J. Appl. Environ. Biol. Sci., 6(11S)10-14, 2016

ISSN: 2090-4274
Journal of Applied Environmental and Biological Sciences
www.textroad.com

Wedding Budget Decision Making Using Fuzzy AHP

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Received: July 22, 2016
Accepted: September24,2016

ABSTRACT

Weddings are the most common ritual used to mark a change in a person's status. For most newlyweds, a wedding ceremony is the first time they will have to think about the huge event and need to spend more money on this event. The best decision plan needs to be done by marriage couple in order to estimate their wedding budget. Therefore, this project adopts the fuzzy analytical hierarchy process (F-AHP) to construct a wedding budget decision making model for newlyweds where four criteria has been considered which are reception venue, bridal wedding budget, stationery and wedding service. The weighted of each criteria and sub criteria are been calculate using FAHP. The FAHP adopted here uses Triangular Fuzzy Number (TFN). The results show the reception venue give the highest weighting among the criteria that contribute the highest cost of wedding budget.

KEYWORDS: Fuzzy Analytical Hierarchy Process, Triangular Fuzzy Number.

INTRODUCTION

Marriage has been always considered as the most important major life event by people from past to present. Organizing a successful wedding ceremony is everyone's dream as it is a starting before they entered the life as a newlywed and the change of status to a wife or a husband. A lot of effort and numerous preparations, such as finding an auspicious time, choosing their attire, sending out wedding invitations, preparing souvenirs and selecting the banquet venue [1]. Nowadays, most people tend to seek for a wedding planner services in order to host a successful and well-organized wedding ceremony. The trend of wedding planners has rise which offering wedding service packages for newlyweds based on their opinions and ideas, and also helping couples with a comprehensive wedding plan [2]. Nevertheless, the wedding services offered by the wedding planners must not exceed the wedding budget because some people used the wedding planners not only because they could afford extra money but they do not have enough spare time to do all the preparations even with the help of close friends and relatives. In addition, another problem could arise to the newlyweds is they need to identify which service that will perfectly suit their budget as they have to allocate their budget wisely.

Therefore, this paper attempts to develop the Fuzzy Analytical Hierarchy Process (F-AHP) in order to help the newlyweds to decide their wedding budget is in which category whether it is slightly expensive, fairly expensive or extremely expensive. The Fuzzy Analytical Hierarchy Process (F-AHP) method is the extension of Analytical Hierarchy Process (AHP). The FAHP method is one of the most outstanding Multi Criteria Decision Making (MCDM) approaches and has widely been applied successfully in many practical decision making problems involving financial decisions associated to non-financial attributes [3,4]. For examples, identifying the factors affecting the success of the business incubators [5], solving students problem of taking a decision on which sector to work in the future [6], evaluating the train scheduling problem on achieving the maximum profit through planning and offering transportation services to meet customers' requirement [7], evaluation for work safety and early warning rating of hot and humid environments in order to guarantee workers' health and safety [8].

The AHP method is a multicriteria method of analysis based on an additive weighting process, in which several relevant attributes are represented through their relative importance [9].In this study, there are some related criteria that most the newlyweds shall consider during the wedding preparations. The criteria are reception venue, bridal wedding budget, stationary and wedding service.

METHODOLOGY

The wedding budget problem is modeled by using F-AHP method. According to which, factor used in the wedding budget are weighted according to this method.

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Development of the Hierarchical Framework

This model contains 4 level of hierarchy starting with the goal, followed by the criteria and sub-criteria. The full forms and necessary details of the criteria and sub-criteria are provided in Table 1.

Table 1: Description of criteria and sub criteria

Criteria	Sub-Criteria	Description
Reception Venue (RV)	Food (F) Canopy (C) Reception Location (RL)	This is concern about the wedding location, decoration and facilities of wedding ceremony, the variety and quality of the food.
Bridal Wedding Budget (BWB)	Bridal Cost (BC) Wedding Product (WP) Beauty Treatments (BT) Bridesmaids (BM)	The newlyweds prepare the wedding dresses, bridesmaids' dresses, accessories such as wedding rings, shoes and jewellery and beauty treatments.
Stationery (ST)	Gifts (G) Invitation Card (IN)	One of the important preparations for wedding ceremony is invitation card, which the newlyweds announce the wedding. Then, to show the appreciation to the guest is giving the wedding favors or gifts.
Wedding Service (WS)	Photography (P) Honeymoon (H) Musician (M)	Most of the wedding ceremony, photographers are hired to capture the photos and videos of bridal and grooms and the ceremony. Besides, music plays many vital roles in the wedding ceremony. The newlyweds are able to plan their first vacation together by choosing the romantic honeymoons destinations across the globe.

Fuzzy Membership Function

Experts are often used the linguistic variables to evaluate the importance of the criteria and to rate the alternatives with respect to various criteria. Among the commonly used was fuzzy numbers, triangular and trapezoidal fuzzy numbers due to their simplicity in modeling [3]. This study adopts the triangular fuzzy numbers that represent the five-level fuzzy linguistic variable. Each rank is assigned to evenly spread membership function that has an interval of 0.3 or 0.25. Based on these assumptions, a transformation table can be found as shown in Table 2 and Figure 1.

Table 2: Transformation for fuzzy membership functions

Rank	Membership Function	Range
Very Low (VL)	(0 , 0.1, 0.25)	(0, 1, 2.5)
Low (L)	(0.15, 0.3, 0.45)	(1.5, 3, 4.5)
Medium (M)	(0.35, 0.5, 0.65)	(3.5, 5, 6.5)
High (H)	(0.55, 0.7, 0.85)	(5.5, 7, 8.5)
Very High (VH)	(0.75, 0.9, 1.0)	(7.5, 9, 10)

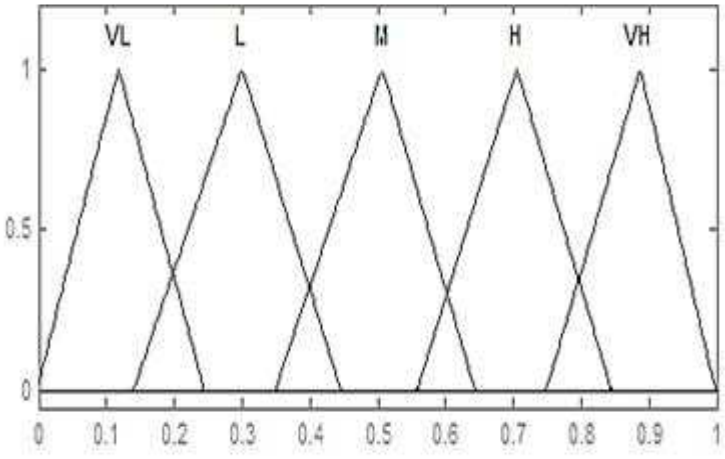

Figure 1: Fuzzy triangular membership functions

Determine the Weights of All Criteria and Sub-Criteria

To determine the weights of all criteria and sub-criteria, there are 7 steps are performed to find the normalized weights of both criteria and sub-criteria [10].

Step 1: Pairwise comparison based on linguistic term

The next step is to use a pairwise comparison to evaluate the weights of its elements and determine the priority. By applying the fuzzy triangular scale, the pairwise comparison for all criteria are been tabulated in Table 3.

Table 3: Pairwise comparison for criteria

CRITERIA	RV	BWB	ST	WS
RV	(1, 1, 1)	(5.5, 7, 8.5)	(7.5, 9, 10)	(7.5, 9 , 10)
BWB	(1/8.5, 1/7, 1/5.5)	(1, 1, 1)	(3.5, 5, 6.5)	(5.5, 7,8.5)
ST	(1/10, 1/9, 1/7.5)	(1/6.5, 1/5, 1/3.5)	(1, 1, 1)	(3.5,5,6.5)
WS	(1/10, 1/9, 1/7.5)	(1/6.5, 1/5, 1/3.5)	(1/4.5, 1/3, 1/1.5)	(1, 1, 1)

Step 2: The geometric means of fuzzy comparison values

According to [10], the geometric means of fuzzy comparison values of all criteria is calculated using this formula:

$$\tilde{r}_i = \left(\prod_{j=1}^{n} \tilde{d}_{ij} \right)^{1/n} , i = 1,2,..,n$$

and $\tilde{d}_{ij} = \frac{\sum_{k=1}^{K} \breve{d}_{ij}^{k}}{K}$ where, $\breve{d}_{ij}^{k}$ indicates the k^{th} decision maker's preference of i^{th} criterion over j^{th} criterion via fuzzy triangular numbers. The geometric means of fuzzy comparison values for criteria is shown in Table 4.

Table 4: Geometric means of comparison value of criteria

CRITERIA	R		
RV	4.193931223	4.879729685	5.399514744
BWB	1.226741202	1.495348781	1.780296747
ST	0.481713338	0.577350269	0.705417147
WS	0.20626091	0.237368104	0.2884875
TOTAL	6.108646673	7.18979684	8.173716139
REVERSE	0.16370238	0.139085988	0.122343373
IN.ORDER	0.122343	0.139086	0.16370238

Step 3: The fuzzy weight

To find fuzzy weight of criterion($\breve{w}i$), multiply each $\tilde{r}i$ with reverse vector. The equation and the relative fuzzy weights of all criteria are shown in Table 5.

$$\breve{w}i = \tilde{r}i * (\tilde{r}1 * \tilde{r}2 * \cdots * \tilde{r}n)^{-1}$$

Table 5: The relative fuzzy weight of all criteria

CRITERIA	W		
RV	0.513098128	0.678702083	0.883913414
BWB	0.150083199	0.207982081	0.291438815
ST	0.058934255	0.08030134	0.115478466
WS	0.025234579	0.03301458	0.04722609

Step 4: Defuzzification and normalization

The relative non-fuzzy weight of all criteria (M_i) is calculated by taking the average of fuzzy numbers for all criteria. By using non fuzzy($M_{i)}$, the normalized weights of all criteria are calculated and tabulated in Table 6.

Table 6: Averaged and normalized relative weights of criteria

CRITERIA	Mi	Ni
RV	0.691904542	0.67275196
BWB	0.216501365	0.210508399
ST	0.084904687	0.082554444
WS	0.035158416	0.034185198
TOTAL	1.02846901	1

From Table 6, the weights for all criteria will be presented as below:

Table 7: Weights for all criteria

CRITERIA	WEIGHTS
RV	0.684232
BWB	0.197173
ST	0.044789
WS	0.044789

Based on Table 7, the reception venue contributes the higher budget which is 0.684232 follows by bridal wedding budget, stationery and wedding service. Steps 1 until step 4 are implemented to calculate the weights for all sub-criteria. The weights for all sub-criteria are shown in Table 8-11.

Table 8: Weights for sub-criteria of Reception Venue

SUB CRITERIA 'RV'	WEIGHTS
F	0.80356998
C	0.12983568
RL	0.066594339

Table 9: Weights for sub-criteria of Bridal Wedding Budget

SUB CRITERIA 'BWB'	WEIGHTS
BC	0.610444307
WP	0.277812091
BT	0.072759862
BM	0.03898374

Table 10: Weights for sub-criteria of Stationery

SUB CRITERIA 'ST'	WEIGHTS
DG	0.8289036
IN	0.1710964

Table 11: Weights for sub-criteria of Wedding Service

SUB CRITERIA 'WS'	WEIGHTS
P	0.710522417
H	0.220943428
M	0.068533416

RESULTS AND DISCUSSION

This research is conducted to propose a method to evaluate the wedding budget by considering all evaluation criteria as listed in Table 1. The method is based on Fuzzy AHP method. There are two main steps involve in this method. First is to determine the weights of each criterion (Table 1) and secondly to evaluate the preference base on the criteria that one would like to have for their wedding ceremony. The evaluation is measured base on 5 categories from very low to very high budget according to one's preferences. Finally, after the respondent has completed the form, then this method will tells in which category of the wedding budget. Is it too expensive or otherwise base on the fuzzy triangular membership functions (Table 2).

The authors have created a survey base on the purposed fuzzy AHP method and distributed to respondents in order to test the method. The respondents were asked to fill up the survey and to give rank to the criterion from level 3 of the hierarchy model. The preferences are based on the 1-10 Likely scale. Table 12 shows the score of the budget for all criteria and sub criteria from 5 respondents that have been chosen for illustration and as for example in this paper.

Table 12: The score of the budget for five respondent

	RV			BWB				S		WS		
BRIDE/GROOM	F	C	RL	BC	BT	WP	BM	DG	IN	H	P	M
1	7	4	4	5	2	4	2	3	3	5	5	1
2	3	4	6	4	2	3	3	4	4	7	5	4
3	8	7	7	6	5	7	3	7	6	6	7	6
4	6	6	4	7	4	7	5	6	5	4	6	5
5	7	7	6	6	5	8	6	5	6	8	7	7

The calculation using the fuzzy AHP methods reveals the following result of each respondent.

Table 13: Result of fuzzy AHP

Bride/Groom	Result from Fuzzy AHP	Category of wedding budget
1	0.564552687	Moderate to high
2	0.186653397	Very low to low
3	0.732462011	High
4	0.602696922	Moderate to high
5	0.670290582	High

Table 13 shows the result from Fuzzy AHP method to measure the preferences made by each respondent. The highest budget for wedding is coming from respondent 3, which is 0.7325 that show the respondent spend more money for reception venue that has the highest weighting. Whereas, the low budget it's from respondent 2 that want to spend more money at wedding service that have lowest weighting for the budget. Furthermore, if the respondent feels that the result from the F-AHP does not suit to their budget, then they can save by spending less at the higher weighting criteria.

CONCLUSION

In conclusion, the aim of this paper is accomplished that is to develop a model base on F-AHP method to assess the wedding budget. The developed F-AHP model for wedding budget is consisting 4 level of hierarchy starting with the goal followed by the criteria and sub-criteria. The criteria are reception venue, bridal wedding budget, stationery and wedding service. The triangular fuzzy numbers that represent the five-level fuzzy linguistic variable was adopted in this study.

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