jordan, yet the same exact system would be economically efficient in the United States. However, one should not ignore the fact that many developing countries such as Jordan are currently working hard to increase the efficiency of their institutions by reducing the number of redundant employees through early retirements, and through the transfer of employees to other departments as well as other institutions regardless of the immediate financial benefits resulting from that.

8) Associating the Cost/Benefits to the proper Department

The problem of associating the cost or benefits to the proper workplace or department within an institution can be a source of confusion to the CBA team. It is unfair for one department to pay for the cost of installing a new system out of its budget, knowingly that other departments would benefit from it. Questions which have to be answered at this point are:

Who would benefit from the new system?

Who should pay for the new system?

What is the sharing factor If the system is to be shared?

If the answers to the above three questions are known, then this problem is solved.

Fortunately, this problem has been put into consideration since the initial stages of the CBA procedure described in this paper. As indicated in Figure 2, the scope of each cost/benefit attribute is determined using the checklist. Of course further measures have to be considered at the later stages of the analysis. The number of expected users in a given department, the expected size of shared data, the number of procedures to be used, and the number of hardware equipment for each department, can all be used to determine the sharing factor for each department.

4. Conclusion

This paper has presented an actual experiment on the application of cost benefit analysis to government institutions in developing countries. The subject institutions were selected from the government of Jordan and include the Prime Ministry, Ministry of Finance, Ministry of Planning, and the Ministry of Industry and Trade. In an attempt to develop a systematic approach to CBA, the study included the evaluation of existing information systems as well as new proposed information system projects in these institutions. After approximately sixteen months of continuous work, the study was completed with a systematic procedure for CBA and a set of Guidelines for data collection and evaluation.

The problems presented in this paper were universal to all the case studies selected in the study. Such problems have made the CBA process much more difficult than expected. The lack of documentation and the lack of available data on existing systems was, probably, the worst problem. The study team had to spend most of their time collecting and verifying data from different sources at all levels of the institutions. It was obvious from the beginning of the study that major problems regarding data collection had existed within these institutions. Other problems, presented in this paper have all contributed to produce the expected negative results (negative Net Present Value) of the majority of the case studies. Fortunately, many of problems such as financing, planning, documentation, training, and maintenance, are currently under study with the aid of foreign agency for technical and financial assistance. Other problems, especially those dealing with employees restructuring and wages are more resilient to change. The introduction of IT did not have any effect on the numbers of employees nor did it have any effect on the reorganization of the institutions. On the other hand, new technical employees had to be hired to support the new projects. This of course was translated to higher operating cost as a result of IT introduction.

In summary, the following points have to be put into consideration during the application of cost/benefit analysis to the public sector of developing countries:

1. The procedure for cost/benefit analysis has to be carefully designed as a systematic yet simple procedures. It has to part of an overall comprehensive planning for information technology.
2. Qualitative benefits are difficult to measure using monetary terms. However, they are extremely important, and therefore, must be evaluated using qualitative techniques such as the pointing system. The final decision regarding a new project must be based on both quantitative as well as qualitative measures.
3. Computer training and computer awareness programs are needed to educate government employees on the advantages of utilizing computer technology to enhance their work efficiency. Training should start from the top-level executives down to every employee in the institution.
4. Governments have to work on fixing the problems causing the widespread inefficiency in the public sector, and the low wages of public employees.

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