

**A DECISION MAKING APPROACH FOR SELECTING AN EVENT  
MANAGEMENT COMPANY**

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Degree of Bachelor of Science in Computer Science and Engineering

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## **APPROVAL**

This Project titled “**A Decision Making Approach For Selecting An Event Management Company**”, submitted by Faria Afrin, ID No: 171-15-9230, Nisar Ahmed, ID No: 171-15-9325 and Md. Mahmudul Hasan ID No: 171-15-9309 to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the Degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 28-01-2021.

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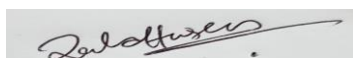
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## DECLARATION

We hereby declare that, this project has been done by us under the supervision of **Md. Zahid Hasan, Assistant Professor** and Co-supervision of **Md. Tarek Habib, Assistant Professor, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

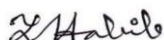
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## **ABSTRACT**

Understanding the goals with planning, designing, conceptualization and co-ordination an event management company plays a vital role and ends this process with proper execution. But nowadays many clients are facing more and more demanding and competitive market where taking decisions are completely tough. For this reason it is much more difficult for a client to find the best company when we have so many alternatives. For that purpose, available decision making methods are studied which may aid the decision makers to set the priorities and help them to make the best decision. The decision-making process involves a choice from a number of alternatives. This process is usually a complex process, which involves resources and time consumption. In this paper, we have considered five important attributes among three different companies as alternatives which is regarded as a multi criteria decision making problem for selecting an Event Management Company. In this study, a decision support framework is proposed for the selection of Event Management Company and ranking them using the Analytic Hierarchy Process (AHP) method and Generic Feature Extraction Method. This paper provides all the detailed information about the decision making process to aid the decision makers. Here all the relative importance of alternatives has been calculated by using AHP. The ultimate decision is prepared based on the arithmetical scores seized by the alternatives and to demonstrate all the things is presented on the proposed methodology.

## TABLE OF CONTENTS

<b>CONTENT</b>	<b>PAGE NO</b>
Board of examiners	i
Declaration	ii
Acknowledgements	iv
Abstract	v

<b>CHAPTER</b>	<b>PAGE NO</b>
<b>CHAPTER 01: INTRODUCTION</b>	<b>1-3</b>
1.1 Introduction	01
1.2 Motivation	01
1.3 Rationale of the Study	02
1.4 Research Questions	02
1.5 Expected Output	03
1.6 Report Layout	03
<b>CHAPTER 02: BACKGROUND</b>	<b>4-6</b>
2.1 Introduction	04
2.2 Related Works	04
2.3 Comparative Analysis and Summary	
2.4 Scope of the Problem	06
2.5 Challenges	06
<b>CHAPTER 03: RESEARCH METHODOLOGY</b>	<b>07-14</b>
3.1 Introduction	07
3.2 Data Collection Procedure	07
3.3 Statistical Analysis	
3.4 Proposed Methodology	08

<b>CHAPTER 04: IMPLEMENTATION AND RESULT ANALYSIS</b>	<b>15-25</b>
4.1 Introduction	15
4.2 Experimental Results & Analysis	15
4.3 Discussion	25
<b>CHAPTER 05: CONCLUSION &amp; FUTURE WORK</b>	<b>26</b>
5.1 Conclusions	26
5.2 Further Work	26
<b>REFERENCES</b>	<b>27</b>



## **LIST OF FIGURES**

<b>FIGURES</b>	<b>PAGE NO</b>
Figure 3.3.1: Proposed Methodology	09
Figure 3.3.1.1: Architectural Theory Diagram selecting an event management company.	10
Figure 4.2.2.1: Selection Performance Evaluation	24
Figure 4.2.2.2: Graphical representation of cross-validation between experimental results and benchmark results	25

## **LIST OF TABLES**

<b>TABLES</b>	<b>PAGE NO</b>
Table 3.2.1: All Criteria and Sub-criteria for Analytical Hierarchy Process	07
Table 4.2.1.1: Data of Providing Services of the Companies	15
Table 4.2.1.2: Using Five Point Scale	16
Table 4.2.1.3: Data of Providing Services of the Companies	16
Table 4.2.1.4: AHP Measurement Scale	16
Table 4.2.1.5: Pairwise Comparison Matrix With Respect to the Goal	17
Table 4.2.1.6: Pairwise Comparison Matrix	17
Table 4.2.1.7: Normalized Pairwise Comparison Matrix	17
Table 4.2.1.8: Eigenvector on Individual Criteria.	18
Table 4.2.1.9: Calculating the Consistency	19
Table 4.2.1.10: Ratio Index	19

Table 4.2.2.1: Customer Getting Services from C1 (6380 Customers in 2018)	20
Table 4.2.2.2: Customer Getting Services from C2 (8320 Customers in 2018)	20
Table 4.2.2.3: Customer Getting Services from C3(5040 Customers in2018)	20
Table 4.2.2.4: Root-Level Attributes“ Weight Calculation	21
Table 4.2.2.5: Table 7: Dataset for Different Companies Providing Services to the Customers (Year 2019)	21
Table 4.2.2.6: Transformation of Evaluation Grades into Numerical Values	21
Table 4.2.2.7: System input acquisition	21
Table 4.2.2.8: Rules set up for knowledgebase Construction	22
Table 4.2.2.9: Initial Input transformation with incomplete information	22
Table 4.2.2.10: Final Input transformation	22
Table 4.2.2.11: Attributes’ minimum value calculation	23
Table 4.2.2.12: Attributes’ Feature Extraction	23
Table 4.2.2.13: Alternatives' Utility Calculation	23
Table 4.2.2.14: A cross-validation between experimental results and benchmark results	24

# CHAPTER 1

## Introduction

### 1.1 Introduction

Event management is the coordination of planning, executing and organizing the different features and tasks where they go through some processes and facilitate the every aspect of event. To smoothen up his process there are loads of event management companies offer their proposal to do the task by charging money. If we say more explicitly they offer their services are given below:

- I. Budget Planning
- II. Event Communication
- III. Site Selection and Negotiation
- IV. Arranging Lighting
- V. Housing Management
- VI. Exhibit Coordination etc.

Apart from that there are loads of tasks to do and can be many elements to involve. From small-scale events to large-scale events they provide more or less same things.

But it is much tougher than saying when we need to choose a best event management company according to our own accord and convenience among many companies.

Therefore, choosing the best company effectively we can take a help from Decision Support System. This system will help us to take a best decision among many decisions.

Basically, Decision Support System is a decision-making process where it involves a choice from various number of alternatives and these essential component will help decision makers to receive and analysis information in an effective manner.

Even though, this process is a complex process which needs resources and time.

### 1.2 Motivation

When it is time to choose a best event management company sometimes it is hard to choose the best option from different possible options. That time client face difficulties because he has to contact with different event companies and usually have to consult with an event manager and have to discuss their requirements, suggestions and different options for event purpose such as themes, venues, budget and so on. During this period

client could be confused seeing so many options and it is a very lengthy task as well as so much time consuming to go every event management company individually and discuss the thing.

To make this thing convenient and more effortless we came up with a plan to build a decision support framework which can provide the best solution to select an event management company.

### **1.3 Rationale of the Study**

As Decision Support System helps decision-makers to take decision in an effective manner and will build a framework using AHP (Analytical Hierarchy Process) and Generic Feature Extraction Algorithm. Here in this paper we will try to keep focus on specific problem to solve.

**1.3.1 Saving Time, Money and Effort:** When time to choose right decision it is tough to do all the things at once. To consult event manager we need to go their office to office and have to ask details what they will provide which is very much time consuming and it takes much effort. A decision Support System will provide the best solution of this problem and allows client to get the best deal in less time.

**1.3.2 Improving Efficiency and the Speed of Taking Decision:** A client can take decision easily among many resources effectively. That s/he does not need to think twice before taking decision because in the meantime, s/he will get the effective result using decision support system.

### **1.4 Research Questions**

Here are some questions which we have tried to solve in this paper.

- I. Is there any decision support system which it will select the best event management company?
- II. Is there any event management company selection process with alternative company name with multi attributes in decision support system?

## 1.5 Expected Output

- I. Time saving
- II. Cost Efficient
- III. Helping to make the best decision efficiently
- IV. Getting the information to select a high rank event management company
- V. Client can reanalyze the decision on own accord

## 1.6 Report Layout

The report is divided into five chapters. Each chapter deals with the different aspects of "Event management Company Selection Using Decision Making Approach". Each chapter has various explaining parts in detail.

- **Chapter 1: Introduction**

This chapter discusses the important theoretical concepts behind our project. Here also discusses motivation, rational of study, research question and expected output.

- **Chapter 2: Background**

This chapter discusses about related works, research summary, scope of the problem and challenges.

- **Chapter 3: Research Methodology**

This chapter discusses about research subject & instrumentation, procedure of data collection, statistical analysis implementation requirements.

- **Chapter 4: Experimental Results and Discussion**

This chapter discusses about experimental results, descriptive analysis.

- **Chapter 5: Summary, Conclusion, Recommendation and Implication for Future Research**

This chapter discusses about summary, conclusions recommendations, further study.

## **CHAPTER 2**

### **Background**

#### **2.1 Introduction**

Everyday a lot of event occurs in cities. To select an event management company is very complex and difficult job. Event management is a process that coordinate every aspect of an event. Here we will try to figure out the best event management company basis on criteria.

In this chapter, we will discuss about other research papers which are related to our work, research summery, scope of the problem and challenges about this research.

#### **2.2 Related Work**

In this time, selection process is grown up. For selection, using AHP there are several works done. The appropriate machine tools selection is an important part of Product Company. Inappropriate selection waste money, time, workforce etc. They developed a selection method using AHP [1]. A similar solution method (TOPSIS) was proposed by Rubayet to eligible alternatives rank [2]. On the other hand, AHP-TOPSIS\_QFD method proposed by Dipika Pramanik select a resilient supplier [3]. In addition, Jasmin J. Lim proposed DEA approach for select supplier [4]. For the post graduate students, Neset tried to solve the selection problem of courses. Using AHP and PROMETHEE methods determines which course will be chosen on master course selection [5]. The selection of CMS (Content Management System) among attainable alternatives is regarded as a multi criteria decision making problem. This paper consists of four alternatives and seven criteria is built they are proposed AHP (Analytic Hierarchy Process) integrated Grey-TOPSIS method, and they applied this in a Turkish foreign trade company. AHP is applied to determine the weights from the seven criteria and from the four alternatives TOPSIS is applied to rank [6]. There is a paper which is reports the final results and process of a hospital site selection among the Region 5 of Metropolitan Shiraz. This paper used integrated fuzzy ANP (Analytical Network Process) systems with GIS. This study used two-step decision-making approach for

selecting the site of hospital in the Region 5 of Shiraz Metropolitan Area. First of all they used FAHP and GIS for selection and the screening of three congenial options out of all developable parcels. Second of all the final evaluation result was performed with the help of FANP which is interactions with the all criteria [7]. There is one more paper, which is presented a study and that is comparison of AHP and FEHP methods with relation to sustainable dimensions and also criteria. Those dimensions and criteria are exceptionally relevant to the problem of sustainable end-of-life vehicles (ELVs) management. This paper also reported the application of the AHP and the FEHP methods. When others company wants to make decisions which is based on evaluation of the sustainable alternatives then the proposed system might be helpful for the other companies. Although this proposed system is too much simple for managers and engineers because this implementation of the technique is very convenient [8]. In 2016, Vipul Jain, Arun Kumar Sangaiah, Sumit Sakhuja, Nittin Thoduka, Rahul Aggarwal proposed a case study for supplier selection. This study selected supplier in an Indian automobile company using analytical hierarchy process (AHP) and TOPSIS. Firstly, this process deals with identifying the qualitative and quantitative criteria and interviewing of the industry experts. Finally, using AHP and TOPSIS the suppliers are ranked [9]. In 2020, Rohit Singh, Shwetank Avikal, Rashmi Rashmi, Mangey Ram proposed a Kano model for selecting best mobile phone which is used analytical hierarchy process (AHP) and TOPSIS. In this paper Kano model describes and also divides mobile phones specification in various categories. Fuzzy AHP model is applied to calculate weight from various mobile phone features. Finally, TOPSIS is also applied for ranking of available substitutes. [10]

### **2.3 Scope of the Problem**

- As the research data is related to the business, so we faced many problems to collect data.
- There was no previous research paper, so the previous data was empty.
- The DSS (Decision Support System) was pretty difficult for implementation.
- Data implementation and calculations are lengthy process.

## 2.4 Challenges

- We went many companies to collect data. Data collection is the biggest challenge.
- Many companies didn't want to share their data.
- Some data are changed day by day for event purpose.
- We didn't get perfect data. Some were missing.
- Some companies need to permission to collect data. So we contact with our supervisor then he contact and get permission for us.
- Select attribute was a big problem.
- Use different algorithm was a challenge.
- Select and implementation of framework was a challenge.
- To the working procedure there were several challenge.



## CHAPTER 3

### Research Methodology

#### 3.1 Introduction

There are many algorithms in computer science for decision making. In this paper, we will use Analytic Hierarchy Process (AHP). The Analytic Hierarchy Process (AHP) is one of the staple mathematical methods for decision making from different criteria.

#### 3.2 Data Collection Procedure

In our works, we need some data about some Event Management Companies. All the data are collected from different Event Management Company from Dhaka city. We have find out some criteria, Depend on those criteria we have also selected some sub-criteria. We need all the information about those criteria and sub-criteria of three Event Management Company. All the criteria and sub criteria of Event Management Company are shown in figure 3.1 which is given below.

Table 3.2.1: All Criteria and Sub-criteria for Analytical Hierarchy Process

Serial	Criteria	Sub-criteria
1	Budget	Budget planning for different events like wedding, birthday, corporate events.
2	Hall size	For different events like birthday, conference, wedding events they provide hall size as per as clients requirement.
3	Photography	Birthday photography, wedding photography, conference photography.
4	Catering	Wedding catering, buffet catering, corporate catering.
5	Decoration	Lighting, audio system, wedding decoration, banquet hall decoration, birthday decoration, conference hall decoration.

##### 3.2.1 Budget:

Budget means the total cost of the ceremony like wedding and Birthday. This Budget also contains the cost for decoration and catering. This Budget is calculated in US Dollar. It's an important parameter for decision making.

### **3.2.2 Hall Size:**

Hall size means the size of the place where the event will take place. This size is calculated in Square feet.

### **3.2.3 Photography:**

All type of photography such as birthday photography, wedding photography, and conference photography will be consider as “Photography” in this section.

### **3.2.4 Catering:**

All type of catering such as Wedding catering, Birthday catering, Buffet catering, sit down catering will be consider as “Catering” in this section.

### **3.2.5 Decoration:**

All type of Decoration such as Lighting, Wedding decoration, Banquet hall decoration, Birthday decoration, and Conference hall decoration will be counted as “Decoration”.

## **3.3 Proposed Methodology**

AHP is very effective, extraordinary and very much time-utilized strategy of solving the complex problem and making the best decision. It is a very popular method for group decision making and helps to handle the problems arising from choosing alternatives. Apart from that, we will use Feature Extraction Method to select the best event management company for customers.

For this reason, we have proposed a methodology which follow the following steps to select the best event management company.

- Defining the unstructured problem and specifying the solution we desire.
- Breaking the complex problem and organizing the problem as a hierarchy to increase the understanding of the problem.
- Constructing a pairwise comparison to form the comparison matrices with respect to relevant criteria.
- Calculating the decision elements with relative weights, eigenvalue method will be used.
- After computing the matrices, consistency properties will be tested that the decision-makers are consistent or not.

- For attaining the general scores of the substitutes we will group the elements in the basis of weighted decision.
- Finding the minimum value of each attribute of every alternative will try to calculate the distance from the minimum value.
- Calculating the utility of an alternative we will rank the alternatives and find the desired result.

This proposed methodology is illustrated in the figure 1 below:

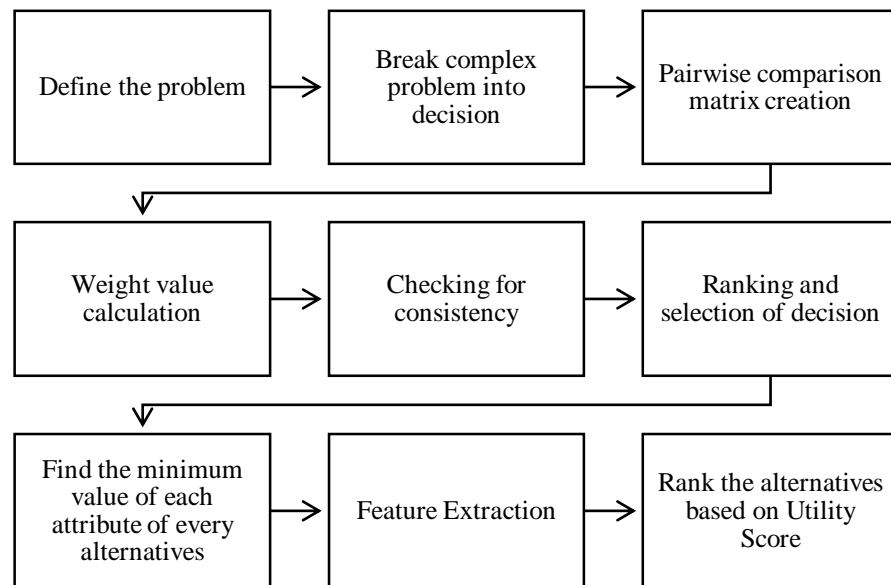


Figure 3.3.1: Proposed Methodology

### 3.3.1 AHP Methodology

For implementing AHP method we will consider the following few steps.

1. Construction of Structural Hierarchy: Here we will decomposed the complex problem into a structural hierarchy where the goal will be highlighted and criteria and alternatives will be identified. This is illustrated in figure 1 below:

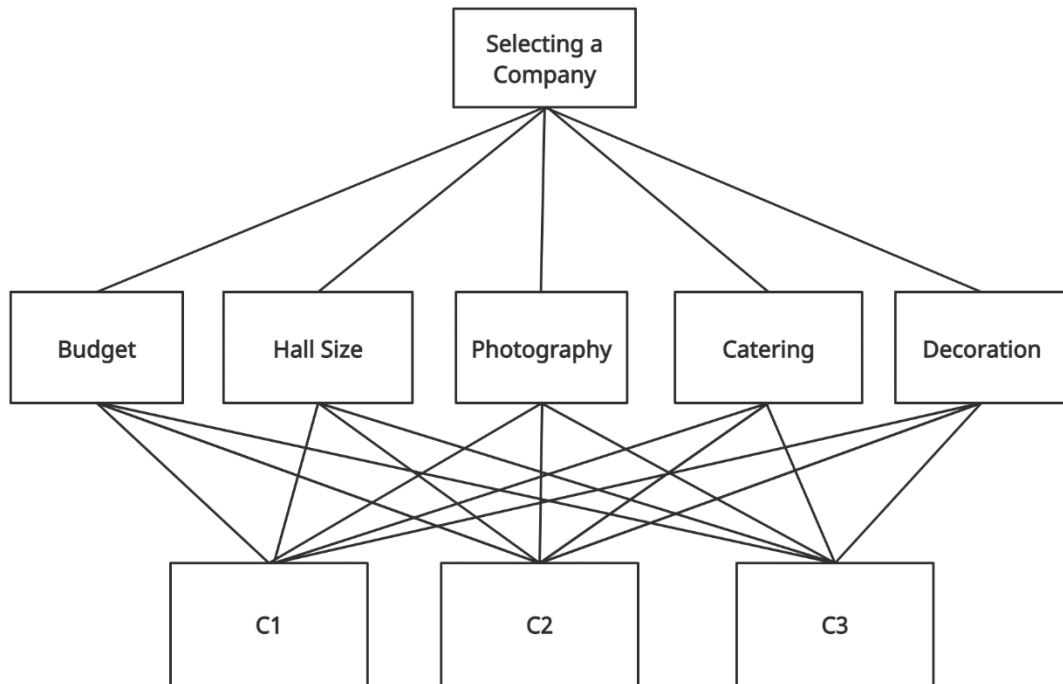


Figure 3.3.1.1: Architectural Theory Diagram selecting an event management company.

2. Construction of Comparative Judgments (Pair-wise Comparison Matrix): We will construct the pairwise comparison matrix for all the criteria and alternatives we have. This pair-wise comparison matrix demonstrate that how much a variable 'A' variable is important than 'B' variable. This logical things are measured using this pair-wise comparison matrix. Now the pair-wise comparison matrix is presented in the following equation :

$$a_{mn} = \frac{w_m}{w_n} \quad m, n = 1, 2, 3 \dots n \quad (1)$$

Here  $n$  stands for criteria compared number.  $w_m$  and  $a_{mn}$  are weights for the  $m$  criterion and the ratio of the weight of the  $m$  and  $n$  criterion respectively.

3. Weight Determination through Normalization Procedure: From the pairwise comparison matrix we will determine the weights of the criteria and local weight of the alternatives from the following equation:

$$a_{ij} = \frac{a_{ij}}{\max_{ij}}, \quad \forall_i \quad (2)$$

4. Synthesis of Weight and Consistency Test: To calculate the eigenvector this equation:

$$w_m = \frac{a_m}{n}, \quad \forall_m \quad (3)$$

The number of times multiplying the number of columns with the main eigenvector is the largest eigenvalue. Eq. 5 from which it can be gained is given below:

$$\lambda_{max} = (\sum GM_{11-n1} * \bar{X1}) + \dots + (\sum GM_{1n-nm} * \bar{Xn}) \quad (4)$$

After that, to calculate the Consistency Index (CI) and Consistency Ratio (CR) will follow the following equation:

$$CI = \frac{\lambda_{max} - n}{n - 1} \quad (5)$$

$$CR = \frac{CI}{RI} \quad (6)$$

### 3.3.2 Generic Feature Extraction Approach Methodology

For implementing Feature Extraction we will consider the following few steps.

#### 1. Weight Generation for Root-layer Attributes

Loads for the essential properties of a choice issue can be produced by investigating the chronicled information. Here, term frequency (TF) indicates the significance of a definite term within the overall document. Term frequency of a term 't' can scientifically depict to as

$$\text{Term Frequency, TF} = \frac{ft,d}{\sum t' \in d ft',d} \quad (7)$$

Whatever, each alternative has some multiple attributes. For this reason, average estimation is computed of the Term frequencies. The normal term recurrence of a property can be depicting to as:

$$\text{AvgTF}_a = \frac{\sum_{i=1}^N TF_a}{L} \quad (8)$$

Here, a= {a<sub>1</sub>, a<sub>2</sub>, a<sub>3</sub>... a<sub>n</sub>} along these lines, the normal TF will be considered as the last loads of the root-level properties.

## 2. Weight generation for Intermediate-Layer Attributes

Most of the time, intermediate level attributes are needed to consider a definite attribute so that the decision attributes can be ranked. Attributes at the intermediate level are not generally appeared to be available straightforwardly in the datasets. Be that as it may, their subsidiaries for the most part decide their importance in decision-making tasks. Weight generation for the properties of the intermediate of the road level can be computed by utilizing Cosine Similarity. Cosine similarity is a measure of similarity between two non-zero vectors of an inner product space that measures the cosine of the angle between them [1]. Assume,  $\alpha$  and  $\beta$  are two non-zero vectors in a vector space model. In this way, cosines likeness between  $\alpha$  and  $\beta$  can be exhibited as,

$$\text{Cosine Similarity} = \frac{\alpha \cdot \beta}{\|\alpha\| \|\beta\|} \quad (9)$$

To propagate loads for the transitional level qualities, one of the non-zero vectors,  $\alpha$  is built with the numeric qualities estimated from the essential properties of the choice issues which is constantly 1. The other vector,  $\beta$  is developed with the Term Frequency of the characteristics.

$$\text{Weight of Attribute } A_j = \frac{\sum_{i=1}^N \alpha_i \beta_i}{\sqrt{\sum_{i=1}^N \alpha_i^2} \sqrt{\sum_{i=1}^N \beta_i^2}} \quad (10)$$

## 3. Handling Uncertainty due to incomplete information.

Highlight extraction approach investigates the properties of all the gave choices to pick the most ideal option for an activity. Assume there are  $N$  an diverse options  $A_j$  ( $j=1 \dots N$ ) for a specific activity. In this way, the choices can be characterized to as,

$$A = \{A_1, A_2, \dots, A_j, \dots, A_N\} \quad (11)$$

Assume, there are  $L$  elementary attributes  $y_z$  ( $z=1, \dots, L$ ) linked with every simple substitute. The elementary attributes can be expressed as follows:

$$Y = \{y_1, y_2, \dots, y_z, \dots, y_L\} \quad (12)$$

In this way, the fundamental properties for  $y_z$  ( $z=1 \dots L$ ) Of an option can be scientifically articulated to as  $y_{jz}$ ; where,  $j$  ( $j=1, \dots, N$ ) is the number of alternatives and

$z$  ( $z=1, \dots, L$ ) is the quantity of attributes.  $y_z$  denotes the  $z^{\text{th}}$  characteristic ( $y_z$ ) of  $j^{\text{th}}$  elective ( $A_j$ ).

Once more, the qualities of an option can be articulated to utilizing some conviction degrees against a predefined assessment grade.

#### 4. Ranking and Selection of Decision

The fundamental principles can be spoken to as follows:

$$C_G^F : \text{if } \{(I_1, J_1) \wedge \{(I_2, J_2) \wedge \dots \dots (I_n, J_T)\} \\ \text{then } \{(L_1, \bar{J}_1), (L_2, \bar{J}_2), \dots \dots, (L_n, \bar{J}_n)\} \quad (13)$$

Where  $C_G^F$ ,  $\{(G=(1,2,\dots,N)$  is the quantity of rules and  $F=(1,2,\dots,N)$  expresses to the quantity of attributes} expresses to the standard for the information base.  $I_i=\{I_1, I_2, \dots, I_T\}$  presents properties' assessment evaluation and  $J_i\{i \in (1, \dots, N)\}$  is the level of confidence as far as  $I_i$ .  $L_i$  ( $i=1,2,\dots,N$ ) is the standard result and  $\bar{J}_{ik}$   $\{(i=1,2,\dots,N), (k=1,2,\dots,N)\}$  is the level of Belief as far as  $L_k$ . Here,  $\sum J_{ik} \leq 1$  and  $\sum \bar{J}_{ik} \leq 1$ .

Level of conviction  $B_{ik}$  can be spoken to by a fluffy enrollment work. All things considered, eq (7) can be composed as

$$C_G^F : \text{if } \{(I_1^k, J_{1kn} \text{ to } J_{1km}) \wedge (I_2^k, J_{2kn} \text{ to } J_{2km}) \wedge \dots \dots \wedge (I_T^k, J_{Pkn} \text{ to } J_{Pkm})\} \\ \text{then } \{(L_1, \bar{J}_{1k}), (L_2, \bar{J}_{2k}), \dots, (L_n, \bar{J}_{nk})\} \quad (14)$$

The minimum value of the attribute  $j$  for the represented alternatives is known plane value and that could be exhibited as,

$$\alpha_j = \min (e_{i,j}) \quad (15)$$

Here,  $i$  is the number of alternatives and  $j$  is the number of attributes. And  $\alpha_j$  is the minimum value of  $j^{\text{th}}$  attribute.

Feature extraction is the simplest way to elucidate the attributes,

$$\beta_{i,j} = e_{i,j} - \alpha_j \quad (16)$$

Arithmetic difference between the minimum value of a certain attribute and similar attribute of all the alternatives is performed by computing. Where,  $\beta_{i,j}$  determines the feature of  $j^{\text{th}}$  attribute of  $i^{\text{th}}$  alternatives with respect to  $j^{\text{th}}$  minimum value ( $\alpha_j$ ).

By using the following formula, the probability of mass of an attribute can be computed.

$$m_{i,j} = \prod_{i=1, j=1}^{i=N, j=L} (\beta_{i,j}, w_j) \quad (17)$$

Where, weights are represented as  $w_j$  ( $j= 1 \dots \dots L$ ) is the number of attributes states the weight of  $j^{\text{th}}$  attribute ( $e_j$ ) with  $0 < w_j \leq 1$ .

The fundamental arithmetic summation formula is used to aggregate the probability masses.

$$C_i = \sum_{i=0, j=0}^{i=N, j=L} m_{i,j} \quad (18)$$

Where,  $C_i$  ( $i=0, \dots, N$ ) is the utility of  $i^{\text{th}}$  alternative.

To make the final decision the best alternative can be approved as,

$$C = \begin{cases} \max (C_i), & \text{for benefit attribute} \\ \min (C_i), & \text{for cost attribute} \end{cases} \quad (19)$$

Here,  $i$  ( $i=1, 2, \dots, N$ ) is the number of alternatives.



## CHAPTER 4

### Implementation and Result Analysis

#### 4.1 Introduction

We will get the best Event Management Company for the client using Analytic Analytical Hierarchy Process (AHP). We apply Analytical Hierarchy Process (AHP) method for decision making and after that to rank the best companies we use Generic Feature Extraction Approach. Finally this methods will give the best Event Management Company among three companies.

#### 4.2 Experimental Result and Analysis

Here we have discussed all the experimental things which used in this paper.

##### 4.2.1 Analytical Hierarchy Process (AHP) Implementation

Here, we have implement the Analytical Hierarchy Process (AHP).

At first, we have taken five criteria to define the unstructured problem along with three alternatives for selecting an event management company (see Table 4.2.1.1).

Here, we have defined three companies such as Company 1 (C1), Company 2 (C2) and Company 3 (C3) are evaluated as alternatives.

Table 4.2.1.1: Data of Providing Services of the Companies

Company	Budget	Hall Size	Photography	Catering	Decoration
C1	650 \$	2600 sq. feet	Good	Excellent	Low
C2	550 \$	3400 sq. feet	Excellent	Average	Excellent
C3	2200 \$	2000 sq. feet	Average	Good	Good

To express the satisfaction of customers we have used five point scale which define the customers individual opinion about the service of each company (see Table 4.2.1.2).

Table 4.2.1.2: Using Five Point Scale

Numbering	
Low	1
Below Average	2
Average	3
Good	4
Excellent	5

Table 4.2.1.3: Data of Providing Services of the Companies

Company	Budget	Hall Size	Photography	Catering	Decoration
C1	650 \$	1600 sq. feet	4	5	1
C2	550 \$	1400 sq. feet	5	3	5
C3	2200 \$	1000 sq. feet	3	4	4

To make a comparison among all the criteria we have use the following Satty Scale (see Table 4.2.1.4).

Table 4.2.1.4: AHP Measurement Scale

Important Intensity	Definition
1	Equal Importance
3	Moderate Importance
5	Strong Importance
7	Very Strong Importance
9	Extreme Importance
2,4,6,8	Intermediate Values
1/3, 1/5, 1/7, 1/9	Values for inverse Comparison

After that, a pairwise comparison matrix is created which is shown in below (see Table 4.2.1.5 and Table 4.2.1.6) using Eq. (1).

Table 4.2.1.5: Pairwise Comparison Matrix With Respect to the Goal

	Budget	Hall Size	Photography	Catering	Decoration
Budget	1	1	2	3	2
Hall Size	1	1	3	2	4
Photography	1/2	1/3	1	2	1
Catering	1/3	1/2	1/2	1	3
Decoration	1/2	1/4	1	1/3	1

Table 4.2.1.6: Pairwise Comparison Matrix

	Budget	Hall Size	Photography	Catering	Decoration
Budget	1	1	2	3	2
Hall Size	1	1	3	2	4
Photography	0.5	0.33	1	2	1
Catering	0.33	0.5	0.5	1	3
Decoration	0.5	0.25	1	0.33	1
SUM=	3.33	3.08	7.50	8.33	11

Getting the normalized pair-wise comparison matrix through Weight determination (see Table 4.2.1.7) using Eq. (2).

Table 4.2.1.7: Normalized Pairwise Comparison Matrix

	Budget	Hall Size	Photography	Catering	Decoration	Criteria Weights
Budget	$1/3.33$ =0.30	$1/3.08$ =0.324	$2/7.50$ =0.266	$3/8.33$ =0.360	$2/11$ =0.181	$1.431/5$ =0.286
Hall Size	$1/3.33$ =0.30	$1/3.08$ =0.324	$3/7.50$ =0.40	$2/8.33$ =0.240	$4/11$ =0.363	$1.627/5$ =0.325
Photography	$0.5/3.33$ =0.15	$0.33/3.08$ =0.107	$1/7.50$ =0.133	$2/8.33$ =0.240	$1/11$ =0.090	$0.72/5$ =0.144
Catering	$0.33/3.33$ =0.099	$0.5/3.08$ =0.162	$0.5/7.50$ =0.066	$1/8.33$ =0.120	$3/11$ =0.272	$0.719/5$ =0.143
Decoration	$0.5/3.33$ =0.15	$0.25/3.08$ =0.08	$1/7.50$ =0.133	$0.33/8.33$ =0.039	$1/11$ =0.090	$0.492/5$ =0.098

The obtained normalized matrix from Table 4.2.1.7 are represented in Eq. 20:

$$\begin{bmatrix} 0.30 & 0.324 & 0.266 & 0.360 & 0.181 \\ 0.30 & 0.324 & 0.40 & 0.240 & 0.363 \\ 0.15 & 0.107 & 0.133 & 0.240 & 0.090 \\ 0.099 & 0.162 & 0.066 & 0.120 & 0.272 \\ 0.15 & 0.08 & 0.133 & 0.039 & 0.090 \end{bmatrix} \dots\dots\dots(20)$$

The eigenvector is needed for representing the priorities which is shown in Table 4.2.1.8 and calculating eigenvector using Eq. (3).

Table 4.2.1.8: Eigenvector on Individual Criteria.

Criteria Weights	
Budget	0.286
Hall Size	0.325
Photography	0.144
Catering	0.143
Decoration	0.098

In Table 4.2.1.9 we have the calculation to determine the consistency where  $\lambda_{max}$  is the eigenvalue of the pair-wise comparison matrix. After that we will calculate the Consistency Index (CI) and Consistency Random Index (RI) is shown in Table 4.2.1.10. Then Consistency Ratio (CR) will be checked in order to check the consistency. Consistency Ratio (CR) must be less than or equal to 0.10 which indicates that the degree of consistency is satisfactory.

Table 4.2.1.9: Calculating the Consistency

	Budget	Hall Size	Photography	Catering	Decoration	Weighted Sum Value....(1)	Criteria Weights .....(2)	(1)/(2)
Budget	0.286	0.325	0.288	0.429	0.196	1.524	0.286	5.328
Hall Size	0.286	0.325	0.432	0.286	0.392	1.721	0.325	5.295
Photography	0.143	0.107	0.144	0.286	0.098	0.778	0.144	5.402
Catering	0.094	0.162	0.072	0.143	0.294	0.765	0.143	5.349
Decoration	0.143	0.081	0.144	0.047	0.098	0.513	0.098	5.234

Eq. (4-6) are used for the following calculation:

$$\lambda_{\max} = \frac{5.328 + 5.295 + 5.402 + 5.349 + 5.234}{5} = 5.321$$

$$\text{Consistency Index (CI)} = \frac{\lambda_{\max} - n}{n-1} = \frac{5.321-5}{5-1} = 0.08025$$

$$\text{Consistency ratio (CR)} = \frac{CI}{RI} = \frac{0.08025}{1.12} = 0.07165$$

$$CR = 0.071 < 0.10$$

Table 4.2.1.10: Ratio Index

n	1	2	3	4	5	6	7	8	9	10
RI	0.00	0.00	0.58	0.90	1.12	1.24	1.32	1.41	1.45	1.49

## 4.2.2 Generic Feature Extraction Approach

Here, we have taken a dataset which is shown in Table 4.2.2.1 where the value of Photography Service is calculated as 500/6380 where 6380 is the total number of

customers and 500 is the total number of customers who have taken the Photography Service from C1. The average Term Frequency (TF) of Photography Service is 0.107 shown in Table 4.2.2.4 which provides its actual weight.

Table 4.2.2.1: Customer Getting Services from C1 (6380 Customers in 2018)

Attributes	Budget Planning Service	Hall size Service	Photography Service	Catering Service	Decoration Service
Attribute's Density	900	450	500	500	538
Term Frequency	0.141	0.071	0.0783	0.0783	0.084

Table 4.2.2.2: Customer Getting Services from C2 (8320 Customers in 2018)

Attributes	Budget Planning Service	Hall size Service	Photography Service	Catering Service	Decoration Service
Attribute's Density	768	230	700	768	780
Term Frequency	0.092	0.028	0.084	0.092	0.094

Table 4.2.2.3: Customer Getting Services from C3 (5040 Customers in 2018)

Attributes	Budget Planning Service	Hall size Service	Photography Service	Catering Service	Decoration Service
Attribute's Density	200	600	800	800	920
Term Frequency	0.040	0.119	0.159	0.159	0.182

Table 4.2.2.4: Root-Level Attributes' Weight Calculation

Attributes	Budget Planning Service	Hall size Service	Photography Service	Catering Service	Decoration Service
Attribute's weights	0.091	0.073	0.107	0.109	0.120

Table 4.2.2.5: Table 7: Dataset for Different Companies Providing Services to the Customers (Year 2019)

Company	Budget Planning Service	Hall size Service	Photography Service	Catering Service	Decoration Service
C1	750	1600	400	500	100
C2	350	1400	500	300	500
C3	1200	1000	300	400	400

Table 4.2.2.6: Transformation of Evaluation Grades into Numerical Values

E <sub>1</sub>	E <sub>2</sub>	E <sub>3</sub>	E <sub>4</sub>	E <sub>5</sub>	E <sub>6</sub>	E <sub>7</sub>	E <sub>8</sub>	E <sub>9</sub>	E <sub>10</sub>	E <sub>11</sub>	E <sub>12</sub>	E <sub>13</sub>	E <sub>14</sub>	E <sub>15</sub>	E <sub>16</sub>	E <sub>17</sub>	E <sub>18</sub>	E <sub>19</sub>	E <sub>20</sub>
0.05	0.1	0.15	0.2	0.25	0.3	0.35	0.4	0.45	0.5	0.55	0.6	0.65	0.7	0.75	0.8	0.85	0.9	0.95	1.0

Table 4.2.2.7: System input acquisition

Company	Budget Planning Service	Hall size Service	Photography Service	Catering Service	Decoration Service
C1	E <sub>12</sub> , 1	E <sub>20</sub> , 1	E <sub>16</sub> , 1	E <sub>20</sub> , 1	E <sub>4</sub> , 0.2
C2	E <sub>5</sub> , 0.25	E <sub>17</sub> , 1	E <sub>20</sub> , 1	E <sub>12</sub> , 0.6	E <sub>20</sub> , 1
C3	E <sub>20</sub> , 1	E <sub>12</sub> , 1	E <sub>12</sub> , 0.6	E <sub>16</sub> , 1	E <sub>16</sub> , 1

Table 4.2.2.8: Rules set up for knowledgebase Construction

Rule No.	Antecedent	Consequence
1.	if (E <sub>5</sub> ,0.25)	then (E <sub>5</sub> , 0.1), (E <sub>4</sub> ,0.75), (E <sub>3</sub> , 0.15)
2.	if (E <sub>12</sub> ,0.6)	then (E <sub>16</sub> , 0.15), (E <sub>12</sub> ,0.8), (E <sub>15</sub> ,0.05)
3	if (E <sub>4</sub> ,0.2)	then (E <sub>5</sub> , 0.7), (E <sub>4</sub> ,0.2), (E <sub>3</sub> ,0.1)
4.	if (E <sub>12</sub> ,0.6)	then (E <sub>11</sub> , 0.25), (E <sub>12</sub> ,0.5), (E <sub>10</sub> ,0.25)
5.	if (E <sub>17</sub> ,0.3)	then (E <sub>16</sub> , 0.3), (E <sub>17</sub> ,0.5), (E <sub>13</sub> ,0.2)
6.	if (E <sub>16</sub> ,0.7)	then (E <sub>17</sub> , 0.2), (E <sub>16</sub> ,0.7), (E <sub>18</sub> , 0.1)
7.	if (E <sub>12</sub> ,0.9)	then (E <sub>10</sub> , 0.1), (E <sub>12</sub> ,0.8), (E <sub>18</sub> ,0.1)
8.	if (E <sub>16</sub> ,0.75)	then (E <sub>19</sub> , 0.15), (E <sub>16</sub> ,0.6), (E <sub>15</sub> ,0.25)

$$E_{12, 0.6} = (E_{16}, 0.15), (E_{12}, 0.8), (E_{15}, 0.05)$$

$$= (0.8*0.15) + (0.6*0.8) + (0.75*0.05) = 0.638$$

Table 4.2.2.9: Initial Input transformation with incomplete information

Company	Budget Planning Service	Hall size Service	Photography Service	Catering Service	Decoration Service
C1	0.6	1	0.8	1	0.2
C2	0.25	0.85	1	0.6	1
C3	1	0.6	0.6	0.8	0.8

Table 4.2.2.10: Final Input transformation

Company	Budget Planning Service	Hall size Service	Photography Service	Catering Service	Decoration Service
C1	0.6	1	0.8	1	0.23
C2	0.2	0.85	1	0.638	1
C3	1	0.6	0.638	0.8	0.8



Attributes' minimum value is representing in the Table 4.2.2.11 using Eq. (15).

Table 4.2.2.11: Attributes' minimum value calculation

Company	Budget Planning Service	Hall size Service	Photography Service	Catering Service	Decoration Service
C1	0.6	1	0.8	1	0.23
C2	0.2	0.85	1	0.638	1
C3	1	0.6	0.638	0.8	0.8
Min	0.2	0.6	0.638	0.638	0.23

Attributes' Feature Extraction is representing in the Table 4.2.2.12 using Eq. (16).

Table 4.2.2.12: Attributes' Feature Extraction

Company	Budget Planning Service	Hall size Service	Photography Service	Catering Service	Decoration Service
C1	0.4	0.4	0.162	0.362	0
C2	0	0.25	0.362	0	0.77
C3	0.8	0	0	0.162	0.57

Attributes' Utility Calculation is representing in the Table 4.2.2.12 using Eq. (18).

Table 4.2.2.13: Alternatives' Utility Calculation

Company	Budget Planning Service	Hall size Service	Photography Service	Catering Service	Decoration Service	Utility
C1	0.0364	0.0292	0.0173	0.0476	0	0.1305
C2	0	0.01825	0.0387	0	0.0924	0.14935
C3	0.0728	0	0	0.0258	0.0684	0.167

To select the best event management company, we have found the maximum utility shown in Table 4.2.2.13 which is C3=0.167 is considered as the maximum utility in this experiment states that C3 is the best event management company.

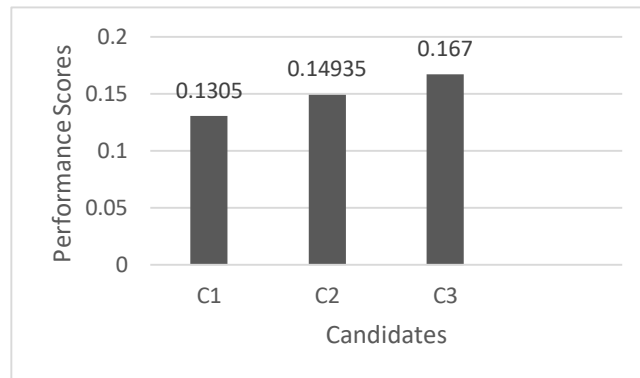


Figure 4.2.2.1: Selection Performance Evaluation

From the above graph Figure 4.2.2.1, it becomes clear that C3 utility is higher than all the rest alternatives. That's why, C3 is selected as the best event management company. To visualize the exactness of our proposed methodology, a comparative evaluation between the systems obtained result and established benchmark result is presented in the Table 4.2.2.14 and Figure 4.2.2.2.

Table 4.2.2.14: A cross-validation between experimental results and benchmark results

Company	System Obtained Results	Benchmark Results	System Inference	HR at Company Inference
C <sub>1</sub>	0.1305	0.1402	C3	C3
C <sub>2</sub>	0.14935	0.16453		
C <sub>3</sub>	0.167	0.1802		

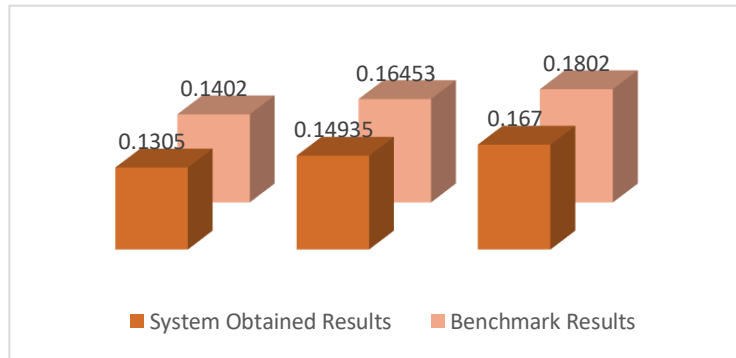


Figure 4.2.2.2: Graphical representation of cross-validation between experimental results and benchmark results

### 4.3 Discussion

In this paper, we have proposed a framework using AHP and Generic Feature Extraction Approach which is the most suitable method when analyzing the complex problem and take a convenient decision. For this reason, we have used these methods to evaluate and rank the event management companies.

## **CHAPTER 5**

### **Conclusion and Future Work**

#### **5.1 Conclusion**

In this paper we have used AHP and Generic Feature Extraction Method to organize and analyze the complex decision and find the best possible options for selecting the best event management company and help customers find the suitable event management company according to their own criteria in a ranking basis. Here for making the decision, we need features which fetch from the inputs given by the decision makers. Using AHP method we get the consistency ratio which is the most important measurement of the results from pairwise comparison and after checking consistency ratio is 0.071 which is less than 0.10 which proves that the whole hierarchical construction of our proposed problem has full acceptable consistency at all levels and the decision of the decision-makers are consistent. To get the optimal result under the risk and uncertainty we use Feature Extraction Approach which is competent enough to make decisions. From doing the numerical experiment of using the feature extracting method we get the utility of an alternative is calculated and rank the alternatives and all the related things of this experiment are collected from the domain expert.

#### **5.2 Future Work**

In this paper, we have proposed a mathematical framework but in future, we will try to implement it programmatically. But all of the underlying methodological and experimental analysis aside, our long-term motive is to design an online system which will provide the customers best possible solutions and rank them according to their own requirements.

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