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Strategic Personnel Selection in Shipping Agencies: A Multi-Criteria Evaluation Model with A Fuzzy AHP Approach

Gemi Acentelerinde Stratejik Personel Seçimi: Bulanık AHP Yaklaşımıyla Çok Kriterli Değerlendirme Modeli

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ÖZET

Dünya ticaretinde denizcilik sektörünün önemiyle birlikte gemi acenteleri bu süreçte kritik bir rol oynamaktadır. Bu önemli rolü gereği gemi acente firmaları alanında uzman ve gerekli niteliklere sahip iş gücüne ihtiyaç duymaktadır. Bu bağlamda gemi acentelerinde stratejik personel seçimi, işletmelerin rekabet gücünü ve operasyonel etkinliğini doğrudan etkileyen kritik bir süreçtir. Bu çalışmada, gemi acentelerinde personel seçimi sürecinin çok kriterli bir değerlendirme problemi olduğu vurgulanmış ve bu süreçte karar vericilerin belirsizlik ve subjektif yargılarla karşılaştığı durumlar dikkate alınmaya çalışılmıştır. Çalışmada, bulanık Analitik Hiyerarşi Prosesi (Bulanık AHP) yöntemi ile personel adaylarının çok kriterli olarak değerlendirilmesine imkân sağlayan bir model geliştirilmeye çalışılmıştır. Model; gemi acente firmalarına personel alım süreçlerinde farklı personel özelliklerini, deneyim ve becerileri, işin gereksinimlerini ve stratejik öncelikleri dikkate alarak en doğru seçimin yapılabilmesini amaçlamaktadır. Bu kapsamda, çalışma sonuçlarına göre gemi acentesinde işe alım kriterlerinden, kurumsal temsil farkındalığı (K1) kriteri %18,04 gibi bir oranla en önemli işe alım kriteri olarak tespit edilmiştir.

Anahtar Kelimeler: *Gemi Acenteleri, Bulanık AHP, Personel Seçimi, Deniz Ticareti.*

ABSTRACT

Given the importance of the maritime sector in global trade, shipping agencies play a critical role in this process. Due to this significant role, shipping agencies require a workforce that is specialized in the field and possesses the necessary qualifications. In this context, strategic personnel selection in shipping agencies is a critical process that directly impacts the competitiveness and operational efficiency of these businesses. This study emphasizes that the personnel selection process in shipping agencies constitutes a multi-criteria evaluation problem and seeks to account for situations where decision-makers face uncertainty and subjective judgments. The study aims to develop a model that enables the multi-criteria evaluation of personnel candidates using the fuzzy Analytic Hierarchy Process (Fuzzy AHP) method.

The model aims to enable shipping agencies to make the most appropriate selection during personnel recruitment processes by considering various personnel characteristics, experience, and skills, as well as job requirements and strategic priorities. In this context, according to the study's results, among the hiring criteria in a shipping agency, the "awareness of corporate representation" (K1) criterion was identified as the most important hiring criterion with a percentage of 18.04%.
Keywords: *Shipping Agencies, Fuzzy AHP, Personnel Selection, Maritime Trade.*

1. Introduction

Maritime transportation plays a vital role in the global logistics sector, with more than 80% of world trade conducted through seaborne transport. Within this extensive industry, shipping agencies, as an essential component of maritime transport operations, derive their effectiveness and competitive advantage in this critical process largely from the quality and competence of their human resources (Büyük, 2023; Von Malmborg, 2024; Köseoğlu & Yorulmaz, 2024; Hocek & Yazır, 2025).

A shipping agent is generally defined as an organization that represents the vessel in areas outside its port of call in dealings with third parties (Nas & Bayırhan, 2014; Arslan, 2022). For this reason, ship agency work is a role that entails significant responsibilities on behalf of the individuals or organizations it represents (Nas & Bayırhan, 2014). On the other hand, shipping agents track the costs associated with all operations to be carried out at the port on behalf of the shipowner or operator, and by communicating this information to the relevant parties, they help ensure that expenses are kept under control (Başarıcı, 2021). Accordingly, the aim is to improve operational efficiency (Ergün, 2019). Through this function, ship agency stands out as one of the indispensables, important, and critical elements of maritime transport (Yorulmaz & Feyzioğlu, 2023).

Given the critical role that shipping agencies play in the maritime industry, the selection of qualified personnel is an extremely important factor for the company and forms the foundation of its success (Koutra et., 2017). Personnel recruitment is a systematic process aimed at identifying suitable candidates and is of vital importance to the continuity of a company's operations (Noyan, 2023). The hiring process is of critical importance for businesses. This is because poor hiring decisions can result in the hiring of a candidate who is unsuitable for the position or the company (Ližbetinová et al., 2022). This situation can lead to significant financial and time-related losses for the business (Hassani, 2017). In addition, hiring unsuitable personnel makes it difficult for businesses to focus on their core operations; this situation also leads to various negative consequences from psychological and social perspectives (Efe & Kurt,

2018). A mismatch between employees and their positions can lead to decreased productivity, a hostile work environment, and even workforce attrition (Elmas, 2022). For these reasons, organizations believe that selecting skilled and talented candidates will lead to success (Ersoy, 2021). When the right candidate is selected, both individual performances will improve and the organization's progress toward its goals will be supported (Taş & Karataş, 2021).

As with any business, shipping agencies must first identify their needs and implement a recruitment process that aligns with the job description when hiring employees (Oğuz & Merdivenci, 2020). The purpose of employee selection should be to determine the correct criteria for the specified position and to identify the most suitable candidate among the applicants for that position (Özekenci, 2024). For this reason, businesses must establish an effective human resources policy, which should be tailored to align with both the company's interests and the candidate's expectations (Acer & İnci, 2020). Ship agencies must also pay close attention during the recruitment process, as the knowledge, skills, aptitude, and abilities of the candidates they select to work within their organization will influence the company's success throughout their professional careers (Ulutaş et al., 2018).

When examining personnel selection studies conducted using the fuzzy AHP method in the literature, it is observed that applications are predominantly concentrated in the manufacturing, healthcare, education, and service sectors. However, it is noteworthy that there is a limited number of multi-criteria decision-making studies in the maritime sector, particularly those addressing personnel selection processes for shipping agencies. Shipping agency operations involve sector-specific dynamics such as operational intensity, time pressure, a multi-stakeholder communication structure, documentation processes, and the simultaneous management of port operations. Therefore, in the personnel selection process, not only educational and technical qualifications but also criteria such as crisis management, communication skills, coordination ability, and operational adaptability gain importance. The main objective of this study is to adopt a scientific approach to the employee recruitment process of shipping agencies using the fuzzy AHP method and to develop an evaluation model for this purpose. In shipping agencies, employee selection is influenced by numerous independent and diverse factors; therefore, by reviewing the relevant literature and consulting industry experts, the criteria affecting employee selection were identified and weighted. As a result of determining the importance levels of the criteria using the fuzzy AHP method, a systematic and applicable decision support model that can be used in industry practices has been proposed. In this way, an effective personnel selection approach for shipping agencies

based on a more systematic, objective, and scientifically grounded framework has been established in recruitment processes. In this respect, the study also presents a sector-specific approach to human resource management and strategic personnel planning in the maritime industry. In addition, by considering the operational requirements specific to shipping agencies and evaluating personnel selection criteria through a multi-criteria decision-making approach, this study contributes to the existing literature. It is also aimed that the evaluation model obtained at the conclusion of the research will be applicable by shipping sector stakeholders, thereby contributing to more effective human resource management for shipping agencies in an increasingly competitive environment.

1.1. Definition and Responsibilities of Shipping Agents

According to the Regulation on Ship Agency published in the Turkish Official Journal dated March 5, 2012, No. 28224; "A ship agent is defined as a natural or legal person who, through the agreements they enter into, acts on behalf of and for the account of the shipowner, the captain, the ship operator, or the charterer, and protects the rights of these parties against third parties and entities; within this framework, they cannot be held liable for any acts or transactions they perform, except for their own negligence, and they represent the person or entity specified in the agreement."

Ship agents ensure the smooth operation of all stages, from cargo booking to the coordination of loading, transshipment, and discharge processes, and manage the necessary documentation related to these processes (Yorulmaz & Feyzioğlu, 2023). In addition, ship agents protect the interests of the country and the ship they represent and provide certain services (Arslan, 2022). These include the following:

- Before the ship arrives at the port, the necessary information regarding the ship must be provided to the port authority, customs office, relevant law enforcement authorities, port health authority, and vessel traffic service,

- Organizing the ship's pilotage and tugboat services,

- Coordinating the ship's loading and discharge operations,

- Ensuring coordination between the port authority and the vessel,

- Organizing the crew change on board,

- Providing the ship with oil, fuel, provisions, fresh water, spare parts, and other supplies it may require,

- Providing instructions for the ship's anchoring and berthing, as well as port clearance for the ship's departure.

1.2. Types of Ship Agents

Ship agencies vary depending on the services they provide and the sides they represent. The definitions of these types of agencies are listed below:

- General Agent: These are agents to whom the shipowner grants long-term authority, providing services in all ports of a specific country, and are typically used in scheduled liner shipping (Yorulmaz et al., 2024).

- Sub-agent: According to the Ship Agency Regulations, these are agents authorized by a principal agent to conduct operations on its behalf and to represent it in regions where the principal agent is not present (Cerit et al., 2013).

- Shipowner's Agent: A type of agent authorized to represent the shipowner in ports of call and protect the rights and benefits of the vessel against third parties (Light, 2013).

- Charterer's Agent: An agent authorized at the port of call specified in the charter party at the charterer's request, who also provides port agency services (Bayırhan & Nas, 2014).

- Protective Agent: A protective agent is an agent appointed to protect the rights of the party they represent in cases where the ship's agent and the cargo agent are different (Sevgili and Nas, 2017).

- Port Agent: Since it is difficult for ship captains to handle official and operational procedures at ports in foreign countries on their own, shipping agents are the individuals or organizations that organize these matters on behalf of the shipowner and act as representatives at the port (Yorulmaz et al., 2024).

- Booking Agent: These are agents that arrange cargo bookings for vessels under a contract with the shipowner and have a strong sales and marketing focus (Sevgili & Nas, 2017)

- Liner Agent: In addition to representing the company at local ports, this type of agent handles the company's marketing and sales activities by arranging cargo bookings, much like a ship broker (Nomer, 2014).

2. Literature Review

A review of the literature reveals that the method used in the hiring process to select the most suitable candidate from among specific criteria or alternative candidates is the multi-criteria decision-making approach (Ersoy, 2021). Studies on multi-criteria decision-making (MCDM) methods have increased in recent years, and the number of scientific publications on the development of various techniques and methods related to individual decision-making processes has grown in parallel (Zavadskas et al., 2020). A review of the literature reveals that the AHP method is particularly widely used in employee recruitment studies. Some of these include:

In their study, Koutra et al. (2017) interviewed experts from 14 shipping companies to examine employee hiring in the shipping industry using the AHP method.

Alp and Topuz (2018) used the AHP and TOPSIS methods to identify the most suitable candidate from among the applicants for a sales specialist position at a company operating in the automotive industry.

Efe and Kurt (2018) examined the hiring of human resources specialists in a port operation using the fuzzy extended AHP and fuzzy TOPSIS methods. The study found that “self-confidence” and “planning and organizational skills” were the most important criteria sought by the port operation in its human resources specialists.

In their study, Nebati et al. (2021) used the AHP method to evaluate the performance of civil servants working at a public transportation agency in Istanbul and identified the criteria contributing to their performance.

Ersoy (2021) conducted a recruitment study in the textile industry using the AHP and TOPSIS methods. In the study, eight alternative personnel candidates were evaluated based on seven criteria for a company operating in the textile sector, with the aim of selecting the most suitable engineer using the AHP and TOPSIS methods. The alternatives were ranked according to the results of the TOPSIS method using the criterion weights obtained from the AHP method, and the most suitable candidate for the company was identified.

Karakul and Akpınar (2022) examined the human resource selection problem related to the reshaped hiring processes of businesses during the COVID-19 pandemic using the AHP method. At the conclusion of the study, the criteria were weighted using the AHP method, and the alternatives were ranked.

Elmas (2022) examined the problem of recruitment for a freight forwarding company using the fuzzy TOPSIS method, and the most suitable candidate was identified using the developed recruitment method.

Aykan and Çataltepe (2022) examined the selection of the most suitable candidate for the position of human resources specialist assistant at a manufacturing company operating in the Kayseri Free Zone, using the AHP and TOPSIS methods—two multi-criteria decision-making techniques. Based on the results obtained from the AHP method, the TOPSIS method was applied to select the candidate who best met the criteria.

In their study, Arıcan and Ünal (2022) used the AHP method to examine the processes and criteria used by shipping companies in hiring personnel for their vessels.

In his study, Büyük (2023) examined the selection of ship captains within the framework of the ISM Code using the AHP method.

In their study, Kantoğlu and Gökçe (2023) used the fuzzy AHP method to identify the criteria for supplier selection at a chocolate manufacturing facility.

In his 2024 study, Güler aimed to identify the criteria necessary for selecting individuals to serve as captains on commercial vessels by using the fuzzy AHP and fuzzy TOPSIS methods. He calculated the importance values of the criteria identified for captain selection using the fuzzy AHP method and conducted a sample application using the fuzzy TOPSIS method to identify the best candidate among the captain candidates.

In their study (2025), Gelgör and Can examined the evaluation of candidates for bank positions using the AHP method. Using the AHP method, the factors were prioritized, and the most important criteria were identified.

When examining studies on personnel selection in the literature, it is observed that criteria such as experience, education level, technical competence, communication skills, and problem-solving ability are frequently used. However, due to the operational structure of the maritime industry, time constraints, and the requirement for multi-stakeholder communication, the personnel selection process differs from that of other sectors. In particular, the dynamic nature of operations carried out in shipping agencies brings sector-specific criteria such as coordination skills, stress management, and process tracking to the forefront. Nevertheless, it is observed that there is a limited number of multi-criteria personnel selection studies focusing on shipping agencies in the literature. This situation makes it necessary to systematically evaluate personnel selection criteria specific to the maritime sector.

3. Methodology

In this study, the Fuzzy AHP method, one of the multi-criteria decision-making methods, was used. The Analytic Hierarchy Process (AHP), developed by Saaty in 1977, is a multi-criteria decision-making method that offers a mathematical approach for decision-making processes where both quantitative and qualitative criteria can be evaluated simultaneously, considering the priorities and preferences of decision-makers (Şahin et al., 2023; Mizrahi et al., 2025). One of the most significant advantages of this method is that it is practical and applicable to real-world problems. In this methodological approach, decision-makers weigh the criteria associated with the problem through pairwise comparisons to rank the alternatives relative to one another (Deng, 1999). Additionally, thanks to its scalable and adaptable features, it can be easily tailored to various decision-making problems (Akman et al., 2021). In the AHP method, when conducting pairwise comparisons, the first study using the fuzzy AHP method with triangular fuzzy numbers was conducted by Van Laarhoven and Pedrycz in 1983 to solve problems that cannot be expressed with exact numbers (Dağdeviren, 2007). Subsequently, in 1996, Chang proposed a new approach to the application of Fuzzy AHP by utilizing triangular fuzzy numbers in the pairwise comparison scale and the order analysis method for the artificial values of pairwise comparisons (Dengiz et al., 2023).

The main importance of the Fuzzy AHP method lies in its ability to incorporate linguistic variables in problem-solving. This feature helps reduce the uncertainties that arise in multi-criteria decision-making processes, thereby ensuring more reliable results (İncekara, 2021; Kantoğlu & Gökçe, 2023).

3.1. Fuzzy Logic

In many situations in daily life, people encounter uncertainty when making decisions. It is often not possible to fully explain these uncertainties or reduce them to precise definitions. People often choose to solve their problems by making decisions through non-numerical linguistic expressions (Yılmaz & Şahin, 2023).

The concept of fuzzy logic comes into play at this point as a system of thought based on the reasoning process and aimed at reaching the most appropriate conclusion through various operations; it refers to an approach that processes information derived from data acquired by humans using algorithms and generates result values through appropriate mathematical logic in accordance with established rules (Keskenler, 2017; Özdemir & Yalınkaya, 2020). The concept of fuzziness was first introduced by Zadeh in 1965; in his published article, he recognized that

classical computer logic was insufficient for expressing and analysing human thought and thus laid the foundations of fuzzy sets (Yapıcı, 2000; Güler, 2024).

3.2. Fuzzy Analytic Hierarchy Process

The Fuzzy Analytic Hierarchy Process (Fuzzy AHP) is one of the multi-criteria decision-making methods developed to address the limitations of the classical Analytic Hierarchy Process in the face of uncertainty and subjective judgments (Chang, 1996; Yazır & Gedik, 2022). While decision-makers' evaluations in classical AHP are expressed as precise numbers, in real-world decision problems, individuals' preferences are often neither precise nor clear-cut. Especially in complex systems, it is more natural for decision-makers to make evaluations using linguistic expressions such as "slightly more important" or "much more important." The Fuzzy AHP approach utilizes fuzzy set theory to mathematically express such uncertain and open-to-interpretation evaluations (Chang et al., 2024; Zyoud et al., 2025).

The AHP method may not fully reflect human thought processes when evaluating experts' knowledge and opinions. To address this issue and minimize uncertainties arising in the decision-making process, the need to convert verbal expressions into numerical values and to reconcile different perspectives on a common ground led to the development of the fuzzy AHP method (Testik & Ünlü, 2022).

In this method, pairwise comparisons made by decision-makers are modelled using triangular fuzzy numbers instead of exact numbers. Thus, each comparison is expressed as an interval consisting of a lower bound, a most likely value, and an upper bound (Ayhan, 2013; Briciu et al., 2024; Huang et al., 2025). These data are shown in Table 1 (Habibi and Sarafrazi, 2015).

Table 1. Fuzzy Matches for Linguistic Expressions

Linguistic Expressions	Scale	Opposite Scale
Equally Important	(1, 1, 1)	(1, 1, 1)
	(1, 2, 3)	(1/3, 1/2, 1)
Column: Moderately Important	(2, 3, 4)	(1/4, 1/3, 1/2)
	(3, 4, 5)	(1/5, 1/4, 1/3)
Column: Is Highly Important	(4, 5, 6)	(1/6, 1/5, 1/4)
	(5, 6, 7)	(1/7, 1/6, 1/5)
Column: Is Very Highly Important	(6, 7, 8)	(1/8, 1/7, 1/6)
	(7, 8, 9)	(1/9, 1/8, 1/7)
Column: Is Extremely Important	(8, 9, 9)	(1/9, 1/9, 1/8)

Source: Created by the authors.

There is numerous analysis methods related to Fuzzy AHP (Alharairi, 2025). In this study, the analysis method proposed by Buckley was employed. This is because the method in question allows statements to be easily adapted to a fuzzy context and enables the attainment of a clear

result at the conclusion of the analysis (Özdemir et al., 2017). Despite this advantage, the geometric mean method used in Buckley's approach can complicate the calculation process, particularly in situations involving many criteria and participants, and as a result, it can be prone to errors and tedious (Alyamani & Long, 2020; Liu et al., 2020).

According to the Buckley analysis method, the first step in the application process involves the expert group and decision-makers specifying the criteria and their descriptions. Subsequently, the fuzzy number scale outlined in Table 1 is used for the evaluations to be employed in the expert opinions. Using triangular fuzzy numbers derived from surveys completed by the experts, pairwise comparisons are made between the criteria, and verbal-based pairwise comparison matrices, as specified in Equation 1, are formulated (Akman et al., 2021).

$$\tilde{A} = \begin{bmatrix} 1 & \tilde{A}_{12} & \dots & \tilde{A}_{1n} \\ \tilde{A}_{21} & 1 & \dots & \tilde{A}_{2n} \\ \vdots & \vdots & \dots & \vdots \\ \tilde{A}_{m1} & \grave{A}_{m2} & \dots & 1 \end{bmatrix} \quad (1)$$

All data obtained from the experts are then combined using the weighted average formula given in Equation 2 (Yazır & Tekel, 2022).

$$\widetilde{A}_{xy} = \frac{Z_1 A^1_{xy} + Z_2 A^2_{xy} + \cdots + Z_k A^k_{xy}}{Z_1 + Z_2 + \cdots + Z_k} \quad (2)$$

The term ''Ãxy'' in Equation 2 represents the comparative value of the criteria x and y relative to each other, while the ''Zk'' value indicates the weight assigned to participant k. In the next step, the weights of all experts are combined to form a single matrix, as shown in Equation 3.

$$A = \begin{bmatrix} 1 & \tilde{A}_{12} & \dots & \tilde{A}_{1n} \\ \tilde{A}_{21} & 1 & \dots & \tilde{A}_{2n} \\ \vdots & \vdots & \dots & \vdots \\ \tilde{A}_{m1} & \grave{A}_{m2} & \dots & 1 \end{bmatrix} \quad (3)$$

After the matrix specified in Formula 3 is constructed, the geometric average is first calculated for each row of the decision matrix using the formula given in Equation 4.

$$b_i = (a_{i1} \otimes a_{i2} \otimes \dots \otimes a_{in})^{1/n} \quad (4)$$

When specifying the number of criteria "n" as indicated in Formula 4, ''ain'' represents the fuzzy comparison value between the i-th criterion and the n-th criterion. The term ''bi'' refers to the geometric mean of all compared criteria. In another step, the fuzzy weights are calculated using the formula specified in Equation 5 (Aydın & Çağıl, 2020; Yazır & Tekel, 2022).

$$\tilde{w}_i = \tilde{b}_i \otimes (\tilde{b}_1 \oplus \tilde{b}_2 \oplus \dots \oplus \tilde{b}_n)^{-1} = (k_i, l_i, m_i) \quad (5)$$

The value ‘’w̃’’ specified in Equation 5 represents the triangular fuzzy number weight, while the values (k, l, m) represent the fuzzy numbers; k refers to the minimum value, l to the average value, and m to the maximum value (Yazır and Tekel, 2022). Subsequently, the data is defuzzied using the formula specified in Equation 6.

$$A = \frac{l_u + m_u + i_u}{3} \quad (6)$$

To normalize the obtained value, the formula in Equation 7 is used. This allows the absolute weights to be ranked more clearly (Özdemir et al., 2017).

$$N_i = \frac{M_i}{\sum_{k=1}^{K} M_i} \quad (7)$$

4. Studies Conducted and Application

Recruitment in shipping agencies is of significant strategic importance in terms of the company’s operational efficiency and sustainable competitive advantage. Identifying the right candidate in this process can directly impact not only individual performance but also service quality, customer satisfaction, and the company’s long-term success. Consequently, the personnel selection process is a multi-criteria decision-making problem that requires decision-makers to consider multiple criteria simultaneously. For this reason, the literature contains numerous studies that analyse the personnel selection process across various sectors using analytical methods, with the Analytic Hierarchy Process (AHP) and Fuzzy AHP methods being frequently preferred for this purpose. Some of these studies are presented in Table 2.

Table 2. A Literature Review of Some Studies Conducted Using the Fuzzy AHP Method

Author	Subject
Gülsün & Erdoğmuş, (2021)	Financial performance in the banking sector was analysed using the fuzzy AHP and fuzzy TOPSIS methods.
Danışan et al., (2022)	In this study, the personnel selection problem for operating a machine with various specific features in a textile factory was addressed using the fuzzy AHP method.
Yazır & Gedik, (2022)	In this study, ballast water treatment systems were examined in accordance with IMO standards. Using AHP and fuzzy AHP methods, the most suitable ballast water treatment system for a vessel with a ballast pumping capacity of 500–1500 m³/h was determined based on four alternatives and seven criteria defined through expert judgments, and a selection was made accordingly.
Bucak et al., (2022)	In their study, a model based on dynamic capabilities was developed for the recruitment process in ports, and the dynamic capabilities that port personnel should possess were identified through a literature review and analysed using the fuzzy AHP method.
Amrullah et al., (2023)	In this study, the fuzzy AHP method was used to solve the subcontractor selection problem in a shipyard company.
Kendir & Bucak, (2023)	In this study, bottleneck criteria in traditional container stacking systems were identified and analysed using the Fuzzy AHP method.
Arıcan et al., (2024)	In this study, the fuzzy AHP method was utilized to develop a comprehensive framework encompassing the factors influencing the yacht captain selection process.
Köseoğlu et al., (2025)	The perceptions of maritime sector employees regarding remote work models were analysed using the AHP method.

Source: Created by the authors.

4.1. Determination of the Expert Group and Criteria

The employee hiring process in shipping agencies is a strategic decision that directly impacts the company's sustainable success. Therefore, it is of great importance to establish the criteria to be considered in the selection process based on scientific foundations. Based on this, the study first conducted a comprehensive review of the literature and attempted to identify general criteria that could be effective in employee selection in shipping agencies. Subsequently, to evaluate the sector-specific suitability of these criteria, the opinions of a 9-member expert group consisting of 5 personnel managers with at least 10 years of experience in shipping agencies, 2 academicians specializing in the maritime sector, and 2 human resources specialists working within shipping agencies were consulted. In selecting the experts, the primary criteria considered were having a minimum level of experience in the industry, being directly involved in operational processes, and possessing competence in personnel selection and human

resources practices. The number of experts was determined in line with sample sizes used in similar studies employing the fuzzy AHP method and the expert ranges suggested in the literature. During the evaluation process, expert opinions were collected and comparative checks were conducted to ensure consistency. Thus, assuming a general agreement among expert judgments, the analysis process was carried out accordingly. Based on the feedback received from the experts, the criteria were revised and finalized. Following this stage, the expert group was presented with pairwise comparison matrices via a survey form and asked to evaluate the relative importance levels of the criteria. Information regarding the experts is provided in Table 3.

Table 3. Information About the Experts Participating in the Study

Expert	Job Title	Sector Experience	Educational Status
Expert 1	Personnel Manager	15 years	Bachelor's Degree
Expert 2	Personnel Manager	15 years	Master's Degree
Expert 3	Personnel Manager	15 years	Bachelor's Degree
Expert 4	Personnel Manager	15 years	Bachelor's Degree
Expert 5	Personnel Manager	10 years	Bachelor's Degree
Expert 6	Academician	10 years	Ph. D.
Expert 7	Academician	2 years	Master's Degree
Expert 8	HR Specialist	5 years	Bachelor's Degree
Expert 9	HR Specialist	5 years	Bachelor's Degree

Source: Created by the authors.

4.1. Determination of Criteria

In determining the criteria used in the study, similar studies in the literature were examined, and sector practices as well as expert opinions were evaluated. In addition, a total of 10 criteria were developed by considering common sources of errors in operational processes, such as communication deficiencies, documentation errors, timing problems, and coordination issues. The final criteria, developed based on a literature review and expert evaluations and to be considered in the employee selection process, are presented in Table 4.

Table 4. Criteria to Be Used in Employee Selection

Number	Criterion	Criteria Description
K1	Awareness of corporate representation	- Communication style, physical appearance, behavioural patterns, and customer relations skills.
K2	Sector/field experience and past performance	- Have held positions consistent with the job description at previous places of employment. - A shorter onboarding period for candidates with port or agency experience. - Positive or negative feedback received from the companies where the candidate has previously worked.
K3	Age	- The candidate's age must allow them to perform the physical demands required for the fieldwork specified in the job description.
K4	Work model adaptability	- The ability to work flexible hours, adapt to shift-based operations, participate in nighttime or early-morning vessel operations, and take on responsibilities in situations requiring 24/7 communication.
K5	Technical tools, software, computer skills, and data management	- Agency/forwarding software, port community systems (PCS), office software, and the ability to enter data quickly, - Ensuring that data such as ETA/ETD, cargo volume, draft information, terminal slots, tugboat and gangway requests, billing details, advance payments, etc., are accurately entered into the systems.
K6	Technical knowledge of ship/port operations and proficiency in documentation	- Proficiency in national and international port/terminal procedures. - Proficiency in ship arrival and departure formalities, immigration, customs clearance, denial of customs clearance, and related processes. - Manifest/bill of lading workflow, proficiency in documentation tasks that vary by cargo type.
K7	Educational background and foreign language knowledge	- A degree from an institution that provides maritime education. - English proficiency at least at the B1-B2 level; fluency in operational reporting, written communication, and spoken English.
K8	Interview evaluation and analytical thinking skills	- Following the in-person interview with the candidate, the candidate meets the required criteria and expectations. - The ability to anticipate operational risks, interpret data, and generate reports.
K9	Operational compliance and stress management	- Ability to work shifts/night shifts. - Stress management during sudden changes in ETA/ETD. - The ability to coordinate multiple points of contact within the captain-port-port authority triangle. - Conflict resolution and calm decision-making. - Prioritization under time pressure.
K10	Communication skills	- Reliable communication with captains, shipowners, ports, and public institutions. - Quality of written reporting. - Negotiation skills with suppliers and service providers. - The reflex to focus on solutions when a problem arises.

Source: Created by the authors.

In the application section, the data obtained from experts were converted into triangular fuzzy numbers using the values in Table 1. Subsequently, the geometric mean was calculated for each row of the combined fuzzy decision matrix using Equation 4. The values are shown in Table 6 below.

Table 6. Geometric Average of the Results of Pairwise Comparisons of Criteria

	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10
K1	1,00	2,75	3,43	2,87	2,48	2,85	1,01	2,69	4,65	5,13
K2	0,37	1,00	0,95	1,05	1,36	1,19	0,43	1,56	2,33	1,99
K3	0,3	1,08	1,00	1,23	1,65	0,79	0,44	0,97	1,72	2,74
K4	0,36	0,98	0,84	1,00	1,45	1,56	0,55	0,66	2,65	4,09
K5	0,42	0,76	0,63	0,72	1,00	2,99	0,43	0,65	3,07	3,31
K6	0,36	0,88	1,3	0,67	0,35	1,00	0,44	1,51	3,07	2,74
K7	1,02	2,41	2,35	1,91	2,42	2,35	1,00	1,23	4,26	6,21
K8	0,38	0,67	1,07	1,59	1,62	0,69	0,84	1,00	4	3,38
K9	0,22	0,44	0,61	0,39	0,34	0,34	0,24	0,26	1,00	1,07
K10	0,2	0,52	0,38	0,25	0,31	0,38	0,16	0,3	0,97	1,00

Source: Created by the authors.

In the next step, the fuzzy weight values for all criteria are calculated using Equation 5. Table 7 shows the weighted values calculated for the criteria.

Table 7. Weighted Decision Matrix for Criteria

K1	**0,1251**	**0,1782**	**0,2379**
K2	0,052	0,0739	0,1018
K3	0,0528	0,0754	0,1023
K4	0,0566	0,0801	0,1086
K5	0,0592	0,0838	0,1128
K6	0,056	0,0799	0,1075
K7	0,0854	0,1254	0,1685
K8	0,0673	0,0988	0,1354
K9	0,0631	0,0898	0,1209
K10	0,0701	0,0987	0,1329

Source: Created by the authors.

After calculating the weighted decision matrix, the values must be normalized so that they represent absolute values. The normalized values obtained after performing the normalization using Formula 6 are shown in Table 8.

Table 8. Normalized Values of the Criteria

Criterion	C. Weight
K1	0,1804
K2	0,0759
K3	0,0768
K4	0,0818
K5	0,0853
K6	0,0811
K7	0,1264
K8	0,1005
K9	0,0913
K10	0,1006

Source: Created by the authors.

After the clarification process, normalization was performed using Formula 7. The normalization values and the ranking of criteria weights are shown in Table 9.

Table 9. Normalization Values and Ranking

Criterion	Standardized Weight	Percentage Importance (%)	Ranking
K1	0,1804	18,04%	1
K7	0,1264	12,64%	2
K10	0,1006	10,06%	3
K8	0,1005	10,05%	4
K9	0,0913	9,13%	5
K5	0,0853	8,53%	6
K4	0,0818	8,18%	7
K6	0,0811	8,11%	8
K3	0,0768	7,68%	9
K2	0,0759	7,59%	10
TOTAL	**1**	**100%**	**-**

Source: Created by the authors.

5. Result and Discussion

According to the study results, among the hiring criteria at shipping agencies, “awareness of corporate representation” (K1) emerged as the most important hiring criterion, with a rate of 18.04%. Based on these findings, it can be stated that technical competence, educational background, and other criteria are not the sole determining factors in the hiring process at shipping agencies. Accordingly, as noted in the criteria description, communication skills, customer relations, and behavioural standards which also represent the company were found to be more important based on the expert findings.

According to the study, the second most important criterion, with a percentage of 12.64%, was educational background and foreign language knowledge (K7). This can be attributed to the fact that ship agency activities involve frequent international communication. Given the global nature of the maritime transport sector, it is of great importance for agency personnel to be able to communicate effectively with ship captains, shipowners, and operational stakeholders from different countries. In this context, foreign language proficiency stands out not only as a means of communication but also as a fundamental competency that ensures operational processes are carried out accurately and efficiently. Additionally, educational level directly influences employees' abilities in analytical thinking, problem-solving, and managing complex operational processes. Particularly given the multifaceted nature of port operations, it can be said that personnel graduating from a maritime education institution are better able to evaluate processes systematically and, thanks to their mastery of maritime terminology and documentation, can identify potential errors in advance. This situation contributes to the development of operational situational awareness and helps reduce the risk of errors.

The fact that communication skills (K10) are the third most weighted criterion at 10.06% demonstrates that ship agency operations require a high degree of coordination and interaction. Ship agencies serve as a bridge facilitating the flow of information among numerous administrative and official entities, such as port authorities, customs agencies, terminal operators, shipowners, and ship personnel. Therefore, communication skills stand out as a critical element that goes beyond mere information transfer; it encompasses the ability to establish accurate, timely, and clear communication. Furthermore, communication skills are a critical competency not only for field operations but also for personnel working in office environments. Particularly in office processes involving documentation, operational tracking, and official correspondence, establishing accurate and clear communication is of great importance for ensuring uninterrupted information flow and preventing errors.

The fact that the criterion with the lowest weighting in the study field experience and past performance (K2) was determined to be 7.59% indicates that, in the selection of personnel at shipping agencies, more dynamic competencies such as communication, representational skills, educational level, and coordination skills have come to the fore rather than the traditional experience-focused approach. Especially today, given that many agency operations are conducted through digital systems and office-based operational processes, it can be argued that the relative importance of field experience may have decreased compared to previous periods.

When examining similar studies in the literature, in a study conducted by Koutra et al. (2017), 44 criteria for personnel recruitment in the maritime sector were identified, and a recruitment process was developed using the AHP method. The results of the study revealed that honesty was the most weighted recruitment criterion. This finding indicates that factors such as ethical behaviour, reliability, and organizational loyalty are generally important in personnel selection. However, while honesty is a fundamental expectation in every sector, it is a natural conclusion that awareness of corporate representation is prioritized in sectors such as ship agency work, which are focused on representation and coordination. Additionally, the high number of criteria in the study may increase the complexity of the evaluation process for decision-makers.

In his study, Ilgaz (2018) identified criteria for hiring in the logistics sector and subsequently used the TOPSIS method to select the most suitable candidate from among five candidates. An evaluation was conducted based on four main criteria—technical competence, professional competence, physical competence, and social competence—and their associated sub-criteria. The study found that the most important criterion was professional competence, with professional education identified as its primary sub-criterion. In this study as well, educational background—the second most weighted criterion—appears to support the notion that it is a significant factor in the hiring process.

In a study conducted by Arslan (2024), six criteria -English language and professional knowledge, operational monitoring, experience, proficiency in national and international regulations, the ability to communicate effectively in customer relations, and the ability to provide quick solutions and approaches to meet expectations- were identified as hiring criteria for shipping agencies, and a specific hiring model was developed using the fuzzy AHP method. The study found that the most important criterion was the ability to communicate effectively, and it also appears that this is directly proportional to customer relations, as indicated under the criterion of corporate representation awareness.

6. Conclusion

In this study, the personnel selection problem in shipping agencies was addressed, and the importance of recruitment criteria for hiring personnel in a shipping agency was determined based on criteria developed through a literature review and expert opinions. The methodology developed using the fuzzy AHP approach aims to minimize the uncertainties, subjective evaluations, and differences based on expert opinions prevalent in the industry, thereby establishing an acceptable standard. Consequently, the goal is to improve the quality of

decision-making in shipping agencies' human resources processes and enhance organizational efficiency.

Due to the multi-stakeholder nature of shipping agency operations, it has been shown that maintaining customer relations and corporate image is an important criterion. Any communication error, misstatement, or lack of representation in port operations does not remain solely an individual issue but can also have a negative impact on the reliability and reputation of the represented company.

When the results of the study are evaluated, it is assessed that adopting a more systematic and multi-criteria approach to recruitment processes in shipping agencies will directly contribute to operational efficiency and service quality. Furthermore, it is believed that this study contributes to the literature by providing an analytical perspective on human resources practices in the maritime sector and demonstrating the applicability of the fuzzy AHP method in this sector; the developed fuzzy AHP-based evaluation model is expected to offer a more scientific, measurable, and consistent approach to personnel selection processes in shipping agencies; and consequently, it is aimed to enhance operational performance, service quality, and competitive strength. However, the study also has certain limitations. Since the criteria and evaluations used are based on a specific sample group, the results of studies conducted in different ports or at agencies of varying scales may vary. It is recommended that future studies utilize different decision-making methods, conduct analyses with broader sample groups, and perform sectoral comparisons.

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