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Research paper

The Use of Analytical Hierarchy Process in Identifying Weight age Criteria for Academic Staff Selection

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Abstract

The academic staff selection for any organization is an important process that involves in decision making process. The process must be carried out carefully because it involves some important aspects towards the staff selection. During the interview session, the selection process based on five criteria of the applicant. The five selection criteria consists of academic qualification, religious knowledge, community services, knowledge, and communication skills. Furthermore, the selection of applicants for the academic ability and suitability with the field in order to make the selection process is becoming more complex. The selection of the applicants for academic staff also relies on judgments of the committee that was appointed for interviewing the applicants with a lot of experience in the selection of academic staff applicant. The study finds that the objectives are to identify all criteria relevant to the selection of staffs. The technique used in giving weights to each criterion is Analytical Hierarchy Process (AHP) technique. As a result, the highest weight was assigned to the first criteria which are academic qualification with the weight 0.3423. It shows that the academic qualification was the most important criterion compared to the other criteria. In addition, the selection of applicant for academic staff is able to assist in the selection of potential qualified academic staff.

Keywords: *Staff selection; Academic staff selection criteria; Analytical Hierarchy Process*

1. Introduction

Allocation problems are concerned with the allocation of limited resources among competing activities so as to optimize some objectives (Klien and Luss, 1991). Allocation would never be a concern if the resources are sufficient or unlimited which means that they are always available. In order to make the best decision for unlimited resources, it should have some selection before made any decision. Regarding the selection of staff, there are various methods. The universities around the world demand high quality and professional academic staffs as there are increasing improvements in the fields of education. Selection usually is a carefully chosen and must serve the aims of some programmed (Zaaiman et. al., 2000). Therefore, Zaaiman et. al., (2000) mentioned in their research towards the academic field which are the educational systems always change indirectly and the major problem that faced is in selection of academic staffs. Selection occurs regularly in any organization. However, some of the selection process bears some weaknesses and which may create dissatisfaction among academic staff in organizations. Normally, selection needs to be done for the purpose of ranking of staffs in order to awards something in an organization. Therefore, an efficient selection procedure is very important and crucial. Then, selection process needs to be carried out in an efficient way. So, it should have further investigation and must have an efficient criterion during selection process.

2. Literature Review

Normally, selecting staffs applied in many fields such as manufacturing, government, tourism, and academic. In selecting the most suitable candidates for required posts, Human Resources Management (HRM) need an important tool to evaluate suitable candidates' for a selection of academic staff. (Rouyendegh and Erkan, 2012). The process of selecting is becoming more challenging and has to be done to the most appropriate applicant. However, making selection is a difficult task because selection usually required to be fair, effective (Zaaiman et al., 2000) and efficient (Zaaiman et al., 2000; Drenth et al., 1983; Altink and Thijs, 1984; Herman, 1995). The importance of efficient selection will give a positive impact to the results. While, if failed selection was done, it will give some negative impact to the results. There are several staff selection that should be highlight.

2.1. Applications of Staff Selection Problem

According to Huber et. al. (2003) mentioned in a research that in Massachusetts General Hospital uses an outside agency to prescreen support staff applicants on the established service background and personality-profile attributessuch as personality, talent, and skills. Waryszak and Bauer (1989) report a study of selection front-office staff in hotels and motels in the state of Victoria, Australia. The most frequently techniques used which are interview, applications forms and references for a survey of 172 establishments with more than 30 rooms. Due to Lockyer and Scholaries (2004) discussed in their study of selecting hotel staff

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in Scottish hotels. They have examined in two proportions which are in a survey of current practice and recruitment conditions in Scottish hotels.
According to Seol and Sarkis (2005) mentioned in a study of selection staff as an internal auditor to help the organizations more effectively select and evaluate internal auditors by introducing a multi-criteria decision model. According to (Albrecht, 2005; Erpenbeck, 2004) discussed in current human resource management models, the individual competences of the employees are defined as the most limited resource of the organisation. In Higher Education, the demand for academic staff has been increasing and expected to increase given by the Government's intention that participation in Higher Education should increase substantially (Metcalf et. al. , 2005). There are some issues that have faced in selection process will be discussed in the next section.

2.2. Importance of Efficient Selection

Selection usually is a carefully chosen and must serve the aims of some programmed (Zaaiman et al., 2000). Therefore, Zaaiman et al., (2000) mentioned in their research towards the academic field which are the educational systems always change indirectly and the major problem that faced is in selection of academic staffs. Normally, selection needs to be done for the purpose of ranking of staffs in order to awards something in an organization. These awards can be in terms of Annual Excellent Service Awards which is usually done annually. In the University of Wisconsin System (2013) mentioned that have criterion for selection of academic staff performance depends on four criteria such as excellence of performance, personal interaction, initiative and creativity, and outstanding achievement. All the criteria were involved in order to awards during the academic staff excellence awards.
Selection also sometimes done in order to assigns the most appropriate staffs to attend a special seminar or workshop. As these awards involve monetary implication, so, it can be considered as privileges. Therefore, an efficient selection procedure is very important and crucial. Since, the outcomes of selection are reflecting the achievement of the particular entity in an organization. Therefore, selection process needs to be carried out in an efficient way. Among the entire selection problem, the selection of academic staff is important. Besides that, from increasing number of staffs in higher education learning institution, it will make the ranking of each institutional increase. So, it should have further investigation and must have an efficient criterion during selection process.

2.3. The Criteria

Selection process in this study used criterion. The identified criteria that used during interview session which is academic achievement, religious knowledge, community service, knowledge, and communication skills.
Academic Qualification. Academic qualification is an achievement in academic field which is including academic certificate (depends on job requirements such as degree, master degree or PhD). Therefore, academic certificate is calculated using the Cumulative Grade Point Accumulation (CGPA) which is accumulated by a student from one semester to another during the years of study. The CGPA is calculated from 0 until 4 pointers. Expert knowledge is one of the sub criteria in academic qualification in any fields of study. The example of fields involve such as mathematics, Al- Quran, Syariah, accounting, Islamic Banking and so forth. Each of staffs will be ask and evaluate depends on their expertise based on the related questions during the interview session.
Religious Knowledge. Generally, the religious knowledge is one of the important criterions for any Islamic organizations. There are compulsory to have an Islamic religion staffs' compare to others.
Community Services. Community service is donated service or activity that is performed by someone or a group of people for the benefit of the public or its institutions. Therefore, the teamwork is a sub criteria in community service which is the process of *working* collaboratively with a group of people in *order* to *achieve* a *goal*. Teamwork *means* that people will *try* to cooperate, *using* their individual *skills* and *providing constructive feedback*, despite any *personal conflict* between *individuals*.
Lau E. (2013) mentioned in his writting ***that working effectively as part of a team is incredibly important for output quality, morale, and retention.***
Besides that, tolerance is one of the sub criteria that involve in community service. According to the United Nations, tolerance is the capacity to accept differences, respect one another and stand up for what one knows is right. The organization considers it one of the foundations of human rights. The another proposed sub criterion, volunteerism, is the principle of donating time and energy for the benefit of other people in the community as a social responsibility rather than for any financial reward. Volunteering is also renowned for skill development, socialization, and fun. It is also intended to make contacts for possible employment.
Knowledge. Studies have found that people who are highly knowledgeable in a particular domain tend to be knowledgeable in many field. General knowledge is thought to be supported by long-term semantic memory ability. A number of studies have found that males tend to have greater overall general knowledge than females, perhaps due to gender differences in interests rather than memory ability. Recent studies have found that general knowledge is associated with exam performance in schoolchildren and proofreading skills.
Communication Skills. Communication skills are the important criteria in selecting staffs applicant. In this criteria also evaluate the ability of applicants in language proficiency. Other than that, the fluency also will help the applicants to communicate with the third party such as students. Its means the language that used are simple and easy to understand.

Table 1: Summary of selection criteria

Criteria	Authors
Academic Qualification	KUIN (2012), N. Chai Liu and Y. Cheng (2005), M. Tsindou et. al. (2010)
Religious Knowledge	KUIN (2012)
Community Services	KUIN (2012), U. Al-Turki and S. Duffuaa (2003)
Knowledge	KUIN (2012), Whitley. R (1995)
Communication skills	KUIN (2012), M. Tsindou et. al. (2010)

3. Methodology/Materials

The academic staff selection criteria were used to evaluate the academic staff applicant in interviews sessions was identified based on the conducted data collection. The identified criteria used during an interview session are adopted from KUIN (2012) such as academic qualification, religious knowledge, community service, knowledge, and communication skills. This study was adopted the Analytical Hierarchy Process (T.L.Saaty, 2008) for weight allocation purposed. Analytical Hierarchy Process (AHP) method was introduced by Saaty is a flexible quantitative method in selection between alternatives based on their relative performance with respect to criteria of interest. The AHP will help the analysts to arrive at the best decision and also provides them with a clear rationale for the choices made (Chin et al., 1999). In addition, Bevilacqua and Braglia (2000) defined AHP method is a multi-criteria decision making tool which powerful and flexible in solving the complex problems where both qualitative and quantitative aspects need to be considered.

3.1. Data Collection Procedure

In this research, there are two types of data involved, first is primary data and second is secondary data. During an interview session, both of the data types are the criteria involve in selecting the academic staff. For the primary data, the source of the data itself is from the experts who have a lot of experiences in interviewing the academic staff. Actually, the criteria and its justification were gained from the interview session with all these experts. In addition, the primary data source involved in this study and the data needs the weights or the importance judgements.

For that purpose, in order to get the respondents' perceptions towards the importance selection criterion, a structured Analytical Hierarchy Process (AHP) types of questionnaires were distributed. A set of questionnaires distributed to the respondents for AHP technique and they required making pairwise comparison between each criterion using the rating judgement scale of from 1 to 9 for the relative importance criteria being considered. From the interview, were found about 5 criteria's of academic staff selection.

3.2. Analytical Hierarchy Process

AHP used to identify the weights of criterion in the staff selection problem in order to achieve the objectives. First step was developing a graphical representation of the problem which is overall goal, the criteria and the decision alternatives. There are some alternatives that require evaluating based on identified criteria to achieve the goal.

Then, the decision makers have to indicate a preference for each decision alternatives based on each criterion. The AHP method needs to establish priorities for the criteria and decision alternatives based on each criterion. Then, the pairwise comparisons used to compare each criterion to another criterion and the same process also conducted with decision alternatives. In order to establishing priorities for the criteria, a set of questionnaire was prepared and distributed to the respondents. The comparison scale is used in the questionnaires to allow the respondents to choose among "extremely more important", "very strongly more important", "strongly more important", "moderately more important", and "equally important". These preferences are for easier understanding of the respondents, while the actual input into the analysis is based on pairwise weights of 1 to 9. The comparison scale for the importance of criteria using AHP is as shows in the Table 2 below.

Table 2: Comparison Scale using in AHP

Verbal Judgement	Numerical rating
Extremely more important	9
Very Strongly More Important	7
Strongly More Important	5
Moderately More Important	3
Equally Important	1

The intermediate values of 2, 4, 6, and 8 provide additional levels of discrimination. Reciprocals: If activity *i* have a specific numeral rating with respect to *j*, then *j* has the reciprocal value when compared to *i*

In order to determine the weights for criterion, the decision maker need to transfer all the result into matrix form, *M*. Then, the weights of the criteria *wj*, *j* = 1, …, n need to determine with manipulated mathematically of the comparison matrix. By referring to the matrix *M*, if *mjk* = 1, hence the criterion *j* is equally important with criterion *k*, whereas if criterion *mjk* = 9, hence criterion *j* is extremely more important to the criterion *k*. the following equation represented the rules:-

$$m_{jk} = \frac{1}{m_{jk}}$$

where, $k > j$

The matrix, *M*:

$$M = \begin{bmatrix} 1 & m_{12} & \dots & m_{1n} \\ m_{21} & 1 & \dots & m_{2n} \\ . & . & . & . \\ m_{n1} & m_{n2} & \dots & 1 \end{bmatrix}$$

In synthesization, the decision alternatives are prioritized within each criterion. So, the information on the relative importance of the criteria and the preferences for the decision alternatives to provide an overall priority ranking of decision alternatives a mathematical process was used. The pair wise comparison matrix was used to calculate the weight of each criterion and sub criterion. This aspect of AHP was referred as synthesization. Hence, to calculate the weights of the criterion and sub criterion which were involved three steps which are sum the values in each column of the pair wise comparison matrix, divide each element in the pairwise comparison matrix by its column total; the resulting matrix is referred to as the normalized pairwise comparison matrix, and compute the average of the elements in each row of the normalized pairwise comparison matrix; these averages provide the weights for the criteria.

In order to determine the weight, *w*, the maximum eigenvector, λ*max* was determined with the following equation.

$$(M - \lambda_{\max} I)w = 0 \quad \text{with} \quad \lambda_{\max} = n$$

The following approach was used in solving the equation where *I* is matrix identity *n x n*.

$$w_j\,(AHP) = \frac{1}{n}\sum_{k=1}^{n} \frac{m_{jk}}{\sum_{i=1}^{n} m_{ik}}$$

For example,

$$w_1(AHP) = \frac{1}{n}\left(\left(\frac{m_{11}}{m_{11}+m_{21}+\dots+m_{n1}}\right)+\left(\frac{m_{12}}{m_{12}+m_{22}+\dots+m_{n2}}\right)+\dots+\left(\frac{m_{1n}}{m_{1n}+\dots+m_{nn}}\right)\right)$$

.

A different AHP matrix was formulated to determine weights for the main criteria. The important consideration in this process is consistency of the pairwise provided by computing a consistency ratio, consistency of the pairwise comparisons can be measure. The pairwise comparisons indicates that is inconsistency when consistency ratio is greater than 0.10. Then, before proceed with the AHP analysis, it should review and revise the pairwise comparisons until the consistency of pairwise comparisons is considered reasonable consistency ratio which is less than or equal to 0.10.

So, each set of pairwise comparison needs to be consistent with another set of comparisons. The consistency in respondent's responses is essential because the AHP was developed based on their responses in order to get a valid result. For each alternative, the Consistency Ratio (CR) is determined the Consistency Index (*CI*) to Ratio Index (RI) for *M* is shows as follows:

$$CI = \frac{\lambda_{\max} - n}{n-1}$$

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

Table 3: Random Index

Matrix Index	RI Value
1	0
2	0
3	0.58
4	0.9
5	1.12
6	1.24
7	1.32
8	1.41
9	1.45
10	1.49

In this research, the multi-criteria were involved which are all the main criteria were identified. Then, the allocation of weights was

used the same approach as explained before for the each of main criteria.

4. Results and Findings

In this research, by referring to the Table 4 that shows the weights was given by each respondent for all the main criteria and consistency ratio for each data set. The highest weight gave by most of respondents were on the academic qualification criteria (C1). Here, shows that the academic qualification was the most important criteria compared to the others criteria. Then, followed by criteria of religious knowledge (C2), community services (C3), knowledge (C4) and communication skills (C5). Therefore, the consistency ratio of all the data is below than 0.1 which mean all the data are consistent.

Table 4: Weights and Consistency Ratio for Main Criteria

Respondents	C1	C2	C3	C4	C5	CR
1	0.3821	0.2250	0.1899	0.1360	0.0670	0.0921
2	0.3283	0.2269	0.2077	0.1458	0.0914	0.0962
3	0.3247	0.2296	0.2117	0.1551	0.0790	0.0813
4	0.3519	0.2233	0.1992	0.1437	0.0819	0.0808
5	0.3280	0.2392	0.2162	0.1373	0.0793	0.0954

By using the geometric mean approach, the judgments of each respondent was aggregated into a group in order to obtain the overall weights. The calculation is as below:

$$\overline{W_j} = \sqrt[5]{w_{1j} w_{2j} \ldots w_{ij}}$$

for

$i = 1, 2, \ldots, 5$

$j = 1, 2, \ldots, 5$

where

$\overline{W_j}$ = geometric mean for criterion j of main criteria

w_{ij} = relative weight given by respondent i for criterion j of main criteria

Table 5: Table of Geometric Mean and Rank of Main Criteria

Criteria	Weights	Rank
C1(Academic Qualification)	0.3423	1
C2 (Religious Knowledge)	0.2287	2
C3 (Community Services)	0.2047	3
C4 (Knowledge)	0.1434	4
C5 (Communication Skills)	0.0793	5

According to Table 5, the highest weight was assigned to the first criteria which are Academic Qualification (C1) with the weight 0.3423. It shows that the academic qualification was the most important criterion compared to the other criteria. The respondents trust that the more staff is select based on the higher academic qualification, indirectly it help to upgrade their institution ranking compared to other private institutions which are business oriented that less highlighted the academic qualification during the interview session. As one of the Islamic University College, the Religious Knowledge (C2) was the second ranking of the selection criteria with the weights 0.2287. Then, Community Services (C3) towards the community in identified area with the weights of 0.2047 was in the third ranking. Knowing that the fourth ranking was Knowledge (C4) with the weights 0.1434 and followed by Communication Skills (C5) for the fifth ranking with the lowest weights 0.0793.

5. Conclusion

As a conclusion, the important of efficient selection of academic staff was discussed. Besides, all the literature review that is related to the academic staff selection criteria also presented together with the related works of data analysis techniques. The Analytical Hierarchy Process (AHP) technique was identified as a suitable technique in order to find the weight of each criterion involved. Using the weights of each criteria to find the important criteria to the less in an efficient way. Based on the weights in findings shows the important criteria of academic staff selection was the Academic Qualification (C1). So, with the highest weights proofed that selection of academic staff in any different fields shows the Academic Qualification that was very important criteria to fulfill. By achieving the objectives in this study, thus the identified selection criteria were presented by ranking; Academic Qualification, Religious Knowledge, Community Services, Knowledge and Communication Skills.

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