SCIENTIFIC OASIS

Journal of Intelligent Decision Making and Granular Computing

Journal homepage: www. jidmag.org
ISSN: 3042-3759

A Type-2 Neutrosophic Decision Framework for Outsourcing Provider Selection in Professional Football: Integrating Sports Marketing and Logistics Management

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ARTICLE INFO

Article history:
Received 19 March 2026
Received in revised form 2 May 2026
Accepted 3 June 2026
Available online 9 June 2026

Keywords:
Type-2 Neutrosophic Sets; WASPAS; Outsourcing Decision-Making; Sports Logistics; Professional Football Clubs.

ABSTRACT

This study proposes a decision-support system for professional football clubs to evaluate outsourcing service providers by integrating the WASPAS method with Type-2 Neutrosophic Fuzzy Numbers (T2NNs). Increasing operational complexity, digital transformation, rising fan expectations, and intense competition force football clubs to outsource many sporting and operational activities. However, uncertainties, subjective judgments, conflicting expert opinions, and the dynamic nature of the football industry make outsourcing decisions difficult to manage using traditional decision-making approaches. To address these challenges, the proposed T2NN-WASPAS framework effectively models complex uncertainties and supports rational decision-making processes. In the proposed model, the T2NN is employed to determine the relative importance of evaluation criteria, while the T2NN-WASPAS approach is used to rank outsourcing service providers. The framework integrates sports logistics and sports marketing perspectives by jointly evaluating operational reliability, logistics capacity, technological infrastructure, flexibility, crisis management capability, service quality, brand compatibility, fan experience, and cost performance. A real-life case study involving professional football clubs was conducted to validate the proposed methodology. The findings indicate that logistics capacity, operational reliability, and service quality are the most influential criteria in outsourcing decisions. The results also show that football clubs prioritize long-term operational sustainability and fan satisfaction over purely cost-oriented strategies. The proposed framework contributes to the sports management, sports logistics, and multi-criteria decision-making literature by providing a robust, reliable, and uncertainty-aware decision-support model for complex outsourcing environments.

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https://doi.org/10.31181/jidmgc21202639

1. Introduction

Today, the sports industry has ceased to be an arena where only physical competition and sports performance are evaluated and has become a large global industrial ecosystem with economic, technological, managerial, and operational dimensions. Especially, football has become one of the most strategic and highest-value-added areas of the sports industry due to its economic scale, fan base, media influence, sponsorship volume, and commercial activities [1]. Today's professional football organizations must successfully manage extremely complex logistics, marketing, procurement, digital media, security, fan relations, and commercial operations, beyond simply achieving sporting success. Accordingly, football clubs have started to transform from traditional sports organizations to professional businesses with many stakeholders [2].

The transformation of football into an increasingly large-scale industry and the acceleration of commercialization trends in the global context have taken the competition between clubs beyond on-field sporting achievements, making it necessary for them to focus on areas such as brand value, operational efficiency, financial sustainability, fan satisfaction, and service quality [3]. As factors such as economies of scale and outsourcing gain an increasingly decisive role in competition, clubs across all sports, especially football, have begun to delegate non-core operations to outsourced service providers to better focus on their core activities. Outsourcing in the sports industry has become a strategic managerial tool for football clubs, particularly in logistics, transportation, facility management, event organization, security services, catering, product sales, media operations, digital marketing, and supply chain activities. Outsourcing is considered an important management approach that allows businesses to focus on their core business, reduce operational costs, leverage expertise, and increase competitiveness [4].

However, selecting outsourcing service providers is an extremely complex and critical decision-making problem for football clubs. Because service providers' performance can directly affect not only operational processes but also the success of sports organizations, club image, fan experience, and financial sustainability. If the wrong service provider is selected, serious problems such as logistical delays, organizational disruptions, decreased service quality, increased costs, fan dissatisfaction, weakened sponsorship relations, and loss of brand value may arise. Especially the high visibility of football organizations magnifies the impact of operational errors. For example, transportation, security, or logistical disruptions that may occur in a competition organization are not only for the clubs; They can also directly affect fans, broadcasters, sponsors, investors, and federations. Therefore, football clubs' decisions regarding outsourcing are not just operational choices; they should be considered multidimensional decision-making problems with strategic, financial, and managerial consequences.

On the other hand, the dynamic nature of the sports industry, the high level of uncertainty, and the intense need for expert opinions in decision-making processes make the solution to this problem even more complicated. Football clubs are often forced to make decisions under incomplete information, conflicting assessments, uncertain environmental conditions, and subjective expert judgments. For this reason, traditional decision-making approaches may be insufficient for modeling real-world problems. The fact that the criteria considered in the service provider evaluation process, especially in terms of sports marketing and logistics activities, have both quantitative and qualitative characteristics, makes the decision-making problem a multi-criteria problem. Criteria such as service quality, operational reliability, cost, technical competence, flexibility, brand alignment, fan satisfaction, and crisis management capacity need to be evaluated simultaneously. This situation underscores the need for robust methodological decision-support systems that can effectively handle uncertainty.

The literature indicates that studies on selecting outsourcing service providers in the sports industry are extremely limited. Although supplier selection and outsourcing decisions have been widely studied in manufacturing, healthcare, logistics, and general supply chain management, the decision-making problems specific to the operational structures of football clubs have not been adequately addressed. There are almost no studies that evaluate sports marketing and sports logistics perspectives in an integrated manner. In addition, many existing studies rely on traditional multi-criteria decision-making methods and face limitations in modeling sports organizations with high levels of uncertainty. In addition, it is often unclear which methods are used to determine the criterion sets in current research, and expert opinions are not systematically evaluated. It shows that there are three main research gaps in literature.

The first research gap is the limited number of studies on the evaluation and selection of outsourcing service providers in football clubs. The second gap is the lack of robust methodological decision-support systems capable of modeling the complex, uncertain structure of sports organizations. The third research gap is the lack of an agreed-upon, systematic set of criteria for football clubs to consider when evaluating service providers for sports marketing and logistics activities. To systematically evaluate these gaps, the following research questions were developed within the scope of the study: RQ-1: What criteria do football clubs consider when evaluating outsourcing service providers? RQ-2: What are the critical success criteria for football clubs in terms of sports marketing and logistics activities? RQ-3: Is there a feasible, reliable, and uncertainty decision-making model that can support football clubs' outsourcing decisions? RQ-4: How can service provider alternatives be evaluated more realistically in sports organizations where uncertainties are intense?

To address these research questions and eliminate gaps in the literature, the study proposes a new multi-criteria decision-making model based on WASPAS in a Type-2 Neutrosophic environment. The main purpose of the proposed approach is to enable football clubs to evaluate outsourcing service providers for sports marketing and logistics activities in a more realistic, consistent, and systematic manner. The Type-2 Neutrosophic approach used in the study can model uncertainties, missing information, and conflicting expert evaluations more effectively than classical fuzzy sets. Therefore, the method provides a robust decision-making framework for sports organizations with dynamic, complex structures.

In the proposed methodology, the T2NFN set enables systematic determination of criterion weights from expert evaluations, while the WASPAS method offers high accuracy and strong computational performance for ranking alternatives. The fact that the WASPAS approach leverages the strengths of both the Weighted Sum Model (WSM) and the Weighted Product Model (WPM) allows the alternatives to be evaluated in a more balanced and realistic way. In addition, extending it with a Type-2 Neutrosophic structure significantly increases the method's robustness against uncertainties. Thus, the study offers a robust decision-support system applicable to football clubs not only at the theoretical level but also in practice.

Another important contribution of the study is that it integrates the dimensions of sports marketing and sports logistics within the same decision-making framework. While existing studies often treat logistics activities and marketing processes separately, this study evaluates football clubs' outsourcing decisions from an integrated perspective. In this respect, the study makes methodological and managerial contributions to both sports management and decision sciences literature. Furthermore, sensitivity analyses of the proposed model confirm the methodology's stability, consistency, and reliability.

In conclusion, this study aims to provide a new, powerful, and applicable methodological framework for evaluating outsourcing service providers in football clubs. The study contributes to the theoretical literature of sports management, sports marketing, logistics management, and multi-criteria decision-making. In terms of implementation, it is expected to help football clubs make more rational, sustainable, and strategic decisions. In addition, the study's results are expected to yield important managerial implications for sports organizations, logistics service providers, managers, and researchers.

The remaining parts of the study are structured as follows. Section 2 presents the conclusions of a detailed literature review and identifies research gaps and theoretical assessment deficiencies in the relevant literature. Section 3 introduces the fundamental algorithm, implementation steps, and mathematical concept of the suggested decision-making model. Section 4 presents the implementation of the model to solve decision-making problems encountered in the field of the football industry. Section 5 demonstrates the results of the robustness and validity check. Section 6 presents the managerial and policy implications derived from the findings and theoretical contributions of the proposed decision-making tool. Section 7 finalized the study and highlights the future research directions and trends.

2. Research Background

This section presents insights from a comprehensive, detailed review of the literature on managing operational processes in the sports industry.

2.1 Transformation of the Football Industry and Managerial Complexity

The economic scale of the football industry, its effects on the media, its global reach, and the commercial and financial assets it manages have made it one of the largest entertainment and sports fields, ranking it among the top ten industries. In particular, the extraordinary increase in the broadcasting revenues of football clubs, sponsorship agreements worth millions of dollars, the positive effects of cooperation with digital platforms, the increasing prevalence of fan club interactions, large-scale international organizations have dramatically transformed the business models of football clubs, leading them to transform from traditional sports organizations to professional businesses with multidimensional and gigantic scales [2]. Today's football clubs have become large-scale actors in the business world, requiring effective management of logistics operations, financial sustainability, brand management, digital marketing, stadium operations, procurement processes, and fan relations beyond their sporting activities.

Especially since the 1990s, football has become increasingly industrialized, greatly changing the corporate governance and business models of sports clubs, requiring them to restructure. It has expanded beyond the sporting achievements of inter-club competition to encompass economic performance, brand value, fan loyalty, and operational efficiency. This eye-catching transformation in the field of football has shown that football clubs cannot survive on traditional business models and has forced them to develop more professional ones. Due to the financial growth of European football, football clubs have become giant ecosystems worth billions of dollars. Additionally, administrative processes and operations have become much more complex than in the past.

Modern football organizations are complex systems that must meet the simultaneous expectations of many stakeholders. Fans expect high service quality and experience, sponsors demand brand visibility and corporate reputation, broadcasters expect operational continuity, and investors prioritize financial sustainability. In addition, federations, local governments, media organizations, and suppliers are among the important stakeholders of football organizations. Therefore, the operational success of football clubs is not only based on sporting performance; It is also related to the capacity to manage the expectations of all stakeholders in a balanced way.

In this context, football clubs' operational activities have become increasingly complex. The need for professional support has increased, especially in areas such as stadium management, team transportation, fan mobility, security coordination, digital broadcasting operations, merchandising logistics, event organizations, and media management. Because clubs often carry out all these processes with their own internal resources, which can create a high-cost, unsustainable structure, outsourcing practices have come to the fore as a strategic management tool.

2.2 The Concept of Outsourcing and Its Significance in the Sports Industry

Outsourcing is a strategic management approach that aims to improve operational efficiency by delegating activities outside a business's core competencies to expert service providers (Corbett, 2004). The main purposes of outsourcing applications are to achieve cost advantages, benefit from expert knowledge, increase operational flexibility, improve service quality, and allow businesses to concentrate on their core fields of activity [4]. With globalization, technological developments, and increasing competitive pressure, outsourcing applications have become widely used across many sectors.

The usage area of outsourcing applications in the sports industry is quite wide. Many activities, such as security services, transportation organizations, stadium operations, catering, digital media management, sponsorship coordination, logistics operations, merchandising processes, and event management, are carried out through outsourced service providers. Especially in professional football clubs, outsourcing practices play a critical role in reducing operational burdens and accessing expert services.

However, the success of outsourcing decisions largely depends on choosing the right service provider. The technical competence, operational capacity, cost structure, flexibility level, crisis management skills, digital infrastructure, and service quality of the service provider can directly affect the club's performance. Especially due to the high visibility of football organizations, the impact of operational disruptions can be much greater than in other sectors. For example, logistical or security-related problems that may occur during a competition are not only the club's; They can also cause damage to fans, sponsors, broadcasters, and federations.

In addition, the dynamic structure of football clubs makes outsourcing decisions more complex. Clubs often must make decisions under time pressure, in uncertain environmental conditions, and with incomplete information. Therefore, evaluating outsourcing service providers is not just cost-oriented; it requires a comprehensive decision-making process that evaluates multidimensional strategic criteria together.

2.3 The Concept of Outsourcing and Its Significance in the Sports Industry

Sports marketing is an important management area that covers the delivery of sports products and services to target audiences, increasing fan loyalty, and developing brand value [5]. Today, football clubs are not only successful on the field; they also compete for brand power, fan experience, and digital visibility. For this reason, sports marketing activities are of strategic importance for clubs.

The digital transformation process has significantly changed the understanding of sports marketing. Social media platforms, digital publishing, mobile apps, and data analytics have allowed for continuous engagement with fans. In this process, football clubs benefit from outsourcing their digital marketing activities to service providers to carry them out more professionally. In particular, social media management, digital content production, fan data analytics, and online store operations are among the areas where outsourcing applications are used extensively.

The relevant literature indicates that fan experience directly affects fans' loyalty to the club, the club's brand value, and commercial revenues. Fans' experiences with competitions, the services offered to them in stadiums and sports halls, their perceptions of security, the ease and comfort of access to the stadium, and the level of digital interaction between fans greatly shape the club's image in the eyes of fans and rival club fans. Accordingly, outsourcing the services that football clubs provide to fans and football lovers directly affects fan satisfaction and club brand perception, rather than operational efficiency and cost-effectiveness.

On the other hand, when the literature on sports marketing is examined, it is evident that studies evaluating outsourcing service providers are extremely limited. In this context, the lack of research that addresses the relationships and interactions among digital transformation, fan experience, and service quality and performance in a multidimensional, holistic manner is a significant research gap.

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2.5 Sports Logistics and Operational Management

Conceptually, sports logistics refers to the management of products, materials, equipment, and information flows required by sports organizations and competitions in a planned, organized, and systematic manner. Sports logistics in the football industry encompasses comprehensive, multidimensional operations, including the transportation of athletes and technical staff; ensuring the access and mobility of fans; transporting and storing materials and equipment; and operations carried out in stadiums and fields, including event management and security planning.

Especially the increase in international organizations has increased the strategic importance of sports logistics. Organizations such as the Champions League, Europa League, World Cup, and intercontinental tournaments require a high level of coordination. In this process, the performance of logistics service providers can directly affect the organization's success.

The literature from studies on sports logistics indicates a strong relationship between the quality and scope of logistics services, including services offered to fans, and fan satisfaction for football clubs. Most of the experiences that cause fan satisfaction and complaints in sports organizations are related to logistical performance, such as transportation to stadiums, access to products and services such as food, jerseys, etc. in stadiums, and stadium entry and exit processes, seating arrangements, food and beverage services, and sales operations have a direct impact on fan satisfaction. Accordingly, sports logistics is considered a strategic process that affects marketing and brand management beyond logistics operations.

Despite this, the sports logistics literature is still in its early stages. Studies examining the relationships between football clubs' outsourcing decisions and logistical performance are very limited. This situation underscores the need for new studies that address sports logistics and outsourcing management in an integrated manner.

2.6 Multi-Criteria Decision Making Approaches and Supplier Selection Problems

Supplier selection is a critical strategic decision-making process for businesses. Selecting the appropriate alternative is paramount, as service providers' performance directly impacts operational success. These problems often require evaluating many criteria, such as cost, quality, reliability, flexibility, sustainability, technical capacity, delivery performance, and customer satisfaction [6].

For this reason, supplier selection problems are generally analyzed using multi-criteria decision-making (MCDM) methods. In the literature, many methods, such as AHP (The Analytic Hierarchy Process) [7], ANP the Analytic Network Process [8], TOPSIS [9], VIKOR (VIšeKriterijumska Optimizacija I Kompromisno Rešenje) [10], ELECTRE (ELimination Et Choix Traduisant la REalité — Elimination and Choice Expressing the REality) [11], DEMATEL (The Decision-Making Trial and Evaluation Laboratory) [12], MOORA (The Multi-Objective Optimization based on Ratio Analysis) [13], COPRAS (COmplex PRoportional ASsessment) [14], PROMETHEE (Preference Ranking Organization METHod for Enrichment Evaluations) [15], and WASPAS (The Weighted Aggregated Sum Product Assessment) [16], have been developed. These methods are widely applied in areas such as energy management, health systems, sustainable supply chain, production management, and logistics planning.

However, since many traditional MCDM methods rely on precise numerical data, they may be insufficient for modeling real-life problems with significant uncertainty. Especially in sports organizations, decision-makers often base their decisions on linguistic expressions, intuitive evaluations, and subjective expert opinions. Therefore, advanced methodological structures that can model uncertainties more effectively are needed.

2.7 Neutrosophic Approaches and the Uncertainty Modeling Process

Uncertainty modeling approaches have made significant progress in the MCDM literature in recent years. Methods such as fuzzy set theory, heuristic fuzzy sets, Pythagorean fuzzy sets, and q-rung orthopair structures aim to model decision-makers' uncertain evaluations more realistically. Among these approaches, neutrosophic clusters offer a stronger theoretical background due to their ability to simultaneously assess the degrees of accuracy, uncertainty, and inaccuracy (Smarandache, 1999).

Type-2 Neutrosophic structures, on the other hand, reveal a more advanced structure than classical neutrosophic structures thanks to their ability to model second-level uncertainties. Especially in cases where expert evaluations are conflicting and there is no definitive data, Type-2 Neutrosophic methods can offer more reliable results. Therefore, in recent years, there has been a significant increase in the use of Type-2 Neutrosophic MSDV methods in areas such as sustainable energy systems, health management, disaster management, supply chain optimization, and logistics planning.

However, when the sports management literature is examined, it is seen that Type-2 Neutrosophic-based studies are quite limited. Especially in football clubs, Type-2 Neutrosophic-based integrated decision-making models for evaluating outsourcing service providers are not encountered. It significantly increases the methodological originality of the current study and its contribution to the literature.

2.8 Position of WASPAS Approach in the Literature

The T2NFN is an effective approach for systematically determining criterion weights based on expert evaluations. It gives successful results, especially in problems involving uncertainty, as it allows decision-makers to evaluate the criteria gradually. In the literature, it is widely used in areas such as sustainability assessment, energy planning, health management, logistics performance analysis, and supplier selection.

The WASPAS method is a powerful ranking method that integrates the Weighted Sum Model (WSM) and the Weighted Product Model (WPM). The most important advantage of the method is that it can evaluate alternatives through both additive and multiplicative structures. It helps ensure the results are more balanced and reliable.

Although studies in the literature use the WASPAS method, research on its application to the football industry in a Type-2 Neutrosophic environment is very limited. In particular, the lack of studies that evaluate sports marketing and sports logistics criteria in an integrated manner draws attention.

2.9 Research Gap and Contribution of the Study

When the literature is evaluated broadly, four main research gaps stand out. First, studies evaluating outsourcing service providers in football clubs are quite limited. Secondly, the lack of integrated models that address the dimensions of sports marketing and sports logistics within the same decision-making framework draws attention. Thirdly, the reliance of most existing studies on traditional MCDM methods imposes significant limitations on modeling sports organizations with high uncertainty. Finally, Type-2 Neutrosophic-based WASPAS models have not been applied in the sports management literature.

This study aims to address these gaps and proposes a Type-2 Neutrosophic-based integrated decision-making model for evaluating outsourcing service providers for football clubs. Study: It offers an interdisciplinary approach that integrates the literature on sports management, sports marketing, sports logistics, outsourcing management, and decision sciences. Additionally, testing the proposed methodology with sensitivity analyses reinforces the model's reliability and applicability. In this respect, the study aims to make significant contributions to the literature both theoretically and practically.

3. The Proposed Decision-Making Model

This section reveals the basic algorithm, implementation steps, and mathematical concepts of the proposed decision-making procedure.

3.1 Preliminary Information about T2NFNs

In decision-making processes, decision-makers often use linguistic terms rather than precise numerical data. These evaluations may contain contradictions, hesitations, and uncertainties, depending on the decision-makers' levels of knowledge, experience, and personal profiles, as well as the industry's dynamic nature. In addition, experts' opinions may be highly subjective and biased. Accordingly, classical fuzzy sets may be insufficient to model complex uncertainties within the framework of their structural problems and limitations. Smarandache [17,18] introduced Neutrophilic set theory to eliminate these limitations and better manage uncertainties in solving complex decision-making problems. It provides a powerful structure that can simultaneously evaluate the degrees of truth, uncertainty, and inaccuracy membership.

Type-2 Neutrosophic Fuzzy Numbers (T2NFNs) are an improved version of classical neutrosophic clusters and are also capable of modeling second-level uncertainties in membership grades. In this way, the ambivalence, incomplete information, and conflicting judgments in expert evaluations can be represented more effectively using T2NFNs. In this context, Type-2 Neutrosophic fuzzy sets provide a more powerful and reliable modeling capability for decision-makers compared to traditional fuzzy sets, intuitive fuzzy sets, and Type-1 neutrosophic fuzzy sets.

Let us review fundamental concepts of T2NFNs to lay the groundwork for the integrated approach.

Definition 1 [19]: X is a limited universe of discourse and $F[0,1]$ be a collection of all triangular neutrosophic numbers. Type 2 neutrosophic number set (T2NFNS) NN is given by

$$NN = (x, T_{NN}(x), I_{NN}(x), F_{NN}(x) | x \in X) \tag{1}$$

Where $T_{NN}(x)$ is the degree of truth, $I_{NN}(x)$ is the degree of indeterminacy, and $F_{NN}(x)$ is the falsity degree. Here, the authors provide a second level of generalization by considering the grades as T2NFNS and hence, $T_{NN}(x) = \left(T_{NN(T)}(x), I_{NN(T)}(x), F_{NN(T)}(x)\right)$; $I_{NN}(x) = \left(T_{NN(I)}(x), I_{NN(I)}(x), F_{NN(I)}(x)\right)$; and $F_{NN}(x) = \left(T_{NN(F)}(x), I_{NN(F)}(x), F_{NN(F)}(x)\right)$. All these grades are in the unit interval.

Remark 1: For ease of use, $NN_i = (T_i, I_i, F_i)$ is called the type 2 neutrosophic number and collection of such numbers for T2NFNS.

Definition 2 [19]: Let NN_1 and NN_2 be as before. Some operations with T2NFN are given by:

(1) Addition "$\oplus$"

$$NN_1 \oplus NN_2 = \Big(\big((T_{1(T)} + T_{2(T)} - T_{1(T)}.T_{2(T)}), (T_{1(I)} + T_{2(I)} - T_{1(I)}.T_{2(I)}), (T_{1(F)} + T_{2(F)} - T_{1(F)}.T_{2(F)}) \big), (I_{1(T)}.I_{2(T)}, I_{1(I)}.I_{2(I)}, I_{1(F)}.I_{2(F)}), (F_{1(T)}.F_{2(T)}, F_{1(I)}.F_{2(I)}, F_{1(F)}.F_{2(F)}) \Big) \tag{2}$$

(2) Multiplication "$\otimes$"

$$NN_1 \otimes NN_2 = \Big((T_{1(T)}.T_{2(T)}, T_{1(I)}.T_{2(I)}, T_{1(F)}.T_{2(F)}), \big((I_{1(T)} + I_{2(T)} - I_{1(T)}.I_{2(T)}), (I_{1(I)} + I_{2(I)} - I_{1(I)}.I_{2(I)}), (I_{1(F)} + I_{2(F)} - I_{1(F)}.I_{2(F)}) \big), \big((F_{1(T)} + F_{2(T)} - F_{1(T)}.F_{2(T)}), (F_{1(I)} + F_{2(I)} - F_{1(I)}.F_{2(I)}), (F_{1(F)} + F_{2(F)} - F_{1(F)}.F_{2(F)}) \big) \Big) \tag{3}$$

(3) Scalar multiplication, where$\lambda > 0$

$$\lambda NN_1 = \Big(\Big(\big(1 - (1 - T_{1(T)})^{\lambda}\big), \big(1 - (1 - T_{1(I)})^{\lambda}\big), \big(1 - (1 - T_{1(F)})^{\lambda}\big) \Big), (I_{1(T)}^{\lambda}, I_{1(I)}^{\lambda}, I_{1(F)}^{\lambda}), (F_{1(T)}^{\lambda}, F_{1(I)}^{\lambda}, F_{1(F)}^{\lambda}) \Big) \tag{4}$$

(4) Power, where$\lambda > 0$

$$NN_1^{\lambda} = \Big(\big((T_{1(T)}^{\lambda}, T_{1(I)}^{\lambda}, T_{1(F)}^{\lambda}) \big), \Big(\big(1 - (1 - I_{1(T)})^{\lambda}\big), \big(1 - (1 - I_{1(I)})^{\lambda}\big), \big(1 - (1 - I_{1(F)})^{\lambda}\big) \Big), \Big(\big(1 - (1 - F_{1(T)})^{\lambda}\big), \big(1 - (1 - F_{1(I)})^{\lambda}\big), \big(1 - (1 - F_{1(F)})^{\lambda}\big) \Big) \Big) \tag{5}$$

Definition 3 [19]: NN_1 is as before. Score and accuracy measures are given by

$$S(NN_1) = \frac{1}{12}\left(8 + \left(T_{1(T)} + 2T_{1(I)} + T_{1(F)}\right) - \left(I_{1(T)} + 2I_{1(I)} + I_{1(F)}\right) - \left(F_{1(T)} + 2F_{1(I)} + F_{1(F)}\right)\right) \quad (6)$$

$$A(NN_1) = \frac{1}{4}\left(\left(T_{1(T)} + 2T_{1(I)} + T_{1(F)}\right) - \left(F_{1(T)} + 2F_{1(I)} + F_{1(F)}\right)\right) \quad (7)$$

Where $S(NN_1)$ and $A(NN_1)$ are score and accuracy measures.

It must be noted that when the score of a is greater than the score of b, if T2NFN $a > b$. If score values are equal, accuracy is calculated, and if the value of a is less than b, then T2NFN $a < b$. When accuracy values are equal for both elements, we break the tie arbitrarily.

3.2 Identifying the Criteria Weights

In this stage, the criteria weights are identified by following the algorithm of the proposed model. This phase consists of four implementation steps as follows.

Step 2.1. Calculate the relative importance of the criteria concerning DMs' evaluations: In this step, criteria weight coefficients are calculated. First, e number of experts $\xi = \{\xi_1, \xi_2, \ldots, \xi_e\}$ evaluate the criteria Cj={C1, C2, …, Cn} by considering the T2NFN linguistic scale. Hence, matrices that consist of expert evaluations are generated. Where; $\Im = \left[\gamma_{jb}\right]_{n\times e}$, (j=1,..,n; b=1,2,…,e); denotes the initial matrix for the criteria, and γ_{jb}represents the elements of the matrix; $\gamma_{jb} = \left[\left(\gamma_{jb}^{T_T}, \gamma_{jb}^{T_I}, \gamma_{jb}^{T_F}\right), \left(\gamma_{jb}^{I_T}, \gamma_{jb}^{I_I}, \gamma_{jb}^{I_F}\right), \left(\gamma_{jb}^{F_T}, \gamma_{jb}^{F_I}, \gamma_{jb}^{F_F}\right)\right]$

Step 2.2. Compute the criteria's significance factor: Next, each criterion's significance factor is identified based on the preferences of the DMs. This value is identified for each degree of the T2NFN; hence, a T2NFN is formed for each factor. The value of the significant factor is computed with the help of Eq. (8).

$$SF_j = \begin{bmatrix} \left(\frac{\sum_{k=1}^{e}\gamma_{kj}^{T_T} - \prod_{k=1}^{e}\gamma_{kj}^{T_T}}{e}, \frac{\sum_{k=1}^{e}\gamma_{kj}^{T_I} - \prod_{k=1}^{e}\gamma_{kj}^{T_I}}{e}, \frac{\sum_{k=1}^{e}\gamma_{kj}^{T_F} - \prod_{k=1}^{e}\gamma_{kj}^{T_F}}{e}\right), \\ \left(\frac{\prod_{k=1}^{e}\gamma_{kj}^{I_T}}{e}, \frac{\prod_{k=1}^{e}\gamma_{kj}^{I_I}}{e}, \frac{\prod_{k=1}^{e}\gamma_{kj}^{I_F}}{e}\right), \\ \left(\frac{\prod_{k=1}^{e}\gamma_{kj}^{F_T}}{e}, \frac{\prod_{k=1}^{e}\gamma_{kj}^{F_I}}{e}, \frac{\prod_{k=1}^{e}\gamma_{kj}^{F_F}}{e}\right) \end{bmatrix} \quad (8)$$

e denotes the number of decision-makers and$\gamma_j = \left[\left(\gamma_j^{T_T}, \gamma_j^{T_I}, \gamma_j^{T_F}\right), \left(\gamma_j^{I_T}, \gamma_j^{I_I}, \gamma_j^{I_F}\right), \left(\gamma_j^{F_T}, \gamma_j^{F_I}, \gamma_j^{F_F}\right)\right]$ denotes the value assigned by the expert to criterion j.

Step 2.3. Compute the score measures of the criteria: Next, the score measure is computed using equation (6). Hence, a vector of order $1 \times n$ is further standardized with the help of equation (9) to obtain the criteria weights.

$$w_j = \frac{S(SF_j)}{\sum_{j=1}^{n} S(SF_j)} \quad (9)$$

Where S(SFj) represents the score measure defined using equation (6), while n denotes the number of criteria. Thus, we obtain the vector of weight coefficients of criteria $w_j = (w_1, w_2, \ldots, w_n)^T$ used in the next step to calculate the weighted sequence of alternatives.

Step 2.4. Normalize the score measures to obtain the weights of the criteria: Next, the final weights of the criteria are identified by considering the normalized values of the criteria.

3.3 Identifying the Ranking Performance of the Alternatives

Step 3.1. Construct the initial decision matrix for each expert ($\aleph^b$): In this phase, decision-makers perform linguistic evaluation by considering the linguistic scale for the decision alternatives. Then, these evaluations are converted to the T2NFNs corresponding to the scale.

Then, each expert is denoted the basic decision-matrix $\aleph^b = \left[\overline{\theta}_{ij}^{b}\right]_{m\times n}$, where $\overline{\theta}_{ij}^{b} = \left[\left(\overline{\theta}_{ij}^{T_T(b)}, \overline{\theta}_{ij}^{T_I(b)}, \overline{\theta}_{ij}^{T_F(b)}\right), \left(\overline{\theta}_{ij}^{I_T(b)}, \overline{\theta}_{ij}^{I_I(b)}, \overline{\theta}_{ij}^{I_F(b)}\right), \left(\overline{\theta}_{ij}^{F_T(b)}, \overline{\theta}_{ij}^{F_I(b)}, \overline{\theta}_{ij}^{F_F(b)}\right)\right]$, $1 \le b \le e$; i=1,...,m; j=1,...n. Each pair $\overline{\theta}_{ij}^{b}$ takes a value from the predefined Type 2 neutrosophic scale.

Step 3.2. Calculate the significance factor of each alternative based on the DMs' evaluations: Afterward, the relative significances of the alternatives are identified concerning decision-makers' evaluations. For this purpose, equation (10) is applied.

$$\theta_{ij}^{SF} = \begin{bmatrix} \left(\frac{\sum_{k=1}^{e}\overline{\theta}_{kij}^{T_T} - \prod_{k=1}^{e}\overline{\theta}_{kij}^{T_T}}{e}, \frac{\sum_{k=1}^{e}\overline{\theta}_{kij}^{T_I} - \prod_{k=1}^{e}\overline{\theta}_{kij}^{T_I}}{e}, \frac{\sum_{k=1}^{e}\overline{\theta}_{kij}^{T_F} - \prod_{k=1}^{e}\overline{\theta}_{kij}^{T_F}}{e}\right), \\ \left(\frac{\prod_{k=1}^{e}\overline{\theta}_{kij}^{I_T}}{e}, \frac{\prod_{k=1}^{e}\overline{\theta}_{kij}^{I_I}}{e}, \frac{\prod_{k=1}^{e}\overline{\theta}_{kij}^{I_F}}{e}\right), \\ \left(\frac{\prod_{k=1}^{e}\overline{\theta}_{kij}^{F_T}}{e}, \frac{\prod_{k=1}^{e}\overline{\theta}_{kij}^{F_I}}{e}, \frac{\prod_{k=1}^{e}\overline{\theta}_{kij}^{F_F}}{e}\right) \end{bmatrix} \tag{10}$$

where e denotes the number of experts. Hence, the T2NFN matrix of alternatives concerning criteria is generated with the help of Eq. (11).

$$\aleph = \begin{bmatrix} \theta_{11}^{SF} & \theta_{12}^{SF} & \theta_{13}^{SF} & \cdots & \theta_{1n}^{SF} \\ \theta_{21}^{SF} & \theta_{22}^{SF} & \theta_{23}^{SF} & \cdots & \theta_{2n}^{SF} \\ \theta_{31}^{SF} & \theta_{32}^{SF} & \theta_{33}^{SF} & \cdots & \theta_{3n}^{SF} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ \theta_{m1}^{SF} & \theta_{m2}^{SF} & \theta_{m3}^{SF} & \cdots & \theta_{mn}^{SF} \end{bmatrix} \tag{11}$$

where $\theta_{ij}^{SF} = \left[\left(\theta_{ij}^{T_T}, \theta_{ij}^{T_I}, \theta_{ij}^{T_F}\right), \left(\theta_{ij}^{I_T}, \theta_{ij}^{I_I}, \theta_{ij}^{I_F}\right), \left(\theta_{ij}^{F_T}, \theta_{ij}^{F_I}, \theta_{ij}^{F_F}\right)\right]$; i=1,...,m; j=1,..,n.

Step 3.3. Calculating the score measure alternatives using Eq. (6): Thus, we get a matrix of score measures input and output factors, Eq (12).

$$\overline{\aleph} = \begin{bmatrix} \aleph_{11} & \aleph_{12} & \aleph_{13} & \cdots & \aleph_{1n} \\ \aleph_{21} & \aleph_{22} & \aleph_{23} & \cdots & \aleph_{2n} \\ \aleph_{31} & \aleph_{32} & \aleph_{33} & \cdots & \aleph_{3n} \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ \aleph_{m1} & \aleph_{m2} & \aleph_{m3} & \cdots & \aleph_{mn} \end{bmatrix} \tag{12}$$

Where $\aleph_{ij} = \frac{\left(8 + \left(\theta_{ij}^{T_T} + 2\theta_{ij}^{T_I} + \theta_{ij}^{T_F}\right) - \left(\theta_{ij}^{I_T} + 2\theta_{ij}^{I_I} + \theta_{ij}^{I_F}\right) - \left(\theta_{ij}^{F_T} + 2\theta_{ij}^{F_I} + \theta_{ij}^{F_F}\right)\right)}{12}$; i=1,...,m; j=1,..,n.

Step 3.4. Preparation of factor compatibility: After the initial decision matrix is formed in the step 3.3 in the proposed model, implementation steps of the Grey Relational Analysis (GRA) approach [20] which is a multivariate method [21,22], are followed.

$$\aleph_i = \left(\aleph_i(1), \aleph_i(2), \aleph_i(3), \ldots, \aleph_i(n)\right) \tag{13}$$

The reference series is presented as follows [23].

$$\aleph_{0j} = \max_i\{\aleph_{ij}\} = \left(\aleph_0(1), \aleph_0(2), \aleph_0(3), \ldots, \aleph_0(n)\right) \tag{14}$$

Step 3.5. Creating a normalized decision matrix: The elements of the first decision matrix are normalized using Eq. (15). In this section, the basic procedure of the WASPAS approach is followed [24–26].

$$x_{ij} = \begin{cases} \frac{\aleph_{ij}}{\max_i(\aleph_{ij})} \text{ if } \text{ i} \in B \\ \frac{\min_i(\aleph_{ij})}{\aleph_{ij}} \text{ if } \text{ i} \in C \end{cases} \quad (15)$$

Here; B represents the utility criteria, while C refers to the cost criteria.

Step 3.6. Calculation of WSM and WPM values: In this step, the weighted sum model (WSM) and weighted product model (WPM) values for each decision alternative are calculated with the help of Eqs (16) and (17).

$$\varphi_i^{(1)} = \sum_{j=1}^{n} x_{ij} w_j \quad (16)$$

$$\varphi_i^{(2)} = \prod_{j=1}^{n} (x_{ij})^{w_j} \quad (17)$$

Step 3.7. Determining the ranking performance of the alternatives: In this step, the WSM and WPM values obtained in the previous step are combined using Eq. (18).

$$\varphi_i = \left(\varphi_i^{(1)} . \alpha\right) + \left((1-\alpha) . \varphi_i^{(2)}\right) \quad (18)$$

where, α represents the parameter of the WASPAS technique that takes values between 0 and 1.

Step 3.7. Ranking of Alternatives: In the final step of the proposed methodology, alternatives are ranked in descending order, considering the combined metrics for the alternatives.

3. A Numerical Illustration

The Type-2 Neutrophochic fuzzy cluster-based WASPAS decision-making procedure proposed in this study was applied to address the decision-making model of a professional football club for selecting an outsourcing service supplier and to produce reasonable solutions. Due to the increasing complexity of the operational processes of the football club, whose operational processes were examined, the constant increase in fan expectations, and the increasingly intense and fierce competition, it was decided to restructure the outsourcing processes to manage the logistics, supply chain, and sports marketing activities of the club in a more professional context.

In the roundtable meetings attended by club managers, experts, and researchers, it was evaluated that the performance of existing service providers was insufficient, especially at the operational level, within the framework of away organizations, team transportation, equipment transportation, digital fan interaction, product logistics, event organizations, and sponsorship dimensions. In addition, delays, disruptions, and breaks in the sports supply chain, decreases in fan satisfaction, and rising operational costs have made the club's outsourcing supplier selection a more critical and strategic decision-making problem.

In this context, the club management decided to use a scientific, systematic decision-support system to select a new outsourcing service provider for sports marketing and sports logistics activities. In the decision-making process, not only cost criteria are considered; multidimensional criteria such as operational reliability, service quality, technological infrastructure, crisis management capacity, brand harmony, flexibility, and fan experience are also evaluated together.

In the first stage, research problems are defined, and a panel of highly experienced experts with extensive knowledge in sports management is assembled to yield results that are more relevant and adaptable to real-world decision-making. In the continuation of this process, the criteria to be used in the research process are determined together with the experts. For this, after determining the criteria used in past studies through a comprehensive literature review, these criteria are discussed with experts, and the inappropriate, unimportant, or ineffective criteria are eliminated, leaving the final criteria. At the end of the process, data are collected based on type-2 neutrophil numbers (T2NFs) according to the determined criteria and alternatives. In this context, the first stage is defined as the preliminary information collection and preparation process. In the second stage, the criterion weights are calculated using the proposed methodology. In the third stage, the relative preferability scores of the alternatives are determined, and the alternatives are ranked accordingly. In the fourth stage, a comprehensive sensitivity analysis is conducted to evaluate the validity and applicability of the suggested methodological framework. In the fifth and final stage, the results are discussed and evaluated, and their managerial implications and theoretical contributions are noted.

4.1 The Preparation Process

During the preparation process, the research problems, one of the main motivations of the study, were first defined. According to this: 1. When the need for outsourcing in football arises, how do clubs outsource? 2. Is there a decision support system or a mathematical model used in this field regarding service supplier selection?

Once these research problems have been identified, a decision-making committee composed of experts with experience and in-depth knowledge in the field of sport has been formed to achieve better results. This board consists of 5 people with at least 10 years of experience in their fields. The members of the decision makers' board also undertook the advisory function throughout the research process (Table 1). These people have been characterized as "decision makers" from this point in the research.

Table 1
Profiles of the experts

DMs	Duty	Graduate	Experience	Country
DM1	Administrator	Ph.D	30	Türkiye
DM2	Coach/Manager	M.A	17	Türkiye
DM3	Coach/Manager	Graduate	15	Türkiye
DM4	Coach/Manager	Graduate	12	Türkiye
DM5	Coach/Manager	Graduate	10	Türkiye

After the decision-makers were identified, "ethics committee approval" was obtained to include the questions in interviews with the decision-makers. Then, together with the decision-makers, the stage of determining the criteria that affect the decision-making process began (Table 2). At this stage, first, studies related to the focus of the study, whether directly or indirectly, are collected, and the criteria used in these studies are listed. These are [27].

Table 2
The list of the criteria

No	Criteria	Description
1	Type	Supplier's product/service quality level and compliance with standards
2	Delivery	Performance of timely and complete delivery of orders
3	Track record	Level of success in previous projects and business relationships
4	Warranty and indemnity policy	Effectiveness of warranty coverage, return, compensation and compensation processes
5	Production possibilities and capacity	Production infrastructure, technology level and capacity adequacy
6	Price	Cost level of the product or service
7	Technical Ability	Technical knowledge, expertise and engineering competence
8	Financial situation	Financial strength, financial sustainability and solvency
9	Compliance with the procedure	Level of compliance with determined procedures, standards and regulations
10	Communication system	Information sharing, turnaround speed and communication effectiveness
11	Reputation and position in the industry	Awareness, reliability and market position in the sector

Table 2
Continued

No	Criteria	Description
12	Willingness to do business	Openness to cooperation, motivation and level of volunteerism
13	Management and organization	Effectiveness of management structure and organizational competence
14	Process control	Monitoring, controlling processes and error management
15	Repair and maintenance service	After-sales maintenance, technical support and service competence
16	Attitude	Collaborative approach, professionalism and behavior
17	Impact left	General impression, corporate perception and satisfaction level
18	Packing ability	Capacity for convenient and safe packaging of products
19	Labor relations	Employee satisfaction, workforce relations and working environment
20	Geographical location	Convenience of physical location in terms of logistics and accessibility
21	Previous work experience	Experience and level of success of previously performed works
22	Educational tools	Educational infrastructure, technical training opportunities and development activities
23	Mutual arrangements	Compliance of contractual and operational arrangements between the parties

Then, the list was sent to each decision-maker and they were asked to note if there were any unimportant, ineffective or inappropriate criteria among the criteria included in the list, and if there were criteria that were not included in the list but were important in real-life situations, they were asked to add them to the list. After the lists were collected back from the decision makers, the repeating criteria were eliminated, and the final list was created. Then, each criterion in this list was discussed with the decision makers one by one and it was determined which criteria would be included in the research process. After reaching a consensus among all decision-makers, the final criteria emerged. These criteria are shown in Table 3 below.

Table 3
The criteria for outsource strategy selection in football industry

Code	Criteria	Code	Criteria
C1	Price	C6	Sustainability of cooperation
C2	Quality	C7	Market reputation
C3	Trust	C8	Delivery time
C4	Technical competence	C9	Willingness to do business
C5	Experience	C10	Public relations (customer relations)

It is possible to state that there are many areas for outsourcing in the literature. Outsourcing is mostly on the agenda in the following areas (Saunders, et al. 1997): Human resources management, Information systems and technology, customer service, accounting – finance, logistics-transportation, raw material supply and stock management, management and administrative procedures, sales and marketing, catering services, security services, cleaning services, hospital services, communication , car rental services and, manufacturing.

The alternatives in this resource have been presented to experts for football outsourcing and have been used to identify alternatives. These alternatives determined because of the evaluations are shown in Table 4.

Then, decision makers considered each criterion and evaluated the alternatives within the framework of these criteria. For this, the T2NF linguistic assessment scale given in Table 5 was used.

Table 4
Decision Alternatives

Code	Alternatives	Code	Alternatives
A1	Transportation	A5	Procurement and purchasing
A2	Healthcare services	A6	Organization
A3	Facility maintenance and repair	A7	Marketing-sales and public relations
A4	Nutrition		

Table 5
T2FNN linguistic assessment scale for criteria

Linguistic Terms	T2NFNS
Low (L)	[(0.20,0.30,0.20), (0.60,0.70,0.80), (0.45,0.75,0.75)]
Medium Low (M)	[(0.40,0.30,0.25), (0.45,0.55,0.40), (0.45,0.60,0.55)]
Medium (M)	[(0.50,0.55,0.55), (0.40,0.45,0.55), (0.35,0.40,0.35)]
High (H)	[(0.80,0.75,0.70), (0.20,0.15,0.30), (0.15,0.10,0.20)]
Very High (VH)	[(0.90,0.85,0.95), (0.10,0.15,0.10), (0.05,0.05,0.10)]

After evaluating the importance of the criteria, the decision makers evaluated each alternative according to each criterion, considering the linguistic assessment scale given in Table 6.

Table 6
T2FNN linguistic assessment scale for alternatives

Linguistic Terms	T2NFNS
Very Bad (VB)	[(0.20,0.20,0.10), (0.65,0.80,0.85), (0.45,0.80,0.70)]
Bad (B)	[(0.35,0.35,0.10), (0.50,0.75,0.80), (0.50,0.75,0.65)]
Medium Bad (MB)	[(0.50,0.30,0.50), (0.50,0.35,0.45), (0.45,0.30,0.60)]
Medium (M)	[(0.40,0.45,0.50), (0.40,0.45,0.50), (0.35,0.40,0.45)]
Medium High (MH)	[(0.60,0.45,0.50), (0.20,0.15,0.25), (0.10,0.25,0.15)]
High (H)	[(0.70,0.75,0.80), (0.15,0.20,0.25), (0.10,0.15,0.20)]
Very High (VH)	[(0.95,0.90,0.95), (0.10,0.10,0.05), (0.05,0.05,0.05)]

4.1 The Preparation Process

In this process, T2NN data needed by decision makers were collected by making linguistic evaluations for criteria and alternatives. In this context, the first stage of the methodology has been completed, and the second stage has been started.

Step 2.1: At this stage, each decision-maker first evaluated the effects of the criteria using the linguistic evaluation scale given in Table 6. Table 7 shows the evaluations of the decision makers.

Table 7
Decision maker evaluations for criteria

Code	Criteria	DM1	DM2	DM3	DM4	DM5
C1	Price	M	H	M	M	H
C2	Quality	M	M	M	M	VH
C3	Trust	H	H	M	M	VH
C4	Technical competence	M	H	H	H	H
C5	Experience	H	H	H	VH	H
C6	Sustainability of cooperation	H	H	H	VH	H
C7	Market reputation	M	M	M	M	VH
C8	Delivery time	H	H	H	M	H
C9	Willingness to do business	H	H	VH	M	H
C10	Public relations (customer relations)	H	M	H	M	VH

In Steps 2.2 and 2.3, these linguistic evaluations were transformed to the corresponding T2NFNs, and these values were aggregated with the help of Eq. (8) the score measures of the criteria were calculated using Eq. (9). Then, the values obtained in the previous step were added together and normalized. The results obtained are presented in Table 8. Normalized values (N.V.) indicate the final criterion weights.

Table 8
Decision maker evaluations for criteria

Code	T	I	F	T	I	F	T	I	F	S.V	w
C1	0.431	0.437	0.424	0.228	0.235	0.319	0.193	0.200	0.207	0.659	0.093
C2	0.406	0.425	0.438	0.242	0.278	0.327	0.207	0.236	0.214	0.640	0.091
C3	0.479	0.472	0.473	0.186	0.193	0.257	0.150	0.150	0.171	0.704	0.100
C4	0.499	0.482	0.460	0.171	0.150	0.249	0.136	0.114	0.164	0.723	0.102
C5	0.533	0.512	0.503	0.129	0.107	0.186	0.093	0.064	0.129	0.765	0.108
C6	0.533	0.512	0.503	0.129	0.107	0.186	0.093	0.064	0.129	0.765	0.108
C7	0.406	0.425	0.438	0.242	0.278	0.327	0.207	0.236	0.214	0.640	0.091
C8	0.499	0.482	0.460	0.171	0.150	0.249	0.136	0.114	0.164	0.723	0.102
C9	0.510	0.493	0.489	0.157	0.150	0.221	0.121	0.107	0.150	0.735	0.104
C10	0.479	0.472	0.473	0.186	0.193	0.257	0.150	0.150	0.171	0.704	0.100

When the results are taken into consideration, it is seen that the two most important criteria (C5 and C6) are in the first place with the same weight values, while the other criteria are listed as C9 > C4 > C8 > C3 > C10 > C1 > C2 > C7. After the criterion weights were calculated, the steps of the model applied to determine the performance of the alternatives were started.

Step 3.1-3.4. In these steps, the decision makers made their linguistic evaluations considering the language scale given in Table 6 and then the first decision matrices were created. Linguistic assessments were then converted into T2NFNs corresponding to the scale. Then, by combining these values and calculating the importance factors with the help of Eq. (8), the T2NN decision matrix was created. Table 9 shows the initial decision matrix.

Table 9
The initial decision matrix

Code	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10
A1	0.5723	0.6275	0.6967	0.6787	0.7139	0.7314	0.7568	0.7639	0.7797	0.7146
A2	0.6092	0.6092	0.6787	0.7003	0.6967	0.6534	0.6092	0.6424	0.7044	0.6607
A3	0.6057	0.6424	0.6424	0.7314	0.7485	0.6275	0.6092	0.7314	0.6804	0.6787
A4	0.6787	0.6787	0.7639	0.7948	0.6424	0.6787	0.6787	0.7139	0.6607	0.6424
A5	0.5754	0.6787	0.6967	0.7485	0.7139	0.7485	0.6967	0.7139	0.6826	0.6967
A6	0.7474	0.6787	0.7474	0.7797	0.7139	0.7314	0.7474	0.7639	0.7797	0.7474
A7	0.5723	0.6057	0.6424	0.6607	0.7474	0.7003	0.6643	0.7003	0.6787	0.6607

Step 3.5. Then, with the help of Eq. (15), the elements of the first decision matrix were normalized, and the normalized decision matrix was created as shown in Table 10.

Steps 3.6-3.8. In this step, the weighted sum model (WSM) and weighted product model (WPM) values for each decision alternative were calculated with the help of Eqs (16) and (17). Next, the VSM and VPM values obtained in the previous step were concatenated using Eq. (18). Then, in the final step of the proposed research methodology, alternatives were ranked in descending order, considering the combined measures for the alternatives. Table 11 shows the final score values and rankings of VSM, VPM, and alternatives.

Table 10
The normalized decision matrix

Code	K1	K2	K3	K4	K5	K6	K7	K8	K9	K10
A1	1.0000	0.9247	0.9121	0.8539	0.9538	0.9771	1.0000	0.8410	1.0000	0.9561
A2	0.9395	0.8976	0.8885	0.8811	0.9308	0.8729	0.8049	1.0000	0.9035	0.8840
A3	0.9448	0.9466	0.8410	0.9202	1.0000	0.8384	0.8049	0.8783	0.8726	0.9080
A4	0.8432	1.0000	1.0000	1.0000	0.8582	0.9067	0.8968	0.8998	0.8474	0.8595
A5	0.9946	1.0000	0.9121	0.9418	0.9538	1.0000	0.9206	0.8998	0.8754	0.9322
A6	0.7657	1.0000	0.9785	0.9810	0.9538	0.9771	0.9876	0.8410	1.0000	1.0000
A7	1.0000	0.8925	0.8410	0.8313	0.9985	0.9356	0.8778	0.9173	0.8704	0.8840

Table 11
WSM, WPM, final score values and rankings of alternatives

Code	VSM	VPM	Score Value	Ranking
A1	0.941	9.94	5.4404	3
A2	0.901	9.90	5.4005	6
A3	0.896	9.89	5.3930	7
A4	0.910	9.90	5.4050	4
A5	0.943	9.94	5.4415	2
A6	0.949	9.94	5.4445	1
A7	0.905	9.90	5.4025	5

As can be understood from Table 11, the A6 (Organization) alternative was determined as the most important alternative by reaching the highest score value. The general ranking is A6 (Organization), A5 > > A1 (Transportation>-transportation), A4 (Nutrition), > A7 (Marketing-sales and public relations>), A2 (Health services) > A3 (Facility maintenance-repair).

5. Robustness and Validity Check

In this section, the proposed decision-making model was tested with a comprehensive robustness and validity check and the analysis results regarding the stability, ranking stability and reliability of the model were discussed.

5.1 Examining the Impacts of the Changing Criteria Weights in Ranking Results

A comprehensive sensitivity analysis was conducted to test the stability and robustness of the research methodology applied in this study. In the first stage of the sensitivity analysis, the criterion weights were changed and its effect on the ranking results was examined. For this purpose, starting with the most important criterion, the criterion weights were reduced by 10% in each scenario and this practice was continued until the criterion weight was zero. The difference value obtained because of the calculations was distributed equally to the other criterion weights, and the condition that the total value of the criterion weights was equal to 1 was met. Accordingly, the following mathematical procedure was followed [28].

$$w_{fv}^{1} = w_{pv}^{1} - \left(w_{pv}^{1}.m_{v}\right) \tag{19}$$

$$w_{nv}^{2} = \frac{\left(1-w_{fv}^{1}\right)}{n-1} + w_{pv}^{2} \tag{20}$$

$$w_{fv}^{1} + \sum w_{nv}^{2} = 1 \tag{21}$$

while w_{fv}^{1}depicts the modified value of criterion j, w_{pv}^{1} shows the previous value of the criterion, m_v the rate of replacement; w_{nv}^{2} refers to the new values of the remaining criteria, n refers to the number of criteria, and w_{pv}^{2} is the previous values of the other criteria. When calculations are made according to the proposed research methodology, the differences in the ranking values of the alternatives are obtained as shown in Figure 1.

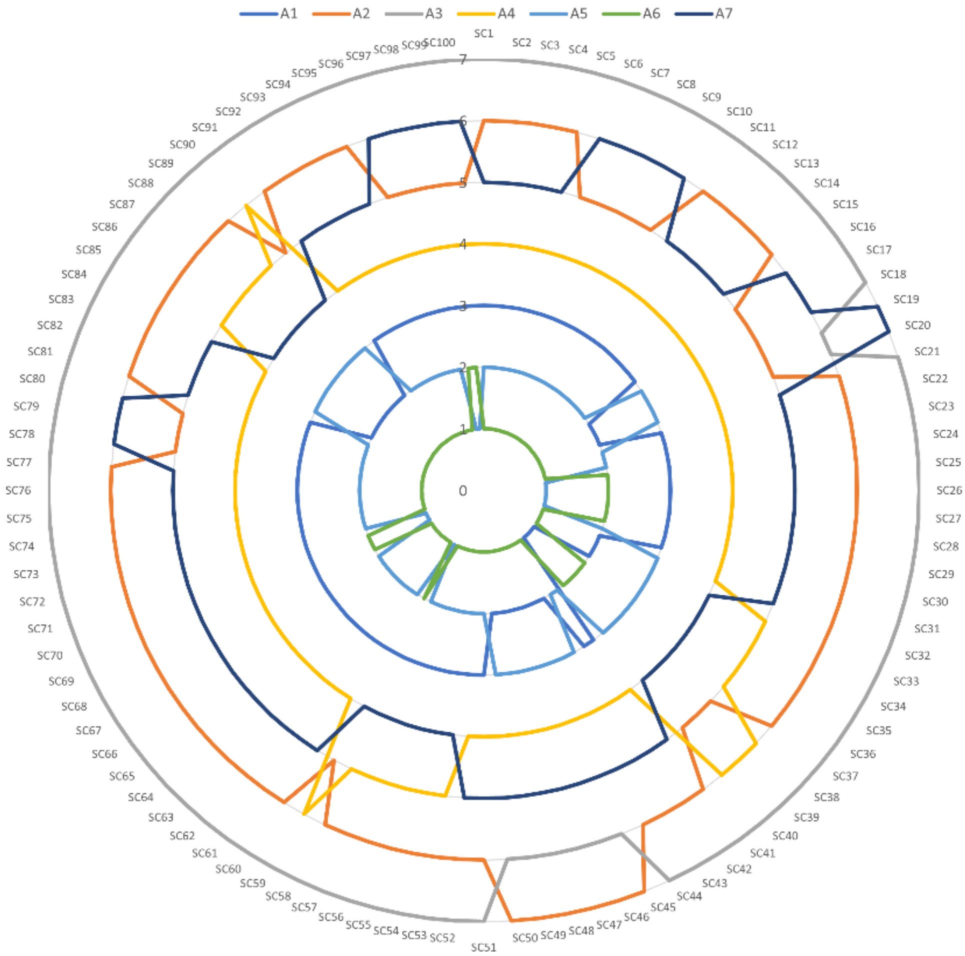

Fig. 1. Changes in the ranking of alternatives according to the new criterion weights

As can be seen from Figure 1, the most suitable alternative, A6, was ranked in the same order in 82 of the 100 scenarios. These differences occurred when the weights of the C2, C3 and C7 criteria, which caused the change, were changed by 70% or more. On the other hand, in real-life conditions, it is not unusual for the criterion weights to change to this extent. Finally, when the other alternatives were evaluated together, the average similarity rate was calculated as 74%. This value proves that the robustness and stability of the proposed methodology are at a satisfactory level.

5.2 Comparative Analysis

In the second stage of the sensitivity analysis, the results of the proposed methodology were compared with some popular and reliable decision-making models. Figure 2 reveals the results obtained. In this context, MABAC, CoCoSo and MAIRCA methods, which are very popular in the last period, were applied based on T2NN, and only the CoCoSo method recorded deviations regarding the rankings, while no deviation occurred in the other methods. However, when the Spearman correlation is applied, it is seen that the average correlation value reaches an extremely high value of 0.94. This value also proves the robustness of the methodology applied.

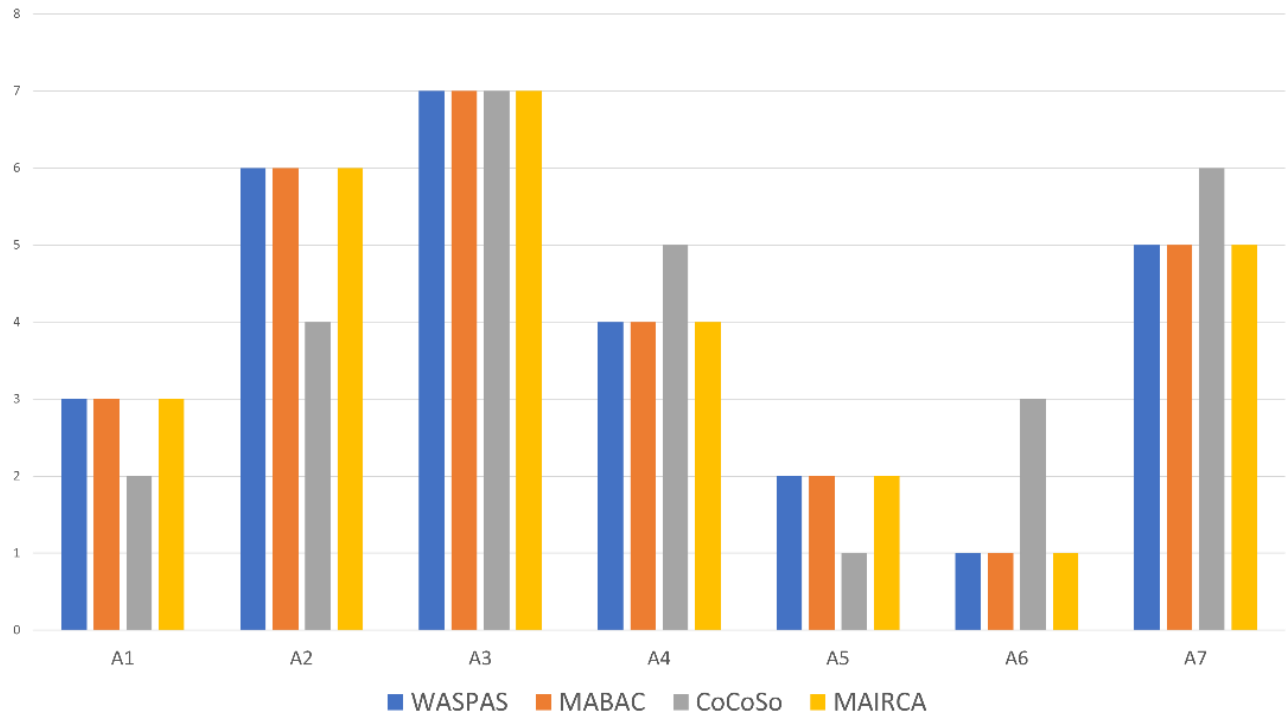

Fig. 2. Ranking results obtained according to different models based on T2NN applied

5.2 Rank Reversal Test

At some stage of the process, the resistance of the proposed T2NN-based method to the sequence rotation problem was tested. Accordingly, the calculations were repeated by removing the worst alternative in each scenario, and the ranking results of the alternatives were compared. This situation is shown in Table 12.

Table 12
The results of the rank reversal test

Scenarios	Ranking
Original	A6 > A5 > A1 > A4 > A7 > A2 > A3
A1	A6 > A5 > A1 > A4 > A7 > A2
A2	A6 > A5 > A1 > A4 > A7
A3	A6 > A5 > A1 > A4
A4	A6 > A5 > A1
A5	A6 > A5
A6	A6

5.2 Monte Carlo Simulation

A 3,000-iteration Monte Carlo simulation was carried out to comprehensively test the reliability and stability of the results of the Type-2 Neutrosophic Fuzzy Number (T2NN)-based WASPAS methodology applied in this study. The Monte Carlo method is a widely used technique in the international literature for the systematic study of uncertainty and parameter sensitivity in decision-making problems [29–31].

In the process of choosing a sports supplier, the elements of the decision matrix and the weights of criteria are inherently uncertain due to factors such as decision-makers' evaluations, market conditions and measurement errors. To measure the effect of this uncertainty on the final sequencing, two types of random perturbation were applied in the simulation: (i) decision matrix uncertainty: normally distributed noise with ±5% standard deviation to each decision matrix cell; (ii) criterion weight uncertainty: 5±% variation was added to the weights calculated by the SWARA method, then the weights were renormalized.

In each iteration, (1) the perturbed decision matrix was normalized, (2) WSM and WPM values were calculated, (3) the final WASPAS score was obtained with the parameter λ=0.5, and (4) the alternatives were ranked according to this score. Ranking, score, and convergence information were recorded over 3,000 iterations. Decision Matrix Perturbation. In each iteration, the following transformation is applied to the original decision matrix DM_0:

$$\tilde{x}_{ij} = x_{ij} \cdot (1 + \sigma \cdot \varepsilon_{ij}), \varepsilon_{ij} \sim N(0,1), \sigma = 0.05$$

Here, σ is the noise level (standard deviation ratio), and εij is the independent random number drawn from the standard normal distribution. This choice of parameters remains within the absolute range of ±10%, creating a simulation environment that aligns with real-life measurement uncertainties. Criterion Weight Perturbation. The following perturbation is applied to the original weight vector:

$$\widetilde{w}_j = \max(\varepsilon, w_j \cdot (1 + \delta \cdot \eta_j)), \eta_j \sim N(0,1), \delta = 0.05$$

The weights are then renormalized to satisfy the condition Σw̃j = 1. This approach simulates the differences of opinion in the criteria and importance assessments of different expert groups.

In each iteration, the normalized decision matrix R̃ is calculated as follows:

$$\tilde{r}_{ij} = \frac{\tilde{x}_{ij}}{\max(\tilde{x}_{ij})} \text{[benefit criteria]} \mid \tilde{r}_{ij} = \frac{\min(\tilde{x}_{ij})}{\tilde{x}_{ij}} \text{[cost criteria]}$$

C1 (Price) is treated as a cost criterion, while the remaining nine criteria are normalized as benefit criteria. Final WASPAS score:

$$\tilde{Q}_i = \lambda \cdot \sum_j (\widetilde{w}_j \cdot \tilde{r}_{ij}) + (1 - \lambda) \cdot \prod_j (\tilde{r}_{ij}^{\widetilde{w}_j}), \lambda = 0.5$$

Rankings are determined in descending order according to Q̃i values; Spearman rank correlation coefficient (ρ) is used as a measure of stability (Table 13). The main statistical indicators obtained as a result of 3,000 iterations are summarized below. The mean Spearman correlation coefficient was calculated as ρ = 0.8745; This value indicates that the simulation results exhibit a strong statistical consistency with the original ranking. The threshold value in question is above ρ ≥ 0.80, which was adopted by Fahmi et al. [32] and Görçün [33] as the proficiency criterion within the scope of the stability test of MCDM methodologies.

Table 13
Monte Carlo Simulation Results

Code	Average	σ	1st Place %	2nd Place %	Avg. Rank
A1	0.92895	± 0.01556	%30.9	%43.5	1.97
A2	0.85872	± 0.01680	%0.0	%0.0	6.56
A3	0.87655	± 0.01620	%0.0	%0.0	5.37
A4	0.88603	± 0.01575	%0.1	%0.7	4.66
A5	0.91788	± 0.01591	%10.3	%27.3	2.62
A6	0.93658	± 0.01444	%58.8	%28.3	1.55
A7	0.87789	± 0.01652	%0.0	%0.2	5.27

The A6 (Organization) alternative took first place in 58.8% of the 3,000 iterations; this rate shows that A6 maintains its superior position in approximately one out of every two simulations. The A5 (Procurement and Purchasing) alternative was the most frequently placed alternative with a rate of 27.3%. The alternative with the highest average ordinal value was A2 (Healthcare), ranking last (7th) in 69.7% of 3,000 iterations.

The sequencing frequency matrix presented in Figure 3 reveals the probability of each alternative falling into different sequencing positions in percentage form. The matrix, with its relatively high density of diagonal elements, indicates that the rankings remain largely stable under uncertainty.

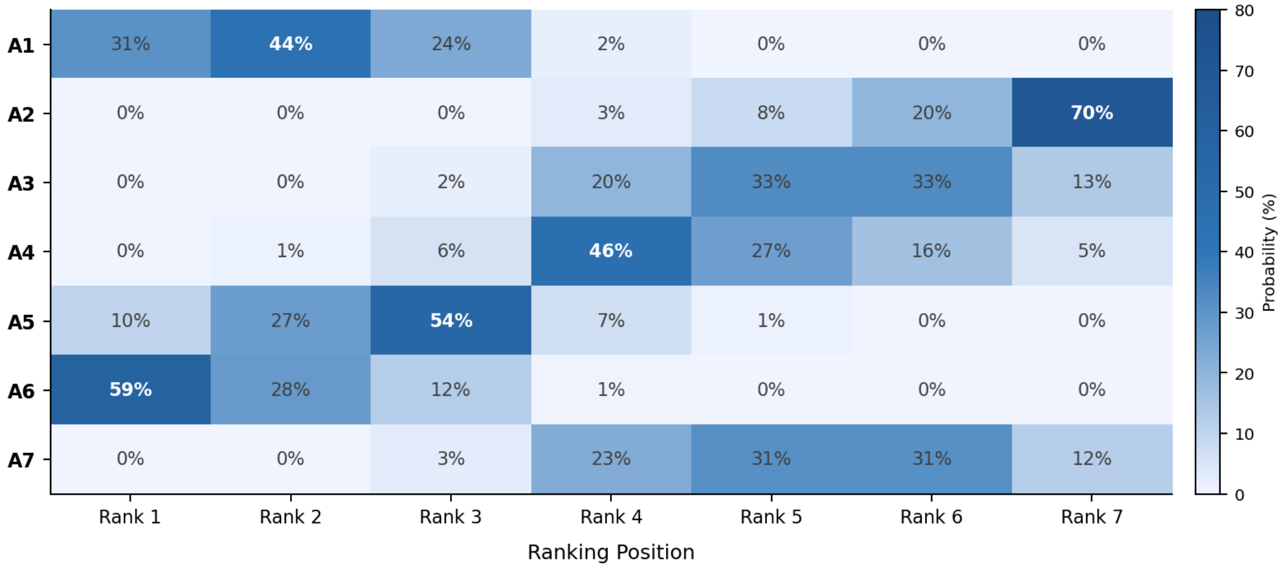

Fig. 3. Sequencing Frequency Matrix — 3,000 Iteration Monte Carlo Simulation. Each cell shows the probability (%) of the corresponding alternative falling into that rank. Dark blue: High probability

Superiority of A6: With a first-line frequency of 58.8%, A6 stands out markedly from all other alternatives. The second and third place probabilities remain at 28.3% and 12.3%, respectively; this reveals that the A6 is in the top three even in the worst-case scenario.

Competition between A1 and A5: A1 (Transportation) and A5 (Procurement and Purchasing) are in intense competition for the second and third places on average. When the probability of A5 entering the second place with 27.3% is evaluated against the tendency of A1 to take the third place with 43.5%, a partial overlap between the two alternatives is observed. As the level of perturbation increases, it is seen that these two alternatives may be replaced.

Constancy in the subset: The A2 (Healthcare) alternative ranks last in every scenario; The probability of seventh place with 69.7% constitutes the highest value. Similarly, A3 (Facility Maintenance and Repair) frequently falls to seventh place with 13.4% and sixth place with 32.8%. These findings indicate that alternatives in the subset also exhibited decisively underperformance.

In Figure 4, the statistical distribution of WASPAS final score values throughout the simulation is presented with two different graph types. The left panel shows the mean score and the range of 1± standard deviation, while the right panel contains box-whisker plots summarizing the entire distribution.

The average score of A6 is 0.93658, which is the highest value in the simulation. Its standard deviation (±0.01444) is the lowest value compared to other alternatives; this proves that A6 is the most resistant alternative to uncertainty. The proximity between the original score (the golden diamond point) and the simulation mean indicates that the deterministic output of the T2NN-WASPAS model remains valid under Monte Carlo conditions.

A1 (Transport-Transportation) has the second highest average score (0.92895) but its standard deviation (±0.01556) is higher than A6. This table shows that A1 fluctuates relatively more in the face of perturbation than A6. In the box-whisker plots, the median values of A6 and A1 stand out significantly; the widest distribution is observed in A2 (Health Services) and A3 (Facility Maintenance and Repair) alternatives.

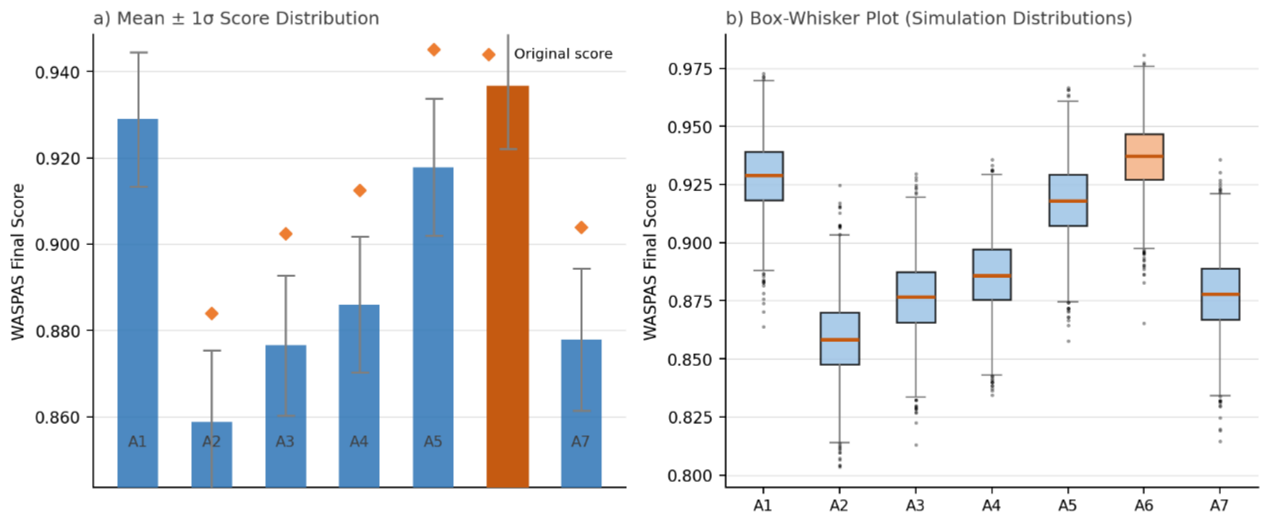

Fig. 4. Monte Carlo Simulation — WASPAS Score Distributions (N = 3,000). Left: Average ± 1σ and original score points (diamond sign). Right: Box-whisker charts; The median line is orange. Orange bar/box: A6 (Organization)

Convergence analysis is critical to evaluate the adequacy of the number of iterations in Monte Carlo simulations. Figure 5 presents two different convergence indicators.

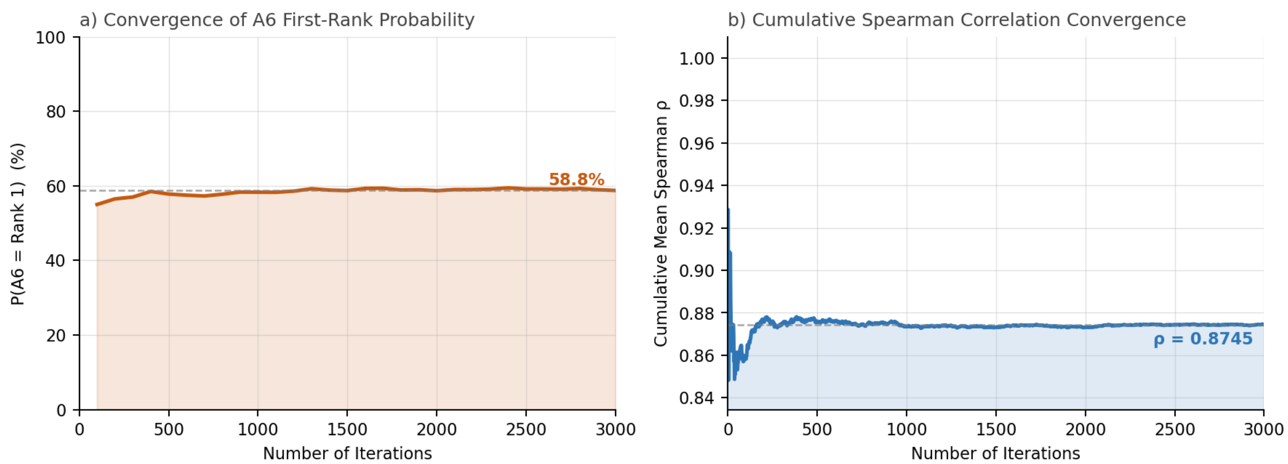

Fig. 5. Convergence Analysis. Left: Stabilization of the first-row probability of alternative A6 with iteration increase. Right: Cumulative Spearman correlation of the original ranking and simulation rankings. Dashed line: The value of convergence.

A6 First Row Convergence (Left Panel): In the first 200 iterations of the simulation, the first row probability of A6 exhibits significant fluctuation; however, from the 600th iteration, a stable stabilization is achieved around the value of 58.8%. The final convergence value at iteration 3,000 is fixed at 58.8%. The curve follows an almost flat course after 400-600 iterations, confirming that 3,000 iterations is more than sufficient for simulation stability.

Spearman Correlation Convergence (Right Panel): The cumulative mean Spearman correlation coefficient converges to ρ = 0.8745 as the number of iterations increases. This value clearly exceeds the 0.80 threshold and confirms that the simulation is in strong statistical consistency with the original T2NN-WASPAS sequencing. After a few hundred iterations, the correlation curve follows a flat course, revealing that the value represents a true convergence value.

Figure 6 presents the average ranking values of the alternatives calculated through the Monte Carlo simulation and the 1st-2nd order probabilities together.

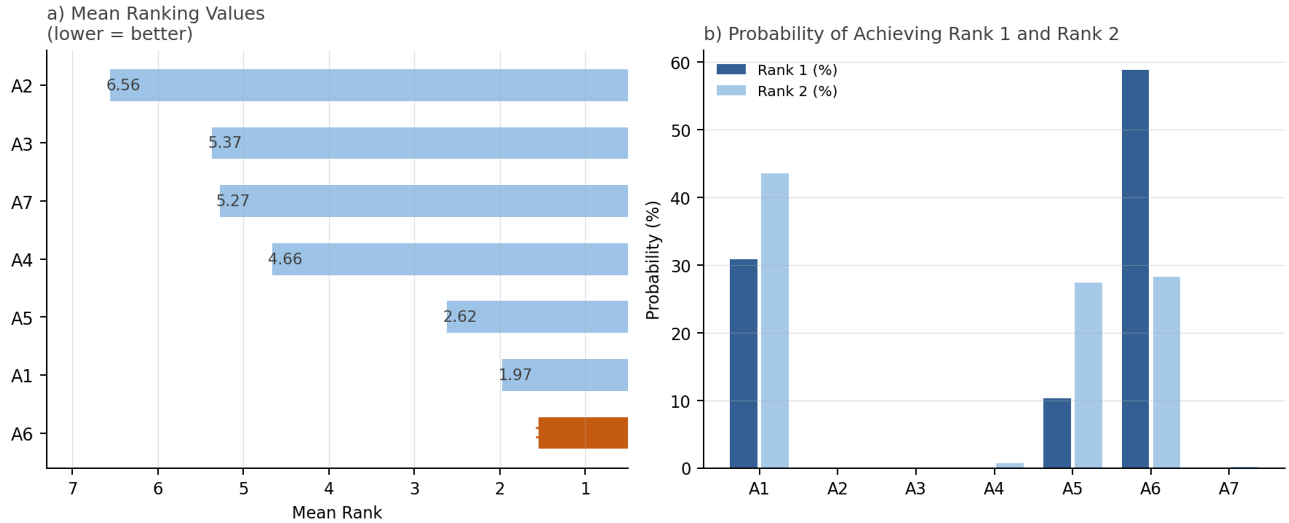

Fig. 6. Simulation-based performance summary of alternatives. Left: Average ranking values (lower = better). Right: Probabilities of getting into 1st and 2nd place. Orange bars: A6 (Organization)

When the average ranking values are examined, the rankings are as follows: A6 (1.55) > A1 (1.97) > A5 (2.62) > A4 (4.66) > A7 (5.27) > A3 (5.37) > A2 (6.56). This ranking largely agrees with the original T2NN-WASPAS results of the thesis (A6 > A5 > A1 > A4 > A7 > A2 > A3). only the second and third positions of A1 and A5 are swapped in Monte Carlo conditions.

When this displacement is evaluated from a statistical point of view, it is seen that the probability of first order of A1 (30.9%) is significantly higher than that of A5 (10.3%). However, A5 is less likely to rank second (27.3%) than A1 is likely to rank second (43.5%). This table indicates that the competitive relationship between the two alternatives has gained a more nuanced dimension under conditions of uncertainty.

The findings from the Monte Carlo simulation confirm the stability and reliability of the T2NN-WASPAS methodology implemented in the thesis in multiple dimensions. This evaluation is structured within the framework of four basic methodological stability criteria.

(1) Determination of the Winning Alternative. The A6 (Organization) alternative maintains its first place in 58.8% of 3,000 iterations under conditions where random perturbation with a standard deviation of 5±% is applied to the decision matrix and criterion weights. This rate is extremely significant in terms of the level of confidence that the winner does not change. In the literature, rates of 40% and above are accepted as high stability indicators in similar MCDM stability studies (Görçün, 2022). In addition, the fact that the A6 does not make it out of the top three even in the worst-case scenarios proves that the fundamental superiority of the alternative is not accidental.

(2) Rank Consistency (Spearman ρ = 0.8745). The average Spearman correlation obtained shows that the original sequencing and simulation sequencing overlap to a high extent in all 3,000 different perturbation scenarios. This value exceeds the ρ ≥ 0.80 criterion, which is adopted as the threshold value, by 9.3%. The fact that the correlation has almost stabilized after the 400-600th iteration in the convergence graph confirms that this reliability value is not due to random fluctuation, but to a real structural stability.

(3) Resistance to Uncertainty. The standard deviation of alternative A6 (±0.01444) is the lowest value of all alternatives. This finding reveals that not only does A6 have the highest average score,

but it also exhibits the most stable performance in the face of uncertainty. In other words, the superiority of the A6 is constantly confirmed not only in specific parameter configurations, but in a wide parameter space.

(4) Subset Stability. The A2 (Healthcare) and A3 (Facility Maintenance and Repair) alternatives rank consistently low in every perturbation scenario. This shows that not only the winner, but all layers of the ranking are determined. Thus, the T2NN-WASPAS methodology confirms that it is consistent with the previously applied sensitivity analysis (Table 15), where it exhibits a high resistance to the sorting transformation problem, in the context of Monte Carlo.

The evidence from the Monte Carlo simulation empirically reinforces the paper's core methodological claim — that the T2NN-WASPAS approach is a robust, stable, and reliable decision-support tool. The following summarizes the key findings and their managerial implications.

Primary Finding. The most suitable alternative for supplier selection within the scope of outsourcing in football clubs has been determined as A6 (Organization), even under conditions of uncertainty. This finding reinforces the Monte Carlo evidence of how the "integrator" model is a suitable outsourcing solution for football clubs.

Secondary Finding. A1 (Transportation-Transportation) and A5 (Procurement and Purchasing) alternatives, which represent logistics activities, exhibit a fierce competition for the second-third place in Monte Carlo conditions. This finding suggests to football club managers that although the overall performance of A5 is close to A1, the order of priority may vary according to the criterion weight flexibility; Therefore, it is critical to outsource planning in both supply areas.

Tertiary Finding. The simulation reveals that the effect of weight variation of the K5 (Experience) and K6 (Sustainability of Collaboration) criteria on the ranking results is relatively limited. This confirms the methodological choice in terms of the contribution of these criteria to determination.

In general, the 3,000-iteration Monte Carlo simulation of the T2NN-WASPAS methodology; (a) resistant to uncertainty, (b) high ranking stability, (c) consistent in the winning alternative, and (d) administrative implications applicable in real-life situations. These results support the robustness of the methodology presented to decision-makers in the field of sports management with strong statistical evidence.

When the results obtained are evaluated, it is seen that the proposed methodology is completely resistant to the queue turning problem. The absence of any change in the rankings proves that an alternative to be added or removed from the index does not influence the ranking results that would change the result. In this respect, the proposed methodology provides decision-makers with a highly reliable decision-making environment.

6. Results and Discussions

According to the results obtained (A6), the "Organization" alternative was determined as the most important alternative by reaching the highest score value. The general order of the alternatives is A6 (organization), A5 > procurement and purchasing> A1 (transportation>-transportation), A4 (nutrition) > A7 (marketing-sales and public relations), > A2 (health services) > A3 (facility maintenance-repair).

In terms of criteria, when the results were considered, it was seen that the two most important criteria were C5 (experience) and K6 (sustainability) ranked first with the same weight values, while the other criteria were listed as C9 > C4 > C8 > C3 > C10 > C1 > C2 > C7.

Accordingly, the order is C5 (experience) = C6 (sustainability of cooperation) > C9 (willingness to do business) > C4 (technical competence) > C8 (delivery time) > C3 (trust) > C10 (public relations - customer relations-) > C1 (price) > C2 (quality) > C7 (market reputation).

When outsourcing is required in the football sector, as in all sectors, football managers first conduct research on outsourcing service providers in this field to meet this need. Outsourcing of clubs is carried out by cooperating with the company that can provide all the conditions for the needs to provide this service. In fact, managing the outsourcing process, which is a long and complex situation, is not easy for those who manage these things in the football industry and especially for club managers.

In cases where football clubs need to outsource, as in other businesses, after the decision to outsource, managers must research the companies in the sector, collect and evaluate company information in to the service needed. As a result, the company from which this service will be received is determined and the service is received by making the necessary agreements. When they do it alone, the process can become quite complicated as they consider many criteria and evaluate many alternatives.

It is possible to explain the complexity of outsourcing alternatives with a single example. For example, when outsourcing is required for the maintenance of the football field, researching and contacting the companies that perform field maintenance, collecting and evaluating information such as the technical information, experience, market information of the companies, and finally deciding on the company from which the service will be received reveals the necessity of managing a very complex process.

Based on what has been explained so far, in this study, a model in which football clubs can meet their outsourcing needs, including sports marketing and logistics activities, from a single source is proposed in the proposed outsourcing model for football clubs to manage this complex process more easily.

The model proposed in the study. In the proposed model, there is an "Integrator" referred to as an "Outsourcing Service Provider". Although the expressions "Industry Innovator" [34] or "Common Service Center and Outsourcing Consultancy" (KPMG, Utilizing the common service center in outsourcing, 2022) are used instead of "Outsourcing Service Provider Integrator" in the literature, it was decided that it would be more appropriate to use the word "integrator" in this study. In the model, there are football clubs that will receive outsourcing services on the one hand, and supplier companies that will provide outsourcing services of football clubs on the other. In the model, clubs will have the opportunity to overcome the complex processes described above by contacting a single company (integrator) instead of searching for the suppliers they need themselves. The "integrator" in the proposed model will act as the organizer who will ensure the communication and coordination of both football clubs and outsourcing service providers with each other.

As a result of the methodology used in the study, when the importance of the alternatives is examined, it is determined that the most important alternative (A6) in outsourcing in football is the "Organization" alternative. This alternative is also a result that emphasizes the importance of the organizer, which is expressed as the "integrator".

In this research, which tried to determine the location of the activities, the two alternatives with the highest score after the A6 (Organization) alternative are A5 (procurement and purchasing) and A1 (transportation-transportation). These alternatives indicate that logistics activities have an important place in football outsourcing.

The leading alternative in terms of marketing in football is expressed as A7 (marketing-sales and public relations). Outsourcing in terms of sports marketing in football comes after logistics activities in terms of importance when we look at the rankings of alternatives. Therefore, it is worth emphasizing that logistics activities in football outsourcing are an issue that needs to be emphasized more than sports marketing or sports marketing-related activities.

In the proposed model, there will be a continuous dynamic structure. All the information about the football clubs and outsourcing service providers that will take part in this model will be collected, evaluations will be made in the light of the results and findings of the research, and it will be decided whether they will continue to stay in the model. To decide, the criteria used in the study will be used. In the Integrator's evaluation, the criteria of C5 (experience) = C6 (sustainability of cooperation) come to the fore. Constant communication with clubs and companies, ensuring the flow of information, especially the efforts of companies to improve themselves will increase the quality of the services to be provided, increase customer satisfaction and keep the model dynamic.

7. Conclusions and Future Research Directions

The applied research methodology is a roadmap presented to the audience and stakeholders of the relevant industry for practitioners and decision-makers in the football industry. It is possible to use the methodology put forward as an effective tool for solving decision-making problems that may be encountered in the relevant industry within the framework of its structural features and applicability. In addition, the applied research methodology provides a flexible group decision-making environment, and in this respect, the structure of the methodology can be expanded with different operators and fuzzy approaches for possible decision-making and evaluation problems. Therefore, the ability to develop additional solutions in parallel with the structural characteristics of the problems encountered can be increased.

Basically, the applied research model is a combination that can be easily applied by almost all types of decision-makers and does not require advanced mathematical knowledge. In this respect, it has a very wide user potential. Compared to traditional approaches of the past, there are extremely few calculations, criteria, and the need for comparisons between alternatives. Thanks to this feature, the applied research model gives solid and consistent results and significantly increases the applicability of the model.

In general, the study evaluated within the framework of ten criteria selected for service production alternatives related to the football industry. For this, the WASPAS method was chosen on the basis of type-2 Neutrosophic fuzzy clusters (T2NFN). The main reason for this is the combination of the WASPAS approach and the advantages of T2NFN sets. Since it has an extremely dynamic structure, uncertainties in the football industry are also extremely complex. Therefore, classical fuzzy sets do not deal with non-membership functions because they consider the membership function and may be insufficient to process these uncertainties. At the same time, classical fuzzy sets can only capture predictable uncertainties. In contrast, T2NFN sets can handle both highly complex uncertainties while also capturing and incorporating unpredictable uncertainties into the evaluation process.

In addition, the WASPAS method provides highly consistent and reliable results compared to traditional decision-making approaches. At the same time, the implementation steps of the proposed approach are extremely few and give effective results with a small number of calculations. From this point of view, the proposed methodology is a robust, consistent and stable model. It can also cope with uncertainties very effectively.

According to the results obtained in line with the methodology used in the study (A6), the "Organization" alternative was determined as the most important alternative by reaching the highest score value. Ranking; A6 (organization) > A5 (procurement and purchasing) > A1 (transportation-transportation) > A4 (nutrition) > A7 (marketing-sales and public relations) > A2 (health services) > A3 (facility maintenance-repair).

In terms of criteria, the ranking is C5 (experience) = C6 (sustainability of cooperation) > C9 (willingness to do business) > C4 (technical competence) > C8 (delivery time) > C3 (trust) > C10 (public relations -customer relations-) > C1 (price) > C2 (quality) > C7 (market reputation).

As a result of the methodology used in the study, it was determined that the most important alternative (A6) in football outsourcing is the "Organization" alternative. This alternative is also a result that emphasizes the importance of the organizer, which is expressed as an "integrator".

In this study, which investigates the place of sports marketing and logistics activities in football outsourcing, it was seen that the two alternatives with the highest score after the A6 (Organization) alternative were A5 (procurement and purchasing) and A1 (transportation-transportation). These two alternatives (A5 and A1) reveal that logistics activities have an important place in football outsourcing.

The leading alternative in terms of marketing in football is A7 (marketing-sales and public relations). Outsourcing in terms of sports marketing in football comes after logistics activities in terms of importance when we look at the rankings of alternatives. Therefore, it is possible to say that logistics activities in football outsourcing are an issue that needs to be emphasized more than sports marketing or sports marketing activities.

In the model proposed in the study (Figure 11), there will be a continuous dynamic structure. All the information of the football clubs and outsourcing service providers that will take part in this model will be collected, and evaluations will be made in the light of the results and findings of the research and it will be decided whether they will continue to stay in the model. The criteria used in the study will be used to decide. In the evaluations to be made by the Integrator, the importance of the K5 (experience) = K6 (sustainability of cooperation) criteria is high.

Genç (2004) explains some of the advantages and benefits of outsourcing; reducing costs, receiving better quality goods and services by making more use of expert service providers, increasing efficiency and competitiveness by focusing on basic capabilities, reducing investments in this field, increasing flexibility, obtaining managerial skills, improving customer service and relations, and finally fast access to the desired service.

In the proposed outsourcing model, there are many benefits for sports marketing for both football clubs that receive outsourcing services and companies that produce sports goods and services. These benefits will be an important reason for clubs and suppliers to stay in the system and will ensure that the model is long-lasting, constantly dynamic and effective.

Businesses can develop these skills and thus increase their competitiveness by outsourcing their work to others, which are not their basic capabilities in the competitive environment. In this way, they both save resources and concentrate on what they are best at [35,36]. In the model proposed for football clubs, it is emphasized that the football club procures other activities other than sports activities from outsource service providers. In this case, the football club will have the opportunity to allocate more time and resources for sporting success by focusing on sporting activities.

The scale, expertise, and experience of outsourcing service providers in their fields make outsourcing attractive for businesses. Thus, by meeting some of their needs from external sources, enterprises do not undertake the costs of investments in areas related to their needs, and in this case, they gain a cost advantage. Thanks to the proposed model, football clubs, like businesses, will be able to gain cost advantages by outsourcing without the need for investments outside the sports field in which they are experts.

Different expertise and resources required by different services spread over different fields at different times can only be provided from a wide pool of resources. The fact that this pool is managed by a company also facilitates resource management, integration and coordination. Outsourcing provides great flexibility to companies, especially for companies whose production or distribution needs increase periodically or seasonally. The fact that football clubs will receive services from different service providers in the system means that these service providers offer customized services according to the needs of football clubs. This will enable football clubs to manage their business flexibly by receiving services according to their needs. In addition, the fact that many companies and customers in this wide pool are together provides easy access to the buyer-seller for both parties.

Likewise, companies that will have the opportunity to do more business in a system with a large customer portfolio will also be able to increase their experience in this field. In addition, their desire to do business will increase, and they will have to spend more effort and effort on customer satisfaction.

Businesses prefer to cooperate with businesses where they can get better quality service in areas other than their basic capabilities. This, as a quality system, ensures that businesses can be successful. For this, outsourcing service providers must have expertise and sufficient technical equipment [37]. In the proposed model, companies must achieve a certain quality standard and be in continuous development to stay in the model dynamically and effectively. To achieve customer satisfaction and customer acquisition, companies should organize their existing structures accordingly. For example, the company that will maintain the turf and ground of the field should have the necessary equipment and expert staff. In case of any deficiency among the suppliers, the supplier must eliminate their deficiencies and reach a certain standard to be included in the model.

In addition, managing different service providers in the model will allow for more quality control. Apart from this, the quality standard in service will create a trust in football clubs belonging to outsourcing service providers and will provide the opportunity to do long-term business with these companies. Football clubs and service providers in the model will also be able to carry out common denominator studies. The most important of these common denominator studies is "sponsorship agreements", which are a very important source of income for football clubs. Thanks to this model, it is possible for clubs that have income problems and difficulty in finding sponsors to find sponsors more easily. Thus, this common denominator work will be a source of income for clubs.

Providing outsourcing from a single source enables businesses and clubs to gain a competitive advantage in a sustainable and continuous development manner, helping to develop service delivery models for customers, reduce costs and achieve specific results. In addition, it will provide easy access to service providers for football clubs in the model, and ease of marketing the sports goods and services they produce in terms of sports marketing for service provider businesses.

It is possible to expand the model proposed in the study not only to football and football clubs, but also to include sports clubs in all sports branches and companies that organize sports. Thus, the outsourcing process in sports can be transformed from a complex and difficult process for sports managers to an easy-to-manage form where common interests are maximized. In fact, in this respect, the study will take its place in literature as a resource for those who will do academic studies in this field.

In addition, while the research methodology provides extremely valuable managerial implications and theoretical contributions, there are also some limitations. One of the main limitations is the focus on outsourcing areas of football clubs in a certain country. This brings with it geographical limitations. Therefore, in future research and studies, it is possible to expand the research methodology to include different countries and international sports competitions and to compare the results obtained with the results of this study. To consider the uncertainties of different natures that may arise in the future, the study can be expanded within the framework of different fuzzy sets and the effect of existing uncertainties can be better examined.

In addition, the criteria obtained were determined because of direct field work and a comprehensive literature review. Within the framework of possible developments that may arise in the future, these criteria may be updated, and the application of the proposed methodology may be repeated according to the changed criteria. Finally, in future studies, the methodology proposed for these branches can be applied by considering different sports branches.

Acknowledgement
This research was not funded by any grant.

Conflicts of Interest
The authors declare no conflicts of interest.

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