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# Fuzzy Measurement of University Students Importance Indexes by Using Analytical Hierarchy Process

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**Abstract**
**Purpose:** The purpose of this paper is to apply a Fuzzy Analytical **Hierarchy** Process model FAHP for estimating students' importance indexes problem, where the measures of students' attitudes and responses are often uncertain or difficult to determine by using non-fuzzy model. Fuzzy set theory treats a kind of uncertainty called fuzziness. It shows that the boundary of "yes" or "no" is ambiguous and appears in the meaning of words or included in the subjunctives or recognition of human beings.
**Design/methodology/approach:** This paper adapts FAHP to analysis students' satisfaction for the services submitted by the university to enhance learning process and circumstance environment for students, this area of researches is still out of university importance. For the purposes of the survey, questionnaires were designed for all the factors which are affecting in students' satisfaction and most probably all these factors are taken according to their suitable priority. There were five main criterions in the questionnaires. Criterion one focuses on administrative university services Si, the second criterion concentrate with teaching and learning process Ti, while the third criterion is university climate and student activities Ai, the fourth criterion covers the administrative facilities Fi, and the fifth criterion is learning facilities students Li, were asked to measure their perceived experiences with those criterions. Each criterion contains some of sub criteria.
**Findings:** The results illustrate that the quality of teachers T1, Opportunities for recreational activities A1, fair evaluation for students T6, and remedial support A3 are the most important indexes for students. The proposed model would help decision-makers to enhancement the quality of the services and may be adding other facility to make the university more attractive.
**Research limitations/implications:** This paper makes some assumptions such as the number of sample are taken from seven colleges only and not cover all colleges in the university and concentrated about the final levels.
**Originality/value:** This paper introduces fuzzy theory with AHP approach to the research of university services as customers in public firms and it has reached some valuable conclusions, which has opened up a new field of study in the universities services area.
**Keywords**: Fuzzy AHP, Multiple Attribute Decision Making MADM, Customers loyalty.

## I. INTRODUCTION

Rapid economic growth in the world has been a main cause for the growth of trade in education it has proved the importance of education in accelerating economic growth. Teaching and learning at the college level have become the focus of a great deal of attention and more researchers are conducting investigations on the quality of instruction in college classrooms. Due to an increasingly competitive and dynamic educational environment, as well as numerous challenges, universities are becoming more aware of the importance of students importance. Students' satisfaction is of compelling interest to colleges and universities as they seek to continually improve the learning environment for students, meet the expectations of their constituent groups and legislative bodies, and demonstrate their institutional effectiveness**.**

The main motives for study in this area are the extensive uses of customers' importance measurements where several studies have shown that university's environment effects students' academic achievement, and one of the most important elements of university's environment is the available technological facilities at university. Therefore, it is essential to investigate the effect of service quality on student's perceptions.

Rowley [1996], identified four main reasons for collecting student feedback:

**(1)** To provide auditable evidence that students have had the opportunity to pass comment on their courses and that such information is used to bring about improvements;
**(2)** To encourage student reflection on their learning;
**(3)** To allow institutions to benchmark and to provide indicators that will contribute to the reputation of the university in the marketplace
**(4)** To provide students with an opportunity to express their level of satisfaction with their academic experience.

Peter Fieger [2012] uses principal component analysis (National Centre for vocational Education Research) to identify the underlying dimensions of the 18 satisfaction items and group the questions as follow:

**Teaching:**

1. Thorough knowledge of the subject content
2. Opportunities to ask questions
3. Treated with respect
4. Understood learning needs
5. Communicated the subject content effectively
6. Made the subject as interesting as possible

**Assessment:**

1. Method to be assessed
2. Assessed was a fair test of skills
3. Assessed at appropriate intervals
4. Feedback on of assessment

**Generic skills and learning experiences:**

1. Development of problem-solving skills
2. Development of ability to work as a team member
3. Improved skills in written communication
4. Development of the ability to plan my own work
5. Confidence of tackling unfamiliar problems
6. Confidence of ability to learn
7. Achieving my goals
8. New opportunities in life

**Overall satisfaction with the training:**

1. How would you rate, on average, your satisfaction with the overall quality of the training?
2. Overall, I was satisfied with the quality of this training

## II. LITERATURE REVIEW

Jalynn Roberts , and Ronald Styron [2008], investigated the students perceptions of services, interactions, and experiences in the College of Education and Psychology at a research-intensive university located in the southern region of the United States. Data were collected relative to participants perceptions for university experiences and services. The constructs included academic advising, social connectedness, involvement and engagement, faculty and staff approachability, business procedures, learning experiences, and student support services.

Azhar Saleem, et. al. [2012], introduced that the level of students' satisfaction in higher education in the State of Azad Jammu and Kashmir. Students' response measured through an adapted questionnaire on a 5-point liker scale by Cross-sectional survey. The sample size of the study consisted of 360 students belong to different private and public sector universities. The study focuses on the factors like courses offered, teachers expertise, transport facilities, library facilities, examination system and learning environment. The difference between gender opinions about level of satisfaction was also investigated. Significance of data trends was measured using t-test, correlation coefficient and multivariate regression analysis..

Giuliana Solinas, et.al. [2012], explored the satisfaction of students to identify which aspects of teaching may be cause of dissatisfaction. A survey questionnaire contains items on motivations, teaching quality and services was compiled in anonymous by the students that attending the courses of the Faculty of Science (University of Sassari, Sardinia) during the second semester of the 2009/2010 academic year.

Terri Rothman , et.al. [2011], introduced the reliability and validity of a tool to measure students evaluation of online courses. A second purpose was to examine students' evaluations of our online courses. A principal components analysis revealed six underlying factors that appear to have high validity: appropriateness of readings and assignments; technological tools; instructor feedback and communication; course organization; clarity of outcomes and assignments, and content format.

Fatemeh Khozaei , et.al [2010], identified the most important factors that predict undergraduate students' level of satisfaction with the student hostels they are living in. This paper also explored the difference in the satisfaction levels of students living in hostels within the campus and those living in hostels outside the campus. This study investigated the most preferred hostels among students and identified the reasons for the preference. A sample population of 288 students (220 females; and 68 males) was involved in this study with 48.3% living in hostels inside the campus and 51.7% living in hostels located outside the main campus area

## III. FUZZY ANALYTIC HIERARCHY PROCESS (FAHP)

Analysis Hierarchical Process (AHP) is a multi-criteria decision making tool that was proposed by Saaty on 1980. Since it was introduced, AHP have been one of the most useful multi-criteria decision making tools available to decision makers and researchers. The conventional AHP is unable to veritably reflect the way human thinks and judges [1996]. Decision makers understood that distanced judgment is more persuasive than fixed value judgments. The reason is the individual often cannot explicitly express his preferences regarding the fuzzy nature of comparison process. Since the relative importance specified by the AHP decision makers is oral, it is vague and imprecise. Decision makers often prefer to employ oral presentation rather than numerical value. Because of the nature of pair comparisons they cannot explicitly express their opinions about priorities correctly. In such circumstances the useful solution is to make decisions on the basis of multiple conditions and goals to achieve a relatively desirable level of achievement. AHP have been one of the most useful multi-criteria decision making tools available to decision makers and researchers.

### 3.1 Definitions

**Fuzzy set theory:** Fuzzy set theory was first developed in 1965, when L.A. Zadeh was trying to solve fuzzy phenomenon problems that exist in the real world, such as uncertain, incomplete, unspecific and fuzzy situations. Fuzzy set theory has more advantages in describing set concepts in human language than traditional set theory. It demonstrates the unspecific and fuzzy characteristics of language through evaluation and uses a membership function concept to represent the field in which a fuzzy set can permit situations such as incompletely belonging to and incompletely not belonging to.

In contrast to classical set theory for coping with Boolean logic problems, fuzzy sets were proposed to represent the degree of elements belonging to the specific sets. Instead of using the characteristic function as a mapping function, a fuzzy subset $\tilde{A}$ of a universal set $X$ can be defined by its membership function $\mu_{\tilde{A}}(X)$.

**Fuzzy number:** We order the Universe of discourse such that $U$ is a whole target that we discuss, and each target in the Universe of discourse is called an element. We have fuzzy $\tilde{A}$ , which on $U$ states that random $X \rightarrow U$appointing a real number$\mu_{\tilde{A}}(x) \rightarrow [0,1]$. We call anything above that level of *X under A*. The universe of real number $R$ is a triangular fuzzy number (TFN):$\tilde{A}$, which means $X \epsilon R$ , appointing $\mu_{\tilde{A}}(x) \in [0,1]$ , and

$$\mu_{\tilde{A}}(X) = \begin{cases} \frac{X-L}{M-L} & L \le X \le M \\ \frac{U-X}{U-M} & M \le X \le U \\ 0 & otherwise \end{cases} \qquad (1)$$

The triangular fuzzy number above can be shown as $\tilde{A} = (L; M; U)$, where $L$ and $U$ represent fuzzy probabilities between the lower and upper boundaries of evaluation information, as shown in Figure 1. Assume two fuzzy numbers, $\tilde{A}_1 = (L1; M1; U1)$, and $\widetilde{A_2} = (L2; M2; U2)$ ; then

$\tilde{A}_1 \oplus \tilde{A}_2 = (L1, M1, U1) \oplus (L2, M2, U2) = (L1 + L2, M1 + M2, U1 + U2)$ where $L_i > 0, M_i > 0, U_i > 0$ (2)

$\tilde{A}_1 \otimes \tilde{A}_2 = (L1, M1, U1) \otimes (L2, M2, U2) = (L1L2, M1M2, U1U2)$ where $L_i > 0, M_i > 0, U_i > 0$ (3)

$\tilde{A}_1 \ominus \tilde{A}_2 = (L1, M1, U1) \ominus (L2, M2, U2) = (L1 - L2, M1 - M2, U1 - U2)$ where $L_i > 0, M_i > 0, U_i > 0$ (4)

$\tilde{A}_1 \div \tilde{A}_2 = (L1, M1, U1) \div (L2, M2, U2) = (L1/L2, M1/M2, U1/U2)$ where $L_i > 0, M_i > 0, U_i > 0$ (5)

$((A)\tilde{}\_1)^{-1} = (L1, M1, U1)^{-1} = (1/L1, 1/M1, 1/U1)$, where $L_i > 0, M_i > 0, U_i > 0$ (6)

Other forms of the membership function can be easily employed by using the same procedures.

$\mu_{\tilde{A}}(x)$

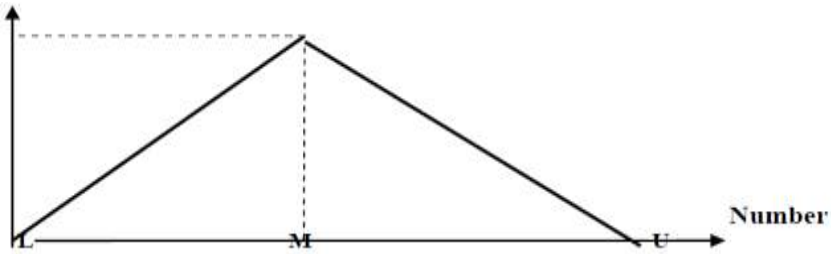


**Figure 1:** Triangular Fuzzy Number (Membership Function)

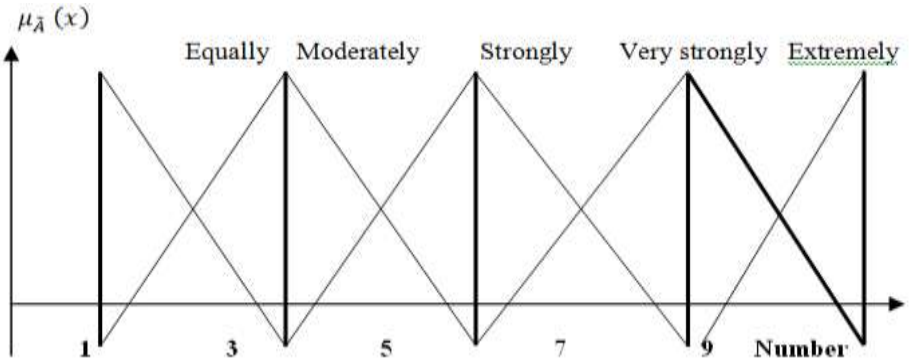


**Figure 2:** Fuzzy Membership Function for Linguistic Values

| Fuzzy number | Linguistic variable | Triangular fuzzy number |
|---|---|---|
| $\tilde{9}$ | Extremely important | (7,9,9) |
| $\tilde{7}$ | Very strongly important | (5,7,9) |
| $\tilde{5}$ | strongly important | (3,5,7) |
| $\tilde{3}$ | Moderately important | (1,3,5) |
| $\tilde{1}$ | Equal important | (1,1,3) |

**Table 1.** Definition and Membership Function of Fuzzy Numbers

**Fuzzy logic**: is a form of multi-valued logic derived from fuzzy set theory to deal with reasoning that is approximate rather than precise. In contrast with "crisp logic", where binary sets have binary logic, fuzzy logic variables may have a truth value that ranges between 0 and 1 and is not constrained to the two truth values of classic propositional logic [1985] Furthermore, when linguistic variables are used, these degrees may be managed by specific functions. Fuzzy logic emerged as a consequence of the 1965 proposal of fuzzy set theory by Lotfi Zadeh [1965], and Adekoya [2010] though fuzzy logic has been applied to many fields, from control theory to artificial intelligence, it still remains controversial among most statisticians, who prefer Bayesian logic, and some control engineers, who prefer traditional two-valued logic.

**Fuzzy linguistic variable:** The fuzzy linguistic variable is a variable that reflects the different levels of human language. Its value represents the range from natural to artificial language. When one precisely reflects the value or meaning of a linguistic variable, there must be an appropriate way to change. Variables for a human word or sentence can be divided into numerous linguistic criteria, such as equally important, moderately important, strongly important, very strongly important, and extremely important. (See Figure2), (see Table1).

## IV. CASE STUDY

Questioners were distributed in seven colleges, college of engineering, college of medicine, college of science, college of computers and informatics, college of dentistry, faculty of administrative & financial sciences, and college of foreign studies were charged with the task of increasing understanding of students concerns and making recommendations for improvements. A plan developed for the students' importance indexes included the following major activities:

**1.** Reviewing related literature about students importance indexes;
**2.** Collecting and analyzing additional information as necessary; and
**3.** Making questioner about students importance; and
**4.** Making recommendations for improvements.

As a result of the initial research activities, seven areas were identified as possible sources of students' satisfaction and dissatisfaction:

• Academic advising
• Attitudes and expectations
• Campus climate
• Career development
• Computer labs and libraries
• Curriculum
• Teaching and research activities

**4.1 Questionnaire Design**

For the purposes of the survey, the sample size of the study consisted of 350 undergraduate students belong to different colleges in various universities. Questionnaires were constructed and consider all the factors affecting in students' satisfaction and most probably all these factors are taken according to their suitable priority. The questionnaires were administered during the first semester of the 2014/2015 academic year. The questionnaire was self-completed anonymously. The time given to complete the entire questionnaire was approximately 20 min. A total of 350 questionnaires were considered for statistical analysis for students' importance.

There were five main criterions in the questionnaires. Criterion one focuses on administrative university services Si, the second criterion concentrate with teaching and learning process Ti, while the third criterion is university climate and student activities Ai, the fourth criterion covers the administrative facilities Fi, and the fifth criterion is learning facilities students Li, were asked to measure their perceived experiences with those criterions. Each criterion contains some of sub criteria.

**4.2 Study Methodology**

AHP-FUZZY methodology for satisfaction measurement. There are many uncertainties, vagueness's, and imprecision in the real world when dealing with decisions of multiple criteria. Fuzzy set theory treats a kind of uncertainty called fuzziness. It shows that the boundary of "yes" or "no" is ambiguous and appears in the meaning of words or included in the subjunctives or recognition of human beings.

**Table 2,** illustrates the main dimensions (criterions) represent the students importance.

| Sub criterion / Main Ci | Sub-Criterion |
|---|---|
| 1. Administrative University Services Si | 1.1 Services Deanship of Admission<br>1.2 Services Deanship of Student Affairs<br>1.3 Assessment procedures fair and transparent<br>1.4 Appropriate recognition for star students |
| 2 . Teaching and Learning Process Ti | 2.1 The quality of teachers<br>2.2 Generally student friendly and focus on specific individual needs.<br>2.3 Providing equal opportunities of learning<br>2.4 Access out of the class to meet my remedial needs(Office Hours)<br>2.5 Scientific and moral support<br>Fair evaluation for students |
| . University Climate and Student activities Ai | 3.1 Opportunities for recreational activities<br>3.2 The students' counseling services and Academic Advising<br>3.3 Remedial support<br>Respect here regardless my family |
| .Administrative Facilities Fi | 4.1 Transportation facilities<br>4.2 Hygienic and affordable food (Cafeteria and Restaurant)<br>4.3 The toilet facilities<br>4.4 Updated of all the university relevant news through Advertisements board |
| . Learning Facilities Li | 5.1 Classrooms well equipped with educational resources<br>IT labs well equipped to meet students' need<br>5.3 University's library<br>5.4 Classroom for group study<br>5.5 Training during study<br>Training in summer |

**Table 2.** Main Performance Evaluation Criteria

**4.3 Calculation of Fuzzy AHP.**

1. Comparing the performance score
2. Construct fuzzy comparison matrix
3. Exam consistency of fuzzy matrix $(\tilde{A}i)$, where $(A - \lambda I)W = 0$

Where λmax is the largest Eigen factor of matrix *A* of size *n*, *W* is its correct eigen factor and *I* is the identity matrix of size *n*. Therefore, the matrix *A* should be tested for consistency using index, *CI*, which has been constructed.

$$CI = (\lambda_{max} - n)/(n-1) \quad (7)$$

CI estimates the level of consistency with respect to a comparison matrix. Then, because *CI* is dependent on *n*, a consistency ratio *CR* is calculated, which is dependent of *n* as shown below.

$$CR = CI / RI \quad (8)$$

Where CI is the consistency index, *RI* is random index (RI) generated for a random matrix of order *n*, and CR is the consistency ratio (Saaty, 1993). The general rule is that CR ≤ 0.1 should be maintained for the matrix to be consistent. Otherwise, all or some comparisons must be repeated in order to resolve the inconsistencies of the pair-wise comparisons.

**4.** Calculate fuzzy evaluation of number by using geometric mean
**5.** Calculate fuzzy weights $\widetilde{W}$
**6.** Defuzzyfication

The defuzzification methods were defined empirically, evaluating mainly the concept of continuity and discontinuity in fuzzification. It is the process of transforming the fuzzy numbers and linguistic values in a standard numeric value (crisp variable). The fuzzy set is usually the union of several subsets representing the conclusion of a fuzzy proposition. Normally, a fuzzy set cannot be represented by a singleton, therefore defuzzification can only be undertaken with the loss of information.

**Table 3** Summary of Questioners for Main Dimensions

| **Dimension** | **Importance** | | | | | **Fuzzy Weights** | **Rank** |
|---|---|---|---|---|---|---|---|
| | **E.** | **M.** | **S.** | **V. S.** | **E.** | | |
| Weights | 1 | 3 | 5 | 7 | 9 | | |
| # of Voters **(S)** | 72 | 84 | 89 | 61 | 44 | 4.5485 | 3 |
| # of Voters **(T)** | 54 | 66 | 87 | 88 | 55 | 5.1371 | 1 |
| # of Voters **(A)** | 53 | 85 | 85 | 76 | 51 | 4.9257 | 2 |
| # of Voters **(F)** | 97 | 52 | 99 | 48 | 54 | 4.4857 | 4 |
| # of Voters **(L)** | 106 | 63 | 80 | 53 | 48 | 4.28 | 5 |

There are several ways of finding a representative number. Two common ways are Centroid method, and weighted abscissa method. The **centroid technique** finds the point where a vertical line would slice the aggregate set into two equal masses.

The study finds the best crisp value, or non-fuzzy value, in accordance with the Centroid method (CO). The concept means that we calculate clear weights for each index (a crisp solution). The calculation method is as follows:

$$\boldsymbol{BNP_i = \frac{(Ui - Li) + (Mi - Li)}{3} + Li} \quad , \forall_i \quad \textbf{(9)}$$

| Ci | S | T | A | F | L |
|---|---|---|---|---|---|
| S | 1,1,3 | 1/3,1/5,1/7 | 1,1/3,1/5 | 1,3,5 | 3,5,7 |
| T | 3,5,7 | 1,1,3 | 1,3,5 | 5,7,9 | 7,9,9 |
| A | 1,3,5 | 1,1/3,1/5 | 1,1,3 | 3,5,7 | 5,7,9 |
| F | 1,1/3,1/5 | 1/5,1/7,1/9 | 1/3,1/5,1/7 | 1,1,3 | 1,3,5 |
| L | 1/3,1/5,1/7 | 1/7,1/9,1/9 | 1/5,1/7,1/9 | 1,1/3,1/5 | 1,1,3 |

λmax=5.237475, CI=0.0593, CR=0.05397, Consistence

**Table 4. Membership Functions for Main Criterion**

| | | | | B |
|---|---|---|---|---|
| | 0.1604 | 0.1295 | 0.1131 | 0.1344 |
| | 0.5550 | 0.5100 | 0.4070 | 0.4907 |
| | 0.2758 | 0.2638 | 0.2592 | 0.2662 |
| | 0.0933 | 0.0636 | 0.0494 | 0.068 |
| | 0.0632 | 0.0329 | 0.0230 | 0.0397 |

**Table 5.** Fuzzy Weights and Best Non-Fuzzy Performance

By the same method can be calculating the fuzzy importance and the best non-fuzzy performance indexes BNP for sub-criteria:

**1. Importance of Administrative University Services (Si)**

| Criteria | S1 | S2 | S3 | S4 |
|---|---|---|---|---|
| S1 | 1,1,3 | 1,1/3,1/5 | 1,3,5 | 1/3,1/5,1/ |
| S2 | 1,3,5 | 1,1,3 | 3,5,7 | 1,1/3,1/5 |
| S3 | 1,1/3,1/5 | 1/3,1/5,1/7 | 1,1,3 | 1/5,1/7,1/ |
| S4 | 3,5,7 | 1,3,5 | 5,7,9 | 1,1,3 |

λmax=4.116978 CI=0.0389926, CR=0.04381 consistence

**Table 6.** Membership functions For Administrative University Services

| | | | B |
|---|---|---|---|
| 0.166922 | 0.117786 | 0.094947 | 0.126552 |
| 0.289118 | 0.263378 | 0.262397 | 0.271631 |
| 0.111628 | 0.055022 | 0.031649 | 0.0661 |
| 0.611007 | 0.563813 | 0.432332 | 0.535717 |

**Table 7**.Fuzzy Weights and Best nonfuzyy performance (Si)

**The Importance of Teaching and Learning Process Ti**

| Ti | T1 | T2 | T3 | T4 | T5 | T6 |
|---|---|---|---|---|---|---|
| T1 | 1,1,3 | 6,8,9 | 7,9,9 | 5,7,9 | 3,5,7 | 1,3,5 |
| T2 | 1/6,1/8,1,9 | 1,1,3 | 1,3,5 | 1,1/3,1/5 | 1/3,1/5,1/7 | 1/5,1/7,1/9 |
| T3 | 1/7,1/9,1/9 | 1,1/3,1/5 | 1,1,3 | 1/3,1/5,1/7 | 1/5,1/7,1/9 | 1/6,1/8,1/9 |
| T4 | 1/5,1/7,1/9 | 1,3,5 | 3,5,7 | 1,1,3 | 1,1/3,1/5 | 1/3,1/5,1/7 |
| T5 | 1/3,1/5,1/7 | 3,5,7 | 5,7,9 | 1,3,5 | 1,1,3 | 1,1/3,1/5 |
| T6 | 1,1/3,1/5 | 5,7,9 | 6,8,9 | 3,5,7 | 1,3,5 | 1,1,3 |

λmax= 6.480296, CI=0.096059, R.I=1.25, CR=0.096059/1.25=0.0768472

**Table 8.** Membership Functions for Teaching and Learning Process

| Ti | Ui | Mi | Li | **BNP** |
|---|---|---|---|---|
| T1 | 0.494594 | 0.456214 | 0.369165 | **0.439991** |
| T2 | 0.05956 | 0.040261 | 0.031685 | **0.043836** |
| T3 | 0.043063 | 0.023245 | 0.0168 | **0.027703** |
| T4 | 0.09642 | 0.074456 | 0.063204 | **0.078027** |
| T5 | 0.164877 | 0.142429 | 0.131469 | **0.146258** |
| T6 | 0.266914 | 0.263395 | 0.262249 | **0.264186** |

**Table 9.** Fuzzy Weights and Best Non-Fuzzy Performance

**Importance of University Climate and Student Activities Ai**

| **Ai** | **A1** | **A2** | **A3** | **A4** |
|---|---|---|---|---|
| **A1** | 1,1,3 | 7,9,9 | 1,3,5 | 3,5,7 |

| | | | | |
|---|---|---|---|---|
| **A2** | 1/7,1/9,1/9 | 1,1,3 | 1/5,1/7,1 | 1,1/3,1/5 |
| **A3** | 1,1/3,1/5 | 5,7,9 | 1,1,3 | 3,5,7 |
| **A4** | 1/3,1/5,1/7 | 1,3,5 | 1/3,1/5,1 | 1,1,3 |

λmax=4.175972283, CI=0.058657, RI=0.89, and CR=0.065907

**Table 10.** Membership Functions for Climate and Student Activities Ai

| | | | | **B** |
|---|---|---|---|---|
| | 0.611889 | 0.557419 | 0.419977 | **0.529762** |
| | 0.080659 | 0.044104 | 0.032377 | **0.05238** |
| | 0.386095 | 0.302228 | 0.273645 | **0.320656** |
| | 0.113269 | 0.096248 | 0.08209 | **0.097202** |

**Table 11.** Fuzzy Weights and Best Non-fuzzy Performance PNW for Climate and Student Activities Ai

**The Relative Importance of Administrative Facilities Fi**

| Fi | F1 | F2 | F3 | F4 |
|---|---|---|---|---|
| F1 | 1,1,3 | 1/3,1/5,1/7 | 1,3,5 | 3,5,7 |
| F2 | 3,5,7 | 1,1,3 | 5,7,9 | 7,9,9 |
| F3 | 1,1/3,1/5 | 1/5,1/7,1/9 | 1,1,3 | 1,3,5 |
| F4 | 1/3,1/5,1/7 | 1/7,1/9,1/9 | 1,1/3,1/5 | 1,1,3 |

λmax=4.170668, $CI = 0.056889$, RI=0.89 , CR=0.063921

**Table 12.** Membership Functions for Administrative Facilities

| | | | | B |
|---|---|---|---|---|
| F1 | 0.207982 | 0.204451 | 0.187372 | 0.199935 |
| F2 | 0.678702 | 0.654467 | 0.599795 | 0.644321 |
| F3 | 0.125304 | 0.095507 | 0.080301 | 0.100371 |
| F4 | 0.087529 | 0.045575 | 0.033015 | 0.055373 |

**Table 13.** Fuzzy Weights and Best non-fuzzy Performance for Administrative Facilities

**The Relative Importance of (Learning Facilities) Li**

**Table 14.**Membership Functions Matrix for Learning Facilities

| Li | L1 | L2 | L3 | L4 | L5 | L6 |
|---|---|---|---|---|---|---|
| L1 | 1,1,3 | 6,8,9 | 3,5,7 | 1,1/3,1/5 | 1,3,5 | 5,7,9 |
| L2 | 1/6,1/8,1/9 | 1,1,3 | 1/3,1/5,1/7 | 1/7,1/9,1/9 | 1/5,1/7,1/9 | 1,1/3,1/5 |
| L3 | 1/3,1/5,1/7 | 3,5,7 | 1,1,3 | 1/5,1/7,1/9 | 1,1/3,1/5 | 1,3,5 |
| L4 | 1,3,5 | 7,9,9 | 5,7,9 | 1,1,3 | 3,5,7 | 6,8,9 |
| L5 | 1,1/3,1/5 | 5,7,9 | 1,3,5 | 1/3,1/5,1/7 | 1,1,3 | 3,5,7 |
| L6 | 1/5,1/7,1/9 | 1,3,5 | 1,1/3,1/5 | 1/6,1/8,1/9 | 1/3,1/5,1/7 | 1,1,3 |

**λmax=6.480296054, CI=0.09605921, RI=1.25, CR=0.07684737**

**Table 14.Membership Functions Matrix for Learning Facilities**

| | | | BNP |
|---|---|---|---|
| 0.266914 | 0.263395 | 0.262249 | 0.264186 |
| 0.043063 | 0.023245 | 0.0168 | 0.027703 |
| 0.09642 | 0.074456 | 0.063204 | 0.078027 |
| 0.494594 | 0.456214 | 0.369165 | 0.439991 |
| 0.164877 | 0.142429 | 0.131469 | 0.146258 |

| | | | |
|---|---|---|---|
| 0.05956 | 0.040261 | 0.031685 | 0.043836 |

**Table 15**. Fuzzy Weights and Best non-fuzzy Performance for Learning Facilities

| Dimensions | S | T | A | F | L |
|---|---|---|---|---|---|
| Index | 0.134416 | 0.490718 | 0.266299 | 0.06881 | 0.039757 |
| (S1) | 0.126552 | | | | |
| (S2) | 0.271631 | | | | |
| (S3) | 0.0661 | | | | |
| (S4) | 0.535717 | | | | |
| (T1) | | 0.439991 | | | |
| (T2) | | 0.043836 | | | |
| (T3) | | 0.027703 | | | |
| (T4) | | 0.078027 | | | |
| (T5) | | 0.146258 | | | |
| (T6) | | 0.264186 | | | |
| (A1) | | | 0.529762 | | |
| (A2) | | | 0.05238 | | |
| (A3) | | | 0.320656 | | |
| (A4) | | | 0.097202 | | |
| (F1) | | | | 0.199935 | |
| (F2) | | | | 0.644321 | |
| (F3) | | | | 0.100371 | |
| (F4) | | | | 0.055373 | |
| (L1) | | | | | 0.264186 |
| (L2) | | | | | 0.027703 |
| (L3) | | | | | 0.078027 |
| (L4) | | | | | 0.439991 |
| (L5) | | | | | 0.146258 |
| (L6) | | | | | 0.043836 |

**Table 16**. Importance Indexes Measurement of main dimensions and Sub-Criterion

| **Factors** | **Score** |
|---|---|
| 1.1 Services Deanship of Admission (S1) | 0.0170106 |
| 1.2 Services Deanship of Student Affairs (S2) | 0.0365115 |
| 1.3 Assessment procedures fair and transparent (S3) | 0.0088848 |
| 1.4 Appropriate recognition for star students (S4) | 0.0720089 |
| 2.1The quality of teachers (T1) | 0.2159115 |
| 2.2Generally student friendly and focus on specific individual | 0.0215111 |
| 2.3 Providing equal opportunities of learning (T3) | 0.0135943 |
| 2.4Access out of the class to meet my remedial needs(Office | 0.0382892 |
| 2.5Scientific and moral support (T5) | 0.0717714 |
| 2.6 Fair evaluation for students (T6) | 0.1296408 |
| 3.1 Opportunities for recreational activities (A1) | 0.1410750 |
| 3.2 The students' counseling services and Academic Advising | 0.0139487 |
| 3.3 Remedial support (A3) | 0.0853903 |
| 3.4 Respect here regardless my family (A4) | 0.0258847 |
| 5.1 Transportation facilities (F1 ) | 0.0137575 |
| 5.2 Hygienic and affordable food (Cafeteria and Restaurant) | 0.0443357 |
| 5.3 The toilet facilities (F3) | 0.0069065 |
| 5.4 Updated of all the university news (university journal) (F4) | 0.0038102 |
| 5.1 Classrooms well equipped with educational resources L1 | 0.0105032 |
| 5.2 IT labs well equipped to meet students' need L2 | 0.0011013 |
| 5.3 University's library L3 | 0.0031021 |
| 5.4 Classroom for group study L4 | 0.0174927 |

| | | |
|---|---|---|
| 5.5 Training during study L5 | 0.005814 | |
| 5.6 Training during summer L6 | 0.001742 | |

**Table 17.** Ranking importance Indexes for Students Importance

## V. CONCLUSION

In recent years, it appears that a particular emphasis has been placed by researchers on the problems of Multiple Attribute Decision Making MADM. Thus, the objective of this paper is to analyze the potential criteria for select the importance indexes for the students.

In a competitive environment, the success of any university will increasingly depend on students' satisfaction in their strategic decisions. However, managers are often uncertain about how to measurement the importance criteria and the attitude of customers satisfaction to enhance their business.

The study adopted samples, a total of 350 responses were collected from Campus and the data was analyzed using FAHP.

In this study, the integration of AHP with the fuzzy synthetic extent analysis method is proposed for students' importance measurement in university sector as a framework to guide managers. There is a lack of research in the literature to deal directly with the uncertainty of human judgments in evaluating satisfaction costumers in university system. Therefore, fuzzy AHP is an appropriate methodology to select the various types of criteria and has the ability to be used as a decision-making analysis tool.

The result of the study in Table 17 reflects the quality of teachers T1, opportunities for recreational activities A1, and fair evaluation for students T6, remedial support A3, and appropriate recognition for star students S4 are the most important indexes for students.

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