PARTNER SELECTION AND EVALUATION PROBLEM FOR CONSTRUCTION PROJECTS

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Citation: Musumba, G.W., Nyongesa, H.O. Kanyi, P.W., and Kituku, B.N. (2016 Partner Selection and Evaluation Problem for Construction Projects. In: Isutsa, D.K. and Githae, E.W. *Proceedings of the Second Chuka University International Research Conference held in Chuka University, Chuka, Kenya from 28th to 30th October, 2015. 391-400 pp.*

ABSTRACT
Different contractors with varied specializations work together in construction projects. Project managers form these teams from a pool of contractors. The success of these collaborations depends on each contractor's performance. These collaborations' competitiveness can be jeopardized if the right partners are not selected. This is attributable to imprecise nature of human evaluations. Limited research has investigated techniques for selecting and evaluating contractors and their performance. This study defined partner selection and evaluation problem as a multi-attribute represented in a hierarchical structure. Fuzzy Analytical Hierarchy Process (FAHP), a Multi-Criteria Decision Making (MCDM) algorithm was designed and used by different project consultants to evaluate and select right partners to implement structural engineering works for a building. Five case studies were used to verify the results. Partners' selection and evaluation problem is a MCDM problem, solvable using fuzzy algorithms. FAHP algorithm can be used when evaluators' judgements are precise and imprecise.
Keywords: Multi-criteria decision making, Analytical hierarchy process, Fuzzy AHP

INTRODUCTION
Kenya has a well-developed building and construction industry with quality engineering, building and architectural design services being readily available. The construction industry is a key sector in Kenya economy and has consistently posted the second highest growth [Kenya Economic Update, 2013]. The industry also offers direct employment to a significant proportion of the labour force spread throughout the country [Kenya National Bureau of Statistics, KNBS Report, 2013].

The Kenya construction industry grew by 5.5% in 2013 compared to 4.8% a year earlier [Kenya Economic Survey, 2014]. The growth was lifted by an increase in the value of building plans approved in the housing sector, which rose by 34.2% to Kenya shillings (KSh) 243.1 billion from KSh 181.1 billion in 2012. This was partly attributed to increased activity in the real estate to cater for rising demand for housing due to rapid population growth in urban areas. This sector has attracted a lot of interests from local and foreign investors as seen from the massive projects that have either been completed, are undergoing implementation or are scheduled to take off [World Bank Report, 2012, KNBS Report, 2013]. Construction industry contributes more than 10% to the country's economy [Kenya Economic Survey, 2013]. The sector has a challenge of poor performance. Some projects upon completion do not last long [Mambo, 2010 and Charagu, 2013]. This is partly due to poor coordination and management of contractors and poor workmanship. This can be attributed to poor choice of contractors for the tasks. These poor choices are as a result of insufficient information available about partners and lack of facilitation techniques for the same. Contractor attributes to be considered for decision making are qualitative with imprecise values as human judgments are uncertain and undeserving partners can be selected. Partner selection and evaluation is a multi-criteria decision making problem involving multiple tasks, selection criteria, selection sub-criteria and potential partners. A multi-criteria decision making technique encompassing imprecise evaluations can solve this problem.

Previous Works

Selection criteria

There is little evidence of research that have tried to identify selection and evaluation criteria specific to construction projects. The following section reviews partner selection and evaluation criteria for other domains that can be considered helpful to the construction sector. Zhang et al [1997], Chen et al [1998] and Camarinha-Matos and Cardoso [1999] used cost, quality, capacity, and delivery time as selection criteria for partner companies. XueNing et al [2000] added customer services and financial stability to the previous list. Bailey et al [1998] conducted a survey to identify the parameters used by companies in different industrial fields in order to select partners. They identify as the most important criteria: technical capabilities, matching aims, cultural compatibility, development speed, strategic position, management ability, security, collaborative record, business strength and cost of development. These criteria were also ranked according to how managers consider them during the selection process. Huang and Mak [2000] proposed a set of selection criteria to be used during the early involvement of suppliers in the development process of new products. The selection criteria consider financial, business and technical factors. Financial factors evaluate the financial position of the partners. The technical factors take into account quality, price, reliability, as well as process and design capabilities. The business factors deal with the flexibility of the partner, its reputation, communication mechanism, and the closeness of relationship between partners.

Wildeman [1998] identified the criteria used in the partner selection and collaboration phases. The partner selection phase considers the following criteria: complementary skills, market position, financial position, management philosophy, and size. The collaboration phase evaluates the "chemistry" between managers, complementarity, culture, trust, commitment, financial position, and openness. This study also provides the relative importance of each criterion but fails to consider the imprecise nature of human judgements during evaluations. Bronder and Pritzl [1992] proposed to select partners in collaboration alliances according to complementarity, strategic and cultural compatibility. The complementarity criteria evaluate, among other factors, the complementation in core capabilities, the potential for increasing shareholders value and risks. The strategic compatibility takes into account the strategic goals and the lifespan of the alliance. A cultural profile of the partners can be used to evaluate their cultural compatibility. The profile considers the attitude of the partners towards the workforce and issues such as quality, cost, innovation, technology, and customer orientation. Sari et al [2007] considered cost, delivery time, quality, trust, credit, performance and reliability to select partners for a business opportunity. It can be stated that partners require skills in business, technical and management domains. Business domain deals with all financial and market related issues to grow the enterprise. Technical domain involves technological requirements for the smooth running of the business. Management domain considers all human resource related issues in the organizations.

Multi Criteria Decision Making Algorithms

Several multi-criteria decision making techniques have been proposed. Zhang et al [1997] considered a Weighted Sum Algorithm (WSA) [Zadeh, 1963] for the selection of partners. However, WSA is applicable only when all the data are expressed in exactly the same unit. Also its weighting coefficients do not necessarily correspond directly to the relative importance of the objectives or allow tradeoffs between the objectives to be expressed. Data Envelopment Analysis (DEA) **[**Molinero and Woracker, 1996, Ji and Lee, 2010, Cooper, 2013, Cook et al, 2014**]** is a Linear Programming based technique for the analysis of efficiency of organizations with multiple inputs and outputs. In DEA, absolute efficiency cannot be measured, statistical tests are not applicable and large problems can be demanding. Elimination EtChoix Traduisant la REalite´ (ELECTRE) [Roy, 1991] allows decision makers to select the best choice with utmost advantage and least conflict in the function of various criteria. The ELECTRE method is used for choosing the best action from a given set of actions. The decision maker uses concordance and discordance indices to analyze outranking relations among different alternatives and to choose the best alternative using crisp data. ELECTRE method is time consuming. The Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method [Hwang et al, 1993, Lai et al, 1994] assumes that each criterion has a tendency of monotonically increasing or decreasing utility which leads to easily defining the positive and the negative ideal solutions. The chosen alternative should have the shortest distance from the positive ideal solution and the farthest distance from the negative ideal solution. TOPSIS is also time consuming.

Analytical Hierarchy Process (AHP) [Saaty, 1980] is a multi-criteria decision-making (MCDM) algorithm that uses pairwise comparisons of alternatives to derive weights of importance from a multi-level hierarchical structure of objectives, criteria, sub-criteria and partners depending on the problem [Saaty, 1980]. AHP shortcomings [Cheng et al., 1999] include, inability to take into account any uncertainty associated when mapping human judgement to a number scale. Wang and Chin [2008] found out that increase in the number of alternatives in each level in the hierarchy geometrically increases the number of pairwise comparisons by $O(n^2/_2)$ which can lead to inconsistency or failure of the algorithm. Zadeh [1963], Mikhailov [2003] and Covella and Olsina [2006] suggested the use of fuzzy logic to deal with subjectivity of the evaluators. Incorporation of fuzzy logic in multi-criteria decision making technique can deal with shortcomings of AHP and improve the outcome of the partner selection and evaluation problem.

METHODOLOGY

Figure 1 illustrates that the problem was decomposed into a four level hierarchy of objective, selection criteria, sub criteria and partners. The process was simplified into finding the best partner for a structural engineering works of a building. This could be replicated to find best organizations for other tasks like electrical, mechanical and plumbing, interior design and landscaping works.

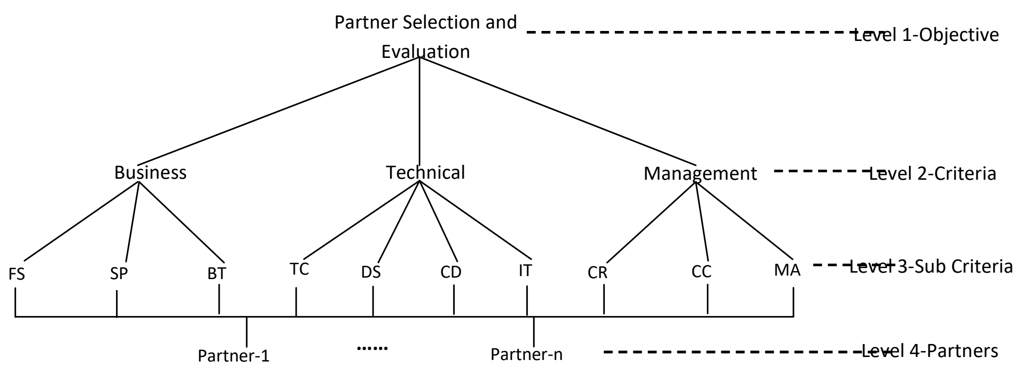

Figure1: Representation of the Partner Selection and Evaluation

A questionnaire (in the appendix) was given to different evaluators to evaluate the alternatives in the problem hierarchy. Section A of the questionnaire was used to indicate level of importance of each criteria (business, technical and management) against each other in the selection and evaluation process. The following sub criteria were rated against each other on how they satisfied business criterion: financial security (FS), strategic position (SP) and business strength (BS). Likewise sub criteria technical capability (TC), development speed (DS), cost of development (CD) and information technology (IT) were rated according they satisfied the technical criterion. Additionally, the level of importance of sub criteria, collaboration record (CR), cultural compatibility (CC) and management ability (MA) in satisfying management criterion were provided. Section B was used to rate partners against each other according to how they satisfy each sub criterion by examining their company profiles. To rate criteria and sub criteria, each evaluator chose alphabetical symbols (A, B, C, D, E) with matching linguistic attributes (extremely important, very important, important, weakly important and not at all important) respectively. The linguistic attributes for partners evaluation were (extremely preferable, very preferable, preferable, moderately preferable and not at all preferable).

Fuzzy Analytical Hierarchy Process (FAHP)

FAHP algorithm incorporates fuzzy logic into AHP [Zadeh, 1965, Mikhailov, 2003]. The evaluators' judgments are normally vague and difficult to represent in terms of exact precise numbers. It can best be given as interval judgements than fixed value judgements. The process of Fuzzy AHP proposed for this study is shown in Figure 2 in the following section.

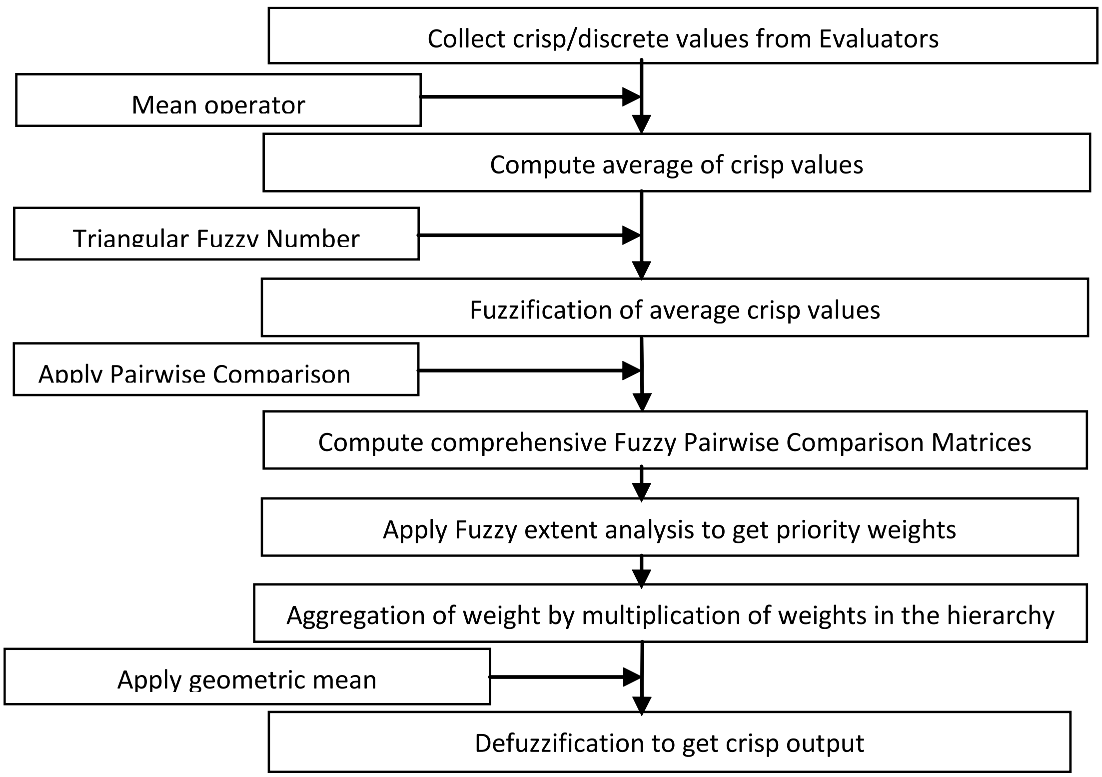

Figure 2: Fuzzy AHP for partner selection and evaluation problem

First, each evaluator use the questionnaire to rate selection criteria, sub-criteria and indicate their preferences for each partner by assigning crisp values. Second, the arithmetic mean of crisp values are calculated. Third, the average values are converted to triangular fuzzy numbers (TFN). Table 1 and figure 3 below illustrates the conversions from crisp to fuzzy values and fuzzy membership function respectively.

Table 1: Membership function for conversion of crisp to fuzzy values

Crisp number	1	3	5	7	9
Fuzzy Membership function	(1,1,3)	(1,3,5)	(3,5,7)	(5,7,9)	(7,9,9)

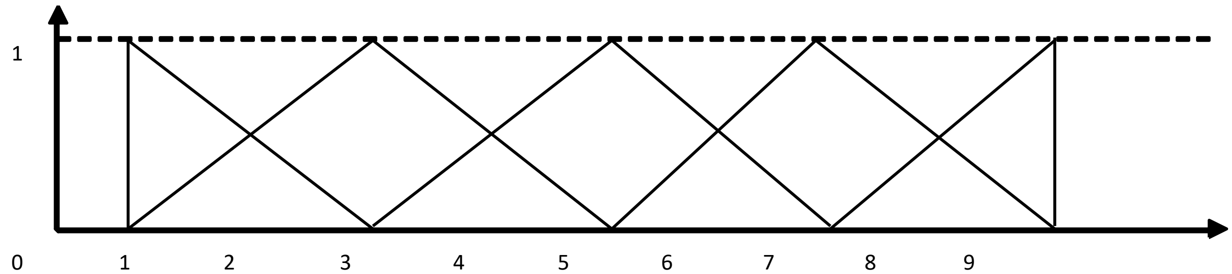

Figure 3: Fuzzy Membership function

In this study, the arithmetic mean of evaluators crisp values were 9, 7, 7 for business, technical and management skills respectively. These were converted to TFN as (7, 9, 9), (5, 7, 9) and (5, 7, 9) for business, technical and management criteria respectively. Fourth step is the computation of a comprehensive fuzzy pairwise comparison matrix (PCM) to derive relative weights of alternatives in the hierarchy. Fuzzy PCM for these values is shown in table 2.

Table 2: Fuzzy Pairwise Comparison for Criteria

Criteria	Business skills	Technical skills	Management skills
Business skills	1, 1, 1	7/5, 9/7, 9/9	7/5, 9/7, 9/9
Technical skills	9/9, 7/9, 5/7	1, 1, 1	1, 1, 1
Management skills	9/9, 7/9, 5/7	1, 1, 1	1, 1, 1
Sum	3, 2.556, 2.428	3.4, 3.286, 3	3.4, 3.286, 3

Values in field 1, column 1 for business against itself is (1, 1, 1) which is found by dividing lower bound fuzzy value by lower bound fuzzy value, middle value by middle value and upper bound value by upper bound value (7/7, 9/9, 9/9). Values in field 3, column 1, is found by dividing (7, 9, 9) by (5, 7, 9). Other field values are derived in the same manner. The sum of each column is addition of lower bound values together, middle values together and upper bound values together. That is sum of column 1, is (1+1+1=3), (1+7/9+7/9=2.556) and (1+5/7+5/7=2.428). Sums of columns 2 and 3 are found in the same manner.

Extent analysis of fuzzy PCM is the fifth step. The basic procedures for fuzzy extent are adopted from Zhu et al [1999] are as follows:
Let X = $\{x_1, x_2, x_3 \ldots x_n\}$ be an object set (objective, selection criteria, or selection sub-criteria) and G=$\{g_1, g_2, g_3, \ldots g_n\}$ be a goal defined for each level in the hierarchical structure of the problem. Thus, G can change depending on the level of the hierarchy.

M extent analysis on each object is taken $\sim M_{gi}^{1}, \sim M_{gi}^{2}, \sim M_{gi}^{3}, \ldots \sim M_{gi}^{m}$, i=1, 2, 3, ……, n, where $\sim M_{gi}^{j}$ (j=1, 2, 3,….., m) are TFNs. The fuzzy synthetic extent value (S) with respect to the ith object is defined as, $S_i = \sum_{j=1}^{m} \sim M_{gi}^{j} * \left[\sum_{i=1}^{n}\sum_{j=1}^{m} \sim M_{gi}^{j}\right]^{-1}$

To obtain $\sum_{j=1}^{m} \sim M_{gi}^{j}$, perform the normalized fuzzy addition operation of *m* extent analysis values for a particular matrix such that $\sum_{j=1}^{m} \sim M_{gi}^{j}$, = $[\sum_{j=1}^{m} lj, \sum_{j=1}^{m} mj, \sum_{j=1}^{m} uj]$, where *l* is the lower limit value, *m* is the most likely and *u* is the upper limit value. Table 3 is normalized by dividing each fuzzy number in a column with the respective sum of the column. That is lower bound elements are divided by the sum of lower bound elements. Likewise the same is done to middle and upper bound elements. Normalization for columns 2 and 3 is done in the same way. Table 3 is the normalized Fuzzy PCM of table 2.

Table 3: Normalized fuzzy PCM for criteria

Selection criterion	Business cluster	Technical cluster	Management cluster	Fuzzy Addition= $\sum_{j=1}^{m} \sim M_{gi}^{j}$
Business	0.333, 0.391, 0.412	0.412, 0.391, 0.333	0.412, 0.391, 0.333	1.157, 1.173, 1.078
Technical	0.333, 0.304, 0.294	0.294, 0.304, 0.333	0.294, 0.304, 0.333	0.921, 0.912, 0.960
Management	0.333, 0.304, 0.294	0.294, 0.304, 0.333	0.294, 0.304, 0.333	0.921, 0.912, 0.960
Sum= $\sum_{i=1}^{n}\sum_{j=1}^{m} \sim M_{gi}^{j}$				2.999, 2.997, 2.998
Inverse of sum				0.333, 0.334, 0.334

Field 1, column 1 values are derived as (1/3=0.333, 1/2.556=0.391, 1/ 2.428=0.412).
Fuzzy addition for business criterion, field 1, column 3 is achieved as 0.333+0.412+0.412=1.157, 0.391+0.391+0.391=1.173; 0.412+0.333+0.333=1.078. Other criteria's fuzzy addition is done in a similar manner. The last column of the last row which is the sum of results of normalized PCM fuzzy addition operation of M_{gi}^{j} (j=1, 2,….m) values such that $\sum_{i=1}^{n}\sum_{j=1}^{m} \sim M_{gi}^{j}=[\sum_{i=1}^{n} li,\ \sum_{i=1}^{n} mi,\ \sum_{i=1}^{n} ui]$

$\sum_{i=1}^{n}\sum_{j=1}^{m} \sim M_{gi}^{j}$ in table 3 is computed as follows:

1.157+0.921+0.921=2.999; 1.173+0.912+0.912=2.997; 1.078+0.960+0.960=2.998

To obtain inverse of $\sum_{i=1}^{n}\sum_{j=1}^{m} \sim M_{gi}^{j}$ is then computed, such that:

$$\left[\sum_{i=1}^{n}\sum_{j=1}^{m} \sim M_{gi}^{j}\right]^{-1} = \left[\frac{1}{\sum_{i=1}^{n} ui}, \frac{1}{\sum_{i=1}^{n} mi}, \frac{1}{\sum_{i=1}^{n} li}\right]$$

Note: Inverse of a fuzzy number N (l, m, u) is N^{-1} ($^1/_l$, $^1/_m$, $^1/_u$)

From table 4, inverses are 1/2.999=0.333, 1/2.997=0.334, 1/2.998=0.334
Extent analysis values are found by multiplying the normalized fuzzy addition of each criteria by the inverse of the sums of the normalized fuzzy addition thus $S_i = \sum_{j=1}^{m} \sim M_{gi}^{j} * \left[\sum_{i=1}^{n}\sum_{j=1}^{m} \sim M_{gi}^{j}\right]^{-1}$

1.157x0.334, 1.173x0.334, 1.078x0.333 = 0.386, 0.392, 0.359

0.921x0.334, 0.912x0.334, 0.960x0.333 = 0.308, 0.305, 0.320

Tl 0.921x0.334, 0.912x0.334, 0.960x0.333 = 0.308, 0.305, 0.320 each block geometric mean of the fuzzy extent values is computed. This gives the weight vector, V_i, for each block. Table 4 show the outcome of this process. The last column of the matrix is determined by finding geometric mean of the fuzzy weights. Thus, for the first row: $(0.386 \times 0.392 \times 0.359)^{1/3} = 0.379$

Table 4: Local Priority Weight

Selection criterion	Fuzzy Priority Weight	Defuzzified Weights
Business cluster	0.386, 0.392, 0.359	0.379
Technical cluster	0.308, 0.305, 0.320	0.311
Management cluster	0.308, 0.305, 0.320	0.311

The same procedure is done when finding the priority weights for all levels in the hierarchy. Global weights are derived like in AHP. Table 5 shows the outcome when data from evaluators were subjected to Fuzzy AHP.

Table 5: Results of Evaluators' Data by Fuzzy AHP

Criteria	Local weight	Sub-criteria	Local weight	Global weight	P1	P2	P3	P4	P5
		FS	*0.413*	0.157	0.333	0.167	0.233	0.112	0.155
Business cluster	*0.379*	*SP*	*0.303*	0.115	0.433	0.167	0.111	0.101	0.188
		BT	*0.282*	0.107	0.285	0.143	0.333	0.154	0.085
		TC	*0.288*	0.090	0.188	0.250	0.167	0.274	0.121
		DS	*0.200*	0.062	0.129	0.375	0.115	0.122	0.259
Technical cluster	*0.311*	*CD*	*0.140*	0.044	0.250	0.150	0.368	0.211	0.021
		IT	*0.371*	0.115	0.133	0.267	0.267	0.194	0.139
		CR	*0.488*	0.152	0.367	0.333	0.211	0.022	0.067
Management cluster	*0.311*	*CC*	*0.280*	0.087	0.200	0.100	0.066	0.289	0.345
		MB	*0.231*	0.072	0.100	0.400	0.315	0.179	0.006
				Priority	0.264	*0.231*	*0.214*	*0.151*	*0.140*
				Total	1.000				
				Error	0				

Global weight (GW) for SP is derived by multiplying local weight of Business criterion by local weight of SP, that is 0.379 x 0.303 = 0.115, GW for CD is 0.311 x 0.140=0.044. Likewise GW for MB is 0.311 x 0.231=0.072. Finally GW for partners is derived by finding the sum of products of global weights of each sub criterion and the local weight of the partner in the sub criterion. For instance GW for partner 2 is 0.157 x 0.167 + 0.115 x 0.167 + 0.107 x 0.143 +0.090 x 0.250 + 0.062 x 0.375 + 0.044 x 0.150 + 0.115 x 0.267 + 0.152 x 0.333 + 0.087 x 0.100 + 0.072 x 0.400 = 0.231. GWs for partners 1, 3 to 5 are derived in the same way. If all was perfect the sum of the weights for partners should be 1. From table 6 the sum is 1.0 with an error of 0. The overall weight of Partner 1 through 5 was 0.264, 0.231, 0.214, 0.151 and 0.140 respectively. To verify these results, five case studies were conducted. Evaluators from the cases gave their opinions on the five partners using the questionnaire. Averages of the outcomes were computed and their average errors are shown in Table 6 below. The mean error of the algorithm is 0.0032. Since the consistency ratio correlate to the judgemental errors in pairwise comparisons [Karlsson et al, 1998] from Table 6, it can be concluded that these mean errors correspond to the consistency ratio [Saaty, 1980].

Table 6: Mean Error of five cases

Case 1	Case 2	Case 3	Case 4	Case 5	Total	Mean Error
0.004	0.005	0.003	0	0.004	0.012	0.0032

DISCUSSION

Using Fuzzy AHP, it has been shown how preference and consensus can be attained if a group decision-making process is used in the partner selection and evaluation problem. The level of accuracy of the prioritization outcome when Fuzzy AHP was 99.68%. It can be concluded that Fuzzy AHP can be incorporated in the design and development of new techniques for the VE partner selection and evaluation for construction projects. Fuzzy AHP has advantages of conventional AHP [Sanga and Venter, 2009], which are: They are flexible, they integrate deductive approaches, they acknowledge interdependence of partners, selection criterion and sub-criterion, they have hierarchical structure, measure intangibles, track logical consistency, give an overall estimation, consider relative priorities and improves judgements. It was shown how subjective partner evaluation measurement can be translated from linguistic descriptions to discrete values, which in turn were extended into continuous values. This was done using fuzzy logic. Fuzzy values were used in the technique to reflect the uncertain judgement of evaluators.

FURTHER WORK

An avenue for future study is to consider how the results of this study could be used for partner selection and evaluation problems in general. The limitations of Fuzzy AHP should probably be addressed in future research. Examples of limitations are: (i) checking if Fuzzy AHP preserve the consistency of the evaluator's judgement; and (ii) whether Fuzzy AHP ignore the dependence between the elements at the same level of the hierarchy.

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QUESTIONNAIRE

Collaboration of Enterprises
Indicate your choice with a tick (√) on the label provided. Note: the term “collaboration” is defined as participation in a project between organizations that operate under a different management.

Section A-Partners Selection and Evaluation Criteria

1. Indicate how important each of the following criterion is when your company is selecting partners for a task in a building construction project. Use the symbols “A to E” with A being “Extremely important”; E being “Not at all important”. Choose symbol which best indicates your choice						
Criterion		Extremely important	Very important	Important	Weakly important	Not at all important
Business Skills		A	B	C	D	E
Technical Skills		A	B	C	D	E
Management Skills		A	B	C	D	E
Criterion		Extremely important	Very important	Important	Weakly important	Not at all important
2. Considering Business Skills Criterion; indicate how important each of the following sub-criteria is when your company is selecting partners for a task in a building construction project. Use the symbols “A to E” with A being “Extremely important” and E being “Not at all important”. Choose the symbol which best indicates your choice.						
Business Strength (BS)		A	B	C	D	E
Financial Security (FS)		A	B	C	D	E
Strategic Position (SP)		A	B	C	D	E
Criterion		Extremely important	Very important	Important	Weakly important	Not at all important
3. Considering Technical Skills Criterion; indicate how important each of the following sub-criteria is when your company is selecting partners for a task in a building construction project. Use the symbols “A to E” with A being “Extremely important” and E being “Not at all important”. Choose the symbol which best indicates your choice.						
Technical Capabilities (TC)		A	B	C	D	E
Development Speed (DS)		A	B	C	D	E
Cost of Development (CD)		A	B	C	D	E
Information Technology (IT)		A	B	C	D	E
Criterion		Extremely important	Very important	Important	Weakly important	Not at all important
4. Considering Management Skills Criterion; indicate how important each of the following sub-criteria is when your company is selecting partners for a task in a building construction project. Use the symbols “A to E” with A being “Extremely important” and E being “Not at all important”. Choose the symbol which best indicates your choice.						
Collaboration Record (CR)		A	B	C	D	E
Cultural Compatibility (CC)		A	B	C	D	E
Management Ability (MA)		A	B	C	D	E

Section B-Partner Selection

Use the company profiles of companies P1, P2,…P5 provided at the end of this questionnaire. Indicate how preferable is each company against each other according to partner selection sub-criterion to perform a task in a building construction project. Use the symbols "A to E" with A being "Extremely preferable" and E being "Not at all preferable". Choose the symbol which best indicates your choice.						
Sub-Criteria		Extremely preferable	Strongly preferable	Preferable	Weakly preferable	Not at all preferable
		P1 P2 P3 P4 P5	P1 P2 P3 P4 P5	P1 P2 P3 P4 P5	P1 P2 P3 P4 P5	P1 P2 P3 P4 P5
Technical capabilities (Have relevant types of skills)		A A A A A	B B B B B	C C C C C	D D D D D	E E E E E
Development speed (Can complete tasks within project timelines)		A A A A A	B B B B B	C C C C C	D D D D D	E E E E E
Financial security (Amount of money deposited before project commencement)		A A A A A	B B B B B	C C C C C	D D D D D	E E E E E
Collaborative record (Have been part of large projects)		A A A A A	B B B B B	C C C C C	D D D D D	E E E E E
Business strength (Have necessary equipment and qualified staff)		A A A A A	B B B B B	C C C C C	D D D D D	E E E E E
Cost of development (The projected task cost within the project budget)		A A A A A	B B B B B	C C C C C	D D D D D	E E E E E
Corporate cultural compatibility (Staff mgt style in the previous projects)		A A A A A	B B B B B	C C C C C	D D D D D	E E E E E
Strategic position (Partnership with other firms like financiers)		A A A A A	B B B B B	C C C C C	D D D D D	E E E E E
Management ability (Handles staff issues amicably)		A A A A A	B B B B B	C C C C C	D D D D D	E E E E E
Use of Information Technology (Use software for designs, finance and staff issues management)		A A A A A	B B B B B	C C C C C	D D D D D	E E E E E

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