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Application of MCDM methods to Qualified Personnel Selection in Distribution Science: Case of Logistics Companies

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Abstract

Purpose: This study aims to propose an integrated MCDM model to support the qualified personnel selection in the distribution science**. Research design, data, and methodology:** The integrated approach of AHP and TOPSIS was employed to address the personnel selection problem. The AHP method was used to define the weights of the selection criteria, whereas the TOPSIS was applied to rank alternatives. The proposed model was then applied into a leading logistics company to select the best alternatives to be the sales deputy manager. **Results:** The results showed that Candidate 3 is the most qualified personnel for the sales deputy manager position as he is ranked first in the order of preference for recruitment. **Conclusions:** The proposed model provides the decision makers with more effective and time-saving methods than conventional ones. Therefore, the model can be applied to personnel selection around the world. In terms of theoretical contribution, this study proposes a personnel selection model for choosing the most appropriate candidates. In addition, the study adds to the theory of human resources management and logistics management the full set of personnel selection criteria including education, experience, skills, health, personality traits and foreign language.

Keywords: AHP, Distribution Science, Logistics, MCDM, Qualified Personnel Selection, TOPSIS

JEL Classification Code: M12, M51, O15

1. Introduction

Logistics is one of the fastest growing industries in Vietnam. Its growth rate has reached 15 per cent to 16 per cent in recent years. As per the World Bank's report on Logistics Performance Index in 2018, Vietnam ranked 39 out of 160 countries, rising 25 places from its position in 2016 and being in the top three of ASEAN countries (World Bank, 2018). To meet the strong and fierce growth of the logistics industry, there exists a large demand on its human resources, which will be up to 2.2 million employees by 2030. However, the personnel selection remains a hard issue for the logistics companies, especially qualified employee selection as they have to re-train both hard skills (professional knowledge) and soft skills (such as communication and negotiation skills, leadership skills and time management skills, etc.) for fresh employees after recruiting them, which is time consuming and costly.

The distribution science of logistics professional selection is then a critical factor for successful logistics management. In fact, personnel selection which depends on the company's development strategies, recruitment policies, and the individual preferences of the decision makers is a greatly complicated problem. Therefore, the qualified personnel selection problem can be considered as a multi-criteria decision-making problem (Hoang & Nguyen, 2020).

Qualified personnel selection problems usually involve numerous quantitative and qualitative criteria. A practicable approach to such problems is the application of multi-criteria decision-making (MCDM) methods to build specialized MCDM models. There are various MCDM

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methods to support the decision-makers in selecting appropriate personnel such as Simple Additive Weighting (SAW), Analytical Hierarchy Process (AHP), Analytical Network Process (ANP), Order Preference Similarity to the Ideal Solution (TOPSIS). However, there is a dearth of research on proposing a comprehensive personnel selection model for the logistics industry. For that reason, in this research, an attempt to propose an integrated MCDM model based on AHP and TOPSIS has been made to support the selection of qualified personnel in the distribution science of the logistics companies. The proposed model was then applied into a practical case of one logistics company to demonstrate its feasibility.

2. Literature Review

2.1. Qualified Personnel for the Logistics Industry

As per Article 233 in Law on Commerce of Vietnam 2005, logistics services are commercial activities whereby traders organize one or more jobs including receipt of goods, transportation, storage, warehousing, customs clearance, other paperwork, and consulting customers, packaging, marking, delivery, or other services related to the goods as agreed with customers for remuneration. In addition, the logistics industry covers and provides services to numerous industry sectors involving retailing, processing, manufacturing, fishing, agriculture, mining, tourism etc. Logistics jobs can be seen in different sizes of business covering from small to large enterprises, from national to multi-national companies. Under that fact, laborers in the logistics industry need to have wide knowledge and multiple skills.

Myer, Griffith, Daugherty, and Lusch (2004) stated that experience, education, and soft skills (including social skills, problem-solving skills, time-management skill, and decision-making skill) influence the working performance of logistics employees. Thai, Cahoon, and Tran (2011) classified the logistics skills into three categories comprising business, logistics and management. The business and logistics skills coped with professional knowledge. That means logistics companies look for competent candidates with appropriate education and experience. In 2020, Kelemenis and Askounis also affirmed in their research that enterprises often put a focus on 02 groups of personnel selection criteria including hard skills and soft skills. Hard skills cover experience, professional knowledge, and educational background whilst soft skills comprise communication skill, time management skill and change adaptability. With the change adaptability skill, candidates need to show their ability to work in a dynamic and persistently changing environment.

Poist, Scheraga, and Semeijn (2001) in their study about the skill requirements for logistics managers found that in addition to logistics knowledge, the top five necessary skills for a logistics manager included communication skill, computer skill, adaption ability, multi-functional capabilities, and foreign language. In these five criteria, foreign language is especially significant, as the prime function of the logistics industry is to enable business between other countries. In 2013, Wu, Huang, Goh, and Hsieh proposed 50 skills necessary for logistics managers. One of the top five skills was also foreign language, accompanied with communication, decision making, risk management and international perspective. In 2017, Ozdemir, Nalbant, and Basligil in their study about evaluation of personnel selection criteria stated that there were a wide range of criteria affecting personnel selection decisions. Those criteria were divided into five main criteria and 23 sub-criteria. One of the essential criteria in this study was foreign language criterion. Later on, many other researchers also confirmed the significant role of foreign language in the logistics personnel selection in their studies (Lin & Chang, 2018; Kotzab, Teller, Bourlakis, & Wünsche, 2018; Prapinit, Sabar, & Melan, 2019).

Further, personality traits also affect the job performance of logistics employees, which are shaped by the job position. For instance, senior personnel are often extroverts whilst middle management personnel are conscientious (Autry & Daugherty, 2003; Richey, Tokman, & Wheeler, 2006). For highly skilled employees, the need for success is also deemed as a good personality trait. It shows that those employees have set their job goals and a way to achieve them (Richey et al., 2006).

According to Nong and Ha (2020), the personnel selection decision depended on four main criteria including knowledge, skills, health, and personality traits. The emerging criterion in this research is health. Employee's health covers from physical, mental to social health. Physical health includes endurance, cleverness, and the ability to confront the severe working conditions. Mental health involves the state of psychological and spiritual satisfaction. Lastly, mental health is denoted in the close relationship with family, colleagues, and friends. The better the health is, the higher the job performance is.

To summarize, numerous criteria can be considered to evaluate qualified personnel in the logistics industry including experience, education, skills, personality traits, foreign language, and health.

2.2. Personnel Selection and MCDM

The personnel selection, one of the problems of MCDM, has attracted the concerns of many scholars. So far, numerous personnel selection techniques have been proposed for the same purpose of employing the right person for the right job. A scientific approach for the selection process is really prerequisite for efficient selection methods.

Before starting the selection of qualified personnel, it is of necessity to define selection criteria and their weights. Common methods to determine the selection criteria involve Delphi method (Chang, 2015; Nguyen, 2021), focus group (Kusumawardani & Agintiara, 2015; Nabeeh, Smarandache, Abdel-Basset, El-Ghareeb, & Aboelfetouh, 2019), literature review (Urosevic, Karabasevic, Stanujkic, & Maksimovic, 2017; Heidary Dahooie, Beheshti Jazan Abadi, Vanaki, & Firoozfar, 2018; Ulutaş Popovic, Stanujkic, Karabasevic, Zavadskas, & Turskis, 2020) or an integrated approach of literature review, indepth interview and exploratory factor analysis (Nong & Ho, 2019). These are the most popular approaches to propose criteria for the personnel selection.

With regard to the determination of selection criteria weights and ranking the candidate alternatives, different MCDM techniques have been introduced. Güngör, Serhadlıoğlu, and Kesen (2009) applied fuzzy Analytic Hierarchy Process (AHP) to derive the weights of selection criteria and rank the best personnel. Using only one MCDM method to select employees was also preferred by some other authors. For example, Bolelli (2019) and Nalbant and Ozdemir (2018) utilized fuzzy Vlsekriterijumska Optimizacija I Kompromisno Resenje (VIKOR) to employ a Region Manager for a pharmaceutical company or Sutrisno, Hidayat, Bastari, and Suharyo (2019) proposed to use *Simple Addictive Weighting Method (SAW) for the personnel selection problem.* On the contrary, many authors choose integrated approaches to derive the weights and evaluate the alternatives. Sutrisno et al. (2019) proposed to use fuzzy number to define the selection criteria and derive their weights. Fuzzy technique for order preference by similarity to ideal solution (TOPSIS) was then applied to prioritize the alternatives. Chang (2015) applied the method of hybrid MCDM to select public relations personnel for tourism industry in Taiwan, whereby analytic network process (ANP) and TOPSIS were used. To define the weights of criteria, the author employed ANP. Then, TOPSIS was conducted to rank the alternatives. Urosevic et al. (2017) proposed to use the Stepwise Weight Assessment Ratio Analysis (SWARA) method for the determination of criteria weights and the Weighted Aggregates Sum Product Assessment (WASPAS) method for choosing the best candidates. In 2018, Heidary Dahooie et al. also suggested to apply SWARA to derive the criteria weights for choosing information technology experts.

However, these authors proposed grey additive ratio assessment (ARAS-G) method to provide the final alternative instead of WASPAS. Also, Stanujkic, Popovic, and Brzakovic (2018) used SWARA to derive the criteria weight, but employed Evaluation based on Distance from Average Solution (EDAS), which was developed by Ghorabaee in 2015 to define the ranking of the alternatives. Choosing the right personnel for the right position is significant and critical for enterprises. Especially, when there exist personal judgments in the decision-making process. For that reason, Kusumawardani & Agintiara (2015) proposed to apply fuzzy AHP – TOPSIS method for weighting the relative significance of criteria and selecting the best candidate who was nearest to the positive ideal and furthest to the negative ideal, respectively. Fuzzy AHP has been chosen to combine with other MCDM methods in the personnel selection process by many researchers because of its robust results. In 2016, Salehi combined fuzzy AHP with fuzzy VIKOR whereas Ali, Nikolić, and Zahra (2017) proposed to use fuzzy AHP with SAW to solve the personnel selection problem. In 2018, Çelikbilek employed another different hybrid approach of gray AHP – Multi-Objective Optimization on the basis of Ratio Analysis (MOORA) for health manager selection. In terms of MOORA, it refers to a matrix of retroaction of alternatives to objectives, to which ratios are employed. Similarly, Nabeeh, Smarandache, Abdel-Basset, El-Ghareeb, and Aboelfetouh (2019) prefered neutrosophic AHP with TOPSIS to illustrate an ideal solution amongst different alternatives. According to the authors, the preferences among criteria could not be obviously defined by decision makers in real life. Thus, this proposed method may overcome the uncertainty and inconsistency in judgement environment. In 2020, Ozdemir & Nalbant applied Consistent fuzzy preference relations (CFPR) and fuzzy AHP in defining the criteria weights and ranking the personnel alternatives, respectively. Uslu et al. (2021) combined fuzzy AHP with MULTIMOORA to weigh the selection criteria and to select the best candidate for the qualified manager position in a healthcare facility. In addition to fuzzy AHP and the above methods, there exist many other approaches, namely Decision-making trial and evaluation laboratory (DEMATEL), ELimination Et Choix Traduisant la REalité (ELECTRE), Evaluation based on Distance from Average Solution (EDAS), Preference ranking organization method for enrichment evaluation (PROMETHEE), intuitionistic fuzzy set (IFS), etc. Yalçın and Yapıcı Pehlivan (2019) employed hesitant fuzzy linguistic terms to cope with the personnel selection decision. In order to validate the results of this method, the authors used fuzzy WASPAS, fuzzy ARAS, fuzzy EDAS, and fuzzy TOPSIS to analyze the same data and re-check the selection results. It was denoted from the experiment result that the methodology was stable and powerful in the personnel selection problem. Kilic, Demirci, and Delen

(2020) utilized DEMATEL and ELECTRE approaches to choose the best candidate for the air-filter manufacturing position. Krishankumar, Premaladha, Ravichandran, Sekar, Manikandan, and Gao (2020) combined IFS with VIKOR method to solve the personnel selection problem effectively.

Table 1: A summary table of MCDM methods to evaluate and select qualified employees

Ordinal number	Methods to derive weights of selection criteria	Methods to prioritize the alternatives	Author (year)
1	Fuzzy AHP		Güngör et al. (2009)
2	Fuzzy VIKOR		Bolelli (2019)
3	Fuzzy VIKOR		Nalbant & Ozdemir (2018)
4	SAW		Sutrisno et al. (2019)
5	Hesitant fuzzy linguistic terms		Yalçın & Yapıcı Pehlivan (2019)
6	Fuzzy number	Fuzzy TOPSIS	Sang et al. (2015)
7	ANP	TOPSIS	Chang (2015)
8	Fuzzy AHP	TOPSIS	Kusumawardani & Agintiara (2015)
9	Fuzzy AHP	Fuzzy VIKOR	Salehi (2016)
10	SWARA	WASPAS	Urosevic et al. (2017)
11	Fuzzy AHP	SAW	Ali et al. (2017)
12	SWARA	ARAS-G	Heidary Dahooie et al. (2018)
13	SWARA	EDAS	Stanujkic et al. (2018)
14	Gray AHP	MOORA	Çelikbilek (2018)
15	Neutrosophic AHP	TOPSIS	Nabeeh et al. (2019)
16	CFPR	Fuzzy AHP	Ozdemir & Nalbant (2020)
17	*ANP*	PROMETHEE-AS	Chuang et al. (2020)
18	*DEMATEL*	ELECTRE	Kilic et al. (2020)
19	IFS	VIKOR	Krishankumar et al. (2020)
20	Fuzzy AHP	MULTIMOORA	Uslu et al.(2021)

To summarize, there has been various literature on the application of MCDM methods to the personnel selection (see Table 1). Among these methods, fuzzy AHP is the most popular multi criteria decision making method, which solves the decision-making problems by arranging each problem into hierarchy with different criteria. In addition, it can be seen from the literature that no research is dedicated to the qualified personnel selection problem in the logistics industry. Therefore, this study aims to develop a comprehensive MCDM approach to the personnel selection of the logistics industry.

3. Research Design and Methodology

3.1 Research Process

As stated earlier, the general goal of this research is to develop a personnel selection model. Therefore, the research process comprises different steps (see Figure 2):

Step 1: Analyze the current situation of the personnel selection problem in the logistics industry to set up the selection goal/ requirements.

Step 2: Define the personnel selection criteria.

The personnel selection criteria are defined based on the literature and expert interviews and then three-tier hierarchical structure is formed with the goal, criteria, and alternatives (see Figure 1).

Step 3: Apply the AHP method to calculate the weights of the criteria.

Step 4: Check the consistency ratio (CR) of the AHP results. If the CR meets the requirements, step 5 will be executed, otherwise go back to step 3.

Step 5: Employ the TOPSIS method to rank the alternatives. The ranking is concluded based on the relative nearness to the ideal solution.

Justification for the selection of AHP and TOPSIS method.

The proposed model is based on an AHP-TOPSIS approach to define the selection criteria weights and rank the alternatives. This hybrid approach is proposed because of the following reasons:

In terms of AHP, an extensive review of the personnel selection literature shows that among the methods mentioned, AHP is the most popularly used method in practice. It provides an effective, easy-to-use, and convenient tool for deriving the weights of both quantifiable and unquantifiable criteria through a simple, flexible, and available software to do quick calculation (Prusak, Stefanów, Niewczas, & Sikora, 2013; Salehi, 2016). Further, Ayhan (2013), who had made a comprehensive review on methodologies for selection problem, categorized AHP as the best, most important and outranked method.

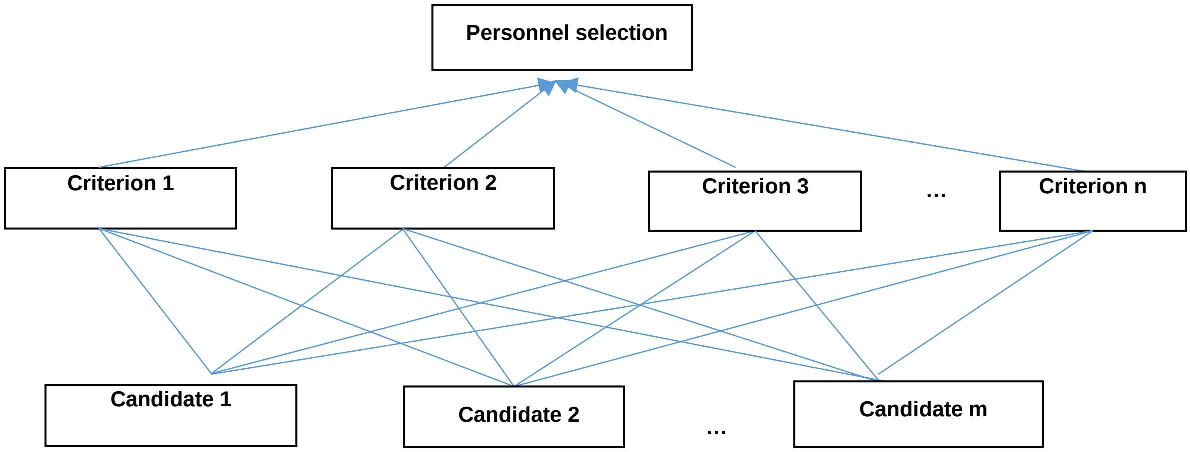

Figure 1: Hierarchical research model

Regarding TOPSIS, it provides consistent results in evaluating and choosing the best candidates from the private evaluations of experts in the recruitment council (Korkmaz, 2019). In addition, this approach was also chosen due to its simplicity, ease of use and composition of both internal and external, emotional, and unemotional criteria.

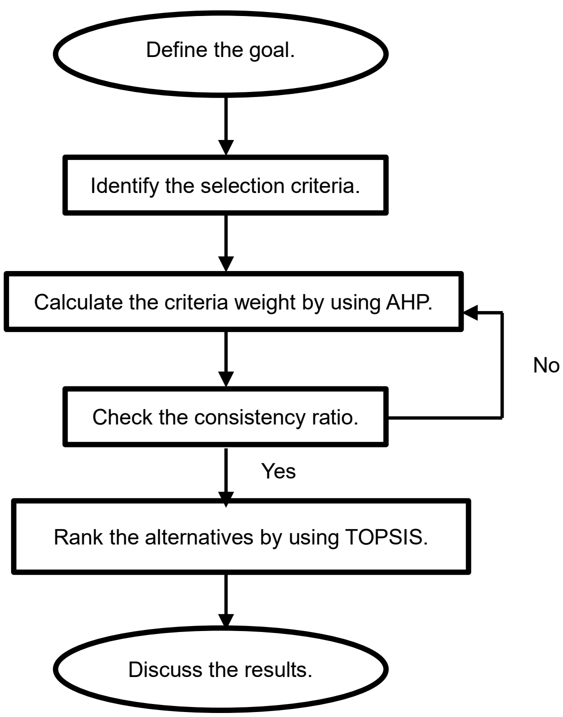

Figure 2: Research process

3.2 Research Methodology

3.2.1 Analytic Hierarchy Process – AHP

The AHP method was developed by Saaty and published in his book, *The Analytic Hierarchy Process,* in 1980. Using the AHP to define the criteria weights can be presented as follows:

Step 1: Build the hierarchical structure.

The hierarchical structure involves at least three levels. The first level is the model goal. The second level comprises a set of *n* criteria. At the third level, a set of *m* alternatives is determined.

Step 2: Set up pairwise comparison matrices for the criteria.

Pairwise comparisons are conducted basing on questionnaires. A scale from 1 to 9 is applied to represent equal importance to extreme importance (Tzeng & Huang, 2011). Pairwise comparison matrix is as follows:

$$A = \begin{bmatrix} a_{11} & \cdots & a_{1j} & \cdots & a_{1n} \\ \vdots & & \vdots & & \vdots \\ a_{i1} & \cdots & a_{ij} & \cdots & a_{in} \\ \vdots & & \vdots & & \vdots \\ a_{n1} & \cdots & a_{nj} & \cdots & a_{nn} \end{bmatrix},$$

Where, a_{ij} is the level of evaluation between the i^{th} and the j^{th} criteria.

$a_{ij} > 0$, $a_{ij} = 1/a_{ji}$, $a_{ii} = 1$.

Step 3: Estimate the relative weights.

The weight matrix is presented as follows:

$$W = \begin{array}{c} w_1 \\ \vdots \\ w_i \\ \vdots \\ w_n \end{array} \overset{\begin{array}{ccccc} w_1 & \cdots & w_j & \cdots & w_n \end{array}}{\begin{bmatrix} w_1/w_1 & \cdots & w_1/w_j & \cdots & w_1/w_n \\ \vdots & & \vdots & & \vdots \\ w_i/w_1 & \cdots & w_i/w_j & \cdots & w_i/w_n \\ \vdots & & \vdots & & \vdots \\ w_n/w_1 & \cdots & w_n/w_j & \cdots & w_n/w_n \end{bmatrix}}.$$

Multiply W with w:

$$W \times w = \begin{array}{c} w_1 \\ \vdots \\ w_i \\ \vdots \\ w_n \end{array} \overset{\begin{array}{ccccc} w_1 & \cdots & w_j & \cdots & w_n \end{array}}{\begin{bmatrix} w_1/w_1 & \cdots & w_1/w_j & \cdots & w_1/w_n \\ \vdots & & \vdots & & \vdots \\ w_i/w_1 & \cdots & w_i/w_j & \cdots & w_i/w_n \\ \vdots & & \vdots & & \vdots \\ w_n/w_1 & \cdots & w_n/w_j & \cdots & w_n/w_n \end{bmatrix}} \begin{bmatrix} w_1 \\ \vdots \\ w_j \\ \vdots \\ w_n \end{bmatrix} = n \begin{bmatrix} w_1 \\ \vdots \\ w_j \\ \vdots \\ w_n \end{bmatrix}$$

or (W-nI) w = 0

The comparative weights can be obtained by multiplying the eigenvector w by λmax such that Aw = λmax.w, where λmax is the highest value of the matrix A, which means find the eigenvector w with respective λmax for (A- λmax I)w = 0.

Step 4: Check the consistency ratio – CR.

In this step, the consistency ratio will be checked with the threhold of CR value is 10%. If the consistency index is less than 0.1, the result will be reliable, or else the expert's evaluations remain inconsistent and need to be re-evaluated. The equation of CR is as follows:

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

With CI as Consistency Index: $CI = \frac{\lambda_{max} - n}{n-1}$

Where λ_{max} is the highest value of the matrix, and n is the number of criteria.

The Random Index (RI) can be determined based on the number of criteria (Tzeng & Huang, 2011).

3.2.2. The Technique for Order Preference by Similarity to The Ideal Solution – TOPSIS

The TOPSIS method was introduced by Hwang and Yoon (1981) to define the best alternative based on the compromise solution, whereby the solution with the nearest distance from the ideal solution and the farthest distance from the negative ideal solution would be chosen (Tzeng & Huang, 2011). The TOPSIS procedure is described as follows:

- Let x_{ij} score of option i with respect to criterion j

We have a matrix $X = (x_{ij})$ m×n matrix.

- Let J be the set of benefit attributes or criteria (more is better)
- Let J' be the set of negative attributes or criteria (less is better)

Step 1: Construct normalized decision matrix.

This step transforms various attribute dimensions into non-dimensional attributes, which allows comparisons across criteria.

Normalize scores or data as follows:

$$r_{ij} = x_{ij} / \sqrt{(\Sigma_i x^2_{ij})} \quad \text{for } i = 1, \ldots, m; j = 1, \ldots, n$$

Step 2: Construct the weighted normalized decision matrix.

- Assume we have a set of weights for each criterion w_j for j = 1,…n.

Multiply each column of the normalized decision matrix by its associated weight.

- An element of the new matrix is:

$$v_{ij} = w_j \, r_{ij}$$

Step 3: Determine the ideal and negative ideal solutions.

- Ideal solution.

$$A^* = \{ v_1^*, \ldots, v_n^* \}, \text{ where}$$

$$v_j^* = \{ \max_i (v_{ij}) \text{ if } j \in J ; \ \min (v_{ij}) \text{ if } j \in J' \}$$

- Negative ideal solution.

$$A' = \{ v_1', \ldots, v_n' \}, \text{ where}$$

$$v' = \{ \min_i (v_{ij}) \text{ if } j \in J ; \ \max (v_{ij}) \text{ if } j \in J' \}$$

Step 4: Calculate the separation measures for each alternative.

- The separation from the ideal alternative is:

$$S_i^* = [\Sigma_j (v_j^* - v_{ij})^2]^{½} \qquad i = 1, \ldots, m$$

- Similarly, the separation from the negative ideal alternative is:

$$S'_i = \left[\sum_j (v_j' - v_{ij})^2 \right]^{1/2} \qquad i = 1, \ldots, m$$

Step 5: Calculate the relative closeness to the ideal solution C_i^*

$$C_i^* = S'_i / (S_i^* + S'_i), \qquad 0 < Ci^* < 1$$

Select the Alternative with C_i^* closest to 1.

4. Findings

To demonstrate the practicality of the proposed process for the qualified personnel selection, the authors applied it into a prestige logistics company. The selection and evaluation of qualified candidates is as presented in the preceding part.

Step 1: Analyze the current situation of the personnel selection problem in the logistics industry to set up the selection goal/ requirements.

The logistics company would like to employ a sales deputy manager. After examining and classifying candidates' profiles that were unqualified for qualifications and health certificates, there were five candidates chosen to the evaluation stage. The recruitment council of the company, including human resource manager, general director, sales manager, was set up for the purpose of sales deputy manager evaluation and selection.

Step 2: Define the personnel selection criteria.

The recruitment council was asked to define selection criteria by using the criteria explored in the literature. All members of the recruitment council gladly accepted the selection criteria explored from the literature and no more criteria were added. The criteria used in the assessment and selection procedure involve:

- Education in logistics
- Experience in logistics
- Soft skills
- Personality trait
- Health
- Foreign language

Consequently, goal, selection criteria and alternatives were structured in a hierarchical form, where the goal – selection of the most qualified candidate for the sales deputy manager position – was in the first level and six criteria were placed in the second level. Five alternatives were in the third level of hierarchy.

Step 3: Apply the AHP method to calculate the weights of the criteria.

The authors employed the AHP method to define the weight of six criteria. The results are shown in Table 2, Table 3, and Table 4.

Table 2: Comparison matrix for criteria.

	Education	Experience	Skills	Personality	Health	Language
Education	1	1/2	3	4	4	2
Experience	2	1	5	6	6	4
Skills	1/3	1/5	1	2	2	1/2
Personality	1/4	1/6	1/2	1	1	1/2
Health	1/4	1/6	1/2	1	1	1/2
Language	1/2	1/4	2	2	2	1

Table 3: Normalized matrix for criteria.

	Education	Experience	Skill	Personality	Health	Language
Education	0.2308	0.2190	0.2500	0.2500	0.2500	0.2353
Experience	0.4615	0.4380	0.4167	0.3750	0.3750	0.4706
Skills	0.0769	0.0876	0.0833	0.1250	0.1250	0.0588
Personality	0.0577	0.0730	0.0417	0.0625	0.0625	0.0588
Health	0.0577	0.0730	0.0417	0.0625	0.0625	0.0588
Language	0.1154	0.1095	0.1667	0.1250	0.1250	0.1176

Table 4: Define weights for criteria.

Education	(0.2308 + 0.2190 + 0.2500 + 0.2500 + 0.2500 + 0.2353)/6 = 0.2392
Experience	(0.4615 + 0.4380 + 0.4167 + 0.3750 + 0.3750 + 0.4706)/ 6 = 0.4228
Skills	(0.0769 + 0.0876 + 0.0833 + 0.1250 + 0.1250 + 0.0588)/6 = 0.0928
Personality	(0.0577 + 0.0730 + 0.0417 + 0.0625 + 0.0625 + 0.0588)/6 = 0.0594
Health	(0.0577 + 0.0730 + 0.0417 + 0.0625 + 0.0625 + 0.0588)/6 = 0.0594
Language	(0.1154 + 0.1095 + 0.1667 + 0.1250 + 0.1250 + 0.1176)/6 = 0.1265

Step 4: Check the consistency ratio.
Calculate λmax

$$0.2392\begin{pmatrix}1\\2\\1/3\\1/4\\1/4\\1/2\end{pmatrix} + 0.4228\begin{pmatrix}1/2\\1\\1/5\\1/6\\1/6\\1/4\end{pmatrix} + 0.0928\begin{pmatrix}3\\5\\1\\1/2\\1/2\\2\end{pmatrix} + 0.0594\begin{pmatrix}4\\6\\2\\1\\1\\2\end{pmatrix} + 0.0594\begin{pmatrix}4\\6\\2\\1\\1\\2\end{pmatrix} + 0.1265\begin{pmatrix}2\\4\\1/2\\1/2\\1/2\\1\end{pmatrix} = \begin{pmatrix}1.4569\\2.5835\\0.5578\\0.3586\\0.3586\\0.7748\end{pmatrix}$$

λmax = [1.4569/0.2392 + 2.5835/0.4228 + 0.5578/0.0928 + 0.3586/0.0594 + 0.3586/0.0594 + 0.7748/0.2365] / 6 = 6.0701

$$CR = \frac{6.0701-6}{1.25 \times 5} = 0.0112$$

CR is in the well acceptable range for consistency. Thus, the authors can keep on the candidate evaluation process.

Step 5: Employ the TOPSIS method to rank the alternatives.

The results of this step were presented in Table 5 to Table 8.

Table 5: The decision matrix for the selection criteria

	Education	Experience	Skills	Personality	Health	Language
Can. 1	9	8	7	7	8	9
Can. 2	8	8	8	8	9	8
Can. 3	7	9	9	7	8	7
Can. 4	7	7	7	9	7	8
Can. 5	8	7	8	9	8	7

Table 6: The normalized decision matrix for the selection criteria

	Education	Experience	Skills	Personality	Health	Language
Can. 1	0.514	0.457	0.400	0.389	0.446	0.514
Can. 2	0.457	0.457	0.457	0.444	0.502	0.457
Can. 3	0.400	0.514	0.514	0.389	0.446	0.400
Can. 4	0.400	0.400	0.400	0.500	0.390	0.457
Can. 5	0.457	0.400	0.457	0.500	0.446	0.400

Table 7: The weighted standard decision matrix

	Education	Experience	Skills	Personality	Health	Language
Can. 1	0.123	0.202	0.037	0.023	0.026	0.065
Can. 2	0.109	0.202	0.042	0.026	0.030	0.058
Can. 3	0.096	0.227	0.048	0.023	0.026	0.051
Can. 4	0.096	0.177	0.037	0.030	0.023	0.058
Can. 5	0.109	0.177	0.042	0.030	0.026	0.051

Table 8: The relative closeness to the ideal solution C_i^* and ranking.

	S_i^*	S'_i	C_i^*	Rank
Can. 1	0.0284	0.0400	0.5852	2
Can. 2	0.0303	0.0310	0.5058	3
Can. 3	0.0318	0.0517	0.6197	1
Can. 4	0.0592	0.0098	0.1417	5
Can. 5	0.0547	0.0164	0.2308	4

As a result, from Table 8, it is seen that the ranking of alternatives is as follows: Candidate 3 first, Candidate 1 second, Candidate 2 third, Candidate 5 forth, Candidate 4 fifth. Candidate 3 is the most qualified personnel for the sales deputy manager position as he is ranked first in the order of preference for recruitment.

5. Conclusion

In recent years, the global logistics market has faced a rapid pace of growth. Logistics enterprises must focus on building business strategies that help reduce costs, enhance working performance and then increase competitive capabilities. Therefore, the selection of the most suitable personnel is one of the most significant strategies in the distribution science. In this study, the authors propose a hybrid MCDM approach of AHP and TOPSIS to support the qualified personnel selection problem for the logistics companies.

The contribution of this study lies in development of a personnel selection model for choosing the most appropriate candidates. It can be seen that the proposed approach provides the decision makers with more effective and time-saving methods than conventional ones. Therefore, the model can be applied to the personnel selection around the world. In addition, the research adds to the theory of human resources management and logistics management the full set of personnel selection criteria including education, experience, skills, health, personality traits and foreign language.

A future step to this research could be the application of other MCDM methods like SWARA, WASPAS, ARAS-G, MultiAtributive Ideal-Real Comparative Analysis (MAIRCA), ANP … in solving the personnel selection problems.

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