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SELECTION OF THE BEST CONSULTANT FOR SAP ERP PROJECT USING COMBINED AHP-IBA APPROACH

Nataša MARTINOVIĆ

SAP West Balkans d.o.o., Belgrade
natasa.martinovic@sap.com

Boris DELIBAŠIĆ

Faculty of Organizational Sciences, Belgrade
boris.delibasic@fon.bg.ac.rs

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Abstract: In this paper we propose a combined AHP-IBA model for selecting the best SAP consultant for an SAP ERP project. The goal of the SAP Project Manager is to choose the best consultant, the one who is able to implement standard SAP functionalities with quality and on time.When making a decision on the basis of multiple criteria, the traditional Analytic Hierarchy Process (AHP) method does not take into account the fact that attributes may correlate, assuming that there are no dependencies between them. However, the dependencies of the attributes can often be used to model important knowledge for multiple criteria decision analysis. We propose an extension to the traditional AHP method by applying Interpolative realization of Boolean algebra (IBA), using AHP to determine the criteria weights, and IBA to model the logical interactions among criteria.

The research conducted on ERP consultant selection suggests that the decision making process is modelled more accurately if logical interactions between attributes are modelled before applying AHP

Keywords: Interpolative realization of Boolean algebra (IBA), Analytic Hierarchy Process (AHP), SAP ERP Consultant selection, Project Management.

MSC: 90B50.

1. INTRODUCTION AND LITERATURE REVIEW

SAP software [44] is an integrated package of business applications. From a business point of view,SAP allows salesmen to enter orders for customers, purchasing officers to buy products from vendors, production people to build things, the warehouse to ship, and finance to keep the book. All this can be done in multiple languages, across multiple currencies, meeting various legal requirements for business around the world. The SAP core product (R/3 originally, now called ECC) was built tightly integrated, which is the key value propositions of the product suite. Everything in SAP is tied together in one common data dictionary across all areas. It contrasts to its big competitor of ERP (Enterprise Resource Planning), Oracle, many of whose business application functionalities are developed by buying different software companies and tying them together. In the last few years, SAP has gone on its own by buying Business Objects, Success Factors, Ariba and Hybris, but the core functionality was all built in-house at SAP.

SAP software comes with a huge set of best practice business processes already built into the package. Yet, the drawback of packaged application is that it is not going to come customized to work exactly the way a given company might want it to work. To meet these demands, SAP software is built with various methods,while maintaining the same stability and flexibility.

Consultants should have expert knowledge of SAP software and the know-how to help companies implement SAP successfully. There is a wide range of skill levels in the consulting realm, from the very green (junior) to the very senior (twenty years+) expert level.

The main question is how to choose the best consultant, the one who should be engaged in the implementation of SAP ERP. To accomplish this, it is necessary to develop a model whose criteria, sub criteria, and weights are set right.An additional problem is that the criteria may be interrelated or conflicted hence, these connections should be considered when decision maker decides about the best alternative on the basis of a set of criteria.

The criteria are most often related to the candidate's personal skills and experience in similar projects. On the other hand, the decision maker could have made an easier decision based on a single performance measure or rank of candidates. But in a real-world situation, several different criteria must be included in the analysis. Furthermore, the criteria and the method for the calculation of performance indicators and rankings should be clearly determined and known.

A number of papers use separately AHP (see e.g. [1, 2, 3, 6, 8, 10, 12, 13, 14, 16, 17, 26, 27, 31, 39, 41, 42, 43, 45, 46, 47]) and IBA approach (see e.g. [15, 18, 20, 21, 22, 24, 25, 28, 29, 30]), but rarely explore integrated AHP and IBA approach as a technique. In this work we present such an integrated approach and its application in consultant selection for SAP ERP project.

Selection of the suitable, qualified project team, and experienced project manager with good leadership skills are prerequisites for successful project outcomes [11].The ability of individuals to meet the project's legal, functional, technical, and experience requirements is important in the selection of the project team so as the ability of a team-member to develop social ties and facilitate group interactions [4].

This study aims to provide an effective selection and recruitment of consultants on different projects, so to contribute to the success on projects in terms of time, cost and quality.

In the literature we can find many similar examples sand case studies. Some of them are summarized in Table 1.

Table 1- Overview of consultant selection papers

Authors	Contributions	Methods used
Vayvay, O., Ozcan, Y., Cruz-Cunha, M. [43]	*ERP consultant selection problem using AHP, fuzzy AHP and ANP - a case study in Turkey*	*AHP, fuzzy AHP and ANP*
Saremi M, Mousavi SF, Sanayei A. [40]	*TQM consultant selection in SMEs with TOPSIS under fuzzy environment*	*TOPSIS*
Chow, L. K., Ng T. S. [9]	*A fuzzy gap analysis model for evaluating the performance of engineering consultants*	Fuzzy gap analysis CPE model
Cheung F. K. T., Kuen J. L. F., Skitmore M. [7]	*Multi-criteria evaluation model for the selection of architectural consultants*	*AHP*
Cebeci U., Da Ruan[5]	*A Multi-attribute comparison of Turkish quality consultants by fuzzy AHP*	*Fuzzy AHP*
Leipold K., Klemow J., Holloway F. and Vaidya K. [19]	*The World Bank e-Procurement for the selection of consultants: challenges and lessons learned*	*e-Procurement solution based on QCBS - Quality and Cost-Based Selection, QBS – Quality Based Selection, SFB - Selection under a Fixed Budget, LCS - Least Cost Selection, CQS - Selection-Based on the Consultants' Qualifications, SSS - Single-Source Selection*

The rest of the paper is organized as follows. The combined AHP-IBA approach is presented in Section 2. The case study is given in Section 3. Section 4 discusses the results, and the conclusion is given in Section 5.

2. COMBINED AHP-IBA APPROACH

The AHP method is used to determine weights of attributes and to rank alternatives. IBA is used to generate new attributes whose weights are further determined by AHP.

2.1. AHP

Analytic hierarchy process (AHP) is one of the most popular methods for dealing with complex decision making when subjective, abstract or non-quantifiable criteria are involved into the decision. AHP includes identifying and organizing objectives, criteria, sub-criteria and alternatives into a hierarchy; evaluating pairwise comparison of relevant elements on each level of the hierarchy, and giving synthesis of the comparisons over all levels. Conceptual and mathematical settings for AHP were given by **Thomas L. Saaty**[37].

Decision maker's preferences are expressed by using the Saaty's scale-adapter, given in Table 2 [37]:

Table 2 – Saaty's scale evaluation

Importance	Definition	Explanation
1	Equal importance	Both elements have the same significance
3	Moderate importance	Experience and judgment slightly favour one element over another
5	Strong importance	Experience and judgment significantly favour one element over another
7	Very strong importance	The dominance of one element is confirmed in practice
9	Extreme importance	The dominance of the highest degree
2, 4, 6, 8	Intermediate values between adjacent scale values	Need a compromise or further division

AHP is able to identify and analyse the consistency of decision-makers in the process of comparing criteria of the hierarchy. In order to provide the necessary accuracy, constant monitoring is required, because the comparison of alternatives is based on a subjective assessment by the decision maker [36, 38]. The traditional AHP method lacks support for the fact that criteria may be interrelated.

Errors in judgment are possible but can be measured by calculating CI – the index of consistency for the resulting matrix comparisons, and then, by calculating CR - the degree of consistency [38]:

$$CR = \frac{CI}{RI} \tag{1}$$

Random index (RI) depends on the order of the matrix of comparisons (details of how to generate random indices are given in [37]).

2.2. IBA

IBA - Interpolative Boolean algebra [35] is consistent multi-valued realization of Boolean algebra in the sense that it preserves the value of the level whereat all the laws of Boolean algebra are applied.

The principle of structural functionality is the following: The structure of any element of IBA can be directly determined from the structure of its components [33]. This principle requires that the transformation which defines the IBA performs on a symbolic level, before the introduction of a value. This ensures that the negation is

treated differently at the structural level, i.e. a negative variable does not immediately transform into a value.

The use of IBA logic allows a description of an object through intensity of more characteristics [23, 34]. Characteristic intensity of an object is compared with the same attribute of another object. The Interpolative realization of Boolean algebra treats logical functions as a Generalized Boolean polynomial (GBP) and takes into consideration the correlation existing among elements, which should be expressed by logical functions.

2.3. Proposed approach

Initial attributes for evaluation of decision makers in solving the problem of the best consultant selection for a particular project are given based on the experience of authors in projects implementations, interviews with other senior project managers, as well as familiarity with SAP implementation in Serbian companies in the past. Specified values are representative because of data confidentiality.

The weights are derived from the analysis of relative importance among all possible combinations of the decision criteria. After criteria comparison, their relative weights are calculated for each element at a given level, and then used to determine the so-called composite relative weights of elements at the lower levels. If the procedure is carried out to the last level where the alternatives are, composite weights for all alternatives are determined. The decision maker obtains key information: (a) the relative importance of each criterion in relation to the goal at the top of the hierarchy, and (b) sequence of alternatives by relevance (ranking).

When making a decision on the basis of multiple criteria, the traditional Analytic Hierarchy Process (AHP) method does not take into account the fact that attributes may be interrelated. It is proposed that the traditional AHP method could be extended by applying Interpolative realization of Boolean algebra (IBA) to merge the two criteria into single objective criteria. For that purpose, IBA was used to generate two new criteria: 1. Equivalence similarity to measure the similarity of the two criteria (if expensive consultant is engaged, then customer recommendation for particular consultant should be high, or, when cheap consultant is engaged, then customer recommendation is expected to be low); and 2. The decision maker includes the "exclusive or"(XOR - exclusive disjunction) because the two criteria have the exclusivity property (i.e. for a consultant it is either important to have a high number of consultant references or to have courses/certification earned by a consultant).

Substituting values criteria according to the suggested equation (specified as Generalized Boolean polynomial) and the selection functions of product t-norm, values were calculated for each alternative (alternatives a_1 to a_6 represents six consultants).

The findings confirm that the problem of assigning consultants to SAP ERP projects can be solved by using AHP-IBA approach. As expected, the results of these approaches are different. AHP method gives one consultant as the best consultant, because of the highest values of criteria (the most experience, the best customer recommendation, lot of references, the highest education level, awareness of responsibility and ability to persuade) even if he is the most expensive. When we include IBA method, result shows another consultant as the best consultant even if he/she has average valuable values of criteria.

3. CASE STUDY

It is very important to assign the most appropriate resource to each project, according to various restrictions (criteria which have impact to the decision maker). Depending on defined criteria and the results obtained from AHP/IBA approach, the decision on the best consultant should be made. When contractor for SAP implementation is SAP, this assignment can be done in three ways: (1) Full engagement of internal consultants (which have the highest level of knowledge and experience), (2) Partial engagement of external consultants (partial outsourcing), and (3) Full engagement of external resources (total outsourcing). If the project is of strategic importance, the need for high quality is further expressed and the third way (full engagement of external resources) is not acceptable. In this case, the selected resource should be the internal consultant because of higher level of quality.

The word "outsourcing" here means that the company engages consultants from other partner companies, which means that contractor (prime) engages other partner company as a subcontractor for their projects. Engagement of internal consultants means that consultants are directly employed in the company that contracted the project as a performer, or consultants are employed in subsidiaries and affiliated companies around the world.

3.1. Model of the problem

This section presents the problem to be solved, defined with a four levels hierarchy:

1. Level 1 - the overallgoal is to select the most suitable consultant who will be engaged by SAP company on contractual projects,
2. Level 2 - the criteria which have to be taken into account in further research are costs, work experience, education, and communication skills (according to experience in more than 30 successful SAP implementations in last more than 8 years and previous research of a similar paper [43],
3. Level 3 - sub-criteria specify criteria more precisely (costs contained transportation and consultants part, where the consultant is employed, his/her previous experience and succeed on the projects, trainings he/she has finished, acceptable awareness of responsibility and ability to persuade),
4. Level 4 displays the alternative decision (consultants A, B, C, D, E and F are chosen as representative options from the Serbian market).

According to the elements of the decision-making hierarchy, the problem is presented in Figure 1:

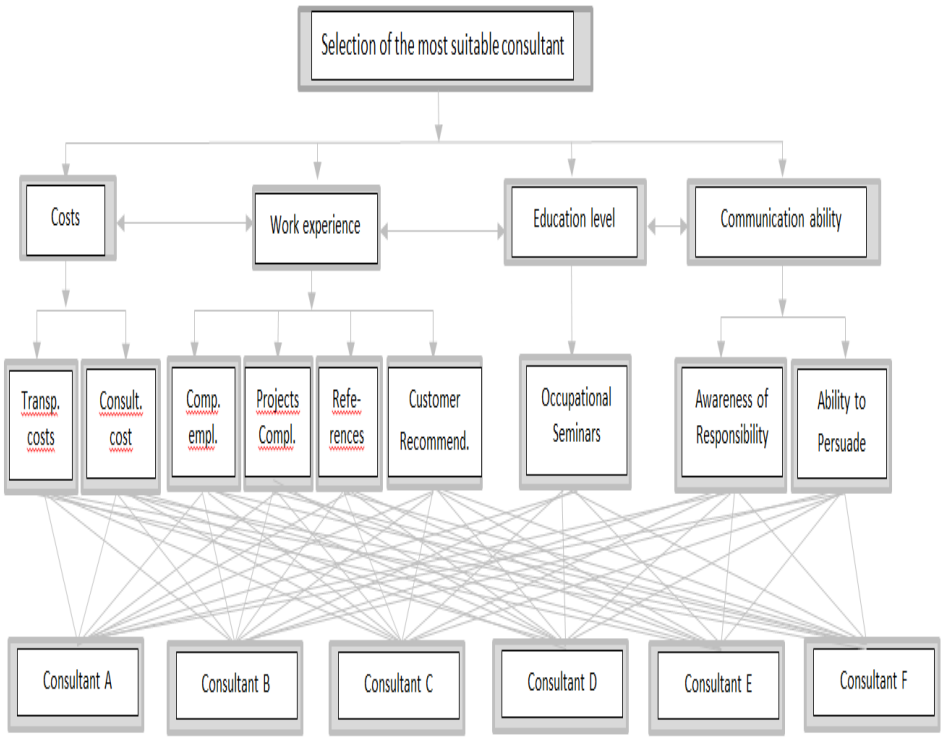

Figure 1: The hierarchy problem of selecting the consultant

This research uses an adapted model described by [43]. The baseline model is taken from the mentioned paper, but adapted to the specific case for selection of the most suitable consultant who will be assigned to the project of SAPERP implementation using integrated IBA and AHP approach (instead of case presented in baseline study where are used AHP, Fuzzy AHP and ANP models). The authors want to prove that the inclusion of IBA methods in AHP approach will additional contribute to the ranking of the consultants.

3.2. Definition of criteria

Table 3 specifies selected criteria for the model proposed in Figure 1:

Table 3 – Definition of criteria

Criteria / Sub criteria		*Description*	*Criteria Type*	*f(x)*
(CO) Cost	**(TC) Technical Cost**	Cost incurredby travelingto where theconsultantis runningthe project, hotel, per Diem, transportation costs.	Quantitative	Min
	(CC) Consultancy Cost	Related to the Consultancy Services Price(man/day).	Quantitative	Min
(WE) Work experience	**(CE) Company where consultant is Employed**	Definessource type for companies where areconsultants employed (previous described as internal, partial outsourcing, total outsourcing).	Qualitative	Max
	(PC) Projects Completed	Defines % of the life cycle ofimplementationin whichconsultants wereinvolved.	Quantitative	Max
	(RE) References	Defines thenumber of consultant references.	Quantitative	Max
	(CR) Customer Recommendation	Scoreofsatisfaction with theconsultantaftercompletion of implementationin the requiredareas (in the range of 1to 5).	Quantitative	Max
(EL) Education level	**(OS) Occupational Seminars**	Courses(training) or certificationpreviouslyreceivedby the consultant(SAPmodulesthat are part ofthe project and theconsultantcanimplement).	Quantitative	Max
(CA) Communication ability[1]	**(AR) Awareness of Responsibility**	Refers to the liabilityof consultants interms of theirwork.	Qualitative	Max
	(AP) Ability to Persuade	Indicates theability ofthe consultantto presentbest practices andconvincethe clientfor a proposed solution.	Qualitative	Max

Alternatives in decision-making correspond to a characteristic set of consultants where selection for a given project may take the values: Consultant A, Consultant B, Consultant C, Consultant D, Consultant E and Consultant F (based on knowledge of the market in Serbia and present representative types of available consultants).

3.3. Application of the Methods

The problem of selecting the most suitable consultant is a systematic review of decision maker, who works at SAP as project manager [32] and hires a consultant for a specific project. Criteria and attribute values of consultant are given based on the experience of author in projects implementations, performed interview with other senior

[1]Communication skillsconsultantevaluatesthe decision makerbased on an interviewwith a potentialconsultant.

project managers, as well as with their familiarity with SAP implementation in Serbian companies in the past. Specified values are representative because of data confidentiality.

Table 4 presents initial attributes for evaluation of decision maker in solving the problem of selection of the best consultant for particular project.

Table 4 –Attribute values of consultants according to evaluation of decision maker

	Cost		**Work experience**				**Educ. level**	**Communication ability**	
	TC	**CC**	**CE**	**PC**	**RE**	**CR**	**OS**	**AR**	**AP**
Cons. A	110	560	Ext	70	2	3.00	2	Good	Average
Cons. B	150	650	Ext	90	2	3.25	2	Good	Very good
Cons. C	100	670	Int	100	5	5.00	4	Excellent	Excellent
Cons. D	120	600	Ext	80	2	3.50	1	Good	Good
Cons. E	130	690	Ext1	100	4	4.00	3	Very good	Very good
Cons. F	170	740	Int	100	7	5.00	4	Excellent	Excellent

Table 6 shows the results of quantification of qualitative values. Transformation of attributes is done based on possible values of Interval scale presented in table 5:

Table 5 – Possible values of Interval scale

Qualitative Evaluations	Poor	Good	Average	Very good	Excellent	Criteria type
Quantitative	1	3	5	7	9	Max
Evaluations	9	7	5	3	1	Min

Table 6– Quantification of qualitative values

	TC	CC	CE	PC	RE	CR	OS	AR	AP
a_1	110	560	2	70	2	3.00	2	5	3
a_2	150	650	2	90	2	3.25	2	5	7
a_3	100	670	1	100	5	5.00	4	9	9
a_4	120	600	2	80	2	3.50	1	5	5
a_5	130	690	3	100	4	4.00	3	7	7
a_6	170	740	1	100	7	5.00	4	9	9

Vector normalization has been done and results are shown in Table 7.

Table 7– Normalized matrix comparisons criteria

	TC	CC	CE	PC	RE	CR	OS	AR	AP
a_1	0.1907	0.1923	0.1304	0.1296	0.0909	0.1263	0.1250	0.1250	0.0750
a_2	0.1399	0.1657	0.1304	0.1667	0.0909	0.1368	0.1250	0.1250	0.1750
a_3	0.2098	0.1608	0.2609	0.1852	0.2273	0.2105	0.2500	0.2250	0.2250
a_4	0.1748	0.1795	0.1304	0.1481	0.0909	0.1474	0.0625	0.1250	0.1250
a_5	0.1614	0.1561	0.0870	0.1852	0.1818	0.1684	0.1875	0.1750	0.1750
a_6	0.1234	0.1456	0.2609	0.1852	0.3182	0.2105	0.2500	0.2250	0.2250

AHP method in selection of the best consultant for the implementation of ERP project: table 8 shows the decision matrix for the criteria specified as the target. The results are derived from the analysis of relative weight among all possible combinations of the decision criteria.

Table 8- Matrixcomparisoncriteriausing theAHP

	Cost	**Work experience**	**Education level**	**Communication Ability**
Cost	1	1	5	2
Work experience	1	1	5	3
Education level	1/5	1/5	1	1/3
Communication ability	1/2	1/3	3	1

After comparing decision-making criteria, their relative weights are calculated. Normalization leads to the following weighted points: price0.360; 0399experience, level of education and communication skills0.069and0.172.

Calculated degree of consistency (CR), according to the equation (1) is 0.0127.

Weighted coefficients (weights) are calculated for each element at a given level, and then used to determine the so-called composite relative weights of elements at the lower levels.

If the procedure is carried to the last level whereat the alternatives are, then the composite weights of all alternatives are determined. The sum of these coefficients is 1 and the decision maker has two following key information: (a) the relative importance of each alternative in relation to the goal at the top of the hierarchy (from materiality), and (b) determined the sequence of alternatives by relevance (ranking).

The research conducted in this study carried out a synthesis of the overall problem of choosing the best consultant, so that all alternatives are multiplied by the weights. According to weights for each consultant, composite weights are calculated as a basis for ranking consultants (table 9).The largest value is the most appropriate or optimal alternative (all results for the following cases are given in Table 11).

Table 9– Composite weights for criteria, attribute and alternative (AHP method)

Crite-ria	Criteria weight	Sub-criteria	Sub-criteria weight	CONS. A	CONS. B	CONS. C	CONS. D	CONS. E	CONS. F
CO	0.360	TC	0.167	0.276	0.055	0.373	0.160	0.107	0.029
		CC	0.833	0.425	0.131	0.079	0.293	0.044	0.028
WE	0.399	CE	0.090	0.144	0.117	0.331	0.094	0.051	0.262
		PC	0.235	0.031	0.102	0.210	0.068	0.259	0.330
		RE	0.555	0.032	0.042	0.234	0.058	0.147	0.487
		CR	0.120	0.025	0.046	0.434	0.084	0.148	0.263
EL	0.069	OS	1.000	0.049	0.061	0.414	0.028	0.153	0.295
CA	0.172	AR	0.250	0.061	0.061	0.332	0.061	0.152	0.332
		AP	0.750	0.033	0.135	0.318	0.063	0.135	0.318

Composite weight for Consultants A, B, C, D, E and F are 0.171, 0.092, 0.234, 0.137, 0.129 and 0.247 respectively. So the AHP method, including composite weight on all 3 levels, gives as the best alternative Consultant F. The complete order of the consultants obtained by this method is F, C, A, D, E and B.

IBA in selection of the best consultant for the implementation of ERP project

In this paper IBA was used to generate two new criteria:

1. Equivalence similarity for measure the similarity of two criteria (if expensive consultant is engaged, then customer recommendation for a particular consultant should be high, or, when cheap consultant is engaged, then customer recommendation is expected to be low):

$$(a \Leftrightarrow b)^{\otimes} = 1 - a - b + 2a \otimes b = 1 - a - b + 2 * \min(a, b) \quad (2)$$

2. The decision maker includes the "exclusive or"(XOR - exclusive disjunction) because one of the two criteria (one excludes the other) must be achieved:

$$(a \veebar b)^{\otimes} = a + b - 2a \otimes b = a + b - 2 * \min(a, b) \quad (3)$$

Relation of the equivalence between criteria CC and CR will be considered as an additional criterion (see equation (2)):

$$a_1 = 1 - 0.1923 - 0.1263 + 2 * \min(0.1923, 0.1263)$$
$$= 1 - 0.1923 - 0.1263 + 0.2526 = 0.9340$$

Substituting values criteria according to the equation (2) (specified as Generalized Boolean polynomial) and to the selections functions of product t-norm, values were calculated for each alternative (alternatives a_1 to a_6 represents six consultants). After receiving the final results, when applied as an additional criterion of equivalence relation of objective criteria CC and CR, authors get the following decision matrix (table 10):

DP1 = (CC $\Leftrightarrow$ CR) … 1st generated criteria

Relation of the exclusive disjunction criteria RE and OS will be considered as the second generated criterion (see equation (3)):

$$a_1 = 0.0909 + 0.1250 - 2 * \min(0.0909, 0.1250)$$
$$= 0.0909 + 0.1250 - 0.1818 = 0.0341$$

Substituting values criteria according to the equation (3), for all alternatives, results are shown as DP2 in table 10:

DP2 = (RE ⩒ OS) …2nd generated criteria

Table 10 – Normalized matrix comparisons criteria – new generated attributes

	DP1	DP2
a_1	0.9340	0.0341
a_2	0.9711	0.0341
a_3	0.9502	0.0227
a_4	0.9678	0.0284
a_5	0.9877	0.0057
a_6	0.9350	0.0682

If combined AHP-IBA method is used, relative weights for Consultants are shown in Figure 2:

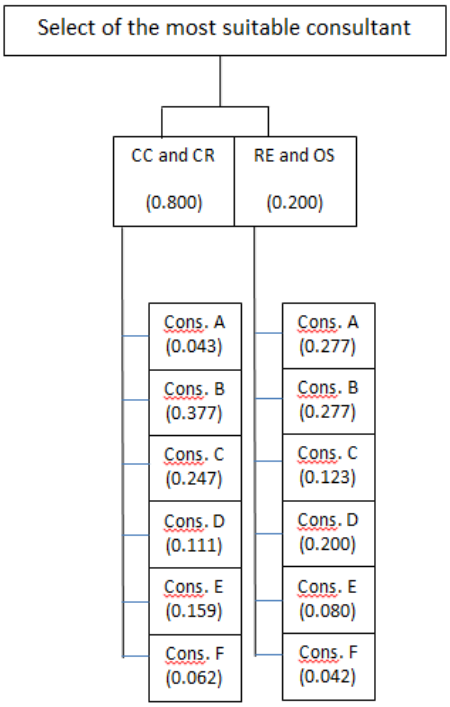

Figure 2 - The relative weights of the decision elements (AHP method with IBA)

The relative weights of the sub-criteria (0.800 and 0.200, when DP1 is more important than DP2) are results of decision-making assessment, as representative, according to the authors' experience. When the chosen relative weights are applied, composite weight for Consultants A, B, C, D, E and F are 0.090, 0.357, 0.222, 0.129,

0.143 and 0.058, respectively. So when IBA is combined with AHP method, including composite weight on all 3 levels, the best alternative Consultant is B. The complete order of consultants obtained by this method is B, C, E, D, A and F.

4. RESULTS

The findings confirm that the problem of assigning consultants to SAPERP projects can be solved using AHP-IBA approach. Interviews are performed with experienced project managers in order to model the importance of various criteria in the decision making process.

Using combined AHP-IBA approach, the problem of selection is modelled and consultants are ranked based on subjective evaluations of the project managers. Final rankings are given in Table 11:

Table 11. Ranking consultants (calculated weights for criteria, sub-criteria and attributes)

The Results of Consultant selection		
Rank	AHP	AHP-IBA (DP1>DP2)
1	Consultant F (0.247)	Consultant B (0.357)
2	Consultant C (0.234)	Consultant C (0.222)
3	Consultant A (0.171)	Consultant E (0.143)
4	Consultant D (0.137)	Consultant D (0.129)
5	Consultant E (0.120)	Consultant A (0.090)
6	Consultant B (0.092)	Consultant F (0.058)

As expected, the results of these approaches are different. AHP method gives the Consultant F as the best consultant, because of the highest values of criteria (the most experience, the best customer recommendation, lot of references, the highest education level, awareness of responsibility and ability to persuade), even if he is the most expensive. IBA method shows the Consultant B as the best consultant even if he/she has average valuable values of criteria.

5. CONCLUSION

This paper presents the application of AHP method integrated with IBA method in choosing the best consultant who should be engaged in the implementation of SAPERP project. One of the major problems in the application of this method is to define the attributes of decision-making on the second level (criteria decision-making) and the third level (sub-criteria decision-making) and the assessment of the irrelative weights.

The criteria may be interrelated or conflicted, so these connections should be considered when decision maker decides about the best alternative on the basis of a set of criteria. The traditional AHP method lacks solution for this type of problem, and could be expanded by applying IBA method to generate new criteria.

Application of AHP-IBA combined approach contributes to the introduction of generated new attributes which include some inter dependencies. The best consultants are always the most expensive. The project has several objectives, but the most important are: the best quality within a certain budget within specific time frame. Therefore, it is necessary to coordinate all the set goals and choose the best consultants in accordance with certain limitations, such as limited budget. Data support the conclusion that the most suitable consultant is not always the best (Consultant F) – the choice of the most suitable consultant depends on a combination of price, experience, user satisfactions and educational level of a consultant. If a project manager includes in decision making all factors (especially when the budget is the prime limitation for the project), consultant B will be chosen as the most suitable consultant. New structure of the components improves the weighted sum approach.

Further research may include Data Envelopment Analysis method (DEA) and the results could be compared with the results obtained in this paper. Additionally, it is possible to perform an analysis to determine the sensitivity and boundary changes which significantly affect the results.

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