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Optimizing Personnel Selection in Transportation: An Application of the BWM-CoCoSo Decision-Support Model

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Abstract: In the logistics domain, the selection of personnel, particularly transport managers and drivers, is pivotal to operational efficacy, demanding a selection process that transcends traditional subjectivity and expertise scarcity. Addressing this, the Best Worst Method (BWM) integrated with the Combined Compromise Solution (CoCoSo) presents a novel decision-support model, employed here for the first time to refine the recruitment process within the transportation sector. Through the application of BWM, criteria weights were ascertained, a method that has shown superior performance and reliability in deriving consistent results. Concurrently, the CoCoSo method facilitated the ranking of candidates, demonstrating greater reliability and stability compared to existing methodologies. The fusion of these methods offers a distinctive approach, enhancing reliability in diverse problems and across various hierarchical strata. A meticulous compilation of evaluation criteria has been delineated, for drivers and transport managers alike, incorporating a gamut of competencies including but not limited to communication and negotiation skills, leadership skills, swift and autonomous decision-making capabilities, resilience under pressure, educational qualifications, proficiency in computer skills, and past work experience. For transport managers, additional competencies such as spatial coordination and orientation, levels of responsibility and precision, adeptness in working under pressure, operational task efficiency, comprehensive understanding of regulations, rules, and documentation, and a history of relevant work experience have been emphasized. This research marks a theoretical and practical contribution to the literature by providing a model crafted for the nuanced requisites of logistics roles. Empirical validation confirms the model's applicability and efficiency in real-world contexts, heralding its potential to refine the Human Resource Management (HRM) landscape in logistics. Consequently, this work signifies a paradigm shift in the strategic and systematic management of human resources in the logistics sector, furnishing industry decision-makers with a robust tool for personnel selection.

Keywords: Personnel selection; Best Worst Method (BWM); Combined Compromise Solution (CoCoSo); Transportation management; Driver recruitment; Human Resource Management (HRM); Logistics; Decision support systems

1. Introduction

In an organizational context, human capital is identified as a paramount asset, necessitating refined methodologies for workforce selection. The competencies demanded by the logistics sector span a comprehensive spectrum, encompassing various facets of the business. The amalgamation of both soft and hard skills, coupled with a structured systematic approach to job design, is imperative for operational prowess within logistics teams (Andrejić et al., 2022). Communication proficiency emerges as a vital soft skill for personnel within this domain; the necessity for effective interaction with colleagues, suppliers, partners, and clientele is paramount to ensure seamless coordination and the transfer of information. Furthermore, abilities in negotiation, problem-solving, and collaborative efforts are indispensable for efficacy in logistics roles. Adaptability and the capacity to rapidly acclimate to evolving industry dynamics and demands are also essential (Kilibarda et al., 2019).

With respect to hard skills, a profound understanding of logistics operations, supply chain mechanisms, transportation, storage, and inventory management is required. Proficiency in logistical software, technological tools, and data analytics for informed decision-making is equally critical. Compliance with legal regulations and standards is also a non-negotiable requisite for maintaining safety and regulatory adherence in logistics operations (Andrejić et al., 2020).

The objective delineated herein is the development of a decision support model tailored for the selection of candidates for diverse roles within logistics. It is designed to mitigate the subjective biases inherent in human resource selection processes, providing a framework for the evaluation of candidates against a multitude of criteria. This model serves as a robust decision support system, facilitating reliable, efficient, and objective assessments of potential hires.

This model's utility extends across various hierarchical echelons within the logistics sector. It is introduced to address the discernible void in extant literature, which lacks a comprehensive model operational across different organizational strata. The exemplifications include the selection of a transportation manager and, at a more foundational level, a driver. The selection criteria are multifarious and inherently distinct between the two scenarios, endorsing the application of multi-criteria decision-making (MCDM) methods to streamline the selection procedure.

The organization of this manuscript is structured as follows: Subsequent to the introduction, a review of the literatures is furnished, detailing the existing methodologies and selection criteria within the logistics sector. Section 3 delineates the methodological framework of the study, with a particular focus on the BWM and the CoCoSo, which are elucidated comprehensively. Sections 4 and 5 subject the proposed methodology to empirical scrutiny through its application to two case studies: the evaluation process for a transport manager and the selection mechanism for drivers are explicated respectively. The penultimate section, Section 6, engages with a discussion on the implications of the findings, and the final section offers a synthesis of the conclusions drawn from the research, alongside considerations for future scholarly pursuits.

2. Literature Review

This section foregrounds the intricacies of personnel selection across various logistical roles, drawing upon diverse MCDM methodologies. In a study conducted within the Turkish context (Kara et al., 2022), a set of ten criteria were distilled for the selection of HRM managers. Here, a hybrid decision-making approach was adopted, entailing the application of the Intuitionistic Fuzzy Weighted Averaging (IFWA) technique for the determination of criteria weights, succeeded by the implementation of the Fuzzy Multi-Attribute Ideal-Real Comparative Analysis (F-MAIRCA) for candidate ranking. Predicated on fuzzy logic and intuitionistic values, these methods collectively illuminated experience as the criterion of supreme import for HRM manager selection, followed by an array of competencies inclusive of managerial and communication skills, decision-making acumen, analytical thought, leadership, educational qualifications, computer literacy, linguistic proficiency, and personal attributes.

Complementary research, also situated within Turkey (Ozer Caylan & Ozkan Yildiz, 2016) proffers insights into criteria assessment for 3PL company candidates. The methodological framework hinged on semi-structured interviews, articulated through seven open-ended inquiries. Findings from this research underscore the centrality of knowledge, experience, linguistic skills—particularly in English—teamwork, relationship management, and communication skills as criteria inherently aligned with the roles in question. Moreover, it was discerned that incumbents in 3PL entities are required to exhibit cultural sensitivity, a propensity for change adaptation, alongside analytical and innovative thinking. Further investigations have engaged the Step-wise Weight Assessment Ratio Analysis (SWARA) in conjunction with the Additive Ratio Assessment (ARAS) for the selection of sales managers (Karabasevic et al., 2015). The SWARA methodology facilitated the weighting of criteria, whilst ARAS was employed for the subsequent assessment of alternatives. Criteria encompassed relevant work experience, proactive abilities, organizational and analytical skills, education, communication and problem-solving skills, and computer skills. It was ascertained that the emergent SWARA-ARAS hybrid model boasts simplicity, user-friendliness, and adaptability, endorsing its application to analogous problematics.

Subsequent research (Popović, 2021) has explored the integration of the SWARA method with the CoCoSo method for enhancing the efficiency of personnel selection decisions. It has been asserted that the CoCoSo method embodies a reliable solution, notwithstanding its inherent limitation due to the exclusive use of integers, which may not fully capture the uncertainties within the decision-making process. The criteria delineated for this study encompassed prior work experience, educational attainment, interview preparedness, interpersonal, communication and presentation skills, and proficiency in computing. Another investigation (Stević & Brković, 2020) conducted an evaluation of 23 drivers, employing the FUCOM and MARCOS methodologies. The FUCOM was utilized to ascertain the weight of criteria, and the MARCOS method facilitated the assessment of potential solutions. The study differentiated criteria into quantitative and qualitative measures: fuel consumption and damage per kilometer (denominated in monetary units) were quantitative, whereas vehicle maintenance, the driver's ability to disseminate information efficiently, and loyalty, which included driver flexibility, were qualitative.

A novel methodology, Relations Between the Ideal and Anti-ideal Alternative (RADERIA), was introduced and evaluated for HR assessment in a transport company (Jakovljevic et al., 2021). The RADERIA approach boasts three principal enhancements: it proffers a new technique for data normalization allowing for the setting of normalization intervals based on decision-maker estimates, an adaptable model for data normalization accommodating various forms of decreasing functions, and an inherent robustness against rank reversal issues. This model's stability was evidenced through simulations and a case study involving 36 alternatives. Criteria weighting was determined using the Level Based Weight Assessment (LBWA), predicated on pairwise comparisons and a non-decreasing array of importance levels for each criterion, thereby mitigating the potential inconsistencies found in other established models like BWM or AHP. The criteria utilized mirrored those in the aforementioned study (Stević & Brković, 2020).

3. Methodology

The selection of candidates for designated positions is conducted through a bifurcated process. Initially, the establishment of evaluation criteria is requisite, subsequent to which the BWM is employed for the derivation of criteria weights. The ensuing phase necessitates the ranking of candidates, a task for which the CoCoSo method is utilized, as delineated in Figure 1. This bifurcated approach ensures a structured and objective assessment of potential candidates.

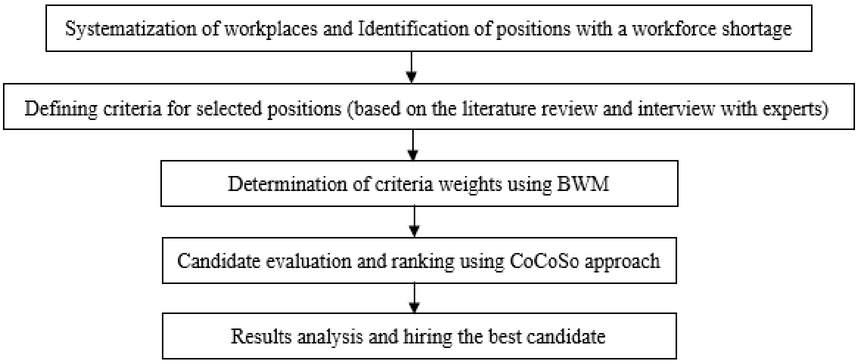

Figure 1. Methodology for personnel selection

3.1 BWM Method

The BWM is operationalized to ascertain the weights of criteria within the initial phase of the methodology. The subsequent steps delineate the process as per reference (Rezaei, 2015):

Step 1 – A set of decision criteria is determined first $\{c_1, c_2, \ldots, c_n\}$.

Step 2 – The best and the worst criteria are identified.

Step 3 – An evaluative comparison is drawn between the best criterion and all other criteria, using a scale from 1 to 9, to derive the Best-to-Others vector, presented in Eq. (1).

$$A_B = (a_{B1}, a_{B2} \ldots, a_{Bn}) \tag{1}$$

where, a_{Bj} indicates the preference of the best criterion B over criterion j. It should be noted that a_{BB} is equal to 1.

Step 4 – Conversely, each criterion is compared against the worst criterion, again utilizing a scale from 1 to 9, to construct the Others-to-Worst vector, as shown in Eq. (2):

$$A_W = (a_{1W}, a_{2W} \ldots, a_{nW})^T \tag{2}$$

where, a_{jW} indicates the preference of the criterion j over the worst criterion W. It should be noted, as in the previous step, that a_{WW}=1.

Step 5 – The optimal set of weights $(w_1^*, w_2^*, \ldots, w_n^*)$ is calculated by resolving the model presented in Eq. (3):

$$\text{Min}\,\xi,\ \text{s.t.}\ \left|\frac{w_B}{w_j} - a_{Bj}\right| \le \xi,\ \text{for all } j; \left|\frac{w_j}{w_W} - a_{jW}\right| \le \xi,\ \text{for all } j; \sum_i w_j = 1, \mathrm{w_j} \ge 0,\ \text{for all } j \tag{3}$$

3.2 CoCoSo Method

In the next phase, a CoCoSo method was applied in order to rank the candidates (alternatives), using the following steps (Pajić et al., 2022):

Step 1 – The initial decision-making matrix is determined.

Step 2 – Subsequent to matrix establishment, normalization is requisite, with the method of normalization contingent upon the criterion type. This is articulated through Eqs. (4)-(5).

$$r_{ij} = \frac{x_{ij} - \min_i x_{ij}}{\max_i x_{ij} - \min_i x_{ij}}; \text{ for benefit criterion} \tag{4}$$

$$r_{ij} = \frac{\max_i x_{ij} - x_{ij}}{\max_i x_{ij} - \min_i x_{ij}}; \text{ for cost criterion} \tag{5}$$

Step 3 – The total of the weighted comparability sequence (S_i) and the whole of the power weight of comparability sequences (P_i) for each alternative sum of the weighted comparability sequence and also an amount of the power weight of comparability sequences for each alternative are determined using Eqs. (6)-(7):

$$S_i = \sum_{j=1}^{n} \left(w_j r_{ij} \right) \tag{6}$$

$$P_i = \sum_{j=1}^{n} \left(r_{ij} \right)^{w_j} \tag{7}$$

Step 4 – Relative weights of the alternatives are then calculated using Eqs. (8)-(10):

$$k_{ia} = \frac{P_i + S_i}{\sum_{i=1}^{m} \left(P_i + S_i \right)} \tag{8}$$

$$k_{ib} = \frac{S_i}{\min_i S_i} + \frac{P_i}{\min_i P_i} \tag{9}$$

$$k_{ic} = \frac{\lambda (S_i) + (1-\lambda)(P_i)}{\left(\lambda \max_i S_i + (1-\lambda) \max_i P_i \right)}; 0 \le \lambda \le 1 \tag{10}$$

where, the value of λ is chosen by decision-makers and is usually equal to $\lambda = 0.5$.

Step 5 – Finalization of the ranking process for alternatives is conducted based on the k_i values obtained from Eq. (11), with the premise that higher values indicate a preferable alternative:

$$k_i = \left(k_{ia} k_{ib} k_{ic} \right)^{\frac{1}{3}} + \frac{1}{3} \left(k_{ia} + k_{ib} + k_{ic} \right) \tag{11}$$

4. Case Study of a Transport Manager Selection Process

In the evaluation of candidates for the role of transportation manager, critical competencies essential to the organization were prioritized. Given the leadership nature of the role, criteria were selected to reflect the key capabilities required for effective performance. The assessment of candidates for this pivotal position informs the selection process, with a significant impact on the logistical and transportation efficiency of the organization.

The criteria for evaluation were established through an examination of pertinent literature and an analysis of the competencies delineated in job descriptions for the role. Some criteria emerged independently, while others were refined based on the aforementioned literature (Cvetić et al., 2019; Jakeš, 2016; Kara et al., 2022; Karabasevic et al., 2015) Seven criteria were identified for the selection process:

- Communication and negotiation skills (C1): For a transportation manager, communication skills involve the ability to communicate effectively with the team, clients, and partners. Negotiation ability is important for achieving favorable contractual conditions, resolving conflicts, and making quick decisions in situations of emergency. These skills are crucial for successful management of transportation operations in a business context.
- Leadership skills (team management ability) (C2): Include leadership, motivation, teamwork, delegation, goal setting, and effective communication to successfully lead the team and achieve the goals of transportation operations.
- Ability to make quick and independent decisions (C3): Involves reacting efficiently and making decisions in emergency situations. This skill is crucial for managing transportation operations that require immediate decisions to ensure safety and efficiency.
- Ability to work under pressure (C4): Due to the speed and unpredictability of the job, the candidate should have no problem working under pressure to successfully perform tasks.
- Education degree (C5): It is assumed that a higher level of education corresponds to a higher level of knowledge and skills for the manager position. Individuals with higher degrees usually have a better chance of employment.
- Computer skills (C6): The better the candidate's computer literacy, the better the chances of success in this position. This position requires advanced IT skills.
- Relevant work experience (C7): More work experience provides a better chance of employment because the employee has a better overview and can contribute more to the company.

A cohort of ten candidates was shortlisted, and during interviews, each was empirically assessed against the criteria using a rating scale from one to five. The subsequent application of the aforementioned methodologies sought to identify the optimal candidate for the role. Leadership skills were deemed the paramount criterion for the position, as reflected in Table 1, owing to the necessity of such skills for team management. Conversely, education degree, as shown in Table 2, were considered the least critical, as academic achievements do not invariably equate to practical competence or requisite knowledge for the role. The BWM method entails further evaluation of the most and least critical criteria by rating them against each other on a scale from one to nine.

Table 1. Best-to-Others evaluation for transport manager selection process

Best-to-Others	Communication Skills and Negotiation Skills	Leadership Skills	Ability to Make Quick and Independent Decisions	Ability to Work under Pressure	Education Degree	Computer Skills	Relevant Work Experience
Leadership skills	2	1	3	7	9	6	4

Table 2. Other-to-Worst evaluation for transport manager selection process

Other-to-Worst	Education Level
Communication skills and negotiation skills	7
Leadership skills	9
Ability to make quick and independent decisions	6
Ability to work under pressure	4
Education degree	1
Computer skills	3
Relevant work experience	5

Based on the application of the previously described methodology, the criteria weights were obtained, and their values are given in Table 3.

Table 3. Criteria weights for transport manager selection process

Weights	C1	C2	C3	C4	C5	C6	C7
	0.220746888	0.35518672	0.14716459	0.06307054	0.02987552	0.073582296	0.11037344

As mentioned earlier, this method is used to determine criteria weights that are necessary for a second phase, in the CoCoSo method. The first step in the CoCoSo method is to construct the initial decision-making matrix using a scale (1 to 5), presented in Table 4.

Table 4. Initial decision-making matrix for transport manager selection process

Criteria	C1	C2	C3	C4	C5	C6	C7
Type	max	max	max	max	max	max	max
Candidate 1 (A1)	5	2	4	5	5	5	3
Candidate 2 (A2)	4	3	5	4	5	5	3
Candidate 3 (A3)	3	5	5	3	4	4	2
Candidate 4 (A4)	2	4	4	3	5	4	3
Candidate 5 (A5)	3	1	4	4	4	4	2
Candidate 6 (A6)	3	1	2	1	3	4	4
Candidate 7 (A7)	2	2	3	2	5	4	5
Candidate 8 (A8)	3	3	3	3	4	4	2
Candidate 9 (A9)	4	3	2	3	5	4	2
Candidate 10 (A10)	5	4	5	3	4	5	2

The following Table 5 presents the normalized matrix, which is obtained by applying Eq. (4).

Table 5. Normalized decision-making matrix for transport manager selection process

Criteria	C1	C2	C3	C4	C5	C6	C7
Weight	0.2207	0.3552	0.1472	0.0631	0.0299	0.0736	0.1104
A1	1.00	0.25	0.67	1.00	1.00	1.00	0.33
A2	0.67	0.50	1.00	0.75	1.00	1.00	0.33
A3	0.33	1.00	1.00	0.50	0.50	0.00	0.00
A4	0.00	0.75	0.67	0.50	1.00	0.00	0.33
A5	0.33	0.00	0.67	0.75	0.50	0.00	0.00
A6	0.33	0.00	0.00	0.00	0.00	0.00	0.67
A7	0.00	0.25	0.33	0.25	1.00	0.00	1.00
A8	0.33	0.50	0.33	0.50	0.50	0.00	0.00
A9	0.67	0.50	0.00	0.50	1.00	0.00	0.00
A10	1.00	0.75	1.00	0.50	0.50	1.00	0.00

As already explained, the next step in implementing the CoCoSo method is to determine the value of S_i and P_i coefficients. S_i is calculated as the total sum of the product r_{ij} and a certain criterion weight of each alternative (Table 6). Next, it is necessary to determine the value of coefficient P_i. Each value of r_{ij} is graded by a certain criterion weight, and the total sum for each alternative is used as the value of this coefficient (Table 6).

Table 6. S_i and P_i values for transport manager selection process

Alternative	C1	C2	C3	C4	C5	C6	C7	S_i
A1	0.22	0.09	0.10	0.06	0.03	0.07	0.04	0.61
A2	0.15	0.18	0.15	0.05	0.03	0.07	0.04	0.66
A3	0.07	0.36	0.15	0.03	0.01	0.00	0.00	0.62
A4	0.00	0.27	0.10	0.03	0.03	0.00	0.04	0.46
A5	0.07	0.00	0.10	0.05	0.01	0.00	0.00	0.23
A6	0.07	0.00	0.00	0.00	0.00	0.00	0.07	0.15
A7	0.00	0.09	0.05	0.02	0.03	0.00	0.11	0.29
A8	0.07	0.18	0.05	0.03	0.01	0.00	0.00	0.35
A9	0.15	0.18	0.00	0.03	0.03	0.00	0.00	0.39
A10	0.22	0.27	0.15	0.03	0.01	0.07	0.00	0.75
							Σ	4.52
Alternative	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	**C7**	P_i
A1	1.00	0.61	0.94	1.00	1.00	1.00	0.89	6.44
A2	0.91	0.78	1.00	0.98	1.00	1.00	0.89	6.56
A3	0.78	1.00	1.00	0.96	0.98	0.00	0.00	4.72
A4	0.00	0.90	0.94	0.96	1.00	0.00	0.89	4.69
A5	0.78	0.00	0.94	0.98	0.98	0.00	0.00	3.69
A6	0.78	0.00	0.00	0.00	0.00	0.00	0.96	1.74
A7	0.00	0.61	0.85	0.92	1.00	0.00	1.00	4.38
A8	0.78	0.78	0.85	0.96	0.98	0.00	0.00	4.35
A9	0.91	0.78	0.00	0.96	1.00	0.00	0.00	3.65
A10	1.00	0.90	1.00	0.96	0.98	1.00	0.00	5.84
							Σ	46.06651

In order to determine the final rank, the coefficients k_{ia}, k_{ib}, k_{ic}, and the main coefficient k_i are calculated using the already mentioned Eqs. (8)-(11). The results are presented in Table 7.

Table 7. Alternatives ranking for transport manager selection process

Alternatives	k_{ia}	k_{ib}	k_{ic}	k_i	Rank
A1	0.139	7.850	0.963	4.002	3
A2	0.143	8.252	0.987	4.179	1
A3	0.106	6.941	0.730	3.404	4
A4	0.102	5.837	0.704	2.962	5
A5	0.078	3.708	0.536	1.977	9
A6	0.037	2.000	0.258	1.033	10
A7	0.092	4.512	0.638	2.391	7
A8	0.093	4.857	0.642	2.526	6
A9	0.080	4.723	0.552	2.377	8
A10	0.130	8.480	0.901	4.169	2

It is discernible that the candidate positioned second overall does not hold the highest scores across all criteria; rather, this candidate's strengths are distributed variably among the criteria. Notably, despite the primacy of leadership skills as established by the weightings, the candidate achieved a moderate score of 3 in this domain. Yet, this individual exhibits strong performance in communication and negotiation, adeptness in rapid decision-making and independent thinking, works well under pressure, has a high level of education, and has excellent IT skills. However, this candidate's work experience relevant to the position is comparatively limited. The comparison reveals marginal differences between the second candidate and the top contenders, namely candidates 10 and 1. The candidate ranked second, however, has been assessed more favorably in the criterion identified as most critical—leadership skills. Conversely, the candidate with lower overall ranking demonstrates a deficiency in leadership, struggles to operate effectively under pressure, and exhibits less acumen in rapid decision-making, although communication skills are a strong suit, augmented by more substantial work experience relative to the highest-ranked candidate. The fine margins separating the top trio of candidates underscore the intricacies inherent in MCDM processes. The leading candidate distinguishes themselves from the runner-up with marginally superior relevant work experience, while the candidate in third place lags slightly in terms of team management prowess. This nuanced differentiation may ultimately influence the suitability of a candidate for the transportation manager role.

5. Case Study of a Driver's Selection Process

In the subsequent section of the manuscript, the same approach is applied to the decision-making process for driver selection. Criteria for this assessment were established from a thorough review of pertinent literature and an examination of the job descriptions for drivers, with a focus on requisite attributes and competences. Accordingly, the criteria incorporated in this study are as follows (Jakovljevic et al., 2021; Kara et al., 2022; Karabasevic et al., 2015; Stević & Brković, 2020)

- Spatial coordination and orientation (C1): These skills are crucial for safe driving and efficient vehicle management. For a driver, coordination involves the ability to handle the vehicle and perform precise movements, while spatial orientation includes the ability to accurately position the vehicle on the road and navigate to the destination safely and efficiently. It is essential that the candidate can navigate in space.
- Level of responsibility and accuracy (C2): A driver must ensure the safety of the cargo, and the vehicle, and compliance with regulations. Accuracy involves delivering the cargo according to agreed-upon deadlines and precisely tracking routes and times. Both skills are crucial for successfully performing the job.
- Ability to work under pressure (C3): As with higher positions, in transportation and logistics, it is important for a person in the driver's position to be capable of working in different conditions and under various circumstances. Typically, this pressure relates to delays and tight deadlines.
- Speed in performing operational tasks, such as reporting, loading/unloading of goods, handover, takeover, document checks, etc. (C4): It is important for the driver to have such a routine that these tasks are done quickly, without delays, to ensure the entire process is swift.
- Level of regulations, rules, and documentation knowledge (C5): A high level of knowledge of regulations and documentation is essential to ensure compliance with laws and regulations, avoid customs issues, and ensure efficiency in the overall supply chain.
- Relevant work experience (C6): Similar to transportation managers, a crucial factor in hiring drivers is their previous work experience. Certainly, for the company, it is easier and better to hire someone who has worked in the same position before, as it avoids training, potential errors, etc.

The selection of the premier candidate for a driving position was conducted utilizing the BWM-CoCoSo methodology. Within this framework, spatial coordination and orientation were emphasized as critical competencies for drivers; the absence of these abilities significantly undermines the efficiency of job performance (Table 8). Deficiencies in this domain are indicative of substandard operational capability. Conversely, the speed in performing operational tasks, while advantageous, is deemed subordinate in importance, as it does not substantially influence the proficiency of overall job performance (Table 9). While increased speed in logistical tasks such as loading may accelerate the process, it is the proficiency in the core function of driving that is deemed paramount.

Table 8. Best-to-Others evaluation for driver selection process

Best to Others	**Spatial Coordination and Orientation**	**Level of Responsibility and Accuracy**	**Ability to Work under Pressure**	**Speed in Performing Operational Tasks**	**Level of Knowledge (Rules, Regulations, etc.)**	**Relevant Work Experience**
Spatial coordination and orientation	1	2	5	9	2	4

Table 9. Other-to-Worst evaluation for transport manager selection process

Others-to-Worst	**Speed in Performing Operational Tasks**
Spatial coordination and orientation	9
Level of responsibility and accuracy	7
Ability to work under pressure	4
Speed in performing operational tasks	1
Level of knowledge (rules, regulations, etc.)	8
Relevant work experience	5

Subsequent to the implementation of the BWM, the criterion weights were ascertained (refer to Table 10). It has thus been deduced that spatial coordination and orientation emerge as the preeminent criterion. This is succeeded by the level of responsibility and level of regulation knowledge. These primary criteria are supported by the additional considerations of relevant work experience, the ability to work under pressure, and speed in performing operational tasks.

Table 10. Criteria weights for driver selection process

	C1	**C2**	**C3**	**C4**	**C5**	**C6**
Weights	0.358719647	0.209713024	0.08388521	0.03311258	0.20971302	0.10485651

In parallel with the preceding case study, the derived results were subsequently utilized as inputs within the CoCoSo method. Consequently, a decision-making matrix was established, comprising 10 alternatives (candidates), each evaluated against six defined criteria. The candidates were rated on a scale ranging from 1 to 5 (as detailed in Table 11).

Table 11. Initial decision-making matrix for driver selection process

Criteria	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**
Type	max	max	max	max	max	max
Candidate 1 (A1)	5	3	4	4	5	5
Candidate 2 (A2)	5	2	4	3	4	3
Candidate 3 (A3)	4	3	3	4	4	1
Candidate 4 (A4)	5	4	3	5	5	2
Candidate 5 (A5)	4	3	1	3	5	5
Candidate 6 (A6)	5	3	2	4	5	4
Candidate 7 (A7)	4	3	2	3	4	5
Candidate 8 (A8)	5	3	1	3	4	3
Candidate 9 (A9)	4	3	1	5	4	2
Candidate 10 (A10)	5	3	2	4	4	2

In the next step normalization was performed based on the criteria type (Table 12).

Table 12. Normalized decision-making matrix for driver selection process

Criteria	C1	C2	C3	C4	C5	C6
Weight	0.358719647	0.209713024	0.08388521	0.033112583	0.209713024	0.104856512
A1	1.00	0.50	1.00	0.50	1.00	1.00
A2	1.00	0.00	1.00	0.00	0.00	0.50
A3	0.00	0.50	0.67	0.50	0.00	0.00
A4	1.00	1.00	0.67	1.00	1.00	0.25
A5	0.00	0.50	0.00	0.00	1.00	1.00
A6	1.00	0.50	0.33	0.50	1.00	0.75
A7	0.00	0.50	0.33	0.00	0.00	1.00
A8	1.00	0.50	0.00	0.00	0.00	0.50
A9	0.00	0.50	0.00	1.00	0.00	0.25
A10	1.00	0.50	0.33	0.50	0.00	0.25

After that, the S_i and P_i coefficients were obtained in the same way as described in the previous case study (Table 13).

Table 13. S_i and P_i values for driver selection process

Criteria	C1	C2	C3	C4	C5	C6	S_i
A1	0.36	0.10	0.08	0.02	0.21	0.10	0.88
A2	0.36	0.00	0.08	0.00	0.00	0.05	0.50
A3	0.00	0.10	0.06	0.02	0.00	0.00	0.18
A4	0.36	0.21	0.06	0.03	0.21	0.03	0.89
A5	0.00	0.10	0.00	0.00	0.21	0.10	0.42
A6	0.36	0.10	0.03	0.02	0.21	0.08	0.80
A7	0.00	0.10	0.03	0.00	0.00	0.10	0.24
A8	0.36	0.10	0.00	0.00	0.00	0.05	0.52
A9	0.00	0.10	0.00	0.03	0.00	0.03	0.16
A10	0.36	0.10	0.03	0.02	0.00	0.03	0.53
						Σ	5.11
Criteria	**C1**	**C2**	**C3**	**C4**	**C5**	**C6**	P_i
A1	1.00	0.86	1.00	0.98	1.00	1.00	5.84
A2	1.00	0.00	1.00	0.00	0.00	0.93	2.93
A3	0.00	0.86	0.97	0.98	0.00	0.00	2.81
A4	1.00	1.00	0.97	1.00	1.00	0.86	5.83
A5	0.00	0.86	0.00	0.00	1.00	1.00	2.86
A6	1.00	0.86	0.91	0.98	1.00	0.97	5.72
A7	0.00	0.86	0.91	0.00	0.00	1.00	2.78
A8	1.00	0.86	0.00	0.00	0.00	0.93	2.79
A9	0.00	0.86	0.00	1.00	0.00	0.86	2.73
A10	1.00	0.86	0.91	0.98	0.00	0.86	4.62
						Σ	38.92012

Lastly, these results were used to calculate the k_{ia}, k_{ib}, k_{ic}, and k_i coefficients, in order to obtain the final ranking of the alternatives (Table 14).

Table 14. Alternatives ranking for driver selection process

Alternatives	k_{ia}	k_{ib}	k_{ic}	k_i	Rank
A1	0.153	7.492	0.998	3.926	2
A2	0.078	4.089	0.508	2.103	6
A3	0.068	2.109	0.443	1.272	9
A4	0.153	7.578	0.998	3.959	1
A5	0.075	3.604	0.488	1.897	7
A6	0.148	6.948	0.968	3.687	3
A7	0.068	2.465	0.448	1.416	8
A8	0.075	4.167	0.492	2.114	5
A9	0.066	2.000	0.430	1.215	10
A10	0.117	4.947	0.765	2.705	4

The analysis reveals that candidate four is the most suitable for selection. This individual demonstrates exceptional spatial coordination and orientation skills, augmented by a commendable level of responsibility and accuracy in task execution, coupled with expedient operational performance. Despite a modest rating in previous work experience and a less robust capacity to work under pressure, this candidate is identified as the optimal choice. In selecting this individual, the employer electively prioritizes a constellation of higher scores over the lower experience rating. In close contention is candidate one, who also boasts notable spatial orientation capabilities. The marginal distinction between the top two candidates is underscored. Despite possessing superior previous work experience, candidate one is somewhat deficient in responsibility and accuracy, and demonstrates marginally lower operational speed. The selected candidate, though potentially requiring additional time to acclimate to novel environments—such as unfamiliar markets—can rely on their pronounced knowledge, spatial orientation, and responsibility to navigate new challenges with relative ease. Conversely, candidates situated at the lower end of the ranking, specifically candidates three and nine, exhibit significantly deficient scores across several criteria. These shortcomings render them less viable for the role of driver, highlighting the practical application of the CoCoSo method in distinguishing the most competent candidates.

6. Discussion

In the process of candidate preselection, interviews are conducted to assess the prospective employees' qualifications, skills, and abilities. Both individual and panel interviews serve to evaluate management competencies, including team management, communication, leadership, and decision-making. Such assessments may incorporate situational exercises or tests. Experience is appraised through an analysis of the candidate’s work history in the transport sector, encompassing past positions, accomplishments, and reference projects. Computer literacy is often verified through examination of the candidate's experience with relevant software.

For driving positions, the type of vehicle to be operated and the class of the driver's license are ascertained, with a critical emphasis on safety credentials—this includes reviewing the history of traffic violations and conducting background checks. Additional skills are evaluated via simulation tests.

In the analyses thus far, selection outcomes have been reported for two distinct roles within the organizational hierarchy: a senior managerial position and an operational-level driving role. Despite the difference in hierarchical status, both positions share key competencies owing to the intrinsic requirements of their functions. The ability to perform under pressure and the possession of relevant work experience emerge as universal prerequisites. The insistence on prior experience is grounded in the analysis of job advertisements as discussed in Section Four, revealing its significance to employers within the sector. The dynamic nature of the transportation environment necessitates that individuals, irrespective of their rank, possess the capacity to manage stress induced by unpredictability and the exigencies of real-time operational demands. Distinctive responsibilities are, however, intrinsic to each role. A transportation manager orchestrates the operations and oversees the workforce, whereas a driver is charged with the navigation and secure conveyance of goods. While both roles are pivotal to the efficacy of the supply chain, they necessitate divergent sets of criteria reflective of their specialized duties.

It has been observed that candidates selected for the roles do not uniformly exhibit superior scores across all evaluation criteria, with marginal differentials distinguishing the candidates for the respective positions. Notably, the appointed transportation manager did not secure the highest marks in leadership abilities—despite its designation as a primary criterion. Nevertheless, the individual demonstrates commendable aptitude in rapid, autonomous decision-making, as well as proficiency in communication and negotiation—skills that underpin leadership potential. In contrast, the chosen driver displays preeminent competency in spatial coordination and orientation, deemed the most critical criterion for the role, alongside a pronounced sense of responsibility, task execution accuracy, and substantive transportation knowledge. While the managerial role encompasses a broader spectrum of operational and team leadership responsibilities, the driver's role is concentrated on navigation and the tangible delivery of goods. This evidence suggests a preference for candidates who offer a well-rounded profile over those who may excel in isolated criteria. The ideal candidate demonstrates a harmonious blend of skills pertinent to the role's requirements rather than an exceptional standing in a singular competency.

In the pursuit of an optimally efficient decision-making model, integers have been employed to facilitate simplicity in the model's application. This approach circumvents the inherent uncertainties and ambiguities traditionally associated with decision-making processes. Nevertheless, these complexities can be adeptly addressed through the adoption of fuzzy numbers, and further, by incorporating Evidence Theory (ET) and Rule-Based Transformation (RBT), the challenges of uncertainty may be surmounted. However, such integrations potentially complicate multi-criteria models and questionnaires to a degree that may confound respondents, thereby impeding their capacity to provide clear and concise input.

Beyond its pragmatic utility, the methodology advanced herein contributes substantively to the scientific discourse. Specifically, this research delineates a novel strategy tailored to address a critical concern within logistics: the selection of personnel. For the first time in scholarly literature, the assignment of criterion weights and subsequent employee appraisal are executed via the synergistic application of the BWM-CoCoSo methods. Securing pertinent outcomes necessitates not only the execution of comprehensive interviews with candidates but also the judicious selection of evaluation criteria tailored to the competencies required by distinct positions.

7. Conclusions

The deployment of MCDM methods has been instrumental in the selection of candidates for distinct positions within the business domain. MCDM is recognized for its efficacy in informed decision-making, thereby facilitating the identification of optimal solutions. The present study harnessed two MCDM approaches: the BWM for establishing the weight of criteria and the CoCoSo method for the ranking of candidates. These particular methods were selected for their user-friendly nature and their efficiency. Notably, the human resources sector can utilize simple software tools, such as Excel, to apply these methods and achieve the requisite outcomes. Furthermore, the CoCoSo method is acknowledged for yielding a balanced solution, which is pivotal in the selection of candidates, ensuring a diverse array of abilities is considered beyond singularly dominant competencies. In this study, optimal candidates were identified for both the transportation manager and driver roles. For the managerial role, a septet of criteria was scrutinized, encompassing: communication and negotiation skills, leadership skills, the ability to make quick and independent decisions, the ability to work under pressure, the education degree, computer skills, and relevant work experience—with the assessment of leadership prowess being notably challenging. The candidate who emerged as the most suitable did not possess the pinnacle of proficiency in the primary criterion. Yet, they demonstrated superior performance across a spectrum of other criteria, displaying adeptness in communication and negotiation, a propensity for prompt decision-making, a composed demeanour in stressful situations, a commendable academic background, and robust IT skills. Nevertheless, their professional experience in the role was not extensive. This selection underscores the CoCoSo methodology's intent to secure a balanced candidate who exhibits a comprehensive skillset rather than excelling solely in a singular, pivotal criterion. In the second part of this study, the driver selection was subjected to a sextet of evaluative criteria: spatial coordination and orientation skills, the level of responsibility and accuracy, the ability to work under pressure, speed in performing operational tasks, knowledge of regulations, and relevant work experience. Among these, the spatial coordination and orientation skills were deemed paramount. The candidate who distinguished themselves exhibited remarkable spatial awareness, coupled with commendable dedication and meticulousness in task fulfillment, and impressive operational efficiency. Their understanding of the industry's regulatory framework was also extensive. However, this individual's prior professional experience and capacity to maintain performance under pressure were rated modestly. It is imperative to acknowledge that the reliability and relevance of personnel selection are augmented when predicated on meticulously curated criteria. The methodology applied herein advocates for the appointment of a well-rounded candidate, whose overall qualifications surpass those of a candidate excelling in only the principal criterion.

A notable limitation identified in this research is the prevailing driver shortage across numerous markets. Under these circumstances, many companies are faced with vacancies that necessitate an expedited selection process, or at times, the bypassing of such processes entirely. While pragmatically understandable, this approach is not devoid of potential pitfalls; it may precipitate additional complications, potentially escalating into consequential costs for the enterprise. Not uncommonly, this hastened hiring may inadvertently welcome individuals prone to fraudulent activities, misconduct, or statutory non-compliance. Additionally, deficiencies in the execution of the interview process may adversely skew the outcomes, thereby constraining the robustness of the proposed selection methodology.

Future endeavors should concentrate on refining the employee selection model to encompass a wider array of roles within the logistics sector. It is prudent to integrate additional methodologies that can enhance the model's discernment and foster the integrity of decision-making. To substantiate the model's efficacy, it is recommended to undertake empirical tests in diverse market environments and conduct comparative analyses. Prospective research should also prioritize the development of dedicated software aimed at supporting the human resources domain in adjudicating candidates. Such a tool would streamline the evaluative computations required across various levels of decision-making. Addressing uncertainties inherent in employee selection will benefit from the incorporation of Evidence Theory and Rule-Based Transformation, highlighting a promising trajectory for future scholarly pursuit.

Data Availability

The data used to support the research findings are available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflict of interest.

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