Strategic framework for selecting advanced air defence systems: insights from a developing country

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Abstract

Introduction/Purpose: In this modern world, every country is trying to improve its defense system by acquiring new technologies. One of the main components of a defense system is the Air Defense System (ADS), which further includes fighter aircraft, drones, 3D radar, fighter command vehicles, and missile systems. The missile system has become the most important component of air defense systems around the globe. Due to the limited resources and weak economy, it is a challenge for a developing country to acquire an ADS that suits its resources and economic capabilities. This research paper aims to study the needs and goals of the defense system of the Pakistan Air Force (PAF) and to select the best missile system to improve its existing air defense system.

Methods: A hybrid Multi-Criteria Decision Making (MCDM) methodology, Decision-Making Trial and Evaluation Laboratory (DEMATEL), and Analytical Hierarchy Process (AHP) are used to evaluate the factors affecting the missile system as well as to select the best missile system for Pakistan.

Results: The results depict that the S-400 missile system is the most feasible for Pakistan's air defense, followed by THAAD and S-300, which can meet the country's current security needs.

Conclusion: The research concludes that precision target capability, range, and maneuverability are the prominent factors that play a greater role in the ADS sector of Pakistan. This research is the first of its kind to use the DEMATEL-AHP approach for the evaluation of air defense systems in the case of a developing country such as Pakistan.

Keywords: Pakistan, ADS, missile system, MCDM, DEMATEL-AHP

Introduction

In today's modern technology-driven world, a nation's Air-Defense System (ADS) forms the backbone of its overall security. The importance it carries can be justified by the fact that no matter how advanced or numerous the nation's aircraft may be, a weaker ADS would make that nation vulnerable to modern threats (Aljohani, 2024). That is the reason that the major European powers and North America have equipped their key cities with the most sophisticated and robust ADS networks, an approach that highlights the growing importance of strengthening such systems in various developing countries (Tytarenko and Pavlenko, 2024). Furthermore, many states across the region have been strengthening their layered air-defense systems to meet evolving threats, such as in the case of India, having signed the contract with Russia back in 2018 for the S-400 Triumf system and began receiving and deploying the system from the year 2021 onwards, with original deliveries that are still under the schedule to be delivered in the coming years as we speak towards the end of 2025 (Yaqub, Ali and Kumar, 2025). Taken together, these acquisitions by various nations paint a picture of a wider regional move towards a multi-band, multi-layered air-defense coverage.

Comparatively, in the case of Pakistan, the requirement under consideration for an effective air-defense and strike system (ADS) must be understood in relation to its own strategic environment. The system's suitability is usually shaped by the state's threat perceptions, geography, and its operational doctrine, rather than by the comparisons of the missile range alone (Eslami and Borges, 2025). Considering the territorial size of Pakistan, a missile with a range of 400 km can provide many target points to an external factor within its territory; however, in the case of a country like Pakistan, to achieve similar reach against external factors that has a much larger territorial size, it would require systems with significantly longer ranges (Kristensen *et al.*, 2025). Similarly, sometimes the technical specifications of a missile system can involve inherent trade-offs, such as the enhancement of range, etc., that will need an adequate fueling system and structural reinforcement that can result in an increase in the overall weight. This can, in turn, reduce its mobility and even result in complicated deployment options (Zou, Liu and Teng, 2025). An ADS in such cases requires a balanced competing requirement for a country like Pakistan, which can constitute a strategically suitable and effective missile capability.

With the advancement in technology and rapidly changing world affairs, the nature of warfare between countries is changing. The huge number of armies cannot win wars in this era of modern technology. Instead of a full-scale war, a new trend of attacks has been developed called a "Surgical Strike" in which the enemies do not launch a full-scale war, but rather enter the targeted country's territory and neutralize the target. Even if the targeted country is nuclear-powered, the one being attacked cannot respond to the attacker with nuclear weapons. In that scenario, a timely response is needed to counterbalance the threat, and such a response is only possible through a complete air defense shield known as an ADS. These systems ensure that no intruder can carry out an intrusion without being intercepted or detected (Kizza, 2024).

In the case of developing countries such as Pakistan, the nation operates within a complex regional and internal environment, having to manage ever-growing economic difficulties, and broader geopolitical dynamics. The location of the concerned country naturally results in shaping its approach and strategic considerations to national security (Adhikari, 2024). Similarly, speaking of Pakistan, the nation has also stepped-in towards modernization of its air-defense posture with the Chinese systems: the LY-80 (HQ-16), which is a low-to-medium altitude air-defense system formally inducted in 2017, and later on, it signed another agreement with the Chinese government for the acquisition of the long-range HQ-9/P surface-to-air missile system, thus providing and extended layer and range to its integrated air-defense network (Hartley and Belin, 2019). While these acquisitions have supposedly improved Pakistan's layered coverage at low to long altitudes, it is widely noted that high-altitude/exo-atmospheric coverage and wider ballistic-missile-defense layers remain the area of concern and something that carries potential capability deployment (Haider, 2025a). Given this evolving context, the current research aims to identify and select the ADS system solution that can best fit Pakistan's operational requirements, economic constraints, and industrial capacity, via a hybrid Multi-Criteria Decision-Making (MCDM) methodology, i.e., Decision-Making Trial and Evaluation Laboratory (DEMATEL), and Analytical Hierarchy Process (AHP), to recommend options that provide realistic, sustainable improvements to the country's air-defense position.

Research questions

Based on the aforementioned discussion, the current research aims to find the answers to the following research questions.

1. What key factors influence the selection of an appropriate ADS system within a country's evolving regional security environment?
2. Which Air-Defense System emerges as the most suitable option for a country like Pakistan when evaluated against multiple factors using the MCDM methodologies?

This paper is divided into five sections. The introduction is followed by a literature review, methodology, results, discussion, and conclusion of the whole research study.

Literature review

A stronger defense system is essential for any state or nation, whether it is developed or developing, as it reduces vulnerabilities and limits external interference. As modern threats keep on becoming more sophisticated, countries increasingly rely on integrated and technologically advanced defense architectures to help protect their strategic interest and their territory (Wasi *et al.*, 2025). In this era, even the countries that have nuclear weapons prefer to be in a defensive mode because it may cause a very dangerous war that may lead to the loss of humans, plants, animals, the nation's economy, natural resources, climate change, etc. (Mynuddin *et al.*, 2024). Despite the dangers that it might pose to the sustainability of the economies, environment, and society, almost every country tries to protect itself from any type of potential adventure from its rivals or enemies (Streeck, 2025).

In such cases, many of the countries have armed themselves with various advanced weaponry, tactical armed systems, improved satellites, aerial and ground artillery, and even the latest air defense systems (ADSs). To do so, the previous literature highlights some of the scenarios in which nuclear and non-nuclear countries have armed themselves with the latest weaponry and ADSs to ensure that they are well protected and can also keep an eye on any potential attack from their rivals. They have also armed themselves to ensure that they can meet the minimal requirements for their protection, as well as to counter any encounters that might arise as a repercussion (Park, 2024). One such example is the United States, which is developing Next-Generation Interceptors (NGIs) to replace the Ground-Based Midcourse Defense (GMD) systems so that it can address aerial vulnerabilities such as hypersonic maneuvering threats (Moric and Kadyshev, 2025). Similarly, in April 2024, the U.S. Missile Defense Agency (MDA) selected Lockheed Martin to build NGIs to protect the homeland against long-range ballistic-missile threats and future advances. In this case, the NGI represents an effort to stay ahead of such threats by replacing older technologies with a more resilient architecture (Raser, 2025). Similarly, the installation of the NATO Integrated Air and Missile Defence (IAMD by the NATO allies against the recent escalations in the Russia-Ukraine conflict is also an example of the country's importance to its ADS (Passbach, 2024). It is also important to mention that countries like China and Russia are also taking it seriously to implement advanced systems, such as China's HQ-9 Series to engage long-range ballistic missiles (Jones, 2024) and Russia’s S-400/S-500 systems to engage targets at a distance of 400km (Sagild and Hsiung, 2024). Such designs ensure that they can integrate multi-layered radar systems while also ensuring their stealth capabilities. These countries are much in line with the improvement of their military business, and in accordance with that fact, two additional S-400 units are in line to be delivered to a South-Asian country by the year 2026-27, a contract comprising delivering 5 regiments (Haider, 2025b). Similarly, Algeria also became part of the list of countries to have adopted the use of the latest S-400 ADS, confirming reliance on the Russian modern technology (Sanef and Trouzine, 2025). Reportedly, Turkey is also in line for the acquisition of the modern S-400s, adding further to the ever-increasing list of nations adopting the modern ADS, further acknowledging the superiority of such systems (Analytica, 2024). Knowing the importance of the latest ADS and its adoption around the globe, its visual representation of installations across various locations can give a much better idea of the trend of adopting advanced security systems for a resilient strategic position, as depicted in Figure 1.

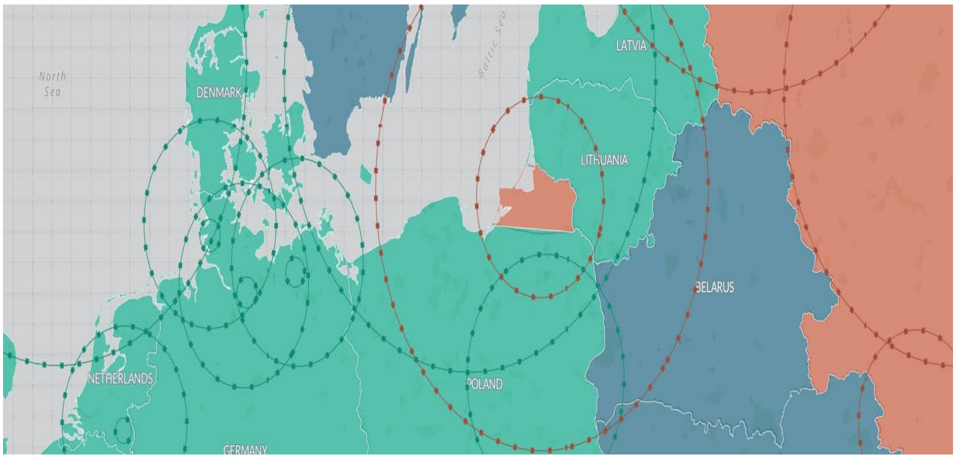

Figure 1. Visualization of long-range ADSs across various locations (Source: Missile Defence Project, 2024)

Furthermore, in the case of a developing country such as Pakistan, the ADS of Pakistan is one of the main components of its defense system, and over the past several years, the country has incorporated Chinese-made (LOMADS) LY-80 in its ADS, which is built by China Aerospace Science and Technology Corps (CASC). This technology hits the target up to an altitude of 400-1000 meters. This missile weighs around 70 kg and can hit a flying aircraft at a maximum altitude of 18 km, while having a horizontal engagement range of nearly 40 km (Khurshid and Zaman, 2024). Similarly, to strengthen longer-range coverage, the nation has also inducted the HQ-9P surface-to-air missile system, alongside related variants such as FD-2000 and HQ-9BE. The HQ-9P is capable of providing high-to-medium altitude defense, thus extending the country’s capability of layered air-defense requirements. Together, these systems form part of Pakistan's move to acquire the latest ADS systems initiatives, designed to address threats across different altitude bands and aerial threat types. Given the country's position in the region, it still requires exploration to further integrate the latest systems to enhance both the medium and long-range defense coverage. To address that, the current research aims to assist policymakers and stakeholders in opting for a much better and well-suited ADS to further strengthen the country's ADS.

Furthermore, Pakistan's pursuit of the acquisition of the latest air defense system is molded by a combination of various entities such as evolving regional threats, economic limitations, and technological dependencies. A challenge that a country like Pakistan faces is the technological and operational gap which poses legacy system limitations and integration challenges along with the shortage of skilled and trained personnel (Muhammad Usman, 2024). Internal security, protection of the infrastructure, and geopolitical dependencies and risks are also key challenges that Pakistan faces (Anwar and Atif, 2025). Similarly, the economic constraint is another major issue for a country like Pakistan being already burdened by inflation and reliance on foreign loans, and together with these external issues, it poses a bigger challenging picture for the protection of the country's sovereignty (Hanif and Sultan, 2024). Such challenges can become even bigger to handle when a country is up against rival countries especially having to deal with them when they are already armed with modern weaponry. Such a task requires effective assessment and resilient evaluation of the options that a developing country such as Pakistan can have to effectively counter such a challenge. Recent literature often overlooks the range of external pressures and internal constraints shaping Pakistan’s security environment. A clearer understanding of these combined factors is important for assessing the country's air-defense needs and future system requirements. The current research focuses on providing a novel assessment to assist policymakers in defining strategic investments in cost-effective, layered ADSs to ensure a viable and effective path to stability and deterrence. In such a way, the country can offset its weaker economy as well as secure its airspace in an imbalanced region.

Multi-criteria decision-making (MCDM) models are useful in assessing complex problems such as decision scenarios that require input from various experts in the form of primary or secondary data. It is an essential tool to evaluate conflicting criteria and assess diverse alternatives. MCDM models are useful when it comes to handling the interdependencies between the criteria as well as the large sets of alternatives, proving to be effective in handling complex decision scenarios (Kumar, 2025). Furthermore, they assist in balancing the conflicting objectives such as revealing optimal compromises or in the quantification of subjective preferences (Kizielewicz and Salabun, 2024). Similarly, the MCDM models are effective in handling both qualitative and quantitative data sets and in helping towards reproducibility and transparency, along with the resilient operations management of uncertainty and subjectivity when it comes to fuzzy logic (Pham *et al.*, 2024). Such factors enable the importance of MCDM models without which decision makers might risk making biased choices and ignoring critical factors. Based on such importance, the current study utilizes a combination of MCDM methodologies out of many available choices in terms of various techniques such as ANP, FUCOM, TOPSIS, VIKOR, etc. Various applications of MCDM models can be observed in the current literature that highlight the all-around applications in various complex decision scenarios. One such example of the MCDM model comprises a hybrid assessment, carried out for the supplier selection in public manufacturing and involves the application of Fuzzy DEMATEL, Best-Worst Method (BWM), COCOSO, MOORA, and TOPSIS (Kolour et al., 2026). Similarly, another application can be observed in the case of optimization of leadership strategies, where the application of the Delphi method along with the Analytic Hierarchy Process (AHP) technique contributes to the prioritization of the key influencing factors that can enable transformational change at the workplace (Malmir, 2026). A unique application of TODIM, i.e., an interactive and multicriteria decision-making technique, can be found for the assessment of robust ranking of criteria weights (Zhang and Gao, 2026). An application of DEMATEL also involves the assessment of cause-and-effect relationships among factors that affect transgender people, a study being carried out under uncertain circumstances

(Appasamy, 2026). Another study involved the application towards the enhancement of the cold supply chain resilience by implementing FUCOM in a hybrid combination with the Fuzzy QFD method (Khan and Ali, 2023). Similarly, the selection of the sustainable supply for the cold supply chain also comes under the domain of MCDM applications, i.e., Interpretive Structural Modelling (ISM), along with the fuzzy VIKOR technique (Khan and Ali, 2021). Also, the risk assessment and mitigation comprise the diverse MCDM applications such as FMEA-RPN and FUCOM techniques (Khan *et al.*, 2022). It is safe to consider MCDM an ultimate choice for the current decision scenario, and therefore, the current research implies a DEMATEL-AHP approach to help with the selection of the air defense system for a developing country such as Pakistan. The choice of these methods is in comparison to others in the sense that the DEMATEL approach is helpful in the identification of the interdependencies among the criteria and can distinguish the cause from the effect, which can be extremely fruitful when it comes to timely decision making. Similarly, the application of the AHP method proves to be helpful when complex problems are to be narrowed down in terms of hierarchical structures to identify the goal, criteria, and alternatives. It thus enables pairwise comparisons and proves worthy in critical scenarios such as defense systems and safety (Khan *et al.*, 2022). Therefore, in a scenario where hierarchy and interdependencies are critical, DEMATEL and AHP can prove to be a top choice for studies of a similar nature.

In the current research, the study utilizes two Multi-Criteria Decision Making (MCDM) methodologies, i.e., Decision-Making Trial and Evaluation Laboratory (DEMATEL) and Analytical Hierarchy Process (AHP). The DEMATEL is a useful method that can convert the relations and "cause and effect" of criteria into a visual structural model. It can also be used for handling inner dependencies within a set of criteria. One such example states the application of the Fuzzy DEMATEL approach in the case of main battle tanks (MBTs), analyzing various concerned factors for better assessment results (Kharola *et al.*, 2024). Similarly, another application involves the use of a hybrid methodological model, i.e., Fuzzy AHP, DEMATEL, & TOPSIS to enhance the protection of airplanes from crashing (Sharma *et al.*, 2025). The DEMATEL method was used for data processing and criteria and attributes determination to eliminate less significant criteria and attributes. For each criterion and attribute, the weight values were determined by the AHP method. The eigenvector for prioritization was used to determine reliability and the consistency ratio for each result (Ahmad Al-Rawashdeh, Al'Azzeh, and Al-Tarawneh, 2025). Similarly, another research applied the ANP and DEMATEL approach for the selection of knowledge management strategies. The study assessed such models to enhance the development of the organizational culture (Vatan, Raissi Ardali, and Shahin, 2024). Recent research has incorporated a novel fuzzy decision-making model to pinpoint appropriate policies for the transition to renewable energy (Dincer et al., 2023). Another research delved into the Financial Performance Evaluation of Energy Companies (Dagistanli, 2023). Furthermore, AHP is a technique used for the selection of the best alternative. It was introduced by Thomas Saaty in 1980, and it sets the priorities and helps the decision maker to make the best decision (Saaty, 1994). AHP, apart from making a decision, also talks about the consistency of data to minimize biases (De Felice and Petrillo, 2024). AHP works by considering a set of criteria and possible alternatives among which a decision is to be made, and it is not necessary for the AHP method that all criteria should be optimized. In AHP, weights are assigned to each criterion (Khan & Ali, 2020). AHP is used in every industry and organization, from a simple problem like bicycle features to the manufacturing of an aircraft. It can also be used in an environment where the exact numerical values for weight are not possible to collect. In that case, the linguistic terms need to be transformed into numerical values. The same approach is used for renewable energy planning in Istanbul. In this case, the best alternative for renewable energy is obtained by using VIKOR-AHP. Similarly, in the same project, the same method is used in a fuzzy environment for the selection of the best site for renewable energy (Ma *et al.*, 2025). Similarly, a hybrid MCDM approach, i.e., fuzzy AHP-Fuzzy TOPSIS, is incorporated in the context of fighter aircraft selection in the case of the Algerian Air Force (Kaanit, Mouss, and Berghout, 2025). The scenario requires a regular check on changes in the criteria that may lead to some interdependency casually; in that case, AHP and DEMATEL were integrated as a top choice (Singh and Sharma, 2024). Moreover, the advantage of the AHP integration is that it can easily improve the supplier performance and is implemented in determining the success factors associated with the spare parts supply chain (Zaid, Saleh, and Tomeh, 2025). AHP is also used for setting the priorities, while DEMATEL is used for the evaluation of success factors, as AHP and DEMATEL both work well even in a fuzzy environment. The studies were done for the evaluation of human resources for science, in which fuzzy AHP is used to weigh each criterion, after which fuzzy DEMATEL is used for the evaluation of the criteria and the alternatives (Lin and Wang, 2024).

Research gap

The current research comprises an idea that concerns developing countries as a whole and Pakistan in particular, as it is designed in such a way that highlights the factors affecting the ADS, as well as evaluating the best missile system based on various factors. Since there is no other study that highlights this topic on such grounds, and similarly, there is no study involved in the previous literature that has carried out a diverse decision scenario in the ADS sector of Pakistan, based on a hybrid DEMATEL-AHP approach, this forms a novel study. Furthermore, the motivation of the current research can also be extracted from the fact that the timing of the study is such that currently Pakistan faces both internal and external threats, and such arrangements are of extreme importance for the country's sovereignty. Therefore, the study is the need of the hour and thus a major motivation and importance for the current research.

Methodology

The DEMATEL approach was first used by the Science and Human Affairs Program of the Battelle Memorial Institute of Geneva in 1972-1976. This approach was designed to determine the complex problems and transform them into a solvable form. Since then, the methodology has been applied by different researchers to find interrelationships among different criteria in multi-criteria decision-making scenarios. The DEMATEL helps capture the logical relationship between different elements of the system and helps frame the strength of the interrelationship as well. DEMATEL classifies the factors of cause and effect while illustrating their relationship through a diagram. It determines the relationship among the factors while prioritizing the criteria according to the relationship and effect on each other. DEMATEL filters out the unnecessary criteria and sub-criteria, which are less important for an alternative selection, and guarantees the important criteria to be included in the selection process (Shafaei *et al.*, 2025). The whole methodology is displayed in the flow chart in Figure 2.

From different literature and sources, the criteria affecting the selection of an air defense system are collected. A 19x19 matrix is formed from the shortlisted criteria which were distributed among experts to get their review on the relative importance of each criterion. In this way, a total of 40 responses were collected from various commissioned and non-commissioned officers of the Pakistan Air Force. Each respondent gave judgment about each criterion and its interdependence with other criteria. This step was done using the DEMATEL approach. The pairwise comparison is performed according to a scale of 0-4 (0 for No Influence, 1 for Low Influence, 2 for Middle Influence, 3 for High Influence, and 4 for Very High Influence).

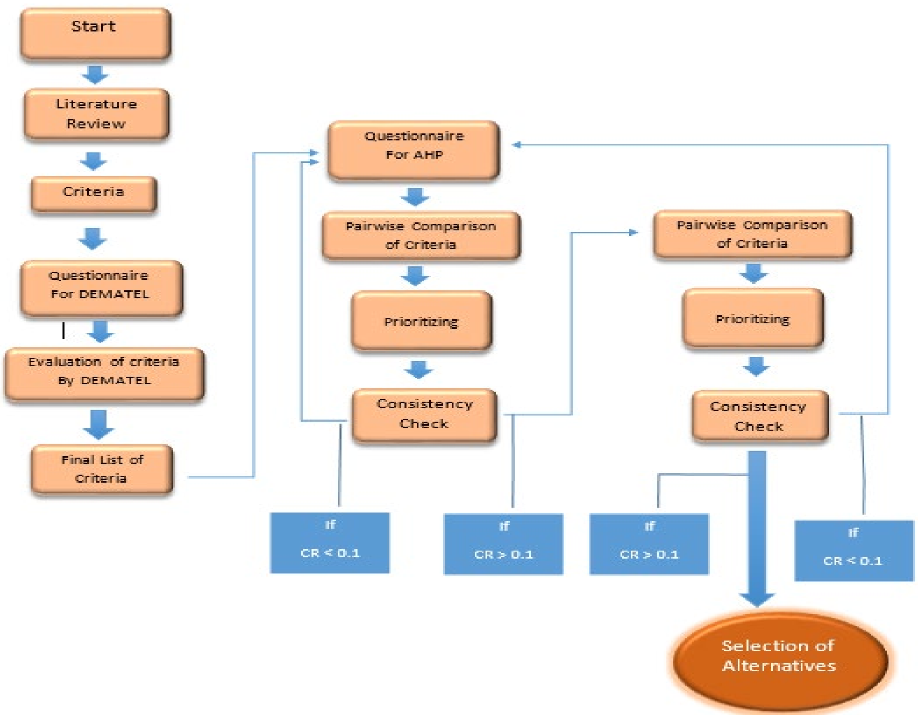

Figure 2. Flow chart showing the methodology

The following are the steps followed in the DEMATEL:

1. The first step in DEMATEL is to study the literature and find the factors affecting the selection of the air defense system. In this case, the expert review is very important for shortlisting the criteria and factors that are very relevant to the selection of the air defense system. The shortlisted criteria are shown in Table 1.
2. The second step in the DEMATEL process is to make an initial matrix that identifies the relationship between any two criteria. This matrix is reviewed by experts who grade the influence of one criterion over another criterion on a scale of 0 to 4. The notation that is used for this influence is X_{ij}, where X_{ij} is the expert judgment on the influence of i over j. When i and j are equal, it means that they do not influence each other. In that case, the

value will be zero. For each respondent, a 19x19 matrix was created in an Excel sheet; as a result, the total number of matrices is equal to the total number of respondents, which is denoted by H in this research. $X_1,\ X_2,\ X_3 ----X_n$

Table 1. List of the criteria

Life Cycle Cost	Durability	Maintenance	Time Of Response
Acquisition Cost	Payload	Reliability	Maneuverability
Versatility	Air Speed	Radar And Other Sensors	Flight Control System
Data Processing Time	Rate Of Fire	Maintainability	Number Of Targets It Can Engage at A Time
Infrastructure	Precision Target Capability	Range	

3. To integrate the responses of all the respondents, all the responses were added to get their average value. All the corresponding elements of the matrices are added, and their sum is divided by the number of responses. The resultant matrix is called the Average Matrix, denoted by A. This step can be summarized in equation 1 as

$$A_{ij} = \frac{1}{H}\sum_{k=1}^{H} X_{ij}^{k} \qquad (1)$$

4. In this step, the Normalized Initial Direct Relation matrix is determined. Each element gets a value between zero and one. Equations 2 and 3 are used for this step.

$$D = A \times S \qquad (2)$$

where

$$S = \frac{1}{max_{1<i<n}\sum_{j=1}^{n} A_{ij}} \qquad (3)$$

5. In this step, the Total Relation Matrix T is constructed by using Equation 4 as

$$T = D\ x\ (I - D)^{-1} \qquad (4)$$

In the Total Relation Matrix, I is the identity matrix. Next, the summation of the rows and columns of the matrices is calculated in the total matrix. R_i represents the sum of rows; C_j represents the sum of columns, while $R_i - C_j$ and $R_i + C_j$ show the sum and difference of R_i and C_i.

The second method used in this research for the evaluation of alternatives is the Analytical Hierarchy Process (AHP). AHP is a very powerful decision-making tool that was introduced by Saaty in 1990. It uses a pairwise comparison between criteria to convert the scale of the comparison between criteria into a number. In AHP, each criterion is weighted against another by weight from (1, 3, 5, 7, and 9). The higher-ranking number indicates the importance of one criterion over another criterion (Huang *et al.*, 2025). Thus, AHP reduces complex decision making to a comparison of criteria, where AHP not only chooses the best alternative but also talks about the consistency of the data.

In this research, AHP is used to evaluate the shortlisted criteria for a missile and then to look for the available alternatives to see which one satisfies the needs of Pakistan's current air defense. To select the best missile system for Pakistan Air Defense (PAD), a set of criteria is chosen with the help of DEMATEL, upon which all the alternatives will be weighted equally. The criteria upon which the selection of the missile system will be evaluated are Payload, versatility, Fire Rate, Reliability, Precision Target Capability, Range, Cruising Speed, Maneuverability, Acquisition Cost, Operation Cost, Maintainability, and Availability. One of the most important criteria is Availability, and this criterion includes the trade embargo and the sanctions that can be placed against a country by the international community or a specific country. The importance of this criterion can be understood well from the cold relations between Pakistan and the US for so many years.

For this project, a total of five options are shortlisted, among which one optimum option will be chosen. The shortlisted alternatives for PAD are shown in Table 2.

Table 2. List of the alternatives

THAAD	S-400	S-300	PATRIOT	LY80

For a comparison of each air defense system against the criteria in the matrices, a detailed review is done from different forums and experts. The required specifications were used against different air defense systems with weights of 1, 3, 5, 7, and 9 for pairwise comparison. All the matrix calculations are done in Microsoft Excel. From these matrices, the normalized matrix, consistency ratio, and priority vector are calculated.

The following are the steps followed in the Analytical Hierarchy Process (AHP).

1. In the first step, all the criteria and decision alternatives are listed.
2. In this step, a rate is assigned to each criterion based on relative importance. The sum of each column will be used for the normalization of the matrix.
3. The next step is to normalize the matrix by dividing each element of every column by the respective sum of the column. The normalized matrix ‘N’ with the weighted vector ‘W’ on the right of the matrix, which indicates the average of each row.
4. The next step is to check the consistency of the matrix by first calculating the weighted sum vector ‘W_s’ using the multiplication of the matrix ‘C’ with the vector ‘W’. This step is summarized in Equation 5.

$$\{Ws\} = [C] \qquad (5)$$

After determining the weighted sum vector, the consistency vector is calculated using Equation 6 as

$$\{Cons\} = \{Ws\} / \{W\} \qquad (6)$$

The average A of the consistency vector {Cons} is used in Equation 9 to calculate the consistency index CI.

$$CI = (A \ - n) / (n-1) \qquad (7)$$

Finally, a random index value is used to calculate the consistency ratio CR using Equation 8.

$$CR = CI / RI \qquad (8)$$

If this value is lower than 0.10, the matrix is consistent; otherwise, an adjustment in the ‘C’ matrix entries is necessary to repeat step 4.

5. The same steps from step 1 to step 4 are applied this time for the evaluation of the alternatives which are shown in Table 2. The priority vector of each matrix is compiled in a matrix. This matrix is called the Final Rating matrix. After taking the transpose of the Final Rating matrix, it is multiplied by the vector ‘W’ using Equation 9.

$$[FRating]T \ x\{W\} = \{Alternative \ Value\} \qquad (9)$$

Results and discussion

The criteria chosen had a complex relationship among them; without the application of a sophisticated technique, it was hard to comprehend the meaning and relation of the criteria. Therefore, DEMATEL-AHP was used to determine the interaction among them, the steps of which are shown in the methodology.

Table 3. R_i and C_j values were obtained for the assessment. (Source: Author's creation)

Criteria	Ri	Cj
Precision Target Capability	2.4926	2.7520
Range	2.6399	2.5009
Manoeuvrability	2.6928	2.4299
Versatility	2.3928	2.6575
Maintainability	2.4501	2.4081
Data Processing Time	2.5969	2.2300
Radar And Other Sensors	2.3524	2.3950
Time Of Response	2.4385	2.3021
Reliability	2.5958	2.1019
Rate Of Fire	2.3806	2.1447
Flight Control System	2.4185	2.0772
Number Of Targets It Can Engage at A Time	2.4268	2.0536
Payload	0.0012	0.2515
Durability	1.8837	2.3120
Air Speed	1.9007	2.2473
Infrastructure	-0.2766	0.0264
Maintenance	1.6561	1.8472
Life Cycle Cost	1.4289	1.9873
Acquisition Cost	1.4854	1.7884

The sum of the R_i and C_j shows the total impact and importance of ‘i' as compared to 'j'. The difference R_i-C_j is called the relation, which represents the net effect of ‘i’ over the system. If the difference is positive, it indicates that the factor ‘i’ is the cause, while the factor will be the receiver if the difference comes out to be negative. The individual values obtained for R_i and C_j are listed in Table 3. Table 4 shows the ranking of the criteria based on the values of R_i+C_j and R_i-C_j. The value of R_i+C_j for the criterion ‘Precision Target Capability' is the highest, i.e., 5.2446, and its corresponding value of R_i-C_j is positive, which means that the Precision Target Capability is the most important factor that should be considered for the selection of an ADS for Pakistan. Moreover, the 'Range' of hitting the target and the 'Maneuverability' are the second and third most important factors based on which the missile system should be selected. The other criteria that should be considered for the selection of ADS are prioritized as shown in Table 4.

Table 4. Ranking of the criteria

Criteria	R_i+Cj	R_i-Cj	Rank
Precision Target Capability	5.2446	-0.25941	1
Range	5.140833	0.138936	2
Maneuverability	5.122678	0.262827	3
Versatility	5.050276	-0.26464	4
Maintainability	4.858191	0.04208	5
Data Processing Time	4.826916	0.366989	6
Radar And Other Sensors	4.747371	-0.04255	7
Time Of Response	4.740586	0.136442	8
Reliability	4.697649	0.493929	9
Rate Of Fire	4.525268	0.235876	10
Flight Control System	4.495664	0.341241	11
Number Of Targets It Can Engage at A Time	4.480463	0.373168	12
Payload	0.252751	-0.25026	13
Durability	4.195692	-0.42825	14
Air Speed	4.148004	-0.34659	15
Infrastructure	-0.25026	-0.30303	16
Maintenance	3.503309	-0.19107	17
Life Cycle Cost	3.416167	-0.55845	18
Acquisition Cost	3.273806	-0.30303	19

These criteria are then used for the evaluation of the alternatives using AHP. After constructing the Normalized Matrix in Table 5, the consistency of the data has been checked, where the Consistency Index (CI) can be depicted as 0.10528. The matrix is consistent with the consistency ratio CR i.e.,

$$CR = \frac{CI}{RI} = \frac{0.10528}{1.12} = 0.094$$

As indicated by Equation 9, the product of the transpose of the Final Rating Matrix and the W vector gives the alternative value. All the alternatives are ranked according to these values. The larger value indicates that the alternative is the best one among all. Therefore, it is concluded from Table 6 that the S-400 Triumf is the best solution for Pakistan Air Defense with the highest value of 0.29, followed by THAAD, S-300, LY 80, and PATRIOT.

Table 5. Construction of the Pairwise Comparison Matrix

	S-400	THAAD	S-300	LY 80	PATRIOT
S-400	1.000	1.0506	1.536	2.394	3.083
THAAD	0.952	1.000	1.462	2.279	2.935
S-300	0.651	0.684	1.000	1.559	2.007
LY 80	0.417	0.439	0.641	1.000	1.287
PATRIOT	0.324	0.341	0.498	0.776	1.000

Table 6. Ranking of the alternatives based on AHP

Missile System	$A_t x W_c$	Rank
S-400	0.29896063	1
THAAD	0.28459462	2
S-300	0.1946512	3
LY 80	0.12483901	4
PATRIOT	0.09695455	5

Based on all the criteria, especially the top three, i.e., Precision Target Capability, Range, and Maneuverability, the best air defense system for Pakistan is the S-400. It is more favorable for Pakistan to purchase the S-400 missile system from Russia, as it possesses the radar system and can hit the target precisely. The S-400 is also easy to maintain, and its cost is more suitable according to the economic situation of Pakistan. The validity of the results obtained can be compared in such a way that it comprises consistency with global studies such as (Sari, et al., 2024), which ranks the S-400 as the most powerful defense system in the world by assessing it based on active sensors for anti-aircraft missiles. Keeping in mind that Pakistan already has the Chinese HQ-9, the outcome from the analysis depicting the S-400 as a better choice paints the picture of the latter offering significantly greater engagement range, along with interception at higher altitudes and flexibility in more missile-type options in comparison to the HQ-9 family, thus enabling wider and more defensible air-defense zones around the critical assets. When the S-400 is added to Pakistan's existing HQ-9 coverage, it would strengthen the outermost layer of defense, complicating enemy strike planning along with improvements in deterrence. It must be kept in mind that the overall success would depend on the robust integration, including radar support, mobility, command-and-control, and maintenance infrastructure to ensure effective operations beyond mere technical specifications (Bronk, 2018). Furthermore, techniques like AHP have been used either alone or in hybrid combination with others, such as TOPSIS, to assess weapon selection. In short, the current research aligns closely in terms of performance with the global studies but diverges in a regional context. The comparative studies validate our choice of methodologies as well as the outcome and therefore prove to be an effective outcome for the country and the region.

Research implications & future recommendations

The current research focuses on the regional context to support and evaluate the assessment of the best and most effective air defense system by considering a hybrid approach of DEMATEL and AHP methodologies. It enforces and supports technical performance and ensures that similar results can be obtained with such efficiency and effectiveness. The current research proves to be timely, especially in the case of heightened tensions in the country's internal and external environment, serving the need for a reliable and effective air-defense system (ADS) which has become more critical for Pakistan's overall security planning. Similarly, in the future context, a similar study can be extended to the combination of more hybrid methodologies to ensure effective comparisons of the results and also to account for the factors qualitatively. Future research can also include factors such as electronic warfare resistance or strategic mobility in a global or developing country(s) context.

Conclusion

Air defense systems (ADSs) are very important for any country, whether developed or developing. The ADS helps a country or a nation to defend its sovereignty. This research paper aims to identify the factors and criteria for the selection of the ADS which is preferable for Pakistan. For this purpose, the criteria, i.e. precision target capability, range, maneuverability, versatility, maintainability, data processing time, radar and other sensors, time of response, reliability, rate of fire, flight control system, number of targets it can engage at a time, payload, durability, airspeed, infrastructure, maintenance, life cycle cost, and acquisition cost, are considered. Moreover, the five missile systems (alternatives), i.e., S-400, S-300, THAAD, LY-80, and PATRIOT, are considered. Two hybrid MCDM methodologies, called DEMATEL and AHP, are integrated to identify and rank the criteria and then select the alternatives based on the criteria. DEMATEL is used for the evaluation of criteria and finding their relative importance to determine the most important criteria. Using AHP, after performing all the necessary steps and checking for consistency, the alternatives were evaluated against each criterion, which generated a ranking vector shown in Table 4. It is concluded that the precision target capability, range, and maneuverability are the prominent criteria based on which ADSs are to be selected for Pakistan. The S-400 Triumf emerged as the highest-ranked option after the AHP assessment application, indicating the most suitable ADS for Pakistan's current needs, based on the concerned distinct criteria.

Limitations

The current research considers various criteria to evaluate alternatives via DEMATEL-AHP methods. The overall boundary of the research scope is limited to Pakistan, and one of the limitations is that it does not cover almost all the developing countries. Only those who face similar crises will be able to benefit from this research . Similarly, the time constraint proves to be another limitation for the research since it is the need of the hour, and it was done to ensure that it is completed within the current time frame. Similarly, the limitation of finding the right experts is another major issue, especially in a country like Pakistan, where most of the experts are not easily available and access to the data is rather difficult. Such limitations, although they did not create any obstacle, could have improved the study by a much greater margin.

References

Adhikari, L.D. (2024) “Exploring the Relationship between National Security Risks and Economic Factors: A Nepalese Perspective,” *Journal of Political Science*, pp. 39–56. Available at: https://doi.org/10.3126/jps.v24i1.62853.

Ahmad Al-Rawashdeh, T., Al’Azzeh, F. and Al-Tarawneh, F. (2025) “An Analytical Hierarchy Process-Based Technique for Software Requirements Prioritization,” *IEEE Access*, 13, pp. 50603–50610. Available at: https://doi.org/10.1109/ACCESS.2025.3552490.

Aljohani, T.M. (2024) "Cyberattacks on Energy Infrastructures as Modern War Weapons—Part I: Analysis and Motives," *IEEE Technology and Society Magazine*, 43(2), pp. 59–69. Available at: https://doi.org/10.1109/MTS.2024.3395688.

Analytica, O. (2024) *Emerald Expert Briefings*. Emerald Expert Briefings. Available at: https://doi.org/10.1108/OXAN-DB283554

Anwar, U. and Atif, M. (2025) '"CPEC & BRI regional game changers: security and geopolitical implications in Pakistan"', *Australian Journal of Maritime & Ocean Affairs*, pp. 1–17. Available at: https://doi.org/10.1080/18366503.2025.2480945.

Appasamy, S. (2026) 'A Study on DEMATEL Approach Under Uncertainty Environments', *Spectrum of Operational Research*, 3(1), pp. 29–39. Available at: https://doi.org/10.31181/sor31202628.

Bronk, J. (2018) "The RAF's Force Structure Plan and Future Threat Scenarios," *The RUSI Journal*, 163(3), pp. 52–57. Available at: https://doi.org/10.1080/03071847.2018.1495806.

De Felice, F. and Petrillo, A. (eds.) (2024) *The Art of Decision Making - Applying AHP in Practice*. IntechOpen (Business, Management and Economics). Available at: https://doi.org/10.5772/intechopen.1003360.

Dincer, H., Yuksel, S. and Eti, S. (2023) 'Identifying the right policies for decision-making model', *Journal of Soft Computing and Decision Analytics*, 1(1), pp. 50–62. Available at: https://10.31181/jscda1120234

Eslami, M. and Borges, L. (2025) "Military Drones and the Offense–Defense Balance in Future Wars," in Eslami, M. and Borges, L., *The Drones Race and International Security*. Cham: Springer Nature Switzerland (Contributions to Security and Defence Studies), pp. 137–154. Available at: https://doi.org/10.1007/978-3-032-05921-5_7.

Haider, U. (2025a) "India's Evolving Air Defence Capabilities and Options for Pakistan," *Journal of Security & Strategic Analyses*, 11(1), pp. 88–109. Available at: https://doi.org/10.57169/jssa.0011.01.0380.

Haider, U. (2025b) "India's Evolving Air Defence Capabilities and Options for Pakistan," *Journal of Security & Strategic Analyses*, 11(1), pp. 88–109. Available at: https://doi.org/10.57169/jssa.0011.01.0380.

Hanif, R. and Sultan, I. (2024) 'The Economic Dependency of Pakistan: Reasons, Challenges and Prospects', *Pakistan Journal of Social Sciences* [Preprint]. Available at: https://doi.org/10.5281/ZENODO.11471595.

Hartley, K. and Belin, J. (2019). *The Economics of the Global Defence Industry*. 1st ed. Edited by K. Hartley and J. Belin. Milton Park, Abingdon, Oxon; New York: Routledge, 2020.: Routledge. Available at: https://doi.org/10.4324/9780429466793.

Huang, J. *et al.* (2025) "Hybrid FAHP-FTOPSIS methodology for objective football player selection and ranking," *Scientific Reports*, 15(1), p. 27913. Available at: https://doi.org/10.1038/s41598-025-13973-6.

Jones, S.G. (2024) *Rebuilding the arsenal of democracy: the U.S. and Chinese defense industrial bases in an era of great power competition*. 1st edn. Blue Ridge Summit: Center for Strategic & International Studies. ISBN: 9781538170779

Kaanit, A., Mouss, K.N. and Berghout, T. (2025). "A Hybrid Fuzzy Multicriteria Decision-Making Approach for Fighter Aircraft Selection: Application to the Algerian Air Force," *International Journal of Aerospace Engineering*. Edited by R. Zhang, 2025(1), p. 9958630. Available at: https://doi.org/10.1155/ijae/9958630.

Khan, A.U. and Ali, Y. (2020) 'Analytical hierarchy process (AHP) and analytic network process methods and their applications: A twenty-year review from 2000–2019

Khan, A.U. and Ali, Y. (2021) 'Sustainable supplier selection for the cold supply chain (CSC) in the context of a developing country', *Environment, Development and Sustainability*, 23(9), pp. 13135–13164. Available at: https://doi.org/10.1007/s10668-020-01203-0.

Khan, A.U. and Ali, Y. (2023) 'Enhancement of resilience and quality of cold supply chain under the disruptions caused by COVID-19: A case of a developing country', *Australian Journal of Management*, 48(2), pp. 341–365. Available at: https://doi.org/10.1177/03128962221095596.

Khan, A.U. *et al.* (2022) 'Risk Management for Cold Supply Chain: Case of a Developing Country', *Acta Polytechnica Hungarica*, 19(8), pp. 161–185. Available at: https://doi.org/10.12700/APH.19.8.2022.8.10.

Kharola, A. *et al.* (2024) "Fuzzy canonical approach based on delphi technique for effective decision making: A case of main battle tanks (MBTs)," in. *INTERNATIONAL CONFERENCE ON RECENT TRENDS IN COMPOSITE SCIENCES WITH COMPUTATIONAL ANALYSIS*, Dehradun, India, p. 040006. Available at: https://doi.org/10.1063/5.0182937.

Khurshid, T. and Zaman, H. (2024) 'AI INTEGRATION IN INDIAN MILITARY: APPRAISAL OF SECURITY APPREHENSIONS FOR SOUTH ASIA', *NDU Journal*, pp. 1–15. Available at: https://doi.org/10.54690/ndujournal.38.179.

Kizielewicz, B. and Salabun, W. (2024) 'A Robust Framework for Renewable Energy Policy Evaluation Using MCDA and Compromise Ranking with Stochastic Weight Identification', *Journal of Intelligent Management Decision*, 3(4), pp. 213–223. Available at: https://doi.org/10.56578/jimd030402.

Kizza, J.M. (2024) "System Intrusion Detection and Prevention," in Kizza, J. M., *Guide to Computer Network Security*. Cham: Springer International Publishing (Texts in Computer Science), pp. 295–323. Available at: https://doi.org/10.1007/978-3-031-47549-8_13.

Kolour, H.R., Momayezi, V. and Momayezi, F. (2026) 'Enhancing supplier selection in public manufacturing: A hybrid multi-criteria decision-making approach', *Spectrum of Decision Making and Applications*, 3(1), pp. 1–20.

HYPERLINK "https

Kristensen, H.M. *et al.* (2025) “Pakistan nuclear weapons, 2025,” *Bulletin of the Atomic Scientists*, 81(5), pp. 386–408. Available at: https://doi.org/10.1080/00963402.2025.2543685.

Kumar, R. (2025) ‘A Comprehensive Review of MCDM Methods, Applications, and Emerging Trends’, *Decision Making Advances*, 3(1), pp. 185–199. Available at: https://doi.org/10.31181/dma31202569.

Lin, L.-H. and Wang, K.-J. (2024) ‘Enhancing Talent Retention in Work 4.0 Era: An Improved Fuzzy Analytical Hierarchy Process and Fuzzy Decision-Making Trial and Evaluation Laboratory Methodology’, *International Journal of Fuzzy Systems* [Preprint]. Available at: https://doi.org/10.1007/s40815-024-01844-7.

Ma, Y. *et al.* (2025) “Hybrid AHP-VIKOR methodology for multi-criteria decision-making in marine renewable energy systems: Optimizing DC-DC buck converters for sustainable offshore applications,” *Marine Pollution Bulletin*, 214, p. 117809. Available at: https://doi.org/10.1016/j.marpolbul.2025.117809.

Malmir, A. (2026) ‘Ranking of Factors Affecting Transformational Leadership in Organizations: Application of AHP Method in Optimizing Leadership Strategies’, *Spectrum of Decision Making and Applications*, 3(1), pp. 62–69. Available at: https://doi.org/10.31181/sdmap31202627.

Missile Defence Project (2024). "Missile Maps and Data Visualizations," *Missile Threat*. Available at: https://missilethreat.csis.org/missile-maps-infographics/.

Moric, I. and Kadyshev, T. (2025) ‘Forecasting Costs of U.S. Ballistic Missile Defense Against a Major Nuclear Strike’, *Defence and Peace Economics*, 36(2), pp. 141–166. Available at: https://doi.org/10.1080/10242694.2024.2396415.

Muhammad Usman, Dr.S. (2024) ‘Pakistan in the Crosshairs and the Rising Stakes of Strategic Information Warfare’, *Journal of Research in Social Sciences*, 12(1), pp. 25–47. Available at: https://doi.org/10.52015/jrss.12i1.235.

Mynuddin, M. *et al.* (2024) ‘Trojan Attack and Defense for Deep Learning-Based Navigation Systems of Unmanned Aerial Vehicles’, *IEEE Access*, 12, pp. 89887–89907. Available at: https://doi.org/10.1109/ACCESS.2024.3419800.

Park, H.-R. (2024) ‘A non-nuclear US ally’s nuclear preparedness dilemma: South Korea’s “Three-Axis System”’, *Defence Studies*, 24(2), pp. 257–276. Available at: https://doi.org/10.1080/14702436.2024.2303412.

Passbach, D. (2024) ‘National and International Perspectives of the Hungarian Ground-Based Air Defence Forces (1): Strategic Environment and First Glimpse of Multinational Capability Development Options’, *Academic and Applied Research in Military and Public Management Science*, 23(2), pp. 39–50. Available at: https://doi.org/10.32565/aarms.2024.2.3.

Pham, T.Y. *et al.* (2024) ‘The fuzzy MCDM for container terminal choice in Vietnam from shipping lines’ perspective based on cumulative prospect theory’, *The Asian Journal of Shipping and Logistics*, 40(3), pp. 147–156. Available at: https://doi.org/10.1016/j.ajsl.2024.06.003.

Raser, J. (2025) “Strategic Safety Time-Lags: AGI-Driven CPA Reversal in U.S. Missile Defense, 2027-2032 -Part I.” SSRN. Available at: https://doi.org/10.2139/ssrn.5565558.

Saaty, T.L. (1994) ‘Highlights and critical points in the theory and application of the Analytic Hierarchy Process’, *European Journal of Operational Research*, 74(3), pp. 426–447. Available at: https://doi.org/10.1016/0377-2217(94)90222-4.

Sagild, R.Å. and Hsiung, C.W. (2024) ‘Chinese Re-Examinations of Russia? The Strategic Partnership in the Wake of Russia’s War Against Ukraine’, *Journal of Contemporary China*, pp. 1–16. Available at: https://doi.org/10.1080/10670564.2024.2358876.

Sanef, A.C. and Trouzine, B. (2025) “Response to Incitement: Call for Algeria Sanctions (International Legal Analysis),” *Law and World*, 11(2), pp. 97–111. Available at: https://doi.org/10.36475/11.2.9.

Sari, R.E., Melamedika, C., Hartati, T. and Iljannah, C. (2024) ‘Active sensor working system on anti-aircraft missiles’, *Journal of Frontier Research in Science*
,

Shafaei, A. *et al.* (2025) “An integrated decision-making approach for identifying sustainable tier-1 suppliers: Fuzzy Delphi-Borda-SWARA,” *Annals of Operations Research* [Preprint]. Available at: https://doi.org/10.1007/s10479-025-06923-y.

Sharma, S.K. *et al.* (2025) “A fuzzy multi-criteria decision-making framework for assessing the impact of multi-agent technology in preventing the probabilities of airplane crashing,” *Aircraft Engineering and Aerospace Technology*, 97(10), pp. 1320–1332. Available at: https://doi.org/10.1108/AEAT-04-2025-0154.

Singh, V. and Sharma, S.K. (2024) ‘Critical factors of multi-agent technology influencing manufacturing organizations: an AHP and DEMATEL-oriented analysis’, *International Journal of Computer Integrated Manufacturing*, 37(3), pp. 243–265. Available at: https://doi.org/10.1080/0951192X.2023.2209857.

Streeck, W. (2025) ‘Notes on the political economy of war’, in R. Giammetti and T. Palley (eds) *The Political Economy of War, Peace, and the Military–Industrial Complex*. Edward Elgar Publishing, pp. 19–33. Available at: https://doi.org/10.4337/9781035357178.00007.

Tytarenko, I. and Pavlenko, I. (2024) “An Approach for Modeling City Defense Means: Sumy Region Case Study,” in V. Ivanov et al. (eds.) *Advances in Design, Simulation and Manufacturing VII*. Cham: Springer Nature Switzerland (Lecture Notes in Mechanical Engineering), pp. 96–106. Available at: https://doi.org/10.1007/978-3-031-63720-9_9.

Vatan, E., Raissi Ardali, G.A. and Shahin, A. (2024) ‘Selecting information systems development models based on organizational culture: an integrated approach of DEMATEL and ANP’, *VINE Journal of Information and Knowledge Management Systems*, 54(3), pp. 531–560. Available at: https://doi.org/10.1108/VJIKMS-08-2021-0164.

Wasi, A.T. *et al.* (2025) “Generative AI as a Geopolitical Factor in Industry 5.0: Sovereignty, Access, and Control.” arXiv. Available at: https://doi.org/10.48550/ARXIV.2508.00973.

Yaqub, M., Ali, J. and Kumar, J. (2025) “The new arms race: analyzing Sino-US geo-strategic dynamics and implications for global security,” *Asian Journal of*

Political Science, 33(2), pp. 198–223. Available at: https://doi.org/10.1080/02185377.2024.2424749.

Zaid, A.A., Saleh, Y. and Tomeh, A.J. (2025) “Identifying the success factors for TQM implementation among automotive spare parts companies using analytic hierarchy process (AHP): evidence from Palestine,” *International Journal of Organizational Analysis*, 33(4), pp. 743–762. Available at: https://doi.org/10.1108/IJOA-02-2024-4252.

Zhang, W. and Gao, H. (2026) ‘Interpretable Robust Multicriteria Ranking with TODIM in Generalized Orthopair Fuzzy Settings’, *Spectrum of Operational Research*, 3(1), pp. 14–28. Available at: https://doi.org/10.31181/sor31202632.

Zou, D., Liu, Y. and Teng, Z. (2025). "Study on the impact resistance of reinforced concrete protective structures for energy facilities subjected to tube-type missile impacts," *Structures*, 79, p. 109445. Available at: https://doi.org/10.1016/j.istruc.2025.109445.

Стратешки оквир за избор напредних ПВО система: увиди из земље у развоју

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КАТЕГОРИЈА (ТИП) ЧЛАНКА: оригинални научни рад

Сажетак:

Увод/циљ:Данас свака држава покушава да унапреди свој систем одбране набавком нових технологија. Једну од најважнијих компоненти система одбране представља систем противваздухопловне одбране (ПВО) који обухвата ловачке авионе, беспилотне летелице, 3Д радаре, борбена командна возила и ракетне системе. Ракетни систем је постао најважнија компонента система ПВО широм света. Услед ограничених средстава и слабе економије, земље у развоју имају потешкоће да набаве ПВО систем који одговара њиховим ресурсима и економским могућностима. Сврха овог истраживачког рада јесте да проучи потребе и циљеве система одбране ваздухопловних снага Пакистана, као и да предложи најбољи ракетни систем који би побољшао постојећи ПВО систем.

Методе: Хибридна методологија вишекритеријумског одлучивања (MCDM), метода DEMATEL и метода аналитичког хијерархијског процеса (AHP) коришћене су за процену фактора који утичу на ракетни систем, као и за избор најбољег ракетног система за Пакистан.

Резултати: Указано је да је за ПВО Пакистана најпогоднији ракетни систем С-400, а затим ТХААД и С-300, који могу да задовоље тренутне безбедносне потребе земље.

Закључак: Закључено је да способност прецизног гађања циљева, домет и маневарске способности представљају водеће факторе који имају значајнију улогу у систему ПВО Пакистана. Ово истраживање је прво такве врсте које користи приступ DEMATEL-AHP за процену система ПВО у земљи у развоју као што је Пакистан.

Кључне речи: Пакистан, ПВО, ракетни систем, MCDM, DEMATEL-AHP.

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