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# Fuzzy AHP and Fuzzy TOPSIS Synergy for Ranking the Factor Influencing Employee Turnover Intention in the Iran Hotel Industry

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## Abstract

This study aims to verify the main factors influencing turnover intention in the Iran hospitality industry. The objective of this study is to construct a fuzzy AHP and fuzzy TOPSIS model to evaluate the dimensions of the hotel employee turnover intention model. The performance evaluation for employee turnover intention includes work itself, supervision, coworkers relationship, salary and benefit, career opportunities, job stress, perceived risk, and job insecurity. These dimensions generate a final evaluation for ranking priority among the employee turnover intention of the proposed model. The importance of dimensions is evaluated by 20 experts, and decision-making is processed through the fuzzy concept and fuzzy environment. From the critical fuzzy AHP and fuzzy TOPSIS analysis results, the study shows that the most important dimensions of employee turnover intention in the hotel industry model are salary and benefits. Moreover, the results indicate that the least important dimensions are the Co-workers Relationship, Supervision, and Career Opportunities. The second group dimensions that impact employee turnover in the context of the COVID-19 epidemic are work itself, job stress perceived risk, and job insecurity. In addition, this study's results show that three-star hotels have the highest value of turnover intention; the second is the Four and Five-star hotels, and the third is the below three-star hotels. The results of the study will help businesses in the field of hospitality have a more comprehensive view of human resource management activities. Especially, this study provides implications for hotel managers in understanding employee behavior and their turnover intention during the context of the COVID-19 epidemic based on the eight proposed dimensions.

**Keywords:** Fuzzy AHP, Fuzzy TOPSIS, Employee turnover, Hotel industry.

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# 1|Introduction

In 2020, Iran's tourism faced many challenges due to the impact of the COVID-19 epidemic. In addition to solutions to overcome difficulties and prevent epidemics, there was an attempt to restructure the tourist market. Like many other industries, human resources in tourism are equipped with the necessary knowledge and skills that play an essential role in the development of tourism products as well as hotel services.; it may not come from the COVID-19 epidemic or other factors. Previous studies have demonstrated the success of human resource management in delivering employee satisfaction and employee motivation in the tourism industry. However, these studies have not yet clarified the specific ranking of these factors. Employee satisfaction and work motivation, commitment to the organization, work environment, or salary level are all the causes of turnover intention. However, in literature, studies mainly focus on the factors affecting work motivation or employee satisfaction. In the context of the complicated COVID-19 epidemic, the tourism industry is predicted to face specific difficulties. This is the time for the hotel industry to retain employees or encourage employees to work hard and support their company in overcoming challenges and preparing conditions to welcome tourists back after the pandemic.

The main objective of this study is to collect, build, and synthesize a complete, systematic document review on current issues related to the field of turnover intention in the hospitality industry. In addition, the study aims to verify the main factors influencing turnover intention in the Iran hospitality industry.

Multiple-Criteria Decision-Making (MCDM) is a technique that evaluates multiple conflicting criteria in decision-making. MCDM combines an alternative's performance across numerous contradicting, qualitative, and/or quantitative criteria and results in a solution requiring a consensus. The objective of MCDM is not to suggest the best decision but to aid decision-makers in selecting suitable alternatives or a single alternative that fulfils their requirements and is in line with their preferences. Various MCDM techniques and approaches have been developed and implemented successfully in many application areas. There are several MCDM techniques, including the Analytic Hierarchy Process (AHP), the Analytical Network Process (ANP), TOPSIS, and fuzzy decision-making [1]–[4]. MCDM has been one of the fastest-growing problem areas in many disciplines. The Fuzzy Analytic Hierarchy Process (FAHP) method was used to solve complex decision-making problems with different selection criteria and people involved in the decision-making process. Although the conventional AHP explains and describes expert knowledge, it cannot detail or reflect human behaviour and thinking. AHP is a powerful management tool that successfully solves many multiple criteria decision problems. In pure AHP, the relative importance of decision elements is evaluated from comparison judgments, which are represented as crisp values. However, in many cases, human preference is uncertain, and decision-makers usually feel more confident utilizing linguistic variables rather than expressing their judgments in the form of numeric values. In order to deal with more decision-making problems in real situations, the fuzzy set theory was incorporated into AHP. Being an extension of AHP, the fuzzy AHP is able to solve hierarchical fuzzy decision-making problems. Since its appearance, the fuzzy AHP method has been widely used by many researchers to solve different decision-making problems in various areas. Therefore, FAHP and fuzzy TOPSIS were developed to solve ambiguous gradation problems. The matrix pair comparisons in the FAHP process are fuzzy numbers, allowing the decision-maker to assign priorities in the form of a natural linguistic expression of the importance of each criterion. Consequently, fuzzy logic provides a systematic basis for dealing with ambiguous or undefined situations.

Additionally, fuzzy decision-making has been applied in various fields, such as [5] in software-defined networking for controller selection and controller placement and [6] in risk assessment using a new consulting process or determining the importance of the criteria of traffic accessibility, applied fuzzy AHP-TOPSIS approaches to prioritize solutions for reverse logistics barriers. Pramanik et al. [7] researched resilient supplier selection using AHP-TOPSIS-QFD under a fuzzy environment. Shaw et al. [8] studied supplier selection using fuzzy AHP and fuzzy multi-objective linear programming for developing low-carbon supply chains. Sun [9] presented a performance evaluation model by integrating fuzzy AHP and fuzzy TOPSIS methods. Related to the subject of human resource management, Sun [9] has researched performance evaluation model by integrating fuzzy AHP and fuzzy TOPSIS methods. Fahmi et al. [10] have studied human resources management using interval-valued intuitionistic FAHP. Goyal et al. [11] applied fuzzy-AHP MCDM methodology to identify the relative importance of various barriers in adopting Sustainable Production and Consumption (SPC) initiatives. Çalık [12] developed a new group decision-making approach based on Industry 4.0 components for selecting the best green supplier by integrating AHP and TOPSIS methods under the fuzzy environment. Hassanzadeh and Valmohammadi [13] evaluate and rank the credit/financial institutes of the Tehran stock market by the use of fuzzy AHP and TOPSIS techniques. The above-mentioned studies have indicated the effectiveness and accuracy of the fuzzy AHP and fuzzy TOPSIS approach in dealing with various practical problems. The comparisons between fuzzy AHP and fuzzy TOPSIS methods can be summarized as follows:

I. Pairwise comparisons for criteria and alternatives are made in fuzzy AHP, while there is no pairwise comparison in fuzzy TOPSIS.
II. Fuzzy TOPSIS ranks alternatives by measuring their relative distances to positive ideal solutions and negative ideal solutions, providing then a meaningful performance measurement for each alternative. In fuzzy AHP, decision-makers make pairwise comparisons and priority weights of alternatives are determined by the extent analysis method for the synthetic extent values of these values.
III. Linguistic variables can be used in both fuzzy AHP and fuzzy TOPSIS.
IV. The ranking results of the fuzzy AHP and fuzzy TOPSIS are the same. It indicates that when the decision-makers are consistent with themselves in determining the data, two methods independently, the ranking results will be the same.

The integrated fuzzy AHP and fuzzy TOPSIS enable decision analysts to understand the complete evaluation process better and provide a more accurate, effective, and systematic decision support tool. Employing the advantages of both fuzzy AHP and fuzzy TOPSIS, the objectives of this study are:

I. To identify the main factors influencing turnover intention in the Iran hospitality industry.
II. To rank the factors based on experts' opinions.

By using the integrated fuzzy AHP and fuzzy TOPSIS methods, this study first applies fuzzy AHP to determine the preference weights of evaluation. After that, fuzzy TOPSIS is used to improve the gaps of alternatives between the actual performance value and the pursued aspirational level in each dimension and criterion. This work will be helpful for the government and management in making policies to promote businesses in the field of hospitality.

# 2|Literature Review

## 2.1|Turnover Intention

Turnover intention is a behavioural factor that has been studied by many scholars, especially in the field of human resource management; it has a role to reflect the actual situation in the workplace, the relationship among colleagues, between staff and investors, or customers. This information helps human resource managers gain a comprehensive perspective and make timely plans to limit the leaving intention of employees to stabilize personnel and sustainably develop their businesses. According to the research of several authors [14]–[18] on turnover intention, the most apparent manifestation of employees' job dissatisfaction is due to a number of reasons. The result leads to the act of leaving, causing severe damage to the organization in terms of people, brainpower, and technology. Or the partner factors affecting employees make them feel unsatisfied, affecting their commitment and leading to turnover intention [19]–[23]. According to the authors, "Turnover intention is understood as the thoughts, considerations, and calculations of employees for the behaviour of leaving the current organization in the context of the influence of subjective or objective factors inside and outside the hotel business."

Many factors affect the intention of leaving hotel employees. During the research process, the authors compiled 360 related articles and then applied the Systematic Literature Review (SLR) method, following the instructions of other researchers [24]–[26]. To use the document system conveniently after researching, the authors have numbered and divided the documents into the job description index theory, commitment to the organization, group of models, and a group of studies. Empirical research is the group of factors affecting turnover intention in general and the group of factors affecting turnover intention in the hotel industry. Most of the articles focus on studying only a few factors affecting turnover intention. Therefore, the study of many factors affecting the turnover intention of the hotel staff, including the use of two moderative variables, is a new research direction that helps the author to contribute a more holistic and multidimensional view of influence and the relationship of factors related to the turnover intention of the hotel industry staff. The authors have coded selected articles according to the article number; the content of the articles is mainly associated with the turnover intention or leaving the hotel industry.

## 2.2 | Turnover Intention of Hotel Staff

Park and Gursoy [27] have shown that the factors such as vitality, dedication, absorption, job satisfaction, practice factors, human resource management and employee development, including performance appraisal, training and development, career advancement, and organizational trust [28], [29], describe a multi-level model of management support at management level, department level, supervisor level, individual level, departmental support, departmental supervision, sincere team, transformational leadership membership, civil rights organizational behaviour, the effect of organizational commitment on employee attitudes and loyalty – hotel employee retention [30], [31], the content of the structural equation research [18] the factors studied by the author are work and life quality, acceptance of organizational culture, job satisfaction and team commitment organization, demographic characteristics in hospitality businesses, [32] the relationship between job change in hotels and intention to quit. The regulatory role of organizational support is perceived in the psychologically competitive environment - artificial intelligence and robot awareness of hotel staff. According to Wang et al. [17], their study shows the influence of professionalism on the intention to change the job of hotel employees, the mediating role of employee engagement and job satisfaction, factors that are paired topics in the research content of professionalism, satisfaction, cohesion the effect of friendship deviant behaviour in the workplace of hotel employees - the regulatory role of the hotel staff. Organization [33] employee green behaviour from a positive perspective and positive spillover because such voluntary behaviours benefit actors other than employees, specifically hotels that use them and their natural surroundings [34] working environment, coworker relations, job satisfaction, salary, organizational commitment, engagement, work motivation, job satisfaction, work environment [35] work attitude, work stress, the conflict between parties [36], [37]. *Table 1* includes the factors influencing turnover intention in the hospitality industry.

**Table 1. Factors influencing turnover intention in the hospitality industry.**

| No | Performance Criteria | Source |
|---|---|---|
| 1 | Work itself | [33] |
| 2 | Supervision | [34] |
| 3 | Coworkers relationship | [27] |
| 4 | Salary and benefit | [27] |
| 5 | Career opportunities | [28] |
| 6 | Job stress | [36], [37] |
| 7 | Perceived risk | [37] |
| 8 | Job insecurity | [36], [37] |

## 2.3 | Proposed Factors

Based on previous studies on the Turnover intention model, this study applies a SLR. Based on the documents, SLR involves activities like planning (identifying research questions), implementation (document retrieval, research selection, and data aggregation), and reporting (writing a report). Research activities are conducted by searching raw data using keywords like Turnover intention, Turnover intention model, or Turnover intention model in the hotel industry. The research overview includes five academic database systems: 1) ResearchGate, 2) ScienceDirect, 3) Elsevier, 4) Scopus, and 5) Emerald Insight. The study's proposed factors of the turnover intention model are included in *Fig. 1*.

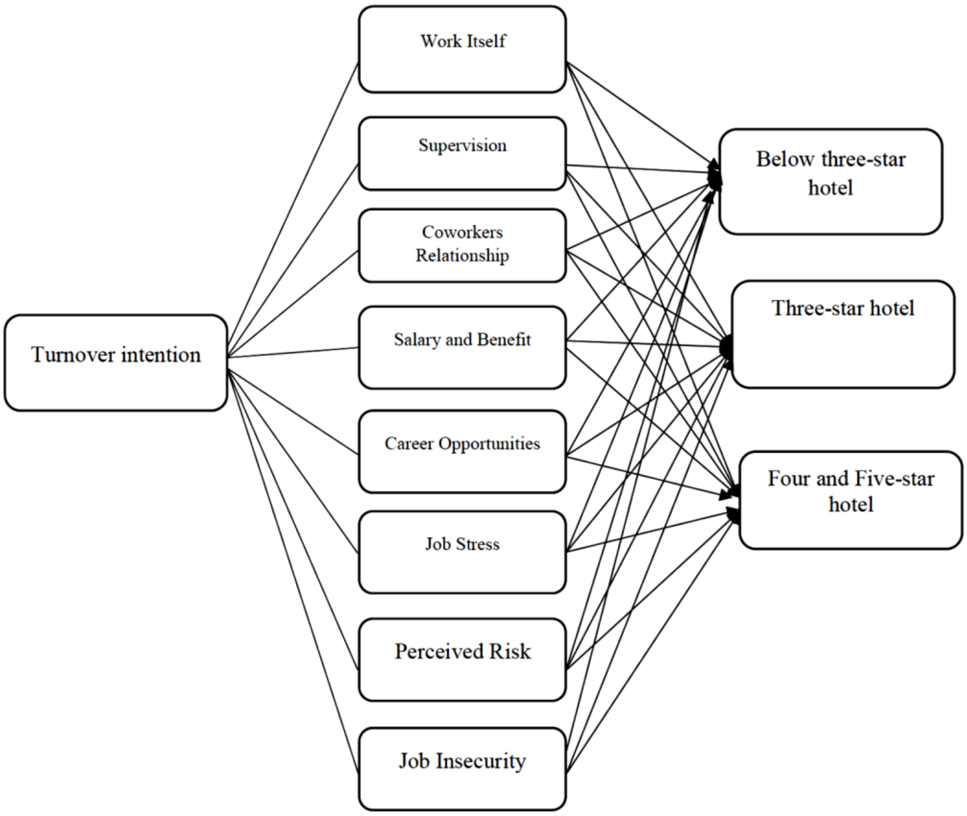


**Fig. 1. The proposed factors.**

# 3 | Research Method

## 3.1 | Determining the Evaluation Criteria Weight

After the most critical factors were identified, the fuzzy AHP method and fuzzy TOPSIS were used to determine the right judgment of factor importance. In this respect, fuzzy AHP can be very useful in involving several decision-makers with multiple conflicting criteria to reach a consensus in the decision-making process. On the other side, the fuzzy TOPSIS technique is used to calculate alternative ratings. TOPSIS was chosen due to its capability to rank a vast number of alternatives. This approach can be considered as a driver in implementing the alternative that represents the best trade-off according to the various considered criteria.

Specifically, this research attempts to evaluate the turnover intention of employees among three classes of hotels. By reviewing the related literature, the criteria for turnover intention evaluation have been developed. However, it isn't easy to assume that each evaluation criterion is equally important. The selection of a suitable method to apply to determine the weights depends on the nature of the problem. Evaluating turnover intention is a complex and wide-ranging problem, so this issue requires an inclusive and flexible method. The pure AHP method tends to be less effective when dealing with uncertainty in the decision-making process. Chen and Tzeng [38] noted that the weights of criteria in decision-making problems have different meanings, and not all of them can be assigned equal importance. Since its appearance, many researchers have widely used the fuzzy AHP method to solve other decision-making problems in various areas. The fuzzy AHP can address the uncertainty and imprecision of the evaluation process [39]. To evaluate the hotel class which is affected the most among the mentioned three classes, this study applied the TOPSIS method, which is based on the concept that the chosen alternative should have the shortest distance from the positive ideal solution and the longest distance from the negative ideal solution [9].

### 3.1.1 | Establishing fuzzy number

Since fuzzy sets were introduced by [39], they are also seen as an extension of the classical notion of sets. In that theory, the membership of elements in a set is assessed in binary terms and with a set of bivalent conditions, which means an element either belongs or does not belong to the set. The concept of mathematics was applied by [9], [40].

A number of fuzzy Ã on ℝ to be a Triangular Fuzzy Number (TFN) if the membership function μA ~(x): ℝ -> [0,1] is equal to *Eq. (1)*.

$$\mu_A\sim(x) = \begin{cases} (x-l)/(m-l), & l \leq x \leq m, \\ (u-x/(u-m), & m \leq x \leq u, \\ 0, & \text{otherwise.} \end{cases} \quad (1)$$

As shown in *Eq. (1)*, l and u represent the lower and upper bounds of the fuzzy number Ã, respectively, and m is the modal value of Ã. The membership function of the TFN is shown in *Fig. 2*.

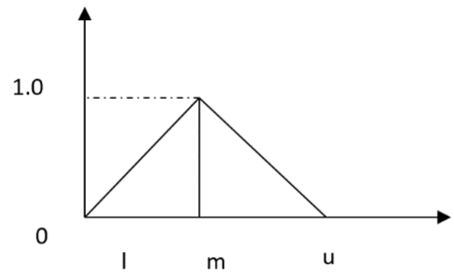


**Fig. 2. The membership function of TFN.**

⊕ is the addition of fuzzy numbers.

$$\tilde{A}1 \oplus \tilde{A}2 = (l1, m1, u1) \oplus (l2, m2, u2) = (l1 + l2, m1 + m2, u1 + u2). \quad (2)$$

⊗ is the multiplication of fuzzy numbers.

$$\tilde{A}1 \otimes \tilde{A}2 = (l1, m1, u1) \otimes (l2, m2, u2) = (l1\,l2, m1m2, u1u2) \text{ for } l1\,l2 > 0;\ m1m2 > 0;\ u1u2 > 0. \quad (3)$$

⊖ is the subtraction of fuzzy numbers.

$$\tilde{A}1 \ominus \tilde{A}2 = (l1, m1, u1) \ominus (l2, m2, u2) = (l1 - ul2, m1 - m2, u1l2) \text{ for } l1\,l2 > 0;\ m1m2 > 0;\ u1u2 > 0. \quad (4)$$

∅ is the division of fuzzy numbers.

$$\tilde{A}1 \varnothing \tilde{A}2 = (l1, m1, u1) \varnothing (l2, m2, u2) = (l1/l2, m1/m2, u1/u2) \text{ for } l1\,l2 > 0;\ m1m2 > 0;\ u1u2 > 0. \quad (5)$$

Reciprocal of a fuzzy number

$$\tilde{A}_1^{-1} = (l1, m1, u1) = (1/u1, 1/m1, 1/l1) \text{ for } l1\,l2 > 0;\ m1m2 > 0;\ u1u2 > 0. \quad (6)$$

### 3.1.2 | Linguistic variable

Zadeh [39] noted that, for conventional quantification, it is tough to express situations that are hard to define reasonably. A linguistic variable's values are words or sentences in a natural or artificial language [9]. This study used this type of expression to compare three apartment investment companies' evaluation dimensions by nine basic linguistic terms, including "extremely important," "very strongly important," "essentially important," "weakly important," and "equally important" concerning a fuzzy nine-level scale. *Table 2* shows the computation technique based on the definition of fuzzy numbers.

**Table 2. Linguistic variables and their fuzzy numbers.**

| Numerical Rating | Linguistic Variable | TFN |
|---|---|---|
| 1 | Equally important | (1,1,1) |
| 2 | Intermediate value between 1 and 3 | (1,2,3) |
| 3 | Essentially important | (2,3,4) |
| 4 | Intermediate value between 3 and 5 | (3,4,5) |
| 5 | Strongly important | (4,5,6) |
| 6 | Intermediate value between 5 and 7 | (5,6,7) |
| 7 | Very strongly important | (6,7,8) |
| 8 | Intermediate value between 7 and 9 | (7,8,9) |
| 9 | Extremely important | (8,9,10) |

## 3.2 | Fuzzy AHP Method

There are various fuzzy AHP methods for solving other managerial problems. The fuzzy AHP method proposed by [40], [41] is utilized to calculate the factor weights in different works such as [9]. The steps are as follows:

**Step 1.** Making pairwise comparisons and obtaining the individual judgment matrices.

The experts perform pairwise comparisons of the importance or preference between each pair of criteria. The comparison of measures is in the form of linguistic variables. This can be achieved through questionnaires.

$$\tilde{A}^k = \begin{bmatrix} \tilde{a}_{11}^k & \tilde{a}_{12}^k & \dots & \tilde{a}_{1n}^k \\ \tilde{a}_{21}^k & \tilde{a}_{22}^k & \dots & \tilde{a}_{2n}^k \\ \dots & \dots & \dots & \dots \\ \tilde{a}_{m1}^k & \tilde{a}_{m2}^k & & \tilde{a}_{mn}^k \end{bmatrix}. \quad (7)$$

The evaluation of experts is calculated according to *Eq. (8)*. The derived matrix is in the form of *Eq. (9)*.

$$\tilde{a}_{ij} = (\tilde{a}_{ij}^k \otimes \tilde{a}_{ij}^k \dots \otimes \tilde{a}_{ij}^k)1/k. \quad (8)$$

$$\tilde{A} = \begin{bmatrix} \tilde{a}_{11} & \tilde{a}_{12} & \dots & \tilde{a}_{1n} \\ \tilde{a}_{21} & \tilde{a}_{22} & \dots & \tilde{a}_{2n} \\ \dots & \dots & \dots & \dots \\ \tilde{a}_{m1} & \tilde{a}_{m2} & & \tilde{a}_{mn} \end{bmatrix}. \quad (9)$$

**Step 2.** Constructing the comparison matrices.

The geometric mean and fuzzy weight of the factors are calculated according to [40]:

$$\tilde{r}i = (\tilde{a}i1 \otimes \dots \otimes \tilde{a}ij \otimes \dots \otimes \tilde{a}in)1/n. \quad (10)$$

$$\tilde{w}i = \tilde{r}i \otimes [\tilde{r}i \oplus \dots \oplus \tilde{r}i \oplus \dots \oplus \tilde{r}i]-1, \quad (11)$$

where $\tilde{a}ij$ represents the relative importance of criterion i to j and $\tilde{r}i$ is the geometric mean value of criterion i. $\tilde{w}i$ is the fuzzy weight of criterion i, represented by TFN. $\tilde{w}i$ = (lwi, mwi, uwi), where lwi, mwi, and uwi are the low, middle, and high values of TFN, respectively.

**Step 3.** Defuzzification.

The Centre Of Area (COA) method is used to calculate the Best Nonfuzzy Performance (BNP) value for each factor.

$$BNP = \frac{[(U_{wi} - L_{wi}) + (M_{Wi} - L_{wi})}{3} + L_{wi}. \quad \textbf{(12)}$$

**Step 4.** Calculating the Consistency Ratio (CR) for a matrix.

Defuzzification is applied to calculate the CR index. Next, the consistency matrix is obtained as in pure AHP. The two matrices, Am and Ag, are derived from the comparison matrix using the defuzzification method by Gogus and Boucher [42].

Am is the matrix derived from the mean (m) values of the fuzzy comparison matrix:

$$\text{Am } [\underset{.}{a}\text{ijm}]. \quad \textbf{(13)}$$

Ag is the matrix derived from the geometric mean by the smallest value (l) and the largest possible (m):

$$Ag = Ag = \sqrt[2]{a_{iju} a_{ijl}}\,. \quad \textbf{(14)}$$

The two matrices with CR values below 0.1 indicate the consistency of the matrix.

The defuzzification is achieved using the following equation:

$$A = [aijl + 2 * aijm + aiju/4]\,. \quad \textbf{(15)}$$

Then, the matrix is normalized with the following equation:

$$A_i = \left[\frac{a_i}{\sum_{i=1}^{n} a_i}\right]. \quad \textbf{(16)}$$

The Consistency Index (CI) for a comparison matrix can be computed with the use of the following equation:

$$CI = (\lambda max - n)/(n - 1), \quad \textbf{(17)}$$

where λmax is the largest eigenvalue of the comparison matrix, and n is the dimension of the matrix.

$$\lambda_{max} = \frac{1}{n}\sum_{i=1}^{n}(AW)_i / w_i\,. \quad \textbf{(18)}$$

The CR is defined as the ratio between the consistency of a given evaluation matrix and the consistency of a random matrix:

$$CR = (CI/RI), \quad \textbf{(19)}$$

where RI(n) is a Random Index (RI) that depends on n, as shown in *Table 3*.

**Table 3. RI of random matrices.**

| n | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| R | 0 | 0 | 0.52 | 0.90 | 1.12 | 1.24 | 1.32 | 1.41 | 1.45 | 1.49 |

If the CR of a comparison matrix is equal to or less than 0.1, it may be acceptable. If the CR is unacceptable, the decision-maker is encouraged to repeat the pairwise comparisons.

## 3.3 | The Fuzzy TOPSIS Method

Nădăban et al. [43] stated that fuzzy TOPSIS is a practical tool for dealing with many practical problems. The mathematical concept of this study is adapted from [9], and the TOPSIS method consists of the following steps:

**Step 1.** The evaluation criteria weight determination.

The fuzzy preference weight is employed from the FAHP results in this research.

**Step 2.** Constructing the decision matrix and assign the linguistic variables to the alternatives.

$$\begin{matrix} & C_1 & C_2 & \dots C_n \end{matrix}$$

$$\widetilde{D} = \begin{matrix} A_1 \\ A_1 \\ \vdots \\ A_1 \end{matrix} \begin{bmatrix} \tilde{a}_1 & \tilde{a}_{12} & \dots & \tilde{a}_{1n} \\ \tilde{a}_{21} & \tilde{a}_{22} & \dots & \tilde{a}_{2n} \\ \dots & \dots & \dots & \dots \\ \tilde{a}_{m1} & \tilde{a}_{m2} & & \tilde{a}_{mn} \end{bmatrix}, \quad i = 1,2,\dots,m; j = 1,2\dots,n. \tag{20}$$

$$\tilde{a}_{ij} \frac{1}{K} (\tilde{a}_{ij}^{-1} \oplus \dots \oplus \tilde{a}_{ij}^{k} \dots \oplus \tilde{a}_{ij}^{K}, \tag{21}$$

where $\tilde{a}_{ij}^{k}$ is the selection rating of alternative Ai with respect to criterion Cj evaluation by the k[th] expert and

$$\tilde{a}_{ij}^{k} = \left(l_{ij}^{k}, m_{ij}^{k}, u_{ij}^{k}\right). \tag{22}$$

**Step 3.** Normalizing the decision matrix.

To normalize the fuzzy decision matrix, $\widetilde{R}$ is used as in *Eq. (23).*

$$\widetilde{R} = [\widetilde{r_{ij}}] mxn \; i= 1,2 \dots, m; j=1,2,\dots n. \tag{23}$$

The process of normalization is conducted as in *Eq. (24).*

$$\widetilde{r_{ij}} = \left(\frac{l_{ij}}{u_{ij}}, \frac{m_{ij}}{u_{ij}}, \frac{u_{ij}}{u_{ij}}\right), u_j^{+} = \max\{uij/i=1,2\dots n\}. \tag{24}$$

Additionally, it can set the best-aspired level $u_j^{+}$, and j=1,2,…n is equal to one; otherwise, the worst is zero [9].

For normalizing the weight of the decision matrix, the formulation is as in *Eq. (25).*

$$\widetilde{V} = [\widetilde{v_{ij}}] \; nxn, i=1,2,\dots,m; j=1,2\dots,n. \tag{25}$$

$$\text{Where} \quad \widetilde{v_{ij}} = \widetilde{r_{ij}} \otimes \widetilde{w_j}. \tag{26}$$

**Step 4.** Determining the FPIS and FNIS.

The Positive Triangular Fuzzy Numbers (PTFNs) are included in the interval [0.1], and the elements of the fuzzy decision matrix $\widetilde{v_{ij}}$ are normalized PTFNs. Therefore, the FPIS is defined as FPIS A+, and FNIS is defined as FNIS A-. The formulas are presented in *Eqs. (27)* and *(28).*

$$A+ = (\widetilde{v_1^{+}}, \dots \widetilde{v_j^{+}}, \dots \widetilde{v_n^{+}}), \tag{27}$$

$$A- = (\widetilde{v_1^{-}}, \dots \widetilde{v_j^{-}}, \dots \widetilde{v_n^{-}}), \tag{28}$$

where $\widetilde{v_j^{+}} = (1,1,1) \otimes \widetilde{w_j} = (lwj, mwj, uwj)$ and $\widetilde{v_j^{-}} = (0,0,0)$, j=1,2,…n [9].

**Step 5.** Calculating the distance of each apartment investor from FPIS and FNIS.

The distance ($\widetilde{d_i^{+}}$ and $\widetilde{d_i^{-}}$) of each apartment investor from A+ and A- can be calculated by *Eqs. (30)* and *(31).* According to the vertex method proposed, the distance between fuzzy numbers and B- is calculated as

$$D\,(\tilde{A}_1, \tilde{A}_2) = \sqrt{\frac{1}{3}[(l_1 - l_2)^2 + (m_1 - m_2)^2 + (u_1 - u_2)^2]}. \tag{29}$$

$$\widetilde{d_i^{+}} = \sum_{j=1}^{n} d(\widetilde{v_{ij}}, \widetilde{v_j^{+}}), I = 1,2,\dots, m; j = 1,2, \dots n. \tag{30}$$

$$\widetilde{d_i^{-}} = \sum_{j=1}^{n} d(\widetilde{v_{ij}}, \widetilde{v_j^{-}}), I = 1,2,\dots, m; j = 1,2, \dots n. \tag{31}$$

**Step 6.** Obtaining the closeness coefficient and rank the order of alternatives.

Now that the closeness coefficient is determined, it is possible to obtain the ranking order of alternatives that allows the most suitable alternative (apartment investor) to be selected by the decision-maker. *Eq. (32)* shows the calculation of the closeness coefficient.

$$CCi = \frac{\widetilde{d_i^{-}}}{d_i^{+} + d_i^{-}} = 1 - \frac{\widetilde{d_i^{+}}}{d_i^{+} + d_i^{-}}, i=1,2,\dots m, \tag{32}$$

where $\frac{\tilde{d_i^-}}{\tilde{d_i^+}+\tilde{d_i^-}}$ is the fuzzy satisfaction degree in the ith alternative, and $\frac{\tilde{d_i^+}}{\tilde{d_i^+}+\tilde{d_i^-}}$ is the fuzzy gap between the degrees in i$^{th}$.

From the formula, a large index value CCi indicates the good performance of the alternative Ai.

# 4 | Data Analysis

## 4.1 | Experts' Information Background

A total of 17 experts, including managers, consultants and scholars from the hotels and universities, participated in the survey. Four of the returned questionnaires were deemed invalid; they were returned to the experts for revisions. Three responses were excluded from the analysis because the experts refused to correct their answers. The results of this study are based on 17 experts. *Table 4* presents the experts' information.

**Table 4. Basic information of respondents.**

| No. | Position | Education | Years of Experience |
|---|---|---|---|
| 1 | Director of human resource | Bachelor | 25 |
| 2 | Director of human resource | MA/MSc | 28 |
| 3 | Director of human resource | Doctor | 25 |
| 4 | Director of human resource | MA/MSc | 20 |
| 5 | Director of human resource | Bachelor | 30 |
| 6 | Director of human resource | Bachelor | 20 |
| 7 | Director of human resource | Bachelor | 20 |
| 8 | Director of human resource | Bachelor | 22 |
| 9 | Training manager | MA/MSc | 18 |
| 10 | Food & Beverage director | Bachelor | 25 |
| 11 | Room division director | MA/MSc | 20 |
| 12 | Human resources director | Bachelor | 25 |
| 13 | Hotel general manager | Bachelor | 18 |
| 14 | Room division director | Bachelor | 20 |
| 15 | Hotel general manager | Bachelor | 20 |
| 16 | Hotel general manager | Bachelor | 22 |
| 17 | Hotel general manager | Bachelor | 18 |

Based on a review of previous studies on employee turnover behaviour and interviews with experts in the hotel industry, this study selected eight performance criteria including work itself, supervision, coworkers relationship, salary and benefit, career opportunities, job stress, perceived risk and job insecurity.

## 4.2 | FAHP Results

The importance comparison for each factor was performed via a questionnaire. The importance ranks of the performance criteria was assessed by 17 experts and converted from linguistic variables to equivalent fuzzy numbers. The geometric mean method by [41] was used to calculate each factor in the comparison matrix.
$\tilde{a}_{ij} = (\tilde{a}_{ij}^1 \otimes \tilde{a}_{ij}^2 \ldots \otimes \tilde{a}_{ij}^{17})^{1/17}$,

where $\tilde{a}ij$ is the element of row i column j of the matrix. Take $\tilde{a}12$ as an example
$\tilde{a}12=(2,3,4)\otimes(3,4,5)\otimes\ldots\otimes(7,8,9)1/17=((2\times3\times\ldots\times7)1/17,(3\times4\times\ldots\times8)1/17,$
$(4\times5\times\ldots\times9)1/17) = (2.10, 2.67, 3.26)$.

Next, the fuzzy weight for each factor was calculated. The following formula was used for the calculation ($\tilde{r}1$):

$\tilde{r}1 = (\tilde{a}11 \otimes \tilde{a}12 \otimes \tilde{a}13 \otimes \tilde{a}14 \otimes \tilde{a}15 \otimes \tilde{a}16 \otimes \tilde{a}17 \otimes \tilde{a}18)1/8$
$= ((1\times2.10\times\ldots\times0.51)1/8,\ (1\times2.67\times\ldots\times0.62)1/8,\ (1\times3.26\times\ldots\times 0.75)1/8) = (0.96,\ 1.17,$
$1.41)$.

Similarly, the $\tilde{r}i$ was obtained as follows:

$\tilde{r}2 = (0.51, 0.61, 0.74)$,
$\tilde{r}3 = (0.55, 0.66, 0.80)$,
$\tilde{r}4 = (1.68, 2.05, 2.47)$,
$\tilde{r}5 = (0.46, 0.55, 0.67)$,
$\tilde{r}6 = (1.12, 1.33, 1.58)$,
$\tilde{r}7 = (0.92, 1.10, 1.31)$,
$\tilde{r}8 = (1.10, 1.28, 1.49)$.

Similarly, the $\tilde{r}i$ was obtained as follows. Then, the factor weight ($\tilde{w}i$) for each factor was calculated with the following equation:

$$\tilde{w}1 = \tilde{r}1 \otimes [\tilde{r}3 \oplus \tilde{r}2 \oplus \tilde{r}4 \oplus \tilde{r}5 \oplus \tilde{r}6 \oplus \tilde{r}7 \oplus \tilde{r}8)-1 = ((0.96,\ 1.17,\ 1.41) \otimes (1/0.96+...+1.10),\ 1/(1/1.17+...+1.28),\ 1/(1.41+...+1.49)) = (0.09, 0.13, 0.19).$$

Similarly, $\tilde{w}I$ for each factor was as follows:

$B\tilde{w}2 = (0.05, 0.07, 0.10)$,
$\tilde{w}3 = (0.05, 0.08, 0.11)$,
$\tilde{w}4 = (0.16, 0.23, 0.34)$,
$\tilde{w}5 = (0.04, 0.06, 0.09)$,
$\tilde{w}6 = (0.11, 0.15, 0.22)$,
$\tilde{w}7 = (0.09, 0.13, 0.18)$,
$\tilde{w}8 = (0.10, 0.15, 0.20)$.

Using the COA method, BNP values in fuzzy number form for each factor were obtained as follows. Taking the BNP value for the A factor (design and quality) as an example, the following equation was used:

$$BNP = \frac{[(U_{w1}-L_{w1})+(M_{W1}-L_{w1})}{3} + L_{w1} = \frac{[(0.19-0.09)+(0.13-0.09)}{3} + 0.09 = 0.14.$$

Using the same calculation, the other BNP values for each factor are shown in *Table 6*.

After obtaining the crisp number of the BNP value, normalization was achieved using *Eq. (15)*. The obtained matrix is shown in *Table 5*. Using *Eq. (16)*, the normalized matrix was derived as in *Table 6*.

**Table 5. Defuzzification matrix.**

| | WO | SU | CO | SA | CA | JS | PE | JI |
|---|---|---|---|---|---|---|---|---|
| WO | 1.00 | 2.67 | 3.71 | 0.92 | 2.33 | 0.66 | 0.42 | 0.63 |
| SU | 0.38 | 1.00 | 0.89 | 0.48 | 0.87 | 0.39 | 0.90 | 0.42 |
| CO | 0.27 | 1.16 | 1.00 | 0.72 | 1.47 | 0.60 | 0.42 | 0.48 |
| SA | 1.13 | 2.13 | 1.42 | 1.00 | 3.11 | 2.71 | 2.95 | 3.91 |
| CA | 0.44 | 1.18 | 0.70 | 0.33 | 1.00 | 0.26 | 0.57 | 0.55 |
| JS | 1.55 | 2.61 | 1.71 | 0.38 | 3.88 | 1.00 | 1.09 | 0.95 |
| PE | 2.43 | 1.14 | 2.44 | 0.35 | 1.79 | 0.93 | 1.00 | 0.59 |
| JI | 1.63 | 2.45 | 2.13 | 0.26 | 1.87 | 1.06 | 1.71 | 1.00 |

**Table 6. Normalized matrix.**

| | WO | SU | CO | SA | CA | JS | PE | JI | MEAN |
|---|---|---|---|---|---|---|---|---|---|
| WO | 0.36 | 0.38 | 0.53 | 0.30 | 0.30 | 0.15 | 0.09 | 0.12 | 0.14 |
| SU | 0.14 | 0.14 | 0.13 | 0.15 | 0.11 | 0.09 | 0.19 | 0.08 | 0.07 |
| CO | 0.10 | 0.17 | 0.14 | 0.23 | 0.19 | 0.14 | 0.09 | 0.09 | 0.08 |
| SA | 0.41 | 0.31 | 0.20 | 0.32 | 0.40 | 0.62 | 0.63 | 0.72 | 0.24 |
| CA | 0.16 | 0.17 | 0.10 | 0.11 | 0.13 | 0.06 | 0.12 | 0.10 | 0.06 |
| JS | 0.55 | 0.38 | 0.24 | 0.12 | 0.50 | 0.23 | 0.23 | 0.17 | 0.15 |
| PE | 0.87 | 0.16 | 0.35 | 0.11 | 0.23 | 0.21 | 0.21 | 0.11 | 0.13 |
| JI | 0.58 | 0.35 | 0.30 | 0.08 | 0.24 | 0.24 | 0.36 | 0.18 | 0.14 |

The consistency indices were calculated using *Eqs. (17)-(19)*. The obtained results are

$\lambda = 8.7$; $CI. = 0.11 \Rightarrow$ with $n = 8 \Rightarrow RI = 1.41$, $CR = CI/RI = 0.08 < 0.1$.

So, the CR is acceptable. After obtaining the factor weight ($\widetilde{w}$), BNP value, and geometric mean matrix for each factor, the ordered ranking of factors is shown in *Table 7*.

*Table 6* shows the BNP importance weight and the geometric mean of eight factors that impact employee turnover in the hotel industry during COVID-19. The results in *Table 6* reveal the experts' experience and knowledge of the priority order of the selected factors in the research model. Salary and Benefits rank first with the highest BNP value (BNP = 0.24). Job stress ranks second (BNP = 0.16); job insecurity ranks third (BNP = 0.15). The fourth-ranking factor is Work Itself (BNP = 0.14), followed by Perceived Risk, which is ranked fifth (BNP = 0.13). Coworkers' relationships rank sixth (BNP = 0.05), and finally, supervision and career opportunities rank seventh (BNP = 0.07).

**Table 7. Rankings and local weights of factors.**

| Factor | Weight ($\widetilde{w}$) | BNP Value | Rank |
|---|---|---|---|
| Work itself | (0.09, 0.13, 0.19) | 0.14 | 4 |
| Supervision | (0.05, 0.07, 0.10) | 0.07 | 7 |
| Coworkers relationship | (0.05, 0.08, 0.11) | 0.08 | 6 |
| Salary and benefit | (0.16, 0.23, 0.34) | 0.24 | 1 |
| Career opportunities | (0.04, 0.06, 0.09) | 0.07 | 7 |
| Job stress | (0.11, 0.15, 0.22) | 0.16 | 2 |
| Perceived risk | (0.09, 0.13, 0.18) | 0.13 | 5 |
| Job insecurity | (0.10, 0.15, 0.20) | 0.15 | 3 |

As a result of FAHP, the study shows that the most important factors influencing employee turnover are salary and benefits. Moreover, the results indicate that the least important dimensions are coworkers' Relationships, Supervision, and Career Opportunities; the second group dimensions that impact employee turnover in the context of the COVID-19 epidemic are Work Itself, Job Stress, Perceived Risk, and Job Insecurity.

## 4.3 | Fuzzy TOPSIS

This study concentrated on the performance evaluation of apartment selection, so it was based on the linguistic term from the definitions of [9], [40]. The experts have their own range of linguistic variables used in this study according to their subjective judgment [9], [40]. The linguistic terms include "very low impacted", "low impacted", "fair", impacted", and "strong impacted" from the selection that term experts can use to express their opinions about the rating of each criterion of hotel class. *Table 8* shows the list of linguistic variables and their equivalent TFNs.

The geometric mean method by [41] was used to calculate each factor in the comparison matrix by applying *Eqs. (21)* and *(22)*, and the integrated matrix is shown in *Table 9*.

*Eqs. (23)* and *(24)* are applied to normalize the fuzzy decision matrix (*Table 10*).

The next step in the fuzzy TOPSIS analysis is to find the weighted fuzzy decision matrix by using *Eq. (25)*. *Table 11* shows the weighted normalized fuzzy decision matrix.

**Table 8. Linguistic variable.**

| Linguistic Variable | Triangular Fuzzy Number |
|---|---|
| Very low impacted | (0,1,3) |
| Low impacted | (1,3,5) |
| Fair | (3,5,7) |
| Impacted | (5,7,9) |
| Strong impacted | (7,9,10) |

**Table 9. Integrated matrix.**

| | Below Three-Star Hotel | Three-Star Hotel | Four and Five-Star Hotel |
|---|---|---|---|
| Work itself | (3.53, 5.35, 7.06) | (3.24, 4.94, 6.59) | (1.76, 3.35, 5.12) |
| Supervision | (2.29, 3.88, 5.65) | (2.35, 4.00, 5.82) | (3.29, 5.12, 6.88) |
| Coworkers relationship | (3.06, 4.94, 6.88) | 3.88, 5.65, 7.24) | (3.76, 5.59, 7.24) |
| Salary and benefit | (3.76, 5.59, 7.24) | (4.06, 5.94, 7.71) | (3.00, 4.65, 6.24) |
| Career opportunities | (1.94, 3.59, 5.53) | (2.76, 4.59, 6.59) | (4.47, 6.41, 8.06) |
| Job stress | (3.00, 4.76, 6.65) | (2.88, 4.65, 6.59) | (4.06, 5.94, 7.65) |
| Perceived risk | (2.41, 4.06, 5.94) | (3.24, 5.00, 6.82) | (3.41, 5.24, 7.00) |
| Job insecurity | (1.82, 3.47, 5.47) | (3.47, 5.24, 7.00) | (3.59, 5.47, 7.18) |

**Table 10. Normalized matrix.**

| | Below Three-Star Hotel | Three-Star Hotel | Four and Five-Star Hotel |
|---|---|---|---|
| Work itself | (0.50, 0.76, 1.00) | (0.46, 0.70, 0.93) | (0.25, 0.48, 0.73) |
| Supervision | (0.33, 0.56, 0.82) | (0.34, 0.58, 0.85) | (0.48, 0.74, 1.00) |
| Coworkers relationship | (0.42, 0.68, 0.95) | (0.54, 0.78, 1.00) | (0.52, 0.7, 1.00) |
| Salary and benefit | (0.49, 0.73, 0.94) | (0.53, 0.77, 1.00) | (0.39, 0.60, 0.81) |
| Career opportunities | (0.24, 0.45, 0.69) | (0.34, 0.57, 0.82) | (0.55, 0.80, 1.00) |
| Job stress | (0.39, 0.62, 0.87) | (0.38, 0.61, 0.86) | (0.53, 0.78, 1.00) |
| Perceived risk | (0.34, 0.58, 0.85) | (0.46, 0.71, 0.97) | (0.49, 0.75, 1.00) |

**Table 11. Weighted fuzzy decision matrix.**

| | Below Three-Star Hotel | Three-Star Hotel | Four and Five-Star Hotel |
|---|---|---|---|
| Work itself | (0.09, 0.13, 0.19) | (0.04, 0.09, 0.18) | (0.02, 0.06, 0.14) |
| Supervision | (0.02, 0.03, 0.08) | (0.02, 0.03, 0.08) | (0.02, 0.04, 0.10) |
| Coworkers relationship | (0.02, 0.05, 0.10) | (0.03, 0.06, 0.11) | (0.03, 0.06, 0.11) |
| Salary and benefit | (0.08, 0.17, 0.32) | (0.08, 0.18, 0.34) | (0.06, 0.14, 0.28) |
| Career opportunities | (0.01, 0.03, 0.06) | (0.01, 0.03, 0.07) | (0.02, 0.05, 0.09) |
| Job stress | (0.04, 0.09, 0.19) | (0.04, 0.09, 0.19) | (0.06, 0.12, 0.22) |
| Perceived risk | (0.03, 0.08, 0.15) | (0.04, 0.09, 0.18) | (0.04, 0.10, 0.18) |
| Job insecurity | (0.03, 0.07, 0.15) | (0.05, 0.11, 0.20) | (0.05, 0.11, 0.20) |

Next, we determine the fuzzy positive and fuzzy negative ideal reference points by defining the Fuzzy Positive-Ideal Solution (FPIS) as A+ and the Fuzzy Negative-Ideal Solution (FNIS) as A- (*Eqs. (27)* and *(28)*).

$A+ = [(1,1,1), (1,1,1), (1,1,1), (1,1,1), (1,1,1), (1,1,1), (1,1,1), (1,1,1)] \otimes \tilde{w}_j$
$= [(1,1,1), (1,1,1), (1,1,1), (1,1,1), (1,1,1), (1,1,1), (1,1,1), (1,1,1)] \otimes$
$[(0.09, 0.13, 0.19), (0.05, 0.07, 0.10), (0.05, 0.08, 0.11), (0.16, 0.23, 0.34), (0.04, 0.06, 0.09), (0.11, 0.15, 0.22) (0.09, 0.13, 0.18), (0.10, 0.15, 0.20)]$
$= (0.09, 0.13, 0.19), (0.05, 0.07, 0.10), (0.05, 0.08, 0.11), (0.16, 0.23, 0.34), (0.04, 0.06, 0.09), (0.11, 0.15, 0.22) (0.09, 0.13, 0.18), (0.10, 0.15, 0.20)$
$A- = (0, 0, 0), (0, 0, 0), (0, 0, 0), (0, 0, 0), (0, 0, 0), (0, 0, 0), (0, 0, 0), (0, 0, 0),$

Using *Eqs. (30)* and *(31)*, we obtain the matrixes of $d^-$ and $d^+$, as shown in *Tables 12* and *13*.

**Table 12. The matrix of $d^+$.**

| | WO | SU | CO | SA | CA | JS | PE | JI | $d^+$ |
|---|---|---|---|---|---|---|---|---|---|
| Below three-star hotel | 0.03 | 0.03 | 0.02 | 0.06 | 0.03 | 0.05 | 0.05 | 0.07 | 0.35 |
| Three-star hotel | 0.04 | 0.03 | 0.02 | 0.05 | 0.02 | 0.06 | 0.04 | 0.04 | 0.29 |
| Four and five-star hotel | 0.06 | 0.02 | 0.02 | 0.09 | 0.01 | 0.04 | 0.03 | 0.04 | 0.31 |

**Table 13. The matrix of $d^-$.**

| | WO | SU | CO | SA | CA | JS | PE | JI | $d^-$ |
|---|---|---|---|---|---|---|---|---|---|
| Below three-star hotel | 0.13 | 0.05 | 0.07 | 0.21 | 0.04 | 0.13 | 0.13 | 0.10 | 0.85 |
| Three-star hotel | 0.12 | 0.05 | 0.07 | 0.23 | 0.05 | 0.12 | 0.12 | 0.13 | 0.89 |
| Four and five-star hotel | 0.09 | 0.06 | 0.07 | 0.18 | 0.06 | 0.15 | 0.15 | 0.14 | 0.89 |

The final step is estimating the ranking and performance of the alternatives. The closeness coefficient of alternatives $d_1^-$ and $d_1^+$ is calculated as an example.

$$d_1^+ = 0.35;\ d_1^- = 0.89.$$

Since the distances from FPIS and FNIS are determined, the closeness coefficient can be obtained with *Eq. (32)*. Therefore, the index CC1 of the first alternative is calculated as

$$CC_1^- = \frac{0.89}{0.35+0.89} = 0{,}71.$$

$$CC_1^+ = \frac{0.39}{0.39+0.86} = 0.29.$$

$CC_i^-$ is defined as the satisfaction degree in the ith alternative and $CC_{1j}^+$ as the gap degree in the ith alternative [9]. Taking CC1 as an example, the result shows that the gap degree in the below three-star hotel should be improved to achieve the aspiration level and that obtaining the best win-win strategy is 0.29 among a fuzzy set of feasible alternatives, and the aspired/desired satisfaction degree of fuzzy TOPSIS is 1.00. Similarly, *Table 14* shows the turnover degree and gap degree of each class hotel. As a result, the turnover degree value of the three-star hotel is 0.75, which shows the highest value; the second is the Four and Five-star hotel with a turnover degree of 0.74, and the third is the below three-star hotel with a turnover degree of 0.71. In addition, the result also indicates the gap degree value of each class hotel. In this, the below three-star hotel has a gap degree value of 0.29, which is the highest value; the second is a Four and Five-star hotel with a gap degree value of 0.26, and the last one is a three-star hotel with a gap degree value of 0.25.

**Table 14. Closeness coefficients to the aspired level among three-class hotels.**

| | $d^-$ | $d^{\mp}$ | Gap Degree of $CC_i^+$ | Satisfaction Degree of $CC_i^-$ |
|---|---|---|---|---|
| Below three-star hotel | 0.85 | 0.35 | 0.29 | 0.71 |
| Three-star hotel | 0.89 | 0.29 | 0.25 | 0.75 |
| Four and five-star hotel | 0.89 | 0.31 | 0.26 | 0.74 |

## 4.4 | Discussion

This research shows that salary has the strongest impact on turnover intention (rank 1; gm 0.45); these are new findings that some other research has not shown. For example, it was only discussed that salary is the basic factor impacting turnover intention, but in the content of the research, many factors impact turnover intention. The authors have not shown the specific level of influence of each factor on the turnover intention and especially on the salary. Some other arguments show that the turnover intention of hotel employees is largely due to the illegitimacy of the employee; therefore, it was accompanied by unsecured welfare policies [44]. In addition, due to the gender structure (about 52% are women), taking care of family and other problems, including the overload of stress in work, are the most important factors leading to turnover intention [45]. According to a study [46], an unsatisfied job is the most influential factor in turnover intention; the work environment and opportunities for promotion or communication with the head of management are also the most influential factors.

In contrast to the above research, the research in Iran shows that the salary, including basic salary and other incomes, is the most influential factor in the turnover intention of hotel employees. The new finding of this research in Iran is that although low per capita income, hotel employees are mainly at a young age. They need to earn more money to live and also to take care of their families, so a good salary is vital for them. In addition, from 2020 to now, due to the effect of the COVID-19 pandemic, hotel employees often have to attend to a non-permanent work schedule, leading to unstable income, so salary is a prerequisite factor to live. Stress in work is the second most influential factor on turnover intention mentioned above (rank 2; gm 0.3). According to experts' opinion, working in a hotel has high psychological pressure, leading to exhaustion. Still, during this period, hotel employees are not only stressed by their work but also stressed by the prevention of the COVID-19 pandemic taking care of their families under the pressure of income. That is the reason why income and stress from work are factors that have the highest influence on turnover intention.

Job insecurity is the third influencing factor (rank 3; gm 0.29), and work itself is the fourth influencing factor (rank 4; gm 0.28), the turnover intention. Job insecurity is the third influencing factor (rank 3; gm 0.29), and work itself is the fourth influencing factor (rank 4; gm 0.28) to the intention of leaving hotel staff. From 2020 to now, the impact of COVID-19 on the hotel business and employees working in the hotel industry. The influence of job insecurity and work itself on the turnover intention has reflected the current situation of the hotel itself. The relationship between work itself and job insecurity is very close; according to the experts, work itself reflects the level of job insecurity with contents such as the characteristics of the job, the advantages or disadvantages of the job, the risk of the job during the COVID-19 quarantine period inside hotels, the risk of serving quarantined guests at hotels allowed by the government, impact of hotel closures on employees working in hotels in areas affected by the COVID-19 pandemic. Based on research data, it has been shown that job insecurity and work itself in Iran have a strong influence on turnover intention; this is different from some research, such as [47], which indicated that job insecurity has the strongest impact in the research, most of the employees feel insecure at work. However, the authors have not shown the influence of job insecurity on turnover intention. Job insecurity research is based on two groups: the severity of the threat and powerlessness, which are six observed variables [48].

In this study, the authors only show the negative impact of the severity of threat and powerlessness on job engagement and thereby affect the turnover intention; it only examined the impact of artificial intelligence on hotel employees through job insecurity perspectives. Job insecurity had negative effects on job engagement [15], [49], and job insecurity and engagement affect turnover intention [21]. In this research, the author only researches the influence of three factors without specifying the level of influence of each factor. The remaining four factors have a low impact in descending order on the intention of leaving hotel personnel: perceived risk (rank 5; gm 0.28), coworker relationship (rank 6; gm 0.14), supervision (rank 7; gm 0.13), career opportunities (rank 8; gm 0.12) showed that there was a difference in comparison with the study of [46]. The remaining four factors have a low impact in descending order respectively on the turnover intention: perceived risk (rank 5; gm 0.28), coworker relationship (rank 6; gm 0.14), supervision (rank 7; gm 0.13), career opportunities (rank 8; gm 0.12) showed that there were differences to the research of [46], these are new points of the research show the different impact of factors on the turnover intention of hotel employees before and after the COVID-19 pandemic.

# 5 | Conclusions

This study aims to construct a fuzzy AHP and fuzzy TOPSIS model to evaluate the dimensions of the hotel employee turnover intention model. The performance evaluation for employee turnover intention includes work itself, supervision, coworkers' relationships, salary and Benefits, career opportunities, job stress, perceived risk, and job insecurity. These dimensions generate a final evaluation for ranking priority among the employee turnover intention of the proposed model. Experts evaluate the importance of dimensions, and decision-making is processed through the fuzzy concept and fuzzy environment. From the steps of fuzzy AHP and fuzzy TOPSIS, this study finds that the most important dimensions in the hotel employee turnover intention model are salary and benefits. Moreover, the results indicate that the least important dimensions are the coworkers relationship, supervision, and career opportunities; the second group dimensions that impact employee turnover in the context of the COVID-19 epidemic are work itself, job stress, perceived risk and job insecurity. In addition, this study's results show that a Three-star hotel has the highest value of turnover intention; the second is the Four and Five-star hotel, and the third is the Below three-star hotel.

The rapidly evolving COVID-19 situation is posing many new challenges in terms of job security. The emergence of the epidemic has completely changed the perspective and normal operation of the structure of global production and trade, in which the service industries are the heaviest impacted. As a country with great potential for tourism, Iran has been making great efforts to realize the dual goal of disease control and economic development, including the hospitality industry. However, the research results show that the anxiety and stress of tourism employees towards their work are clearly expressed. The research results also show that insecurity and reduced income are the most important factors impacting employee turnover. Previous studies such as [21] also showed similar results when studying hotel employees' intention to leave their jobs. However, the results of these studies come from traditional causes; the observed variables (concepts) in the study are not directly associated with the COVID-19 epidemic.

The results of the study will help businesses in the field of hospitality have a more comprehensive view of human resource management activities. Having a clearer and deeper understanding of the employees' thoughts, managers shall make more appropriate policies, make employees sympathize, and be willing to share the difficulties that the business is facing and, at the same time, retain employees, especially highly skilled workers. Hotels need to take steps to give employees a stable mentality, peace of mind to work, love their job and believe in the future development of the tourism industry after the pandemic, thereby limiting the intention to leave. Businesses and workers need to grasp the labour demand of the economy in the context of transforming production methods to meet new requirements. Enterprises need to change the way they arrange work to protect the health of workers and create a safe mentality for employees while working. It is necessary to strictly adhere to the 5K+ Vaccine message, actively sourcing vaccines, and encourage employees to fully and timely vaccinate.

By integrating the fuzzy AHP and fuzzy TOPSIS method to evaluate the hotel employee turnover intention model, this study provides implications for hotel managers in understanding employee behaviour and their turnover intention during the context of the COVID-19 epidemic based on 8 proposed dimensions. Moreover, this study also provides the turnover degree and gap degree to improve the aspiration level and achieve the best strategy to maintain good employees in the hotel industry. In addition to the implications, there are some limitations in this research, including the dimension selected in this proposed model and the hotel class. Therefore, for future research, the same model can be used for other case studies by considering different dimensions. Moreover, other methods of MCDM, such as VIKOR and ELECTRE, should be used to generate this study result.

Regarding the methodology, FAHP is utilized to determine the influential weights of criteria that are utilized in TOPSIS for preference values among alternatives. We demonstrate the applicability of the proposed methods to solving an MCDM problem of assessing the factors affecting the intention of leaving hotel employees. The computational experiment results of our hybrid FAHP-TOPSIS model support the efficacy of incorporating fuzzy values concerning influential weight criteria. The framework can help managers better evaluate the systematic influential relation structure among factors influencing employee turnover intention in the hotel industry.

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# Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

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