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Hamming and Hausdorff Distance Measures for Staff Selection Problem: A Comparison

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Abstract: Selecting the right person to a particular job needs a lot of considerations, especially in a growth company. To solve this problem, many organisations have created an ideal candidate that fulfils all requirements for a particular job. In this case, decision makers will make a comparison between a set of candidates with the ideal candidate. The distance measures are then used to compare whether the candidates are on the par with the ideal candidate. Hamming and Hausdorff distances are the two distance measures that popularly used to compare the set of candidates with the ideal candidate. In this study, reseachers employ fuzzy set theory along with the Hamming and Hausdorff distances to solve staff selection problem. Based on numerical computations that have been carried out, final results showed that both methods produced almost the same results even at different exigency levels. The results also showed that both distance measures have its own advantageous and can be applied according to suitable condition.

Key words: Fuzzy set theory, staff selection problem, Hamming distance, Hausdorff distance, Malaysia

INTRODUCTION

The distance measures hold an important key in solving many problems related to biological, science, social and technology. This is because the capability of this method to construct some related distance measures notably similarity and proximity which always become the norm in handling various problems (Marinov *et al*., 2012). In recent years, many distance measures have been proposed and applied to solve many practical problems. Some of them are Hamming, Euclidean, Hausdorff and Minkowski distance measures. Although, the properties and the need of these methods are different, the results of these methods are almost similar. Due to this, many applications of these distance measures can be found in solving multicriteria decision making problem.

Literally, staff selection process is one of the multicriteria decision making problems. It is a process of selecting and rearranging the best or suitable candidate for a particular position. It is a vital for a well-established company to select the best candidate that suitable with the working position. This is to ensure that the survival and success of the company in the long run. Beside that the companies are not going to take a risk if the selected people are not qualified to be in the assigned post. The process of staff selection usually is not an easy task to be handled, even when it is tackled in simplified ways which consists of a homogeneous skill and a criterion (Wagner, 1975). It is because of human nature and tendency to imply validity, trust and criteria fixing (Canos and Liern, 2008) which sometimes could lead to bias during the process. Consequently, the mathematical models are proposed in order to obtain more favourable results and to handle this unexpected condition than traditional ways.

Beside that the good decision making models should be able to handle uncertainty or vagueness that exits in most of decision making problems. Fuzzy sets are one of the solutions for this problem. Introduced in 1965 by Zadeh, fuzzy sets are used to solve a problem that deal with ambiguous data and it is multi-valued logic that can define intermediate values in conventional evaluation (Baran and Kilagiz, 2006). In staff selection problem, the use of fuzzy set could help the decision maker in dealing with data that incomplete, imprecise and vagueness. It is because sometimes the available information are not precise or exact and even worse, the imprecise information could be represented as linguistic information in terms of variables such as feelings, thoughts, beliefs and opinions (El-Hossainy, 2011).

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Up to these days, there are several well-known multicriteria decision making in order to solve staff selection problem. As for this research, researchers will focus on the use of different distance measures, namely Hausdorff and Hamming distances. Hausdorff distance is one of practically well-known distance measure which was proposed by Hausdorff in 1914. Since years ago, this method plays an important role in theoretical and practical application notably in pattern recognition, data analysis, decision analysis and robotics (Marinov *et al*., 2012). Lately, it had also extended its ability to solve the problem on measuring the distance between fuzzy sets (Srivastavaa and Srivastavaa, 1985). Although, this method shows favourable results in many areas, the Hausdorff distance are not really popular in the staff selection problem. There are only a few researches that have been reported regarding this method. However, Hamming distance is practically well-known method in solving staff selection problem. There are numerous existing literatures that have been reported on the use of Hamming distance in solving staff selection problem which are Canos and Liern (2004), Canos *et al*. (2011), Merigo and Gil-Lafuente (2012) and Md Saad. This method was proposed by Hamming (1950). It is very practical for calculating the difference between two sets or elements.

The objective of this study, is to study the staff selection problem by means of Hausdorff and Hamming distance measures. Since, the Hausdorff distance are rarely been used in this field, it is a wise choice to use Hamming distance as an indicator when comparing the final results. This research also will be based on management by competences. It can be classified as individual, knowledge, skills and attitude of workers performance in managing task and duty (Canos *et al*., 2011). Each one of the competence will be evaluated by different experts and the comparison between ideal candidate (benchmark profile of the competence) and the candidates will be done. All of this calculation will be done in the form of fuzzy interval-valued.

PRELIMINARIES

A fuzzy set was proposed by Zadeh (1965). It is a multi-valued logic that can define the intermediate values in conventional evaluation (Baran and Kilagiz, 2006). A fuzzy set can be represented in two ways which are a continuous membership function, $\mu_{\tilde{A}}(x)$ or by a set of discrete points (Prodanovic, 2001).

A fuzzy set A in x, where x is denoted as a universe of discourse is defined as (Baran and Kilagiz, 2006):

$$\tilde{A} = \{\langle x, \mu_{\tilde{A}}(x)\rangle : x \in X\}$$

Where, its membership function of A is:

$$\mu_{\tilde{A}} : X \rightarrow [0,1]$$

That assigns to every x a degree of membership $\mu_{\tilde{A}}(x)$, in the interval [0, 1].

While, a fuzzy number is a fuzzy subset in the universe of discourse x that convex and normal. It should follow these conditions which are its $\mu_{\tilde{A}}(x)$ is interval continue, convex and normalise fuzzy set that $\mu_{\tilde{A}}(n)=1$ where n is real number (Baran and Kilagiz, 2006).

Triangular fuzzy interval: The triangular fuzzy interval is specified by three parameters and can be defined as triplet $\tilde{A}=(a_1,a_2,a_3)$ where $a_1<a_2<a_3$ with the x = a_2, as the core of the triangle. Its membership function can be represented as:

$$\mu_{\tilde{A}}(x) = \begin{Bmatrix} 0, x < a_1 \\ \frac{(x-a_1)}{(a_2-a_1)}, a_1 \le x \le a_2 \\ \frac{(a_3-x)}{(a_3-a_2)}, a_2 \le x \le a_3 \\ 0, x > a_3 \end{Bmatrix}$$

The α-cuts of this fuzzy number A are denoted by:

$$[\tilde{A}]^{\alpha} = [a_1 + \alpha(a_2 - a_1), a_3 - \alpha(a_3 - a_2)], \alpha \in [0,1]$$

Interval-valued fuzzy sets: Sometimes, it is difficult for the experts to quantify or express their evaluation of the candidate as a number in interval [0, 1] (Ashtiani *et al*., 2009). Thus, it is applicable to use interval-valued fuzzy sets. From the definition of the fuzzy sets, the interval-valued fuzzy set can be simplified as follows (Canos *et al*., 2011):

The common representation of fuzzy sets was defined as:

$$\tilde{A} = \{(x, \mu_{\tilde{A}}(x), x \in X)\}$$

Admitting $\mu_{\tilde{A}}(x)$ to be tolerance interval, then a multi-valued membership function was defined as:

$$\mu^{\Phi} : X \rightarrow P([0,1])$$

Given by:

$$\mu^{\Phi}(x) = [a_x^1, a_x^2] \subseteq [0,1]$$

Then by using the interval-valued fuzzy set (Gil-Aluja, 1999), the interval-valued fuzzy sets is defined as:

$$\tilde{A}^{\Phi} = \{(x, \mu^{\Phi}(x), x \in X)\}$$

When the referential set is finite, $X = \{x_1, x_2, ..., x_n\}$, it will be defined as:

$$\tilde{A}^{\Phi} = \left\{\left(x_j, \mu^{\Phi}(x_j)\right), j = 1, ..., n\right\}$$

For staff selection process, researchers will assume that all the competence evaluations for candidates and ideal candidate will be done in the interval-valued fuzzy sets as the experts can evaluate the candidates by giving higher and lower values.

Hausdorff distance: Hausdorff distance is defined as the greatest distance of a point of one set to the nearest point of the other set. The general definition of Hausdorff distance given by Szmidt and Kacprzyk (2009, 2011).

Definition 1: Given two finite sets $A = \{a_1, a_2, ..., a_p\}$ and $B = \{b_1, b_2, ..., b_p\}$ then the Hausdorff distance of H (A, B) is defined as:

$$H(A,B) = \max\{h(A,B), h(B,A)\}$$

And:

$$h(A,B) = \max_{a\in A}\min_{b\in B} d(a,b)$$

Where:

a and b = Elements of the set A and B
d (a, b) = Any metrics between these elements
h (A, B) and h (B, A) = The directed Hausdorff distance

According to Szmidt and Kacprzyk (2009), the directed Hausdorff distance from A to B ranks each elements of A based on its distance to the closer elements of B. From this function, the value of the distance will be taken from the largest ranked of the elements which is the most mismatched elements of A. Generally, if h (A, B) = c, each element of A can be considered within the distance c of some elements of B. For the most mismatched element, there is also some elements of A that are exactly distance c for the nearest element of B. The directed Hausdorff distances are not symmetric, thus h (A, B) and h (B, A) can obtain different values. From definition 1, if A and B consist only one element each which is a_1 and b_1, the distance is just equal to d (a_1, b_1).

The Hausdorff distance between two intervals $A = [a_1, a_2]$ and $B = [b_1, b_2]$ is defined as (Wang *et al*., 2011):

$$H(A,B) = \max\{|a_1 - b_1|, |a_2 - b_2|\}$$

Hamming distance: Hamming distance is used to calculate the distance between two elements and very useful in fuzzy set theory when it involved the calculation of the distance for example the distance between fuzzy sets and interval-valued sets (Lindahl and Gil-Lafuente, 2012).

Definition 2: Given a reference set, $X = \{x_1, x_2, ..., x_n\}$ and two fuzzy subsets, $\tilde{A}$ and $\tilde{B}$ with membership functions are $\mu_{\tilde{A}}$ and $\mu_{\tilde{B}}$, respectively (Grzegorzewski, 2004) then the Hamming distance is defined as:

$$d(\tilde{A}, \tilde{B}) = \left(\sum_{i=1}^{n}\left|\mu_{\tilde{A}}(x_i) - \mu_{\tilde{B}}(x_i)\right|\right)$$

Then, the normalized Hamming distance is defined as:

$$d_{NHD}(\tilde{A}, \tilde{B}) = \frac{1}{n}\left(\sum_{i=1}^{n}\left|\mu_{\tilde{A}}(x_i) - \mu_{\tilde{B}}(x_i)\right|\right)$$

The normalised Hamming distance for two interval-valued fuzzy numbers Φ-fuzzy $\tilde{A}^{\Phi}$, $\tilde{B}^{\Phi}$ whose membership functions are $\mu_{\tilde{A}}^{\Phi}(x_i) = [a_{x_i}^1, a_{x_i}^2]$ and $\mu_{\tilde{B}}^{\Phi}(x_i) = [b_{x_i}^1, b_{x_i}^2], i = 1, 2, ..., n$ is defined as:

$$d_{NHD}(\tilde{A}, \tilde{B}) = \frac{1}{2n}\left(\sum_{i=1}^{n}\left(\left|a_{xi}^1 - b_{xi}^1\right| + \left|a_{xi}^2 - b_{xi}^2\right|\right)\right)$$

MEASURING DISTANCE WITH IDEAL CANDIDATE

According to Hausdorff (1962), distance is a measure of similarity or difference between sets. One of the main advantages of applying the distance measure in decision making is the comparison between the alternatives or competence of the problem with the ideal results (Gil-Aluja, 1999). The comparison of sets, especially in fuzzy sets theory are done by using a similarity or distance measure in between their assigned membership or/and non-membership functions (Yang and Chiclana, 2012). For example, let take one parameter of fuzzy sets with the membership value, then the distance value between two fuzzy sets will classify as an aggregated value of distance between the membership values of all their elements (Kacprzyk, 1997). Hence, if researchers try to apply it into the case of staff selection problem, researchers can simplify it as the comparison between the prospects of the candidate with the ideal candidate in order to determine the distance between them. Generally, the ideal candidate is virtual candidate created by the decision makers that execute the desirable competence values for the job position. The distance measure that researchers get will determine either the candidate is suitable to fill in the vacancy or not. It is based on the distance value between the ideal candidate and the candidate which means, the less distance between the candidates and the ideal candidate or the bigger intersection between the ideal candidate and the candidate, the highly chances for candidate to be selected into the position. Eventually, comparison with the ideal candidate is one way to order the candidates in a ranking (Canos and Liern, 2008).

Generally, Hamming distance along with Euclidean distance are well-known distance method that had been used in measuring the distance between two fuzzy set. It is used to calculate the distance between the extremes of the intervals (Canos *et al*., 2011). While the Hausdorff distance is one of the other distance methods that is rarely been used to solve the decision making problem. In this study, researchers use Hausdorff distance in solving the staff selection process. Theoretically, the concept of the Hausdorff distance is almost similar with the Hamming distance which is to find the distance between one point to another points. In this case, the values of the distance will be getting between fixed point which is the ideal candidate and the candidates that will be manipulative point. The differences between these methods occur after the distance between two sets is obtained. For Hamming Distance Method, the distance value is obtained after addition of the distance values between two elements of the sets. While for the Hausdorff distance, the higher distance value within two elements of the set will be proclaim as the required distance value. Theoretically in the staff selection problem, there is >1 competence. Hence, the final distance values will be getting from all the addition of each competence distance values.

Problem definition: First and foremost, researchers should know this selection will be based on the n necessary competences by p different experts. The evaluation of the competences will be done on the ideal candidate and the R possible candidates, Cand. = $\{P_1, P_2, ..., P_R\}$ by a set of p experts, Exp = $\{E_1, E_2, ..., E_p\}$ through interval-valued such that the lower and the higher values can be stated. The referential set for these competences will be denoted as X = $\{c_1, c_2, ..., c_n\}$. Literally, the evaluation of ideal candidate also can be done by the other experts other than p experts. But for this case, researchers will prefer to use the same experts that evaluate the candidates' competence as they know the best benchmarks values for the ideal candidate. Moreover, researchers choose to have >1 expert, even though it still applicable to have only one expert. It is because in certain cases, there are some candidates that have the same distance values which will hinder the final decision. Thus, it is better to have >1 expert so that researchers could identify which experts that their evaluation are most valuable and needed and if there are similarities between two or more candidates, researchers could refer the distance values from the evaluation of the most important experts.

Based on Canos *et al.* (2011), researchers will have RΦ-fuzzy numbers such that $\tilde{P}_i^{\Phi}(\alpha), 1 \le i \le R$ will represent each one of the candidates $\tilde{I}_i^{\Phi}(\alpha)$ and will represent the ideal candidate for each level α requirement, $\alpha \in [0, 1]$. In order to measure the distance between the candidates and the ideal candidate, researchers will use the Hausdorff and Hamming distances. The distance values that are obtained from this calculation will be used to rank the candidate from the minimum values to maximum values. Apparently, the candidate with the minimum distance value is the most suitable candidate for the post. The candidate is ordered for its level α of requirements when the set of real numbers $\{d_i(\alpha)\}_{i=1}^{R}$ is ordered where d represents the Hausdorff and Hamming Distance Methods. When this process is repeated for the different values of $\alpha \in [0, 1]$, researchers will have an order of the candidates in the different values of α. The decision maker can determine the final result by looking at each α values since the ranking of the candidate may be changed at the different α. For example, at α = 0.0, the cand. 4 might be placed at ranking number one but at the α = 0.5, it might be ranked at 2. In what follows, researchers present an algorithm for the staff selection problem by using Hausdorff and Hamming distances.

The algorithm

Step 1: Construct a fuzzy number for the ideal candidate, $\{\tilde{I}_1, \tilde{I}_2, ..., \tilde{I}_n\}$ for each competence from p experts' evaluation.

Step 2: Construct a fuzzy number for the candidate, $\{\tilde{c}_{i_1}, \tilde{c}_{i_2}, ..., \tilde{c}_{i_n}\}$ for each competence from p experts' evaluation.

Step 3: Construct an interval-valued fuzzy number for each competence with an exigency level, $\alpha \in [0, 1]$ for each candidate and the ideal candidate:

$$\tilde{P}_i^{\Phi}(\alpha) = \left\{c_{ij}, \left[c_{ij}^1(\alpha), c_{ij}^2(\alpha)\right], 1 \le j \le n\right\}, i = 1, 2, ..., R$$

$$\tilde{I}^{\Phi}(\alpha) = \left\{c_j, \left[I_j^1(\alpha), I_j^2(\alpha)\right], 1 \le j \le n\right\}$$

Step 4: Calculate the distance value between the candidate and the ideal candidate for the chosen exigency level, $\alpha \in [0, 1]$ by using two distance methods which are: Hausdorff distance method:

$$H\left(\tilde{P}^{\Phi}, \tilde{I}^{\Phi}\right) = \sum_{i=1}^{n} \max\left\{\left|I_{x_i}^1 - c_{x_i}^1\right|, \left|I_{x_i}^2 - c_{x_i}^2\right|\right\}$$

Hamming Distance Method:

$$d_{HD}\left(\tilde{P}^{\Phi}, \tilde{I}^{\Phi}\right) = \frac{1}{2n}\left(\sum_{i=1}^{n}\left(\left|I_{xi}^{1} - c_{xi}^{1}\right| + \left|I_{xi}^{2} - c_{xi}^{2}\right|\right)\right)$$

Step 6: Compare the distance values between each candidate and order the candidate according to ascending distance value for the exigency level α.

Step 7: Repeat step 2-6 for different α values.

Step 8: The decision makers then will select the suitable candidate to fill the post based on the exigency level.

COMPUTATIONAL PROOFS

For the computational proofs, researchers will apply the competence values taken from Canos *et al*. (2011). Let say if the manager from company A want to choose only one person to fill in one vacant position (T = 1) and there will be 5 competences Comp. = 5, 10 candidates Cand. = 10 and 2 experts Expert = 2 evaluation. Researchers will consider that the most important evaluations of the candidate is come from the expert number 2, since researchers assume that he/she hold the highest position in the company. Regarding the calculation, researchers will use exigency level, α values ranging from 0-1. Based on the final results, the comparison and discussion between the Hausdorff and Hamming distances will be done, especially on the rank and the distance values for selected candidates. The competence values for the ideal candidate and the candidates (Table 1 and 2) and the results of using Hausdorff (Table 3) and Hamming distance (Table 4).

Table 1: Valuation of the ideal competences

	Ideal candidates	
Competence	Low value	High value
1	0.65	0.70
2	0.80	1.00
3	0.50	0.80
4	0.80	0.85
5	0.50	0.90

Analysis descriptions: Table 3 and 4 show the ranking results of the candidates with the use of two different measures which are Hausdorff and Hamming distances. These results are recorded based on level α requirement from 0-1. These results are based on the evaluation on 5 competences by 2 experts on 10 selected candidates. The comparison between two distance measures can be made based on the final results to determine the potential candidate for the available position.

Based on the results, it is obvious that the most suitable candidate for the selected position belonged to the Cand. 4. Even with the use of different methods and α values, the Cand. 4 still maintain as spotted at number one with the less distance values. If researchers look at Table 2 and compare with Table 1, researchers could see that the Cand. 4 had almost all of the competence values that similar with the ideal candidate competences values. Thus, researchers can conclude that the more intersection between the candidate and the ideal candidate values, the less distance values that researchers got, the higher

Table 2: Valuation of the candidates' competences

		Competences									
		1		2		3		4		5	
Candidates	Experts	Low	High	Low	High	Low	High	Low	High	Low	High
1	1	0.30	0.65	0.20	0.70	0.35	0.50	0.40	0.80	0.15	0.55
	2	0.30	0.80	0.70	0.90	0.50	0.70	0.50	0.60	0.50	0.60
2	1	0.25	0.60	0.35	0.80	0.40	0.60	0.45	0.75	0.50	0.70
	2	0.25	0.70	0.35	0.60	0.40	0.50	0.50	0.80	0.50	0.80
3	1	0.25	0.70	0.35	0.65	0.30	0.55	0.40	0.90	0.55	0.75
	2	0.35	0.70	0.30	0.60	0.50	0.90	0.60	0.85	0.50	0.70
4	1	0.60	0.80	0.70	0.90	0.35	0.80	0.75	0.80	0.50	0.90
	2	0.50	0.70	0.80	1.00	0.60	0.90	0.85	0.85	0.60	0.80
5	1	0.25	0.60	0.35	0.80	0.30	0.70	0.50	0.60	0.60	0.65
	2	0.25	0.70	0.35	0.60	0.40	0.50	0.50	0.80	0.50	0.80
6	1	0.25	0.55	0.35	0.70	0.50	0.65	0.50	0.60	0.45	0.90
	2	0.30	0.70	0.50	0.60	0.35	0.50	0.30	0.45	0.40	0.55
7	1	0.25	0.45	0.35	0.55	0.30	0.70	0.50	0.65	0.30	0.90
	2	0.25	0.70	0.35	0.60	0.30	0.45	0.30	0.60	0.50	0.90
8	1	0.25	0.50	0.35	0.45	0.30	0.75	0.40	0.55	0.60	0.70
	2	0.25	0.65	0.35	0.60	0.40	0.50	0.35	0.80	0.30	0.80
9	1	0.25	0.65	0.35	0.90	0.25	0.50	0.55	0.60	0.60	0.75
	2	0.40	0.45	0.30	0.55	0.50	0.60	0.50	0.90	0.35	0.80
10	1	0.50	0.50	0.35	0.65	0.30	0.70	0.60	0.60	0.35	0.50
	2	0.30	0.30	0.40	0.45	0.60	0.85	0.70	0.70	0.50	0.65

Table 3: Ranking of candidates by using Hausdorff distance

	Hausdorff distance										
Ranking	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
1	4	4	4	4	4	4	4	4	4	4	4
2	1	1	1	1	1	1	1	1	1	1	1
3	3	3	3	3	3	3	3	3	3	3	3
4	5	5	5	5	5	5	2	2	2	2	2
5	10	10	10	10	2	2	5	5	5	5	5
6	2	2	2	2	9	9	9	9	9	9	9
7	9	9	9	9	10	10	10	10	10	10	10
8	6	6	6	6	6	6	6	6	6	6	6
9	7	7	7	7	7	7	8	8	8	8	8
10	8	8	8	8	8	8	7	7	7	7	7

Table 4: Ranking of candidates by using Hamming distance

	Hamming distance										
Ranking	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
1	4	4	4	4	4	4	4	4	4	4	4
2	3	3	3	3	3	3	3	3	3	3	3
3	1	1	1	1	1	1	1	1	1	1	1
4	2	2	2	2	2	2	2	2	2	2	2
5	5	5	9	9	9	9	9	9	9	9	9
6	9	9	5	5	5	5	5	5	5	5	5
7	6	6	6	10	10	10	10	10	10	10	10
8	10	10	10	6	6	6	6	6	6	6	6
9	8	8	8	8	8	8	8	8	8	8	8
10	7	7	7	7	7	7	7	7	7	7	7

opportunity the candidate to be selected. Furthermore, if researchers reviewed at the top three ranking for both distance measures, it showed that most of the competence values were slightly closed to the ideal candidate competence value and it evolved around the same candidates which are Cand. 4, 3 and 1. Beside based on the results for both distance measures, researchers can clarify that at certain α level, the ranking of the candidate is almost the same. For example, for level requirement $\alpha = 0.3$, the ranking of Cand. 6 is at number 8 for both methods. Researchers also can identify that the use of different α values, did not really affect the rank for some candidates which means that at the different levels of requirement, $\alpha \in [0, 1]$, some candidates still stay at the same rank. For instance from Hamming distance, the Cand. 8 still maintain its spot at number 9 and while Cand. 7 is ranked at number 10.

During the staff selection process, it is crucial for the decision maker to be aware and prepared in handling some unexpected occurrences. This includes the difference candidates exhibit the same distance value. If this is the case, then the decision maker must make a wise decision by considering several aspects which are weight for each competence and expert evaluation. For Hausdorff distance, it is appear that the Cand. 2 and 9 share the same distance value at level 0.0. This circumstance occurred for the ranking 4 and 5. Thus from the observation and since, we selected evaluation from the expert 2 as important measure, the distance values from his or her evaluation will be considered to rank the candidate. So, the Cand. 2 is selected to fill the spot rather than Cand. 9. It is because the distance values for Cand. 2 from the evaluation of the expert 2 are less than Cand. 9. Moreover, the decision maker can solve this problem by using weight for each competence to determine the most needed competence for the specified position. As for this study, researchers only use the evaluation from the most needed expert. Eventually, this situation would help the decision makers to overview back the results in choosing the right candidate.

CONCLUSION

The increasing competition in global markets, especially among a big company had urged the human resource management to take decisive action in selecting the right worker for their company. Selecting the right person for the right position is not an easy task. Thus with the help of mathematical model in decision making problem, especially in staff selection problem, the decision makers can make decision faster, clearer and easier to understand. Although, there exist limitations of the use of mathematical model namely quantification and objectives, it can be solved by using fuzzy set theory. This is because the capability of fuzzy set theory in handling the uncertainty and subjectivity problems. The Hausdorff and Hamming distances are among the distance measures that can be used to calculate the distance between two elements. Therefore in this study, researchers have used these two methods in solving staff selection problem. Researchers managed to show that these methods are applicable to use in searching for the best preference candidate through the distance values between the ideal and possible candidates. From the final results, Cand. 4 seems as the most preferably candidate to be selected. Overall, there are also some differences on the ranking when using the Hausdorff and Hamming distances at certain α values. For the future research, researchers hope to apply the weight for each competence in order to classify which competence that valued the most for the selected position.

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