A FRAMEWORK FOR EVALUATING THE PERFORMANCE OF ENTERPRISE-WIDE IT DEPARTMENT USING AN INTEGRATED ANALYTIC NETWORK PROCESS (ANP) AND BALANCED SCORECARD

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Abstract: There are two viewpoints about usefulness and performance in the information technology department in an organization. One side favors that the benefits in question have not been fulfilled. Another side emphasizes the important role of information technology in all life aspects and facets. Conflicts exist about the results and benefits of information technology are just one of the relatively old challenges in information technology scope. This study aimed is done to provide a framework for evaluating the performance of information technology department. Essential factors in evaluating the performance are derived from texts and standards. Potential criteria were reduced by screening method and assigned to Balanced Scorecard framework. Relationships Network between Balanced Scorecard aspects and criteria were determined by using DEMATEL method. Analytical Network Process method was used to determine weights of criteria.

Keywords: IT department performance, evaluation framework, DEMATEL, ANP.

I. INTRODUCTION

Although considerable financial and intellectual capital is allocated to IT by organizations, some organizations have restricted IT budget due to lack of evidence on the efficiency of investments (Martinsons et al, 1999).Often, managers ask if investment in IT/IS is really worth it or not, and if the IT department plays any important role in the organization. For such managers, the value of information technology and IS performance must be seriously evaluated (Amy et al, 2008).Researchers in IT evaluation regard it inadequate to solely emphasize on the tangible measurable aspects while consider the intangible aspects such as empowerment, fame and social acceptance more important (Gomez and Pather, 2012). A major emphasized challenge is the lack of, and not implementing, a suitable framework to evaluate IT in organizations, therefore, a better methodological and theoretical framework in IT evaluation is highly recommended (Berghout et al, 2005). Various methods and techniques to evaluate the investments in IT/IS or to assess the performance of IT department have been presented in the past two decades. Meanwhile, it has been clarified that the sole inspection of criteria such as Rate of Investment (ROI), Internal Return Ratio (IRR), Net Present Value (NPV) and Payback Period (PP) are not enough (Abran and Buglione ,2003).

In fact, due to the specific features of IT management, its performance evaluation and benefits assessment at the organizational level poses serious challenges to the managers and it is not possible to recommend a unique methodology or an exclusive technique to tackle its problems (Albertin and Albertin , 2010).

Therefore, the evaluation of the success of IT performance has turned into a research topic in IT literature.

Implementing balanced score card (BSC), as a framework that combines both financial and non-financial assets in its assessment of the organization's performance, can be a suitable solution in this respect (Amy et al, 2008). Combining DEMATEL and Analytical Network Process can also consider the internal effects of the evaluation criteria on each other. Therefore a combination of these three methods has been recommended in this study.

II. THE BALANCED SCORE CARD, DEMATEL AND ANALYTICAL NETWORK PROCESS

2.1. The Balanced Score Card

Kaplan and Norton have introduced the balanced score card at the organizational level. The base of their idea is that evaluating an organization must not be confined to financial evaluation, however, other non-financial criteria such as customer satisfaction, internal processes and creativity must play a role in complementing it (Kaplan and Norton, 1992, 1996, 2004). In the balanced score card, not only the financial indexes but other indexes, that is, customer indexes, internal processes, improvement and learning in the management process are considered strategic aspects (Yüksel and da Hdeviren, 2010). Financial aspects, customer, internal process and improvement and learning are the four aspects of the balanced score card (Kaplan and Norton, 1996). The balanced score card is a pattern and must be customized to each organization. There is also the possibility of applying the balanced score card in a specific field in the organization (Martinsons et al, 1999).

2.2. DEMATEL

The assumption that the variables are independent in some studies is actually not a realistic assumption. DEMATEL is a method to analyze the relations

between factors in a pair-wise comparison matrix. This method determines the key factors as well as the relations between them (Fonetla et al, 1974). The DEMATEL method not only can turn the cause and effect relations between the criteria in a structural model, but it also can be used to control the dependencies in the criteria (Tseng, 2009).

In management and social problems, it is possible to categorize and organize the mutual effects of numerous factors on an issue, using the EMATEL method (Uzunovic et al, 2000). The DEMATEL technique is used in order to determine the relations between different aspects and helps understand complicated problems. Influential Network Relationship Map (INRM), which is achieved through a combination of the DEMATEL technique and Analytical Network Process, is used to measure the two-sided importance of each criterion (Chen et al, 2011).

2.3. Analytical Network Process

The major assumption in Analytical Network Process is the independence of sub-criteria or criteria all together (Saaty, 2006). This method divides the problem into clusters and each cluster includes some variables to evaluate. Using the synthetic DEMATEL method along with the Analytical Network Process to determine the dependence of criteria, will reflect a more accurate view of the real world (Chen et al, 2011). It is possible to use the Shen (2014) method as an alternative to Saaty Analytical Network Process.

By applying the results of the DEMATEL method and predicating them as base, and by using a mathematical model, this method forms an analytical Network Process's super matrix and by putting limits on the super matrix, achieves the relative significance of the criteria.

III. THE APPLICATIONS OF BSC'S FRAMEWORK AND COMBINING IT WITH OTHER METHODOLOGIES

Since the introduction of the Balanced Score, Analytical Network Process and the DEMATEL, researchers have used combinations of these methods. Various studies in numerous areas have been conducted, combing the balanced score card and multi-criteria decision-making techniques. In this paper, in order to evaluate IT performance, the balanced score card along with DEMATEL and ANP have been used.

IV. THE PROPOSED FRAMEWORK

The process of proposed framework is as follows:

The extraction of evaluation criteria. The beginning of the process involves a review of texts ,international standards and experts' opinions in order to extract the criteria for evaluating IT department.

Filtering criteria. the extracted criteria could not have had an equal weight. Therefore, the expert will be asked to rate them on a spectrum from "unnecessary" to "necessary". Necessary criteria preserved and the rest will be deleted.

Allocation of the criteria to the 4 aspects of BSC. The allocation of the chosen criteria, regarding their nature, to the 4 aspects of the balanced score card, will be done according to Cobit's framework version 2012 (ISACA, 2012).

Implementing the DEMATEL method. At this stage, the DEMATEL technique must be applied to both the 4 aspects of the BSC and the criteria mentioned in it. To fulfil this, a 4x4 matrix and another nxn will be provided and the experts will be asked, based on the standard method, to determine the effect intensity of each of the 4 aspects and each of the n criteria on each other on a scale of 0= no effect, 1= little effect, 2= moderate effect, 3= great effect, 4= really great effect. The outcome of the data processing with the DEMATEL method will be the cause-effect relationship between the 4 aspects of the BSC and the n criteria. The result for a case study is presented in figure 1.

Implementing ANP. At this stage, the relative weight of the 4 aspects of BSC and the relative weight of the n criteria can be calculated through the technique presented by Shen. This method, which is a consistent solution of a direct use of the results of DEMATEL analysis, was presented by Shen et al in 2014.

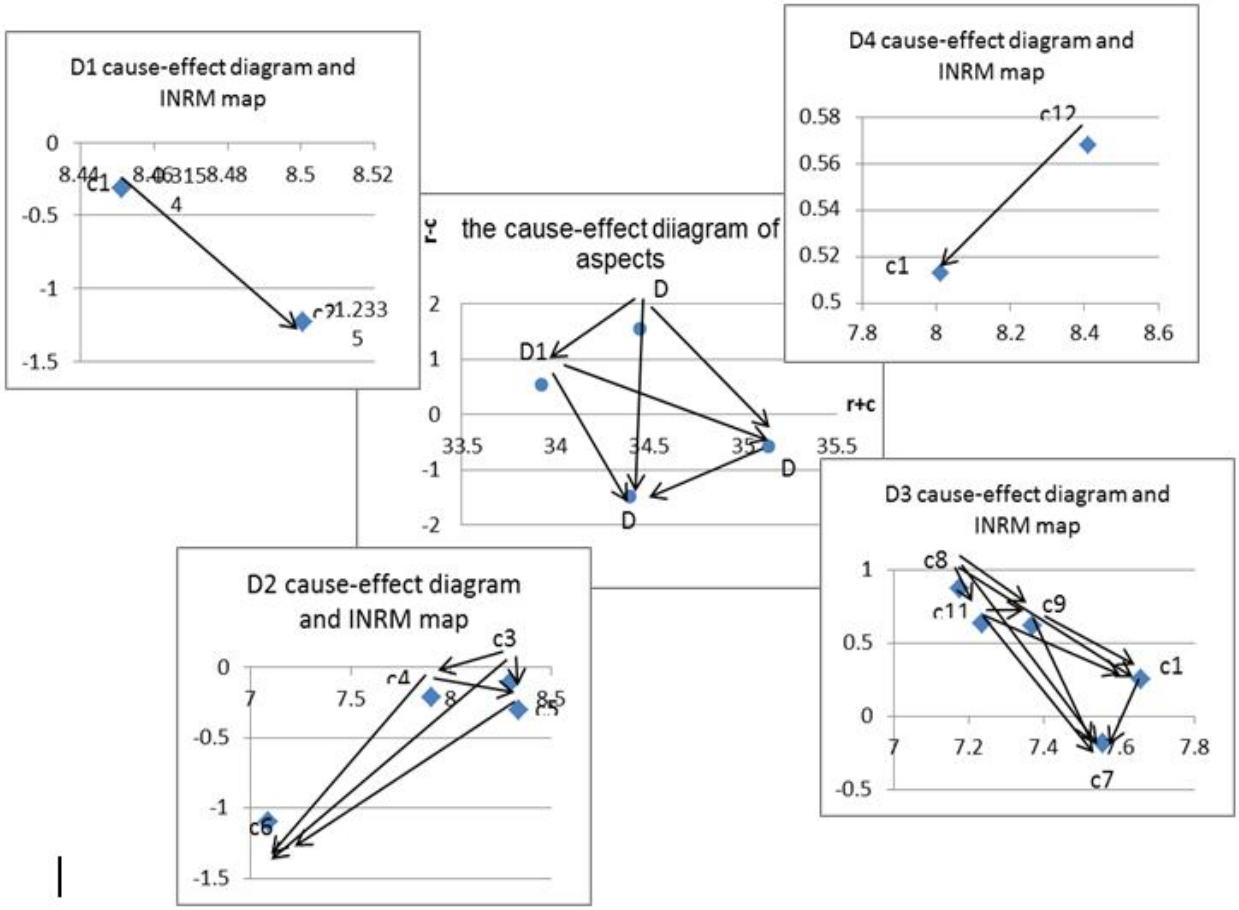


Figure 1. the penetration ratio of BSC's aspects along with the penetration and effect map of criteria in each aspect

Evaluating the performance of enterprise-wide IT department.

In order to evaluating the performance of enterprise-wide IT department, a questionnaire can be provided to the expert. The responses can be attributed quantities of 1 to 5 and it is possible to evaluate the IT department in an organization using these amounts and their weights.

RESULTS AND SUGGESTIONS

As IT departments in organizations are currently providing IT services to their home organization, establishing an organized framework that guarantees services that are in line with the strategic objectives of the organization can be very useful. The analysis of the results of the DEMATEL method indicated that the chosen indexes and the BSC aspects have mutual effects on each other and are not independent. The INRM map of the aspects of BSC shows that improvement and learning has the greatest effect on other aspects and the financial aspect (the organization's share) has the second rank in being influenced. The INRM map was used for each of the influencing and under influence indexes in each aspect. Since this map divides the indexes and the score card's aspects into two categories of cause and effect, focusing on the indexes and the influencing aspects and improving them must logically improve the indexes and the under influence aspects. The relative significance of criteria and the BSC's aspects in relation to each other has been achieved through the combined method of DEMATEL-analytical Network.

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