Applications of Artificial Intelligence in the Aviation Industry and Air Accidents

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Abstract:
The purpose of this research is to identify and explain the capabilities of artificial intelligence on the aviation industry and air accidents. To review and analyze the strengths and weaknesses, opportunities and threats, the opinions of 25 managers, professors, experts and experts in the field of artificial intelligence have been used. Selected people in this field include people who have books, articles, authorships, translations in the field of aviation and artificial intelligence, and also have work experience as university professors, managers and consultants in terms of education and positions. Opportunities, threats, strengths and weaknesses were collected from the expert community based on an open questionnaire and interviews using the grand theory method. Then, using the Shannon entropy technique, weighting and ranking have been done. After ranking, 18 opportunities, 13 threats, 15 strengths, and 14 weaknesses were identified. Then, using the quantitative matrix of strategic planning, the indicators were scored and weighted. The total score of the internal factors was 2.469 and the total of the external factors was 2.316, which was drawn on the matrix, and Aggressive strategy was chosen to formulate strategies for the use of artificial intelligence in the aviation industry and air accidents. Therefore, the strategy was presented with an aggressive approach.

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1. Introduction

Artificial intelligence (AI) is a broad field of computer science that makes machines act like human brains. It is used to address problems that are difficult to clarify using traditional computational techniques. Artificial intelligence was first discovered in 1956 by John McCarthy, but it failed to achieve its goals [1] and the lack of technological innovation made it less promising. From 1960 to 1970, researchers explored artificial intelligence through knowledge-based system (KBS) and artificial neural network (ANN) systems [2]. KBS systems are computers that provide advice based on human-provided knowledge using predetermined rules. On the other hand, artificial neural networks are systems of neural connections designed in different layers and modeled from the human brain, which have been used in medicine, biology and engineering, language translation, law, construction, etc [4].

In that time period, interest in artificial intelligence declined due to limited applications of artificial neural networks and lack of data until 1980 [5]. "Since the 1980s, researchers have been working on a technique called gradient descent to reduce prediction errors. This method, known as the back-propagation algorithm, is used to train artificial neural networks with multiple hidden layers and has been applied to various problems in diverse fields [6]. Artificial intelligence (AI) is defined as 'the theory and development of computer systems able to perform tasks that normally require human intelligence' and 'enables machines to learn from experience, adapt to new inputs, and perform human-like tasks'. AI encompasses all forms of classical machine learning and modern artificial neural networks and, through the processing of vast amounts of available data, is developing increasingly human-like capabilities for decision-making and planning. AI is one of the rapidly evolving technologies that most countries are employing in critical sectors. Iran has also made some progress in this field, and it is time to consider implementing measures to advance its AI capabilities [7]."

One of the issues that have benefited from this technology is the aviation industry. From there, the airline industry, especially the commercial aircraft sector, is constantly striving to improve both the way it works and the loyalty of passengers. Therefore, they have put the use of artificial intelligence in their work priority [8]. Artificial intelligence (AI) is rapidly changing the aviation industry. This technology is currently used in a wide range of applications in flight, aircraft and air accidents, and its potential to increase safety, efficiency and comfort in this sector is great [9]. Although artificial intelligence is still in its infancy in this industry, progress has been made as some major and reputable airlines have put the use of artificial intelligence on their agenda. For example, facial recognition, passenger baggage control, passengers' questions and answers, increase in airplane fuel, etc. are examples that are used now. However, artificial intelligence may be able to go far beyond current applications [10].

It should be noted that today leading airlines are investigating how artificial intelligence enables them to keep pace with customer demand and improve operational quality, speed, and customer loyalty [11-12]. Many experts believe that the use of artificial intelligence technology can reduce the cycle of the aviation industry, especially aviation accidents, because the investigation of various causes in aviation accidents and the factors that cause them, and according to the invention and creation of various monitoring and inspection tools, it is possible to Prevent these incidents as much as possible or minimize possible damages [3]. One of the most famous techniques used in this field is the use of artificial intelligence tools, which can be used in the processes of predicting and preventing all kinds of accidents and air accidents and dealing with them in a planned way [13]. Therefore, artificial intelligence has made our world smarter and continues to penetrate in various fields. The aviation industry is one of the areas where the tendency to adopt modern technologies, including artificial intelligence, is increasing, and its results have been observed in airports and air travel to some extent [14].

Also, the use of artificial intelligence in the analysis of predictive maintenance can be of significant help. These days, advanced aircraft are used to simplify the maintenance procedure and at the same time improve the customer experience [15]. According to this report, today the use of artificial intelligence in the air transportation sector and the industry's focus on cyber security is increasing [3]. Artificial intelligence is a field that can be greatly developed and expanded, and its development can generate good income for the country [8]. The aerospace industry, like many other industries, has changed due to automation and digitization as part of the industry 4.0 revolution. The need to reduce human intervention has led to the development of many applications such as additive manufacturing, augmented reality, intelligent software, and accurate data prediction tools [16]. Whether we are talking about pilot errors or technical problems caused by poor maintenance, it is well known that 60-80% of air accidents are caused by human factors.[19] Therefore, experts in this field are constantly searching to identify new solutions to improve aviation safety and methods to prevent human error [20]. Like any other field, the aviation industry relies heavily on various quantitative and qualitative analysis methods to provide researchers and practitioners with sufficient insight. In today's inextricably linked world, where the use of artificial intelligence is increasing in every industry, in addition to the insights provided by previous literature reviews, there is a real demand to find, study and explain the links between artificial intelligence and the aerospace industry [22]. Therefore, in the present research, we will present the assessment of artificial intelligence applications in the aviation industry and air accidents with the SWOT approach.

2.Research literature

2.1. Artificial intelligence

Artificial intelligence, despite its widespread use, remains a complex concept that defies a simple definition. Researchers such as Hamet and Tremblay [13]. and Kaplan and Haenlein [14], provide a hybrid generalization and define artificial intelligence as a set of algorithms designed to mimic human intelligence to some extent. These algorithms can interpret, analyze and suggest based on the data provided, without explicit programming. Artificial intelligence consists of different branches, each of which has different applications. As shown in Figure 1, machine learning, computer vision, and natural language processing (NLP) stand out as some of the most well-known applications of artificial intelligence.

These applications are relevant in various fields, fields such as medicine, monitoring, transportation, pricing, operations, military applications and intelligent enterprise planning [21]. In several studies, the term "AI" is closely related to other terms such as "Big Data Technologies (BDT)", "Machine Learning (ML)" or "Intelligent Analytics" [22]. While scholars may disagree on the exact terminology of these concepts, there is consensus that data as a common currency connects them all [13].

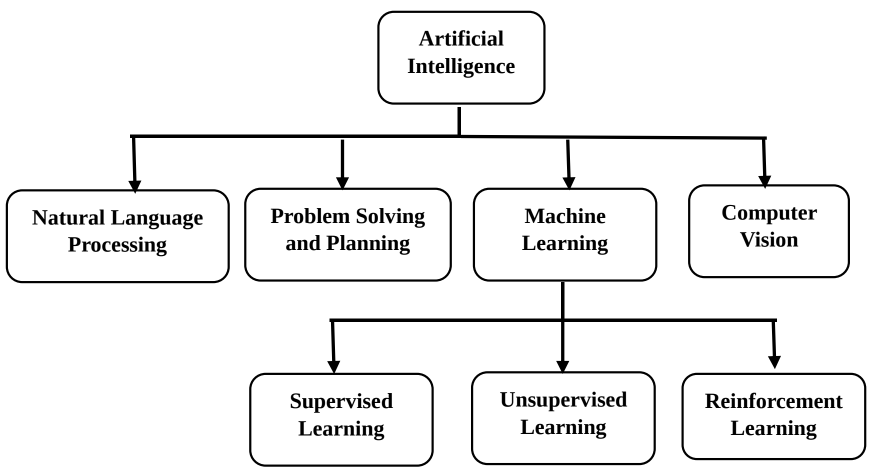


Figure 1. A summarised view of the various concepts contained within Artificial Intelligence [23].

Algorithms used to develop intelligent systems vary widely in terms of complexity, suitability and field of application. Although most of these algorithms are supervised by machine learning, they are still a subset of artificial intelligence [23]. With the variety of problems we face today, it can be assumed that there is no one-size-fits-all solution. With this perspective, ML algorithms are usually classified into 3 main paradigms: supervised, unsupervised and reinforcement learning. The desired result and the type of available data control the range of techniques that can be used [24]. Figure 2 provides an overview of these different ML techniques.

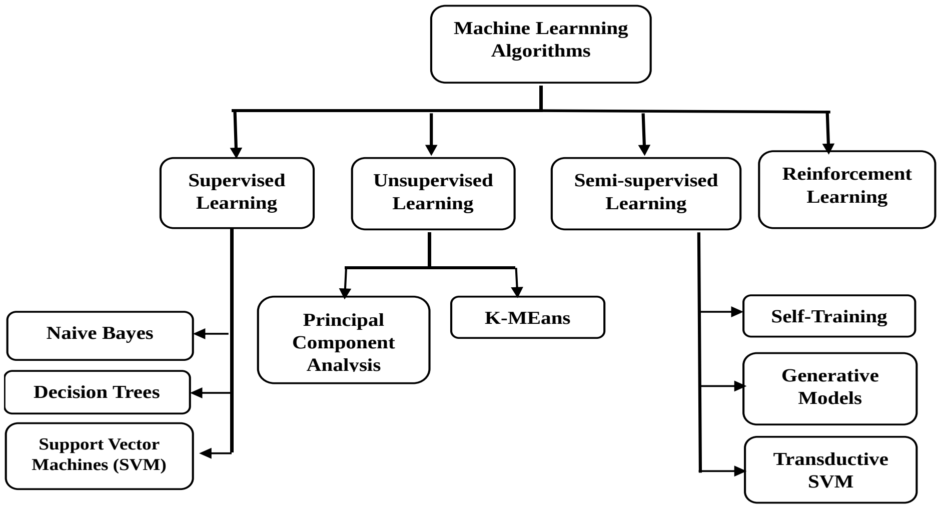


Figure 2. Most prominent machine learning algorithms and their subcategories [25].

The use of technology should simplify, improve or accelerate the achievement of results. Therefore, choosing and using technology in the form of simple automation tools or in the form of artificial intelligence techniques should always add value to the industry it serves [26]. There are many techniques for creating artificial intelligence, but the most well-known method is the use of machine learning (ML) algorithms [27]. Unlike classical programming, where an algorithm can be developed explicitly using a predefined set of features. ML uses datasets to generate algorithms that identify new links and trends between existing data [2]. In the case of classical programming, developers create algorithms based on a set of predefined rules so that if certain conditions are met, the computer executes precise commands and provides the desired output [28]. These rules are created by engineers according to the tasks to be performed. They have prior knowledge of the subject and the goals they want to achieve. In the ML paradigm, the computer learns from the data and produces an algorithm that optimizes its results during its iterations. In this case, the output is unknown, it must be discovered [6].

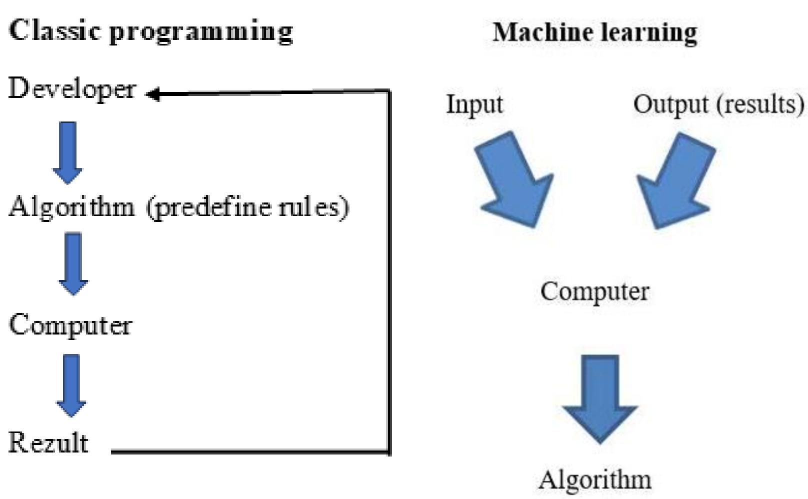


Figure 3. Classic programming vs Machine learning [29].

Machine learning algorithms are powered by a learning process that involves data assimilation, so that it can make predictions both on training data and on other data it has not been trained on [29].

In the case of an air accident, some data is represented by the statements of the entities involved in the accident. The selection of suitable algorithms for processing these data is done only through a validation step. Evaluating the effectiveness of an algorithm can be done by testing it and by understanding its mathematical foundations [30]. Today, in many fields, artificial intelligence and its subfields are constantly reshaping and challenging our view of what can be done [11].

2.2. Artificial intelligence in the aviation industry

The aviation industry has undergone a huge transformation with the advancement of technology and the development of new digital capabilities. Smart solutions can increase effectiveness, reduce costs and increase productivity in the industrial sector. Advanced systems integrate a variety of advanced technologies, including automation, robotics, artificial intelligence (AI), machine learning, mixed reality, and the Internet of Things (IoT) [22].

Digitization has changed the paradigm of the smart aviation industry. Innovative digital approaches recently improve efficiency, safety and security in the operational process and increase passenger satisfaction by better understanding their needs, preferences and habits [12]. Digitization has increased collaboration and communication between airlines, airports and other aviation stakeholders [30]. With machine learning and mixed reality, the aviation industry has the chance to revolutionize aerospace engineering and enhance the passenger experience [31]. Machine learning is critical to digitize, interpret and identify features, patterns and trends in digital data to gain valuable insights and make informed decisions [14]. Machine learning provides powerful tools to create efficient, reliable and safe aircraft design, manufacture and training. Applications of machine learning in digital twins, aerospace design, aerospace manufacturing, aerospace verification and validation, and aerospace services have increased automation and simplified processes in the aerospace industry [5]. Transformative machine learning using digital modeling and simulation impacts manufacturing, automation and data analysis in the aerospace industry [32].

The data-rich aviation industry is poised to capitalize on the machine learning revolution. Machine learning optimizes transportation networks, predicts customer behavior, and provides tailored services to improve the passenger experience. Airlines can optimize operations, improve loyalty and increase revenue by analyzing passenger data [1&9]. Machine learning tracks and analyzes multiple stages of passenger transit, including arrivals, departures, and waiting periods to reduce delays and improve the customer experience. Airlines use mobile apps to provide real-time updates and personalized service. Smart services such as customized tickets, baggage tracking and flight tracking are provided by airlines [33]. Machine learning is a useful technology that makes traveling more enjoyable and enjoyable [34]. Mixed reality can be applied to aviation through a combination of robotics, analytics, mobility and visualization. Mixed reality has the potential to revolutionize aerospace engineering [19]. Using mixed reality, aerospace engineers can easily develop virtual worlds where they interact with physical objects in a realistic way [13].

With the growth of the aviation industry, the demand for affordable and high-quality aircraft parts has increased. To meet this need, aircraft companies are looking for innovative ways to design aircraft parts. Artificial intelligence, especially machine learning, can help aircraft companies in this area. Machine learning can help aircraft companies design aircraft parts in a number of ways. For example, machine learning can be used to identify patterns in historical data so that engineers can design parts that perform better while being more cost-effective. Machine learning can also be used to simulate the performance of real-world aircraft components so that engineers can design components that are safe and reliable. Regarding the size of the aircraft, engineers must ensure that the aircraft is large enough to carry cargo and passengers. However, the size of the aircraft also affects fuel consumption and performance. Machine learning can help engineers optimize aircraft size to meet performance and economic needs. In the past, traditional mathematical models were used to simulate the performance of aircraft. However, these models were often not sufficiently accurate. Machine learning can help with this problem by providing models that are more accurate. All in all, artificial intelligence, especially machine learning, can help aircraft companies design aircraft parts in a number of ways. This technology can help aircraft companies design parts that are more cost-effective, safer and more efficient [4].

Mixed reality transforms manual work into digital assistance for intelligent maintenance, visualizing complex parts and achieving problem solving in a virtual environment [8]. The cost and time associated with developing and testing physical prototypes is reduced. Using mixed reality, pilots can undergo safe and cost-effective training in a highly efficient visualization environment. Virtual instructions are overlaid on physical training items, allowing personnel to gain hands-on experience [35]. Mixed reality merges the virtual and physical worlds to create interactive and immersive experiences for passengers. Some airlines use mixed reality for in-flight navigation, promotional recommendations, informational notifications and immersive entertainment [5]. Mixed reality increases the efficiency of airport infrastructure, such as baggage handling and security checks. In addition, passengers can enjoy a more user-friendly and convenient experience [36]. The potential of mixed reality in the aviation industry is almost limitless [1].

Examining the applications and challenges of machine learning and mixed reality in the aviation industry with digital solutions:

1- Exploring machine learning-based intelligent tools for more efficient and reliable aerospace engineering through design, manufacturing, testing and service.

2- Research on mixed reality-based applications, which combine digital information with physical objects to visualize the entire aerospace engineering process, identify potential issues, and provide an immersive learning experience from product design to manufacturing.

3- Studying machine learning solutions to improve passenger experience using data from customer surveys, ticketing and reservation systems to better understand passengers, predict their needs and provide personalized service [30].

4- Explore mixed reality services, which immerse passengers in a multi-dimensional experience, provide real-time flight information and expand passenger entertainment options.

5- Discuss future opportunities for smart aviation as well as potential digital solutions for efficiency, productivity, automation, comfort, safety and collaboration [35].

6- Examining various challenges of the aviation industry, including safety, environmental, technology, cost, security, capacity and regulation issues

The aerospace industry, like many other industries, has changed due to automation and digitization as part of the industry 4.0 revolution. There is a need to reduce human intervention

It has been used to develop many applications such as additive manufacturing, augmented reality, intelligent software, and accurate data prediction tools [14].

Whether we are talking about pilot errors or technical problems caused by poor maintenance, it is well known that 60-80% of air accidents are caused by human factors [1]. Therefore, experts in this field are in constant search to identify new solutions to improve aviation safety and methods to prevent human error. Understanding the past to improve the future is a fundamental mindset that can be applied to all aspects of the aerospace industry [36].

3. research method

This research includes identifying and explaining the capabilities of artificial intelligence in the aviation industry and air accidents, and in terms of the goal; in the qualitative part of the developmental type and in the quantitative part; Applied and in terms of its nature, it is considered a descriptive-survey type of research. The collection tool in this research is a questionnaire, which has been used to prepare the questionnaire and compile the research literature using library methods, documents, interviews, internet, etc. It should be noted that, in this research, with the help of Shannon's entropy and using the experience and knowledge of experts in the desired field and considering the characteristics of the study area, appropriate factors have been determined and weighted. One of the advantages of this method is its simplicity and documentation. First, according to the results obtained from the knowledge and experience of experts and the use of available information, weight has been assigned to each of the factors. In this way, first the weights were calculated separately through expert knowledge and data, then the desired weight was determined by comparing the obtained values. As a result, the probability of mistakes will be reduced and the weights will be closer to reality. First step: We formed the decision matrix. Second step: We normalized the matrix. The third step: calculating the entropy of each index: the entropy Ej is calculated as follows:

K as a constant value, we have kept the value of Ej between 0 and 1.

$$E_j = -k \sum_{i=1}^{m} P_{ij} \times Ln_{ij} \qquad i = 1,2, \ldots..m$$

Step 4: Next, we calculated the degree of deviation, which indicates how much useful information the relevant index (dj) has provided to the decision maker. The closer the measured values of an index are to each other, it indicates that the competing options do not differ much from each other in terms of that index. Therefore, the role of that index in decision-making should be reduced to the same extent.

$$dj = 1 - Ej$$

Fifth step: Then the value of weight Wj is calculated and in fact the standard weight is equal to each dj divided by the sum of djs.

Table 1. SWOT matrix

Evaluation of internal and external factors	Strengths (S) List of aviation industry strengths	Weaknesses (W) List of weaknesses of the aviation industry
Opportunities (O) List of aviation industry opportunities	SO Strategies Take advantage of opportunities by leveraging strengths	WO strategies eliminate weaknesses by taking advantage of opportunities.
threats (T) List of threats to the aviation industry	ST Strategies Use strengths to avoid threats.	WT Strategies Minimize weaknesses and avoid threats.

This research includes the analysis of strengths, weaknesses, opportunities and environmental threats. The collection tool in this research is a questionnaire, which was used to set up the questionnaire and compile the research literature, considering that the techniques used are SWOT and IE (internal factors) from library methods, documents, documents, interviews, internet, etc. In this research, sampling was not done for the domestic and foreign expert community, a census was taken and the sample is the same community.

To review and analyze the strengths and weaknesses, opportunities and threats, the opinions of 25 managers, professors, experts and experts in the field of artificial intelligence have been used. Selected people in this field include people who have books, articles, authorships, translations in the field of aviation and artificial intelligence, and also have work experience as university professors, managers and consultants in terms of education and positions. - Postgraduate education in this field should be a field. First, a questionnaire designed during coordination was sent to the mentioned people in an open form via email, and after collecting the sent questionnaires, the contents were summarized based on the closest opinions. To reach a consensus, the questionnaire was sent and collected again, and this work continued until the desired result was obtained. According to the conditions of the research, in-depth interviews were also conducted with the expert community. After the finalization of the aforementioned dimensions and indicators, the knowledge, expertise and experiences of the expert community have been used in order to assign importance coefficients and weight them.

SO strategies:

In the form of these strategies, companies try to take advantage of external opportunities by using their internal strengths and maximize the opportunities by taking advantage of their strengths. Organizations usually use WO, ST and WT strategies to reach such a situation, so that they can use SO strategies.

WO strategies:

The purpose of these strategies is that the company tries to improve the internal weaknesses by taking advantage of the opportunities in the internal environment. In this case, the company cannot take advantage of these opportunities due to its internal weakness. Therefore, it is necessary to use strategies such as the use of new technologies, etc. in order to use the opportunities properly by eliminating the weak points.

ST strategies:

By implementing these strategies, companies try to reduce or eliminate the effects of existing threats by using their strengths.

WT strategies:

Organizations that use this strategy become defensive, and the purpose of this strategy is to reduce internal weaknesses and avoid threats from the external environment. In fact, in order to maintain its survival, such an organization tries to reduce its activities (downsizing or divestment strategies), merge with other companies, declare bankruptcy, or finally dissolve.

4. findings

At this stage, the internal factors of the investigation and the weaknesses and strengths that exist in connection with artificial intelligence in the aviation industry have been extracted (Table 2). In this research, each strength and weakness has been given a weight from 0 to 1. , so that in the end, the sum of the coefficients of the internal factors is equal to 1. And each of the strengths and weaknesses has been given a rank between 1 and 4 according to the importance of each of them from the point of view of experts.

4.1. Matrix of external factors of artificial intelligence in the aviation industry

To prepare the evaluation matrix of external factors (EEE), we first list the opportunities and threats and assign a weight coefficient between zero (unimportant) and one (very important) to each factor. In this case, the sum of assigned weight coefficients must be equal to one; This weight is calculated using the Shannon entropy technique. We give a score of 1 to 4 to each of these factors. A score of 1 indicates a serious threat, a score of 2 indicates a low threat, a score of 3 indicates an opportunity, and a score of 4 indicates an excellent opportunity. The ranking is based on coefficients and from 1 to 4; These numbers represent the capabilities of artificial intelligence in the aviation industry. These ranks are determined by the effectiveness of the capabilities.

Table 2. Matrix of external factors of artificial intelligence in the aviation industry

Row	Opportunity	Coefficient	rank	score
O1	Optimization of aircraft design	0.08	4	0.094
O2	Making travel more efficient and safer	0.06	4	0.113
O3	Control of safety regulations and air traffic	0.08	3	0.092
O4	Decision making in emergency situations	0.07	3	0.105
O5	Identification of passengers' faces	0.03	2	0.088
O6	Anticipate potential maintenance needs	0.03	3	0.109
O7	Anticipation of possible problems of programs	0.05	4	0.092
O8	Baggage check	0.04	3	0.083
O9	Automated service delivery	0.03	2	0.092
O10	Personalize and streamline the airport experience	0.04	3	0.113
O11	Optimization of aircraft design	0.05	4	0.097
O12	Making travel more efficient and safer	0.04	4	0.103
O13	Control of safety regulations and air traffic	0.03	3	0.098
O14	Eliminate noise and provide full text of air traffic controller voice	0.02	2	0.112
O15	Identification of passengers' faces	0.02	3	0.099
O16	Increasing the automation of repetitive tasks	0.08	2	0.107
O17	Greater collaboration and data sharing	0.06	2	0.083
O18	Data control and analysis that reduces air accidents	0.08	1	0.084
Row	Threats	Coefficient	rank	score
T1	Risks to data privacy	0.03	3	0.043
T2	Legal and regulatory challenges	0.02	3	0.072
T3	Data integrity and manipulation	0.03	2	0.062
T4	Risk of data errors and defects	0.02	2	0.051
T5	Destructive social and psychological effects on the pilot	0.02	2	0.065
T6	Resistance to the adoption of artificial intelligence	0.01	2	0.044
T7	Risks to data privacy	0.03	1	0.031
T8	Legal and regulatory challenges	0.02	1	0.083
T9	Data integrity and manipulation	0.02	1	0.042
T10	Risk of data errors and defects	0.03	1	0.072
T11	Destructive social and psychological effects on the pilot	0.01	1	0.035
T12	Resistance to the adoption of artificial intelligence	0.03	1	0.063
T13	Risks to data privacy	0.02		0.042
	total	1		2.469

Matrix of internal factors of artificial intelligence in the aviation industry

Internal or internal environmental factors are factors that are inside the organization and can be controlled by the organization. Strategists try to capitalize on internal strengths (strengthen them) and eliminate weaknesses. After examining the internal factors, the known and important factors were listed according to the discretion of the experts, and the weight coefficients were determined by their consensus, which have a total of one. These coefficients range from zero (unimportant) to 1 (very important), which indicates the relative importance of a factor in terms of the success of the relevant organization in that factor. The ranking is based on coefficients and from 1 to 4.

Table 3. Matrix of internal factors of artificial intelligence in the aviation industry

Row	Strengths	Coefficient	rank	score
S1	Flight planning and scheduling	0.07	4	0.099
S2	Increasing the efficiency and stability of flight operations	0.06	4	0.102
S3	Airplane fuel optimization	0.04	3	0.113
S4	Adding new features in emergency times	0.04	3	0.107
S5	identifying fraudulent activities and malicious behaviors	0.03	2	0.113
S6	Increasing security in travel and tourism	0.03		0.093
S7	Personalize and smooth the travel experience	0.05	3	0.109
S8	Processing improvements and uncovering hidden insights	0.04	4	0.113
S9	Reveal patterns, relationships and other hidden insights	0.04	3	0.097
S10	Quickly process big data and provide results to the pilot	0.03	2	0.103
S11	Weather control and prediction of air turbulence	0.05	3	0.117
S12	It automates repetitive and time-consuming tasks.	0.04	4	0.103
S13	Waiting time and flight costs are reduced.	0.03	4	0.098
S14	Do repetitive and boring tasks without errors	0.05	3	0.122
S15	Development of autonomous aircraft, drones	0.04	2	0.099
Row	Weakness	Coefficient	rank	score
W1	Inability to accommodate human and moral characteristics	0.04	3	0.072
W2	Costs and requirements of other resources	0.03	3	0.062
W3	Only able to perform planned and one-dimensional tasks	0.03	2	0.051
W4	The possibility of hacking and cyber attacks on the program	0.03	3	0.065
W5	The need for teaching and learning by humans	0.02	2	0.044
W6	Substitute jobs and increase unemployment (in few cases)	0.02	3	0.031
W7	Unknown bias in the data on which the system is trained	0.03	2	0.083
W8	Decision making based on "black box" algorithms.	0.02	2	0.042
W9	The use of artificial intelligence raises ethical concerns	0.02	1	0.072
W10	it is a technology based on pre-loaded facts and experience.	0.03	1	0.035
W11	Potential reduction of human interactions	0.01	2	0.023
W12	works based on algorithms that cannot be understood	0.03	1	0.052
W13	Educational data can have human biases	0.02	2	0.049
W14	Implementing artificial intelligence systems can be costly	0.03	1	0.047
	total	1		2.316

The factor evaluation matrix was used to determine the strategy that was chosen. This matrix considers the strengths, weaknesses, opportunities, and threats (SWOT) of artificial intelligence (AI). The final score for each factor is calculated based on its rank and score coefficient. The SWOT matrix allows for the creation of four different strategic options: defensive, adaptive, contingent, and offensive. These strategies are based on a combination of the internal and external factors affecting AI. In practice, different strategies may overlap or be implemented together. Given the current state of AI capabilities, four categories of strategies can be identified, each with a different level of activity.

Strategic analysis is a very important step in the strategic planning process. At this stage, the position of the organization is evaluated according to the strengths and weaknesses it has in its internal environment and the opportunities and threats it faces in the external environment. There are three basic steps in analyzing these factors:

1-Evaluation of the key factors influencing the mission and realization of the organization's vision that can be identified within the system. (weaknesses - strengths)

2-Evaluation of the key and influencing factors on the realization of the organization's mission and vision that exists in its external environment. (opportunities - threats)

3- Situation evaluation and strategic action.

4.2. Internal and external matrix

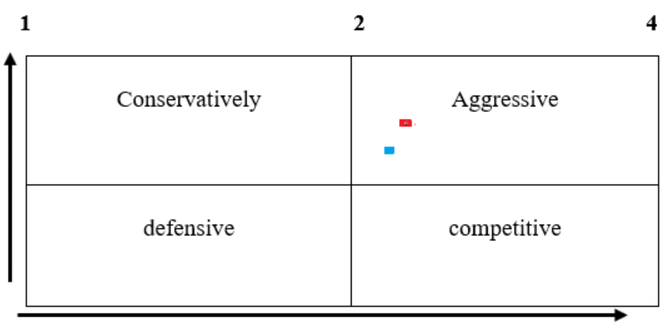
For the simultaneous analysis of internal and external factors, the internal and external matrix is used so that the scores obtained from internal and external factors are used. The grades obtained from the evaluation of internal factors (IFE) are written in the horizontal dimension and the grades obtained from the evaluation of external factors (EFE) are written in the vertical dimension.

In the square matrix, these scores are classified in a two-part spectrum, strong (2.5 to 4) and weak (1 to 5.2). growth and development), if it is in the second house, a conservative strategy (maintenance and external support) and if it is in the third house, a defensive strategy, and finally, if it is in the fourth house, a competitive strategy is recommended.

By using the IE matrix and placing the scores of the evaluation matrices of internal and external factors on it, the strategic position in the first region was determined as follows, and the competitive strategies (SO) will be selected accordingly.

Evaluation of internal factors (IFE): 2.469

Evaluation of external factors (EFE): 2.316



Since the area marked with red and blue colors is the aggressive strategy area, we will continue to present aggressive strategies in the internal and external environment.

- Reduce bias. Airlines and government agencies should take steps to reduce bias in their AI training data. This can help prevent incorrect decisions based on artificial intelligence.
- Improve security. Airlines and government agencies must take steps to improve the security of their AI systems. This can help reduce the risk of cyber attacks and other security threats.
- Reduce costs. Airlines and government agencies should look for ways to reduce the costs of developing and implementing artificial intelligence systems. This could make AI more cost-effective for small and medium-sized airlines.

- Using artificial intelligence to predict dangerous weather conditions. This can help pilots avoid flying in dangerous conditions.
- Using artificial intelligence to detect defects in aircraft. This can help pilots land the plane safely.
- Using artificial intelligence to help pilots make decisions in emergency situations. This can help increase the chances of passengers and crew surviving in the event of an accident.

5. Conclusion

The aerospace industry has always been at the forefront of technological advancements, pushing the boundaries of what is possible and transforming the way we live and work. The aerospace industry is already making extensive use of AI for various applications and is just beginning to make an impact. Business and technology grow hand in hand. Companies that don't use technology to benefit their customers or employees often don't survive. Almost every aerospace and defense company is looking to exploit the potential of AI to improve their aircraft, focusing on safety, security, AI assurance, human factors and ethical considerations. But AI isn't just changing the way airplanes fly. It will also revolutionize almost every aspect of aviation on Earth. One of the most important ways that artificial intelligence is revolutionizing aerospace engineering is through the optimization of aircraft design. As artificial intelligence and machine learning technology has matured in recent years, the aviation industry has looked for ways to capitalize on it by making processes more efficient and often safer.Dispatchers are responsible for safely planning the most efficient route for each aircraft. They work with pilots to ensure safe flight paths and operations. Therefore, current and expected weather, recorded air turbulence, aircraft performance, safety regulations, compliance with air traffic control, and traffic volume must all be considered, making the planning process a very complex workflow. Artificial intelligence and machine learning can be used to increase the efficiency and stability of flight operations by optimizing routes and increasing the prediction and flow of airline traffic. Airlines and other operators can also use artificial intelligence to optimize fleets, flight planning and ground operations. Engineers developing aircraft can use artificial intelligence tools to facilitate and speed up the design and certification of products even before they enter the market.

The aviation industry has already used at least some form of early AI technology for years, particularly for manufacturing and MRO. Artificial intelligence can be used to analyze data from various sensors on the aircraft to predict potential maintenance needs. IoT data can be combined with weather, airport and navigation data to predict and minimize potential application problems. Using AI to process data and uncover hidden insights is a tremendous boon for those responsible for secure programming. For example, crew members' qualifications and previous trips (e.g. between multiple time zones, work regulations, flight type, fuel consumption, and even flight path) should all be linked. Pilots and flight attendants must meet certain legal requirements for time off and maximum working hours. All this and more should be included in the program. Airlines can also use AI to personalize and streamline everyone's airport experience in other ways. For example, they can analyze customer data to provide booking assistance and attractive loyalty rewards. Customer data can be analyzed in aggregate, allowing airlines and airports to make informed decisions about how to keep their customers happy. Customers can now book flights, manage luggage, communicate with hotel staff in unfamiliar languages, and even take virtual tours of unseen cities, all thanks to the power of artificial intelligence. Artificial intelligence allows companies to automate operations, derive insights from data, and create new value propositions, which help companies create new goods and services, increase productivity, and gain competitive advantage as they continue to grow. bring It is possible for airlines to simplify their flight planning, crew scheduling, aircraft dispatching and other processes. With artificial intelligence, travel arrangements have become easier as it provides automated and customized services.

AI automates repetitive and time-consuming tasks, reducing wait times and costs while freeing employees to focus on more important responsibilities and addressing chronic understaffing. Artificial intelligence is being implemented by airlines for facial recognition, customer Q&A, baggage checking, optimizing factory operations and optimizing aircraft fuel. Artificial intelligence has the ability to predict travel changes in advance regarding traffic and reasonably estimate the time required to reach any airport based on the time of day. Artificial intelligence also enables engineers to add new capabilities to passenger, military aircraft in times of emergency. Artificial intelligence can also be used to increase security in the travel and tourism industry by identifying fraudulent activities and malicious behavior. For example, AI-based facial recognition systems can ensure that only authorized personnel have access to secure areas at airports and other travel destinations.

However, not all airlines may be able to afford or invest in such expensive new technology. Second, it will take some time to be implemented by the aviation industry worldwide. Air Traffic Control (ATC) is one of the most critical aspects of all flights. In the case of international flights, the communication between the pilot and the air traffic controller is usually cross-linguistic and cross-cultural. Even though they both use English to communicate, their accents may be different, which can cause confusion. For example, it can be difficult for an Indian pilot to understand the highly accented English of a European controller. In addition, the communication channels of ATCs are noisy, which makes it more difficult for the pilot to follow. Thanks to Airbus's AI-Gym program, they have been able to develop a machine learning algorithm that not only removes noise in real time, but also provides a full transcript of the controller's voice.

Travelers often struggle with navigating unfamiliar airports to find transportation and the rest of the post-flight experience. By collecting and analyzing various types of transportation and customer experience data, AI-enhanced apps can guide travelers to the baggage carousel and help them book a trip, and even point out nearby points of interest to help make it clearer. Suggest a time after getting off. The technology can continuously monitor weather conditions and other factors with the goal of reducing unplanned downtime. AI can also be used to identify hidden patterns to provide the airline industry with insights into other possibilities that could cause flight delays and cancellations. Some airlines have equipped the cabin crew with a data analysis program that provides detailed information about the passengers sitting in each seat. During the flight and during the boarding process, this information can be used to make changes in the seats and adjust the offers according to each person's taste. One of the main challenges of artificial intelligence in aviation is to ensure the safety and security of the system. As with any complex technology, there is a risk of error and failure, and it is important to ensure that AI systems are fully tested and validated before deployment.

Ultimately, all of these benefits lead to one thing that is at the core of any airline's business: a better customer experience. Major airlines are using artificial intelligence, machine learning (ML), and the Internet of Things (IoT) as ways to enhance customer experience, cut costs, and stay competitive. Take your check-in kiosk to the next level with facial recognition and a passenger's passport photo to speed people through the check-in process and reduce boarding times. The use of artificial intelligence in aviation has made many tasks easier for airlines and airport authorities around the world. From passenger identification to bag screening and providing fast and efficient customer care solutions. In aviation, AI is limited to non-critical ground activities, as aviation-specific challenges in terms of reliability, cyber security and real-time factoring still need to be solved for more complex tasks, such as air traffic control or aircraft operations.

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