

Artificial Intelligence and Airports

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Abstract

Due to the introduction of AI, the aviation sector has changed forever, as have many other industries. Six recent articles from the field have been researched to give a clearer perception of these technologies concerning data collection, automation, and predictive maintenance of aviation infrastructure. Airport terminals are intricate systems that require the synchronous functioning of many processes. This research narrates about the use of AI technologies in the airport space and how this, in turn, enhances the performance, the integration, and the safety of an airport.

AI has become a game changer in aviation, as it is in every other sector, as the use of AI technologies allows for greater safety, adaptability, improvement, efficiency, capacity and greater support for all stakeholders in the aviation sector, as AI has become a major control over many aspects of aviation such as dynamic pricing that seeks to maximize revenue, in addition to optimizing pricing, predicting delays, optimizing flight paths and more. AI also works to improve pricing strategies through recommendation engines for detailed offers, sentiment analysis on social media, chatbots and customer service automation. AI is used in aviation by identifying passengers, checking their luggage and working to assist customers, as well as some of the challenges facing AI in aviation such as managing data confidentiality, investments and monitoring progress. Accordingly, the writer and researcher Jassim Haji prepared a research paper in which he discussed the role that artificial intelligence has come to play in the field of aviation and the challenges facing artificial intelligence in aviation. Owing to the importance of the topic, this research was conducted.

The research objectives

The current research aims at identifying the effect of using the AI in airports, clarifying how the AI technology affected the business procedures in airports, and how this affects the passengers' travelling. Also, the current research examines 6 related articles, identifying the strength and weakness points of these articles.

The methodology

The research adopts the systematic review methodology. It is an in-depth process of collecting and analyzing previous published studies on a specific topic, in a precise and systematic manner. The systematic review aims to summarize the available scientific evidence and assess its quality; thus, providing reliable and comprehensive conclusions. It is a powerful tool for guiding decision-making, public policies, and scientific research.

The selected articles

Authors	Year	Title	Journal/Publisher	DOI/Link	results
Vinothkumar Jaikumar A.karunamurthy	2023	Recent Advancements in Artificial Intelligence Technology: Trends and Implications	Quing International Journal of Multidisciplinary Scientific Research and Development 2(1):1-11	DOI:10.54368/qijmsrd.2.1.0003	The quest for generalized AI models continues, while data quality and domain adaptability remain concerns. Regulatory efforts and collaborative initiatives are

					shaping the ethical and policy dimensions of AI, aligning technology with societal values
Michael Haenlein Andreas Kaplan	2019	A Brief History of Artificial Intelligence: On the Past, Present, and Future of Artificial Intelligence	July 2019 California Management Review 61(4):000812561986492	DOI:10.1177/0008125619864925	Depending on its cognitive, emotional, and social intelligence, artificial intelligence can be divided into three categories: analytical, human-inspired, and humanized. A limited approach that only impacts some countries but not others is unlikely to be successful in the long run due to the nature of AI.
Xiangjie Kong Zhejiang Xiaomei Bai	2018	Artificial Intelligence in the 21st Century	Article in IEEE Access	10.1109/ACCESS.2018.2819688	The decline of self-references suggests that AI is growing more tolerant from

					the standpoint of reference behavior. The key publications, scholars, and organizations that found highlight significant moments in the evolution of this area.
Iain M. Cockburn Rebecca Henderson Scott Stern	2018	THE IMPACT OF ARTIFICIAL INTELLIGENCE ON INNOVATION	NATIONAL BUREAU OF ECONOMIC RESEARCH 1050 Massachusetts Avenue Cambridge, MA 02138	http://www.nber.org/papers/w24449	The possibility of a shift in the innovation process presents important questions for a variety of management and policy domains, from how to assess this novel science to the possibility that prediction techniques could create new obstacles to entry in a broad range of sectors.

Yeabtsega Behailu Adere	2023	THE IMPACT OF ARTIFICIAL INTELLIGENCE ON SOCIETY	International Research Journal of Engineering IT & Scientific Research 5(10)	DOI:10.56726/IRJMET S45708	AI has the ability to enhance patient outcomes and deliver more effective and efficient healthcare services, according to the report. By offering individualized and flexible learning opportunities, it can also revolutionize education. However, there are worries about job displacement and the possibility of economic injustice when AI is used in the workplace. The study also assesses the ethical ramifications of AI and highlights the necessity of developing and using AI systems
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					responsibly. To address concerns like prejudice, privacy, and openness, ethical frameworks and rules are necessary. All things considered, this research paper offers a thorough analysis of how AI is affecting different facets of society, highlights important trends and implementation-related difficulties, and suggests potential solutions to these problems.
Renato Lopes da Costa	2022	Artificial Intelligence in Project Management: Systematic Literature	International Journal of Technology Intelligence and Planning 13(2):1	DOI:10.1504/IJTIP.2022.10050400	Numerous sectors use project management, and it is not exempt from the advancements that artificial

		Review			intelligence is bringing about globally. Nevertheless, artificial intelligence is not yet widely used in businesses, particularly not in all project management domains. Although the exact causes are unknown, they appear to be connected to the unpredictability of using artificial intelligence in project management.
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Strength and weakness

- **Strengths:**

Most articles are new articles starting from 2018 until 2023. Literature review is clear and the data submitted is good. All articles use citations are well cited. All articles applied the scientific procedures in their data. All articles indicated that the technological and cognitive revolution has

made a big difference in the subject of event management, as the widespread spread of these modern technologies has forced many business organizations to pay attention to this aspect and put it at the top of their priorities due to the great role of these technologies and their direct contributions to developing all institutions, improving their performance.

The studies indicated that there are many technological means that help organizations use it as a distribution channel that ensures that their products reach these markets in a manner that suits the organization and customers, as well as the AI which can be used in different organizations, as a tool for marketing communications in its various forms, allows the organization the ability to develop its services.

The objectives of the 6 articles are clear and precise.

Study 1: This work has contributed to identify Artificial Intelligence Technology: Trends and Implications

Study 2: This paper tried to identify A Brief History of Artificial Intelligence: On the Past, Present, and Future of Artificial Intelligence

Study 3: This paper tried to identify Artificial Intelligence in the 21st Century

Study 4: this paper tried to identify the impact of artificial intelligence on innovation

Study 5: The study aims at clarifying the effect of AI on society.

Study 6: The study sought to have a deep explanation on Artificial Intelligence in Project Management.

- **Weakness:**

No much great data about AI in airports. No article focused on the effectiveness of small smart applications of the AI. These smart applications further enhance the security within a premise while improving the operations in airports. On the other hand, the implementation of AI in airports presents several challenges such as high cost, data security, and technical challenges. These challenges limit the full potential that AI can bring to airports and need to be resolved. Hence collaboration techniques, for example federated learning, are proposed as potential approaches to advance the security of data and the efficiency of learning across platforms.

Comprehensive analysis

The previous articles indicated that Cameras and sensors supported by AI technology and AI algorithms eliminate limitations and observe the mobility of people resulting in effective reduction of crowds and enhancement of the boarding process. Also, most articles indicated that Increase of Operational Effectiveness of AI. It has been observed when airlines employed systems powered by AI and data from AI devices for scheduling resources, it enabled youths to be much better. For example, it has been demonstrated that AI algorithms can optimize the scheduling of arrival flights from gate assignments and reduce reasonable waiting time and hence decrease the cost of operations. AI devices applications deployed at airports had enabled the automated provision of flight updates and other notifications that creates a unique experience for the user. All hesitant travelers were supported cross service by AI based Chatbots which made customer services better. The data received from AI devices are processed using advanced machine learning algorithms to find out traceable actions to avoid intrusions. This pre-emptive step enhances security features and assists to lower risks. There are many things that call for concern when it comes to the security and safety of AI Devices and their applications in the

airport operations. However, certain mechanisms can be employed to try and manage these concerns as there is a dire need to try and protect the airport operations from such threats.

A good integration of Data Analytics in Aviation stakeholders should strategically make use of the collaborative models exemplified by this study as they can enable them to aggregate different data sources for instance sensors and cameras to Early Warning Systems which would be effective in sustaining business continuity. There are many things that call for concern when it comes to the security and safety of AI Devices and their applications in the airport operations. However, certain mechanisms can be employed to try and manage these concerns as there is a dire need to try and protect the airport operations from such threats. A good integration of Data Analytics in Aviation stakeholders should strategically make use of the collaborative models exemplified by this study as they can enable them to aggregate different data sources for instance sensors and cameras to Early Warning Systems which would be effective in sustaining business continuity.

Critical Analysis

The following are the most prominent uses of artificial intelligence in the aviation industry.

- Passenger identification: Machines identify passengers and record their arrival at the airport. Delta Air Lines has tested this process through some initiatives such as Delta ticket kiosks and phone check-in through the “Fly Delta” app.
- Baggage inspection: American Airlines launched an application development competition with the aim of developing an application that facilitates the process of checking passengers’ luggage.

- Customer assistance: United Airlines uses Amazon's Alexa to answer customer inquiries. The company announced its use of Alexa in September 2017, which answers common passenger questions such as check-in and onboard Wi-Fi.

The air transport sector faces new challenges such as reliance on advanced systems in aircraft, which increases the complexity of operations and maintenance, as well as the increase in air traffic of aircraft, compliance with more stringent environmental standards, and competitiveness among commercial airlines, for which AI can provide opportunities. A wide range of AI applications can be used in the field of aviation. For example, enhancing virtual assistance to the pilot by providing advice on routine tasks or providing enhanced advice in high workload conditions, which helps the crew in decision-making processes. AI can provide predictions that help prevent some critical situations according to operational conditions and the status of the crew (such as physical stress). Or when calculating the amount of fuel for the flight and detecting ice, etc. The use of AI may develop to include complex models on board aircraft systems that are more efficient in processing and storing data, with the possibility of advanced automation of aircraft systems, and reaching aircraft designs capable of performing autonomous flights, which currently face many difficulties in complying with the safety requirements of manned aircraft designs. In contrast, the emergence of air taxi systems in urban air mobility helps design these vehicles based on systems to enable complex decisions to ensure safe flight and landing or to manage the separation between air vehicles at reduced distances. This is where artificial intelligence comes in to process and use the huge amount of data generated by the integrated sensors and as a result of machine-to-machine communications between vehicles to support such flights without human intervention.

Synthesis of Information

The Synthesis of Information is good. Most articles assured that there are many challenges facing the aviation industry as AI becomes more widely applied. Below, the most prominent of these challenges.

- **Data confidentiality management:** As the aviation industry adopts AI, large amounts of data will be used, which will put data and information security at risk. The need to properly manage data is not a new challenge for airlines.
- **Progress monitoring:** Monitoring and tracking progress is another challenge for airlines. These companies first need to develop analytics that help them develop and process data accurately. This in itself is a challenge due to the difficulty of determining the appropriate type of analytics.
- **Investment management:** AI technology requires huge investments, which poses a challenge for small airlines that will not have sufficient capabilities to fully implement AI technologies. The solution to this problem may be represented in mergers and acquisitions, as large airlines may have a desire to acquire small airlines, and there are some small airlines that have a tendency to adopt AI technologies, such as Southwest Airlines.

Conclusion

The integration of AI has advanced and revolutionized the aviation industry. Airports that are able to adapt these technologies will be able to demonstrate more efficiency, better passenger satisfaction, and good security systems. Long-term focus on development of AI would be critical for overcoming current issues and further enhancing the features of smart airports ecosystems. AI is having a profound impact on the efficiency of aviation professionals, and the entire aviation industry needs to prepare for this significant change.

- **Dynamic pricing:** AI in aviation seeks to maximize revenue, with airlines optimizing their already calculated base published fares based on flight characteristics and broad segmentation, adjusting fares after assessing details about passengers and current market conditions.
- **Pricing optimization:** Similar to dynamic pricing, these algorithms look for ways to optimize long-term sales revenue to ensure all flights are optimally booked.
- **Flight delay prediction:** Since flight delays depend on a wide range of factors, including weather conditions and what's happening at other airports, an intelligent system can be applied to analyze massive data sets in real time to predict delays and rebook customers' flights in a timely manner.
- **Flight route optimization:** Consider machine learning-powered systems that can find optimal flight paths, resulting in optimally booked and timed flights, lower operating costs, and increased customer retention.
- **Avoiding Travel Disruption:** Amadeus, a leading global distribution system (GDS), has developed a schedule recovery system to help airlines mitigate the risk of travel disruption.
- **Crew Scheduling:** The number of flight crews at major carriers has grown and their expenses now often exceed \$1.3 billion annually, the second largest component of the total operating cost for major carriers (besides fuel).
- **Fraud Detection:** By analyzing specific customer travel and purchase patterns and correlating them with historical data, algorithms can identify suspicious credit card transactions and eliminate fraud, saving airlines and travel companies millions of dollars each year.

Recommendations

For strategic thinking, direction and focus of efforts, it is necessary for institutions to define the purpose of their initial efforts in the field of artificial intelligence and their area of focus, and then identify the obstacles that may face the workflow during the transition phase to artificial intelligence, which includes many advantages, including: early analysis of diseases, providing better medical services, and diagnosing diseases, which contributes to improving the quality of services, in addition to its importance in automating tasks to increase efficiency and cost.

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