An Integrated Decision Support System for Selecting Software Systems

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Abstract- **Enterprise Resource Planning (ERP) product selection can be seen as one of the most critical and difficult decision making stages for an organization. This research explores the application of a hybrid multi-criteria decision making (MCDM) procedure for the evaluation of various ERP alternatives. The proposed evaluation framework integrates three methodologies: Analytic Network Process (ANP), Choquet Integral (CI) and Measuring Attractiveness by a Categorical Based Evaluation Technique (MACBETH). ANP produces the priorities of alternatives with respect to the interdependent evaluation criteria. The conjunctive or disjunctive behaviors between criteria are determined using MACBETH and CI. Numerical application of the proposed methodology is implemented on the decision making problem of a firm that faces with four ERP projects. The final ranking is compared to the one obtained by ignoring the interactions among criteria. The results demonstrate that the ignorance of the interactions may lead to erroneous decisions.**

Keywords- ERP, supplier selection, MCDM, ANP, Choquet Integral.

I. INTRODUCTION

An ERP system is a critical investment that can significantly influence future competitiveness and performance of a firm. It is increasingly important in today's modern businesses because of its ability to integrate the flow of material, finance, and information and to support organizational strategies [1]. A successfully implemented ERP can offer organizations automating business process, timely access to management information and improving supply chain management through the use of e-commerce [2]. It standardizes processes and stores information as well as recalls that data when it is required in real time environment. Implementing an ERP system may be costly and time-consuming. Companies spend billions of dollars and use numerous amounts of man-hours for installing elaborate ERP software systems. However, the benefits of a successful ERP project are worthwhile. In order to implement an ERP software successfully, it is necessary to select an ERP system which can be aligned with the needs of the company. Thus, an efficient decision making approach for ERP software selection requires both company needs and characteristics of the ERP system and their interactions to be taken into account [3]. The selection process for determining the most appropriate ERP software among a set of possible alternatives in the market is a multi-criteria decision making problem.

This paper introduces a hybrid multi criteria decision making (MCDM) model for ERP selection based on Analytic Network Process (ANP), Choquet Integral (CI) and Measuring Attractiveness by a Categorical Based Evaluation Technique (MACBETH). Initially, we have categorized ERP selection criteria into three main criteria set: Vendor related criteria (VRC), customer related criteria (CRC), and software related criteria (SRC). Each one consists of its own sub-criteria set. Since these sub-criteria and criteria have both inner and outher dependencies, we have made use of the ANP to determine these dependencies and relative priorities of all criteria. MACBETH is both an approach and a set of techniques that have the goal of providing an overall ordering of options, and that aid on the construction of interval numerical scales based on qualitative (non-numerical) pairwise comparison judgments [4, 5]. In this research, we have used MACHBETH and CI to determine conjunctive or disjunctive behaviors between criteria. The last phase of the proposed methodology involves ranking the given ERP alternatives according to their final performance scores. We have shown the feasibility of the proposed framework on the decision making problem of a company that needs to evaluate four ERP software alternatives and select the most suitable one according to its requirements.

The remaining part of the paper is organized as follows: in Section 2 we give related literature. Section 3 briefly describes the methodologies that constitute the proposed framework. The steps and details of the proposed decision support framework and its implementation into the ERP selection problem is given in Section 4. Finally, Section 5 concludes the study.

II. LITERATURE REVIEW

There are various solutions in the ERP market and each one of them has its own features. Furthermore, buying an

ERP software is a very serious and difficult task for a firm since it may cost hundreds of thousands and even millions of dollars. Therefore, in the academic literature there are many research on the selection process of ERP products. Wei et al. [1] have presented a comprehensive framework for selecting a suitable ERP system. Their selection framework is based on analytic hierarchy process (AHP) approach. Liao et al. [2] have presented a model which is based on linguistic information processing, for dealing with such a problem. Yazgan et al [6] have considered this selection problem as a multi-criteria decision making problem and they have integrated artificial neural network and analytic network process. This integration enables them to interview only one expert for the assessments. Karsak and Özoğul [3] have proposed a selection framework that enables both company demands and ERP system characteristics to be considered, and provides the means for incorporating not only the relationships between company demands and ERP system characteristics but also the interactions between ERP system characteristics through adopting quality function deployment principles.

III. The Methods

A. Analytic Network Process (ANP)

ANP is a generalization of Saaty's AHP, which is one of the most widely used multi-criteria decision support tools. AHP is limited to relatively static and unidirectional interactions with little feedback among decision components and alternatives [7].

Many real life decision problems cannot be structured as a hierarchy because of the fact that they involve the interaction and dependence of higher level elements in a hierarchy on lower level elements. So the hierarchy becomes more like a network. On this context, ANP and its supermatrix technique can be considered as an extension of AHP that can handle a more complex decision structure as the ANP framework has the flexibility to consider more complex interrelationships (outerdependence) among different elements [8, 9].

AHP incorporates both qualitative and quantitative approaches to a decision problem [10]. It is also capable of capturing the tangible and intangible aspects of relative criteria that have some bearing on the decision making process, but AHP cannot deal with interconnections and innerdependences between decision factors in the same level [8]. This is because an AHP model is structured in a hierarchy in which no horizontal links are allowed. In other words, AHP can only be applied to a hierarchy that assumes unidirectional relation between decision levels. In fact, this weakness can be overcome by using the advance multi-criteria making technique, which is ANP. So, ANP is very useful in these kinds of situations providing a general framework without the assumptions of independence of higher-level elements from lower ones, or independence on the same level [11].

In this approach, comparison matrices, prioritization and the weights while considering the interdependencies are formed between various attributes of each level with the scale of 1–9 suggested by Saaty [12]. Also the consistencies of the pairwise comparisons, made by the experts or decision makers, have to be checked in order to make the necessary changes if there is any inconsistency above the allowed limit. Once the pairwise comparison matrices are formed, weighted vectors for all the matrices are calculated. The concept of supermatrix is employed to obtain the composite weights that overcome the existing interrelationships. The synthesizing step is to rate the alternatives according all the criteria, compute the overall score for the alternatives and make the final decision as to choose the best alternative or to obtain the final ranking of the alternatives.

B. Choquet Integral (CI)

The CI, which has been introduced in the fuzzy measure community by "Murofushi and Sugeno [13]" is a fuzzy integral proposed by "Gustave Choquet [14]" and considers the interactions between k out of n criteria of the problem, which is called the k-additivity property.

Letting $t_i, \quad i = 1, \ldots, n$ be the scores on the criteria, by using only the interaction index, it is possible to express CI in the case of 2-additive measures as follows [15]:

$$C_\mu(t_1,\ldots,t_n) = \sum_{I_{ij}>0}(t_i \wedge t_j)I_{ij} + \sum_{I_{ij}<0}(t_i \vee t_j)\left|I_{ij}\right| + \\ + \sum_{i=1}^{n} t_i(\Phi_i - \frac{1}{2}\sum_{j\neq i}\left|I_{ij}\right|) \qquad (1)$$

$$\text{with} \quad \Phi_i - \frac{1}{2}\sum_{j\neq i}\left|I_{ij}\right| \geq 0, \quad \forall i = 1,\ldots,n$$

Here, Φ_i represents the relative importance of criterion i with $\sum_{i=1}^{n}\Phi_i = 1$ and I_{ij}, defined in the interval [-1; 1], is the interaction value between criteria i and j. Positive values of I_{ij} implies a conjunctive behavior between criteria i and j. *i.e.* simultaneous satisfaction of both criteria is significant for the global score. Negative values of I_{ij} implies a disjunctive behavior between criteria i and j. *i.e.* the satisfaction of either one is sufficient to have a significant effect on the global score. If I_{ij} is null, then there is no interaction between criteria i and j. If for all pairs of criteria, I_{ij} are null then the Φ_i value acts as a weight vector in a weighted arithmetic mean.

C. Measuring Attractiveness by a Categorical Based Evaluation Technique (MACBETH)

MACBETH is a multi-criteria decision analysis approach which has been proposed by studies of "Bana e

Costa [16]", "Bana e Costa & Vansnick [17]", "Bana e Costa & Vansnick [18]". The method requires only qualitative judgments about differences of value to help an individual or a group in quantifying the relative attractiveness of the elements of a finite set A and to associate a real number $v(x)$ to each element x of A [19].

Let X be the finite set of elements (alternatives) with at least two elements and J the group of decision makers who want to compare the relative attractiveness of these elements. Here, it is assumed that the DM or each DM is able to rank the elements of X either directly or through pairwise comparisons. Each DM is first asked to provide a judgment about the relative attractiveness of two elements at a time to retrieve the ordinal judgment. Then secondly, he/she is asked to provide a qualitative judgment on the difference of attractiveness of those two elements if they are not equally attractive using the following linguistic terms: *Very weak*, *weak*, *moderate*, *strong*, *very strong* and *extreme*.

MACBETH method presents a procedure to transform qualitative preferences into coherent quantified elementary and aggregated performances. In order to solve the inter-criteria commensurability problem, it is sufficient to determine, for all interval scales, two common reference points namely the good situation and the neutral situation with the performance values one and zero respectively.

Let p_i^k be the performance expression of the k^{th} alternative for criterion i. Suppose the DM prefers for criterion i the alternative k to the alternative l and in addition to that information, DM will characterize the strength of his judgments with a level of strength that can take values from one to six (from the least to the most strong level) according to the six semantic categories of difference of attractiveness explained above and zero for a null strength. This level will be denoted with h. Therefore, if the DM prefers for criterion i the alternative k to the alternative l, with a strength h, then the following equation, where α is a coefficient necessary to meet the condition p^k and $p^l \in [0;1]$, will be obtained:

$$A^k \succ^h A^l \Leftrightarrow p_i^k - p_i^l = h\alpha \tag{2}$$

Therefore, a preference ranking of alternatives for a specific criterion collected from a DM with the strength of the comparisons will give us a system of equation and after solving it the individual performance values of the alternatives for the criterion in question will be determined.

In order to define CI parameters, the DM is asked to provide preferential information on the criteria and the couples of criteria including the strength of the preferences. This information will help us to build a system of equations with the Shapley and the Interaction parameters as variables. For the elementary performance expressions, MACBETH proposes to consider some particular and possibly fictive situations, S, in which the alternatives satisfies one criterion or two criteria simultaneously. A preference ranking of those situations collected from a DM with the strength of the comparisons will give us a system of equation and after solving it the CI parameters will be determined.

In the situations where only one $p_i = 1$ (i.e. criterion i is satisfied) and all others are equal to zero, the aggregated performance expression will be as follows (Cliville et al. 2007):

$$p_{Ag}^i = \varphi_i - \frac{1}{2}\sum_{\substack{j=1 \\ j \neq i}}^{n} I_{ij} \tag{3}$$

The aggregated performance expression of the situations where only one $p_i = 0$ and all others are equal to one (i.e. all criteria except i is satisfied) will be as follows [5]:

$$p_{Ag}^i = 1 - \varphi_i - \frac{1}{2}\sum_{\substack{j=1 \\ j \neq i}}^{n} I_{ij} \tag{4}$$

The aggregated performance expression of the situations where only two elementary performance expressions are equal to one (namely i and j) and all others are equal to zero (i.e. criterion i and j are satisfied) will be as follows [20]:

$$p_{Ag}^{i,j} = \varphi_i + \varphi_j - \frac{1}{2}\left(\sum_{k \in \aleph_{1;n} / p_k = 0} I_{ik} + \sum_{k \in \aleph_{1;n} / p_k = 0} I_{jk} \right) \tag{5}$$

IV. ERP SYSTEM EVALUATION FRAMEWORK

A. *Evaluation procedure*

The evaluation procedure of this study consists of seven steps as follows:

1. Identify the ERP software selection/ evaluation criteria that are considered the most important for the users.
2. Once the model is built and the relations between criteria are defined, decide the method to use. This is not an arbitrary choice.
3. If there is an outer-dependence between sub-criteria, then this is something to be analyzed with ANP because of the simple fact that CI cannot handle two elements that are connected to two different points. In this case, two sub-criteria in question belong to two different criteria. Hence, these dependencies will be handled with ANP.
4. Analyze sub-criteria of the same cluster in order to define the conjunctive and disjunctive behavior between them. If there is such relation, use CI in order to find the interaction values. In case of no such interaction, handle the relations with ANP.
5. After handling the sub-criteria, take in consideration the upper level, i.e. the criteria.
6. A preference ranking of the criteria given by the DMs will define the conjunctive/disjunctive behavior between those. If there is not any interaction of this kind between criteria, then solve the model with ANP. Make the final aggregation and obtain a ranking.
7. If there are conjunctive/disjunctive behavior between criteria, then use the Shapley indices and the interaction

values including the weights of the sub-criteria and the alternatives' individual performance values for each of those sub-criteria in order to perform the final aggregation.

B. *Selection criteria*

Baki and Çakar have summarized the ERP selection criteria in their research after reviewing the related literature [21]. We have used the 16 criteria that they have proposed but we have grouped them under three main categories: vendor related, customer related and software related (Table 1).

TABLE I. SELECTION CRITERIA

C_1	**Vendor related criteria (VRC)**
C_{11}	Support and service
C_{12}	Vision
C_{13}	Market position
C_{14}	Domain knowledge
C_{15}	Reputation
C_{16}	Methodology of software
C_2	**Customer related criteria (CRC)**
C_{21}	Ease of customization
C_{22}	Better fit with organizational structure
C_{23}	Fit with parent/allied organizational system
C_{24}	Cross module integration
C_3	**Software related criteria (SRC)**
C_{31}	Functionality
C_{32}	Technical aspects
C_{33}	Cost
C_{34}	System reliability
C_{35}	Compatibility
C_{36}	Implementation time

C. *Proposed decision framework*

The hierarchical structure of the decision model of the paper with the alternatives and the identified criteria is portrayed in Fig. 4. The proposed decision model consists of three levels: at the highest level the objective of the problem is situated while in the second level, the criteria are listed. The lowest level belongs to the alternatives. As alternatives, A_1, A_2, A_3 and A_4 are selected since they are in the same interval of price.

D. *NUMERICAL APPLICATION OF THE PROPOSED FRAMEWORK*

1) *Part 1: ANP*

In the first part of the framework, pairwise comparison matrices for all the sub-criteria have been prepared and filled out by the DM. The consistency indexes of the matrices are all smaller than 0.10, which proves their consistency [12]. The pairwise comparisons enable us to retrieve relative weights for the sub-criteria. The supermatrix, which has the role of obtaining the composite weights, has been constructed (Table 2).

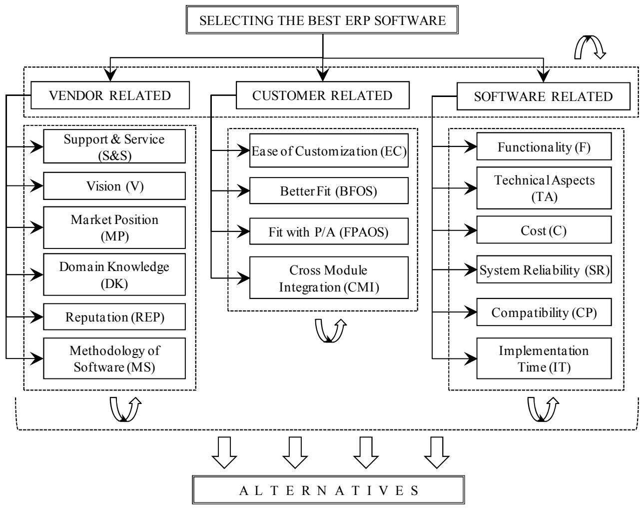

Fig. 4. Hierarchical structure of the decision making problem

TABLE II. UNWEIGHTED SUPERMATRIX.

	S&S	V	MP	DK	REP	MS	EC	BFOS	FPAOS	CMI	F	TA	C	SR	CP	IT
S&S	0	0	0.07	0	0.25	0	0.39	0.25	1	0	0	0	0.11	0	0	0.11
V	0.75	0	0.15	1	0.75	1	0.07	0	0	0	0.25	0	0	0.17	0.13	0
MP	0	0	0	0	0	0	0	0	0	0	0	0	0.64	0	0	0
DK	0.25	0	0.39	0	0	0	0.39	0.75	0	0	0.75	0	0	0.83	0.88	0.26
REP	0	0	0.39	0	0	0	0	0	0	0	0	0	0.26	0	0	0
MS	0	0	0	0	0	0	0.15	0	0	0	0	0	0	0	0	0.64
EC	0.64	0	0.43	0	0	0	0	0.43	0.25	1	0.08	0.19	0	0	0.15	0.38
BFOS	0.11	0	0.14	0	0	0	0.09	0	0	0	0.20	0.08	0	0	0.39	0.13
FPAOS	0	0	0	0	0	0	0.46	0.43	0	0	0.20	0.08	0	0.75	0.39	0.38
CMI	0.26	0	0.43	0	0	0	0.46	0.14	0.75	0	0.52	0.66	0	0.25	0.07	0.13
F	0	0	0.05	0	0	0	0.25	0	0	0	0	0	0.19	0.25	0	0.26
TA	0	0	0	0	0	0	0.75	0	0	1	0	0	0.07	0.75	1	0.11
C	0	0	0.48	0	0	0	0	0	0	0	0.73	0.64	0	0	0	0
SR	1	0	0.21	0	1	0	0	0	0	0	0	0.26	0.19	0	0	0
CP	0	0	0.05	0	0	0	0	0	1	0	0.18	0.11	0.07	0	0	0.64
IT	0	0	0.21	0	0	0	0	0	0	0	0.08	0	0.47	0	0	0

As the next step, cluster/criteria comparison matrices have been prepared and filled out by the DM in order to normalize the supermatrix (Table 2). Using the weights retrieved from these matrices, the cluster matrix is constructed and weighted supermatrix is calculated. The cluster matrix and the weighted supermatrix are represented in Table 3 and Table 4, respectively.

TABLE III. CLUSTER MATRIX.

	VRC	CRC	SRC
VRC	0.637	0.258	0.258
CRC	0.105	0.637	0.105
SRC	0.258	0.105	0.637

TABLE IV. WEIGHTED SUPERMATRIX.

	S&S	V	MP	DK	REP	MS	EC	BFOS	FPAOS	CMI	F	TA	C	SR	CP	IT
S&S	0	0	0.043	0	0.178	0	0.101	0.072	0.258	0	0	0	0.030	0	0	0.027
V	0.478	0	0.097	1	0.534	1	0.018	0	0	0	0.07	0	0	0.043	0.033	0
MP	0	0	0	0	0	0	0	0	0	0	0	0	0.184	0	0	0
DK	0.159	0	0.248	0	0	0	0.101	0.216	0	0	0.19	0	0	0.215	0.226	0.067
REP	0	0	0.248	0	0	0	0	0	0	0	0	0	0.075	0	0	0
MS	0	0	0	0	0	0	0.039	0	0	0	0	0	0	0	0	0.165
EC	0.067	0	0.045	0	0	0	0	0.305	0.159	0.87	0.01	0.027	0	0	0.016	0.039
BFOS	0.011	0	0.015	0	0	0	0.058	0	0	0	0.02	0.011	0	0	0.041	0.013
FPAOS	0	0	0	0	0	0	0.290	0.305	0	0	0.02	0.011	0	0.079	0.041	0.039
CMI	0.027	0	0.045	0	0	0	0.290	0.102	0.478	0	0.05	0.093	0	0.026	0.007	0.013
F	0	0	0.013	0	0	0	0.026	0	0	0	0	0	0.138	0.159	0	0.165
TA	0	0	0	0	0	0	0.079	0	0	0.14	0	0	0.052	0.478	0.637	0.067
C	0	0	0.124	0	0	0	0	0	0	0	0.47	0.547	0	0	0	0
SR	0.258	0	0.055	0	0.289	0	0	0	0	0	0	0.222	0.138	0	0	0
CP	0	0	0.013	0	0	0	0	0	0.105	0	0.12	0.090	0.052	0	0	0.406
IT	0	0	0.055	0	0	0	0	0	0	0	0.05	0	0.332	0	0	0

As the final step of ANP procedure, from the weighted supermatrix given in Table 4, the limit supermatrix has been calculated. The relative importances of the sub-criteria have been collected and then normalized with respect to the criteria (Table 5).

TABLE V. WEIGHTED SUPERMATRIX.

VRC	**S&S**	**V**	**MP**	**DK**	**REP**	**MS**
w	0.138	0.473	0.065	0.235	0.045	0.044
CRC	**EC**	**BFOS**	**FPAOS**	**CMI**		
w	0.422	0.049	0.202	0.327		
SRC	**F**	**TA**	**C**	**SR**	**CP**	**IT**
w	0.099	0.276	0.238	0.159	0.126	0.102

2) *Part 2: CI*

In order to find out criteria weights and conjunctive/ disjunctive interactions between criteria, a preferential ranking, including the strength of the judgment, has been asked to the DM. The following ranking has been obtained:

$$C_1 \,\&\, C_3 \succ^{M} C_1 \,\&\, C_2 \succ^{W} C_2 \,\&\, C_3 \succ^{M} C_1 \succ^{W} C_3 \succ^{S} C_2 \succ^{S} "0"$$

Using Eq. 2-5, the resolution of this equation system has given the results shown in Table 6.

TABLE VI. CHOQUET INTEGRAL PARAMETERS.

Parameter	Φ_1	Φ_2	Φ_3	I_{12}	I_{13}	I_{23}
Value	0.4375	0.2083	0.3542	0.0417	0	0.0417

Table 6 shows that Vendor Related Criteria is the most important cluster for the DM with a relative importance (Φ_1) of 0.4375, whereas Customer Related Criteria is the least important with a relative importance (Φ_2) of 0.2083. Furthermore, it is possible to state that an employee must be successful on both VRC and CRC in order to be considered successful for the DM. The same situation is valid for CRC and SRC, as the interaction values (I_{12} and I_{23}) are positive for those couples of criterion. On the other hand, there is no conjunctive/ disjunctive interaction between VRC and SRC as the interaction value for these (I_{13}) is null.

3) *Part 3: Relative performance scores of alternatives*

For each sub-criterion, the DM has been asked to give us a preferential ranking, including the strength of the comparisons. For example, forVRC, the following ranking has been obtained.

$$C_{11} \rightarrow Good \succ^{VW} A_4 \succ^{M} A_1 \succ^{M} A_2 \succ^{M} A_3 \succ^{M} Neutral$$

$$C_{12} \rightarrow Good \succ^{VW} A_1 \succ^{W} A_2 \succ^{M} A_3 \succ^{S} A_4 \succ^{S} Neutral$$

$$C_{13} \rightarrow Good \succ^{VW} A_4 \succ^{W} A_1 \succ^{M} A_2 \succ^{S} A_3 \succ^{S} Neutral$$

$$C_{14} \rightarrow Good \succ^{VW} A_1 \succ^{W} A_2 \succ^{M} A_4 \succ^{M} A_3 \succ^{S} Neutral$$

$$C_{15} \rightarrow Good \succ^{VW} A_1 \succ^{W} A_2 \succ^{M} A_4 \succ^{S} A_3 \succ^{S} Neutral$$

$$C_{16} \rightarrow Good \succ^{VW} A_1 \succ^{W} A_2 \succ^{M} A_3 \succ^{S} A_4 \succ^{S} Neutral$$

Similarly, rankings for CRC and SRC has been obtained. The equations systems have been retrieved from these three preference rankings, using Eq. 2. The resolution of these equation systems are summarized in Table 7.

TABLE VII. PERFORMANCE VALUES OF ALTERNATIVES WITH RESPECT TO SUB-CRITERIA.

	C_{11}	C_{12}	C_{13}	C_{14}	C_{15}	C_{16}	C_{21}	C_{22}	C_{23}	C_{24}	C_{31}	C_{32}	C_{33}	C_{34}	C_{35}	C_{36}
A_1	0.692	0.929	0.786	0.923	0.929	0.929	0.214	0.625	0.625	0.786	0.714	0.857	0.067	0.867	0.800	0.133
A_2	0.462	0.786	0.571	0.769	0.786	0.786	0.429	0.813	0.813	0.643	0.929	0.714	0.267	0.733	0.667	0.267
A_3	0.231	0.571	0.286	0.308	0.286	0.571	0.643	0.563	0.563	0.500	0.500	0.500	0.533	0.467	0.400	0.533
A_4	0.923	0.286	0.929	0.538	0.571	0.286	0.857	0.188	0.188	0.214	0.286	0.286	0.800	0.267	0.200	0.800

4) *Part 4: Final aggregation*

As the last step of the proposed procedure, the scores of the alternatives for each criterion have been calculated (Table 8).

TABLE VIII. PERFORMANCE VALUES OF ALTERNATIVES WITH RESPECT TO CRITERIA.

	VRC	**CRC**	**SRC**
A_1	0.8854	0.5042	0.5754
A_2	0.7232	0.5950	0.5803
A_3	0.4310	0.5760	0.4934
A_4	0.4877	0.4788	0.4467

In order to determine the final performance scores of four alternatives (Table 9), we have used the values in Table 6 and Table 8 and Eq. 2.

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TABLE IX. FINAL SCORES OF ALTERNATIVES.

	A_1	A_2	A_3	A_4
Score	0.6867	0.6429	0.4786	0.4705

The result indicates that the final performance score of alternative A_1 is the highest (0.6867) and that of alternative A_4 is the lowest (0.4705). The fact that VRC has the greatest relative importance (Φ_1=0.4375) has played an important role for A_1 and A_2 to be ranked first two in the final ranking and for A_3 and A_4 to be ranked last two. Although A_2 has greater performance values for CRC and SRC, VRC was the defining crieteria for A_1 to be ranked first. The same situation is present between A_3 and A_4: A_4 has lower performance values with respect to CRC and SRC and greater performance value with respect to VRC. However in this case, A_3 is ranked before A_4. The reason is the fact that the differences between performance values with respect to CRC and SRC for those two alternatives are greater than that for A_1 and A_2.

V. CONCLUSION

Enterprise resource planning is a software application package that integrates internal and external management information across an entire organization. As there are various ERP software product in the market, a client needs to choose the product that uses less resources and produces more output. In other words, the client needs to choose the most appropriate product for its own requirements.

Our work presents a comprehensive framework for selecting a suitable ERP system based on an hybrid multi-criteria decision analysis process. The procedure consists of three methodologies: Analytic Network Process (ANP), Choquet Integral (CI) and Measuring Attractiveness by a Categorical Based Evaluation Technique (MACBETH). We have illustrated the applicability of the framework through a case study of the ERP software selection of a company. The proposed decision making framework is flexible enough to fit other sectors with some specific characteristics changes and to incorporate different criteria in the evaluation process.

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