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Abstract

The outsourcing of services related to Information Technology and Information Systems (IT/IS) is seen by many organizations as a tool for achieving strategic objectives. Reducing costs, focusing on core capabilities and improving business/process performance are held to be the main reasons for investing in IT/IS outsourcing.

However, the process of outsourcing is complex and involves considering not only the benefits but also evaluating investments and the risks inherent in making decisions during this process. When planning to outsource these services, companies are faced with a choice of different projects, suppliers and contract settings. Reaching appropriate decisions is crucial to achieving the desired goals, and the consequent success of investments.

This research in progress paper presents a model for assessing and prioritizing different IT/IS outsourcing projects. This model uses the methodology of Data Envelopment Analysis (DEA) and allows consideration to be given not only to the intrinsic aspects of such projects (cost, schedule, benefits, customization, etc.), but also the characteristics of the proponent company. Therefore, the proposed model aims to assist companies in evaluating different projects for outsourcing operations related to IT/IS.

Keywords: IT/IS outsourcing, Assessment model, Data Envelopment Analysis.

1 INTRODUCTION

The Information Technology (IT) and Information Systems (IS) outsourcing has been one of the subjects most studied in the IT/IS academic area, with many researchers (Grover et al. 1996; Kim and Chung, 2003; Rouse, 2006) discussing how organizations should best manage their IS/IT outsourcing activities in order to achieve success. Although "IT Outsourcing Statistics 2011/2012" study, conducted by Computer Economics (2011), concluded that IT executives are maintaining the status quo, while awaiting evidence that the tenuous economic recovery will progress before engaging in more strategic outsourcing initiatives, the percentage of the total IT spending on service providers, world-wide, rose from 6.1 percent in 2009 to 7.1 percent in 2010. Given such a scenario, it is important to analyse the main aspects of this movement and its consequences.

In fact, IT/IS outsourcing is seen as a strategic tool used by many firms either to reduce their total costs on IT/IS or to gain access to IT/IS capabilities not available in-house and therefore this justifies the increasing interest of companies and the consequent investment in this area. However, to outsource activities, even when not directly related to core business, is a complex task. It involves deciding: what area/activity to outsource, which supplier best fits the needs of the business, how to contract the supplier, how to measure the quality of service and penalize the supplier when necessary, etc.

The purpose of this paper is to propose a model to assist managers in selecting the best IT/IS outsourcing project. Here, IT/IS outsourcing project is understood as a proposal to outsource a particular area/activity and one that should be assessed not only by the attributes/qualifications of the project but also by the characteristics of proponent company. In this model, what is not considered is the first decision: that of whether or not to outsource a specific activity. It is assumed that this decision has been made and what remains is to decide what the best choice is with respect to the supplier and type of project. Similarly, the subsequent aspects related to the type of contract and the way of evaluating the service provided were not analyzed. Although the decision addressed in this work can be influenced by these latter aspects, giving consideration to them in a decision process will come at a later stage of developing this study.

In the literature, outsourcing decisions are often reached by using multicriteria approaches and coming to a group decision (e.g. Yang and Huang, 2000; Wang et al. 2008; Kahraman et al. 2009). The model proposed in this paper aims to support not only the decision but how the problem is structured. Thus, it includes defining the evaluation criteria and the feasible projects. In order to evaluate the alternatives it is suggested use be made of the Data Envelopment Analysis (DEA) methodology, which states for each alternative (project) an efficiency measure on the basis of evaluation criteria. The DEA model has been widely used in the evaluation of information systems and technologies. Shafer and Byrd (2000), Sowlati et al. (2005) and Bernroider and Stix (2006) make contributions in this context. However, there are no studies that address the use of this methodology in the evaluation of IT/IS outsourcing projects.

In the next section, a brief review is made of the issues related to the model proposed. Then, the model proposed is presented and some aspects of it are discussed. Thereafter, in Section 4, the subsequent steps of this study and its objectives are set out. As this is a research-in-progress, the final findings will be presented at a later stage.

2 RELATED LITERATURE

2.1 IT/IS Outsourcing

Outsourcing refers to subcontracting of a set of functions or processes by one firm to another. The companies usually outsource non-core business operations, which include applications, assets, people and other resources. The practice of IT/IS outsourcing started around 1954, although the outsourcing activities emerged, mainly in the manufacturing sector, many years prior to that (Kahraman et al. 2009).

According to Loh and Venkatraman (1995), due to the rapid advances in technology, it has become extremely difficult for companies to profitably develop the skills needed to manage complex IT functions and so IT/IS outsourcing has become increasingly significant. The responsibility for IT is increasingly being moved towards external vendors and, thus, the monolithic centralized IS department is giving way to a streamlined decentralized corporate entity.

During recent years, many successful cases of IT/IS outsourcing have been cited, although a growing number of firms has reported failures (McCue, 2005; Fabriek, et al. 2008). Within this context, academic research has focused on both identifying the determinants of IT/IS outsourcing, in an attempt to characterize the companies investing in IT/IS outsourcing, and ways to improve this practice in order to increase the probability of the success of contracts.

Based on a review of 143 published papers on IT/IS outsourcing, Lacity et al. (2009) listed 17 reasons that prompt organizations to outsource their IT/IS services or products. The main reasons, given in 75% of the papers, are: reducing costs; focusing on core capabilities; access to expertise/skills; improving business/process performance and technical reasons.

Despite all recommendations that outsourcing should be conducted strategically and not only thought about in terms of saving money, reducing costs is regarded by many organizations as the major contribution of IT/IS outsourcing. They argue that vendors serving multiple customers can exploit economies of scale relating to the development, maintenance and operation of systems. The suppliers can also relocate where services are performed to exploit lower-cost labor pools, both domestically and offshore (Loh and Venkatraman, 1992; Dibbern et al. 2004; Bhalla et al. 2008).

Many companies also invest in IT/IS outsourcing with the desire or need to focus on its core capabilities, since they seen IT/IS as a support activity. There are also enterprises, where the employees do not have the skills or abilities required to implement or develop new IT/IS tools. Therefore, Rockart (1996) discussed the importance of IT outsourcing as a way of obtaining skills that companies do not have. To a certain extent, and because of these latter reasons, IT/IS outsourcing can also help improve a client's business, processes or capabilities.

Due to the importance that outsourcing has gained in the IT/IS environment, during recent years many papers have focused on building decision models for IT/IS outsourcing. In fact, it is increasingly important to make the right decisions on evaluating and selecting possible IT/IS outsourcing projects (Chen and Wang, 2008). Lacity et al. (1996) proposed a 2x2 decision matrix to guide the selection of outsourcing candidates based on the business, economic, and technical factors. The use of the Analytic Hierarchy Process (AHP) method to help users to structure outsourcing problems was proposed by Yang and Huang (2000). Roy and Aubert (2002) presented an IT outsourcing decision model based on the resource theory. Wang et al. (2008) applied a hybrid of AHP and improved ELECTRE III methods to the IS outsourcing decision in an effort to demonstrate a quantitative approach to this complex decision. Many other papers have analyzed decisions regarding IT/IS outsourcing.

IT/IS outsourcing decisions may be related to: whether to outsource the IT/IS operations, selecting what activities to outsource, selecting an IT/IS outsourcing project from the proposals of different providers and aspects of managing the relationship between clients and outsourcing providers. In this paper we are concerned only with the decision about selecting the best IT/IS outsourcing project proposal and do not consider the remaining types of outsourcing decisions. To do this, we propose in this paper a model for evaluating IT/IS outsourcing projects that takes into consideration not only benefits from this but also the investment required. The DEA methodology is used to determine an efficiency measure for each project based on evaluation criteria (inputs and outputs).

2.2 DEA Methodology

The original DEA methodology was proposed by Charnes et al. (1978). It consists of solving a linear programming (LP) problem for evaluating the efficiencies of decision making units (DMUs) observed such as banks, schools, industries, etc. What these DMUs have in common is that they convert the same set of inputs (resources) into the same set of outputs (results, expected outputs).

Since DEA is a widely recognized technique and has been successful applied in case studies, this methodology has come to the attention of businesses and academy researchers. DEA methodology has been used in various areas, for example: selecting best vendors (Liu and Hai, 2005), examining a bank's efficiency (Chen et al. 2005), analyzing firm's financial statements (Edirisinghe and Zhang, 2007) and measuring the efficiency of organizational investments in IT/IS (Shafer and Byrd, 2000; Sowlati et al. 2005; Bernroider and Stix, 2006; Asosheh et al. 2010; Gusmão and Costa, 2011). Although DEA models have been widely used to evaluate IT/IS projects, the authors have not found any reports of this methodology having been used to evaluate IT/IS outsourcing projects.

The definition of efficiency in DEA is specified as the ratio of the weighted sum of outputs to the weighted sum of inputs of a DMU, as shown in Figure 1.

$$Efficiency_k = \frac{\sum_{j=1}^{n} W_{jk} Output_{jk}}{\sum_{i=1}^{m} V_{ik} Input_{ik}} \qquad k = 1, \dots, N$$

Figure 1.   Definition of efficiency in DEA.

where V_{ik} is the unitary weight of input i and W_{jk} is the unitary weight of output j for the unit k. In this notation, there are N units, m input variables and n output variables.

Although various forms of the efficiency frontier can be determined, there are two models of DEA that are considered classics: that of the CCR or CRS (constant returns to scale) and that of BCC or VRS (variable returns to scale). The CCR model, originally presented by Charnes et al. (1978), works with constant returns to scale, that is, any change in inputs produces a proportional variation in the outputs. The BCC model, as per Banker et al. (1984), works with variable returns to scale, that is, it replaces the axiom of proportionality between input and output by the axiom of convexity.

The DEA model can be divided into: input oriented and output oriented versions. In the input oriented model, the goal is to minimize inputs, while keeping the output unchanged, whereas the output oriented model seeks to maximize results, while the inputs remaining unchanged. Independent of the orientation, the DEA model consists of an LP problem for each DMU, in which the decision variables are the weights for the inputs and outputs chosen.

Classic DEA models allow complete freedom regarding the selection of weights that give the maximum efficiency value of the DMU. Having the flexibility to choose weights is one of the advantages offered by the DEA model. However, the calculated weights may be inconsistent with a priori knowledge about the relative values of inputs and outputs. Because of this latter point, there is a large diversity of methods for incorporating value judgments in DEA. An overview about this subject can be found in Allen et al. (1997) and Gusmão and Costa (2011) present an important contribution on this issue.

Some of the advantages of using DEA, in relation to the traditional models used in evaluating investments in technology and systems, are the facts of being able to consider various aspects in the evaluation, in addition to using the idea of better utilization of the resources (investments made). The evaluation criteria can be strategic, operational, financial, etc. Another advantage is the possibility of conducting this evaluation so as to consider the impacts of the investments in different periods, which will permit a time analysis to be made (Gusmão and Costa, 2011). These advantages can also be observed when evaluating IT/IS outsourcing projects and this is the reason for using this methodology in this paper.

3   THE MODEL PROPOSED

The model proposed in this paper is presented through the framework of the Figure 2. The steps of this model should be followed so as to obtain an evaluation of IT/IS outsourcing projects and, then, to choose the one that would be best for the enterprise to invest in.
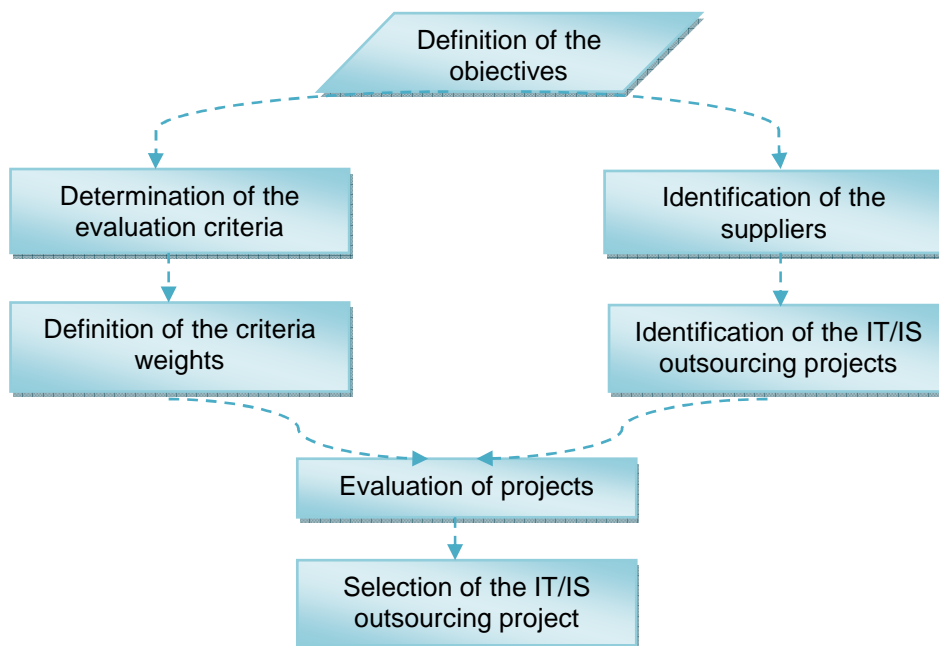
Figure 2.   Model for evaluating IT/IS outsourcing projects.

The development of IT/IS outsourcing projects must be aligned with the organization's strategic planning if the investments made are to be successful. Thus, before the company decides which projects to consider, it is necessary first to define what objectives for the outsourcing process should be set. This is done in the first step "Definition of the objectives", which consists of analyzing the organization's Strategic Planning and then, the planning for the area to be outsourced. This plan enables a company to:

- Become aware of its challenges and opportunities (defined by the gap between vision and reality).
- Identify strategic options of the IT area that best meet these challenges.
- Identify which evaluation criteria and analysis techniques to select from various options.
- Identify the best options for IT outsourcing and its implications.
- Determine the changes necessary to architectures and organization to support the IT/IS outsourcing strategy.

For this step the methodologies suggested include Managing the IS strategic planning process (King, 1978) and the Strategic Grid (Davis, 1974).

From this first step, two analyses should be conducted: one will focus on determining the criteria that would be used to evaluate the IT/IS outsourcing projects and the other will identify the companies that can provide services and products in IT/IS and their respective proposals for outsourcing a particular activity of the enterprise. For the first analysis, use may be made of such methods as: the Balanced Scorecard (BSC) used in many studies of this context (e.g. Asosheh et al. 2010); Critical Success Factors (CSF) as implemented by Sabherwal and Kirs (2007).

Because of the way it has been designed, this model allows the problem to be structured, since it does not merely calculate the efficiency measure for each project, but includes determining the evaluation criteria (inputs and outputs) aligned to the company's strategy and defines what projects meet the needs of the company (decision alternatives).

The major contribution of this paper is the proposition of the DEA model in the process of evaluating projects. Therefore, the evaluation criteria will function as the inputs and outputs of the DEA model. The inputs will be associated with: the investments that have to be made, the time required to provide the outsourced service or to supply a system/technology, the number of its own employees involved with the project, and so forth. On the other hand, the outputs will correspond to the benefits derived from the outsourcing process: reducing costs, increasing productivity, improving business/process

performance, and so on. Thus, the criteria that are to be minimized are viewed as inputs whereas the criteria to be maximized are considered as outputs.

Many of the inputs and outputs are not easily measured. They are related to intangible aspects and most of them are estimates. In the case of the increase in productivity, for example, this will be estimated, based on similar processes of outsourcing and on particular characteristics of the company; how much production will increase while maintaining the same resources or how many resources can be saved while maintaining the same rate production. Regarding the fact that many aspects are intangible, this is a problem found in many studies where the objective is not only to assess the financial gains from the investment in IT/IS, but also to analyze the strategic returns. As explained before, the DEA methodology allows us to consider both financial and strategic aspects when evaluating projects.

4 NEXT STEPS

The next step of this research will be to proceed with data collection. The aim is to collect data from different companies, which need to choose between different projects of IT/IS outsourcing, by interviewing CIOs in order to complete a questionnaire. Thus, the proposed model will be applied and the results reached will be compared with the results from other methodologies. If necessary, some adjustment will be made in the steps set out in the model.

Therefore, this research project intends to deliver on the following goals:
- To analyze the procedures currently used to evaluate IT/IS outsourcing projects.
- To develop a tool to quantitatively measure the attractiveness of IT/IS outsourcing project proposals.
- To study what is the best orientation in this context i.e., whether this should be input-oriented or output-oriented.
- To define if there is proportionality between input and output and, then, to choose between BCC or CCR model.
- To apply the proposed model in a real life case.
- To support companies in the decision process of deciding on the best IT/IS outsourcing project.

All these objectives are directed to the higher purpose of deveolping a model which enables increasing the chances of the outsourcing IT/IS activities by companies being successful.

With a view to overcoming the limitation of DEA regarding the choice of weights, some methods used to incorporate DMs' value judgments in DEA could be analyzed, in future research studies, which could then be aggregated to the model. Future research could also analyze the problem of evaluating IT/IS outsourcing projects as a portfolio problem. In this type of problem, the decision is related to choosing more than one IT/IS outsourcing project to be implemented in different operations, while taking into consideration the relationship between these projects.

This work has already started and is part of a larger project focused on the study of various aspects related to outsourcing IT operations. Specifically for this work, we intend to present the results obtained from applying the model at the end of 2012.

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