The Effect of Artificial Intelligence on Strategic Agility of Airlines: EgyptAir as a case study

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Abstract

The adoption of artificial intelligence applications has expanded in various companies and sectors, including the aviation industry, due to the numerous positive effects of using AI applications in supporting performance and competitive capabilities. The study aims to evaluate the impact of AI and its three applications (chatbots, forecasting, and robots) on strategic agility in airline companies. To achieve the study's objective, a questionnaire was designed and distributed to a random sample of employees in EgyptAir branches in Cairo and Giza governorates. 352 questionnaires were distributed, and 312 valid questionnaires were analyzed. The study's results showed that artificial intelligence has a significant and positive impact on strategic agility in EgyptAir company. The results also highlighted that forecasting having the strongest impact on strategic agility, followed by chatbots and finally robot.

Keywords: artificial intelligence, chatbot, forecasting, robot, strategic agility, airline, EgyptAir.

Introduction

In today's rapidly changing and unpredictable work environment, businesses need to be able to quickly adapt to evolving needs, requirements, and trends. Technological advancements such as artificial intelligence, cloud computing, and the Internet of Things can contribute to improved performance and success (Mikołajczyk, 2022). To thrive in this environment, companies must embrace continuous change and updates, while enhancing their flexibility and adaptability to tackle new challenges. This requires investing in modern technologies and utilizing them to improve performance and achieve greater success (Björkdahl, 2020).

It's important to note that technological advancements bring new benefits and opportunities, but they also require updates and modifications in organizational structures, processes, and culture. To achieve greater success, companies must be willing to embrace these changes and continually adapt. In a dynamic and unpredictable work environment, it's crucial for companies to remain flexible and receptive to ongoing change, utilizing technological advancements to advance performance and achieve greater success in a competitive labor market (Roblek et al., 2021).

In the past few years, Artificial Intelligence (AI) has become a major technological breakthrough. AI is based on computer programs that simulate human cognitive abilities, allowing them to process data and make intelligent decisions. This technology has many potential applications in fields such as medicine, commerce, finance, and travel. The travel industry, in particular, could benefit significantly from AI technology, as it has the potential to improve customer experience, increase efficiency, and reduce costs (Talan & Kalinkara, 2023). The field of AI technology has made

significant strides since its inception, and its growth is predicted to continue, presenting new opportunities for innovation, improved performance, and greater success in various industries, including travel. AI technology can provide significant advantages to businesses, organizations, and individuals, such as improving performance, saving time and money, enhancing customer experience, and promoting innovation. As AI technology continues to evolve, it is expected to create new opportunities to leverage this technology and achieve even greater success (Mhlanga, 2023).

The concept of strategic agility in business management aims to enhance operational efficiency and profitability by simplifying company processes, updating technology, optimizing resource utilization, and controlling costs. To implement strategic agility, companies must take various measures, including improving production processes, design and marketing, customer relations, and streamlining administrative operations. Strategic agility can also improve project management and planning, overall organization and control (Walter, 2021).

To apply strategic agility, companies must prioritize the improvement of efficiency, productivity, quality, data analysis, and informed decision-making. In addition, advanced technology can be utilized to streamline processes, increase efficiency, and enhance customer experience (Awan et al., 2021). Strategic agility enables companies to become more adaptable and competitive, allowing them to swiftly respond to emerging challenges and opportunities in the market. It also facilitates cost reduction, increased profitability, and future success. As a modern management tool, strategic agility is critical in enhancing company performance and achieving success in an ever-changing business environment. Technology plays a crucial role in achieving strategic agility, allowing companies to improve efficiency, streamline processes, enhance product quality, and achieve profitability by utilizing appropriate technological advancements (Harsch & Festing, 2020).

Literature review
Artificial intelligence
Definition of artificial intelligence
Artificial Intelligence is a technology that involves programming computers and intelligent devices to perform tasks that require independent thinking, learning, and decision-making. This typically involves creating systems and technologies that allow computers to process and analyze large amounts of data, performing complex mathematical operations (Helo & Hao, 2022). Artificial Intelligence operates using technologies such as Machine Learning, Neural Networks, Deep Learning, and Reinforcement Learning. These technologies enable computers to enhance their performance by identifying patterns, predicting outcomes, and making intelligent decisions (Zohuri & Rahmani, 2023).

Artificial Intelligence can be classified into various types, such as (Liu et al., 2021):

A. Machine Learning: This refers to the ability of computers to improve their performance in recognizing patterns and predicting outcomes by analyzing available data.

B. Neural Networks: These are mathematical models inspired by the workings of the human brain, used to solve problems related to image and speech recognition and outcome prediction.

C. Deep Learning: This is a learning method that uses deep neural networks to extensively process information, and is used in applications such as speech and image recognition, and automatic translation.

D. Reinforcement Learning: This refers to the ability of computers to make decisions through trial and error, where they are trained to improve their performance by identifying rewards and penalties.

Importance of artificial intelligence in airlines

Artificial Intelligence is a popular and modern technology that has found applications in various industries, including the travel industry. It enables travel companies to enhance efficiency, save time and costs, and improve customer experience. In the travel industry, Artificial Intelligence can be leveraged in several areas, such as improving customer experience. By utilizing AI, travel companies can offer personalized services to customers based on their interests and preferences, thus enhancing their experience (Daqar & Smoudy, 2019). Moreover, Artificial Intelligence can be used to analyze data related to customer bookings, prices, offers, cancellations, and identify trends and forecasts in the travel industry (Ledro et al., 2022).

Similarly, Artificial Intelligence is employed to improve efficiency and cut down costs in management, operations, marketing, and technical support processes (Llan, 2021). Artificial Intelligence is used to enhance the prediction of demand for tourism services, weather forecasts, local and global events, and also to provide prompt solutions to customer-related issues (Agrawal et al., 2019). Likewise, Artificial Intelligence can be employed to improve safety and security in the travel industry by analyzing security-related data, recognizing potential risks, and offering suggestions to enhance safety measures (Nascimento et al., 2019).

Moreover, there are numerous uses of Artificial Intelligence technology in the travel industry, such as:

- Personalized Recommendations: Artificial Intelligence can be used to analyze customer data and provide tailor-made recommendations for hotels, trips, and activities that match their preferences (Kumar et al., 2019).

- Technical Support: Artificial Intelligence can be employed in creating self-service systems that rely on AI and machine learning technologies to aid customers in resolving their concerns (Prentice et al., 2020).

- Data Analysis: Artificial Intelligence can be employed to scrutinize customer data, bookings, pricing, and revenues, and offer precise forecasts for the demand of tourism services (Lee et al., 2021).

- Smart Marketing: Artificial Intelligence can be employed in smart marketing, which employs customer data and recommendations to devise efficient marketing campaigns (Chintalapati & Pandey, 2022).

- Effective Management: Artificial Intelligence can be employed to examine data concerning performance, revenues, and costs, and enhance management and operations to achieve efficiency and cost reduction (Basri, 2020).

Applications of artificial intelligence in airlines

Airlines utilize Artificial Intelligence applications like Chatbots to improve customer experience and provide fast and efficient services. Chatbots can be employed in several areas, including:

A. Booking and Ticketing: Chatbots can aid customers in booking tickets and furnish essential information about flights, prices, and supplementary services (Shin et al., 2023).

B. Reservation Changes: Chatbots can help customers modify their reservations, such as changing their flight schedules or destinations (Meyer-Waarden et al., 2020).

C. Inquiries: Chatbots can respond to customer inquiries and supply essential details about services, flights, and other amenities offered at airports (Arreza, 2022).

D. Travel Assistance: Chatbots can aid customers in verifying their flight status, receiving schedule updates, and furnish essential details about lounges, restaurants, and other amenities offered at airports (Pillai & Sivathanu, 2020).

E. Complaints and Issues: Chatbots can help customers report complaints and issues, monitor the status of their requests, and offer essential support to resolve problem (Zhang et al., 2023).

Airlines also leverage Artificial Intelligence-driven predictive and analytical tools to enhance efficiency and business planning. AI analytics can forecast demand, improve productivity, optimize internal operations, and improve safety and security. Below are some instances of AI applications in airlines, such as forecasting:

- Demand Prediction: Artificial Intelligence can scrutinize data obtained from customers, past sales, social media, and other factors to predict future demand. Airlines can leverage this information to refine marketing strategies, flight planning, and enhance revenues (Rachmawati & Maulana, 2022).

- Weather Prediction: Artificial Intelligence can examine weather data and forecast expected weather conditions in the future. Airlines can utilize this information to refine flight plans, mitigate delays and cancellations, and improve customer experience (Jafari, 2022).

- Maintenance Prediction: Artificial Intelligence can scrutinize data concerning maintenance and predict possible malfunctions in the future. Airlines can leverage this information to refine maintenance plans and improve safety and security (Sulaiman et al., 2022).

- Revenue Prediction: Artificial Intelligence can examine financial data and predict future revenues, enabling airlines to refine revenue plans and enhance financial planning (Demir, 2022).

- Yield Prediction: Artificial Intelligence can scrutinize customer-related data and predict future yields from different customers. Airlines can leverage this information to refine marketing strategies and augment yields (Cao et al., 2022).

Airlines also employ Artificial Intelligence-driven robots in various areas to enhance efficiency, save time, and improve customer experience. Below are some instances of AI applications in airlines, such as robots:

- Production and Assembly: Robots powered by AI can enhance production and assembly processes, augment efficiency and quality, and reduce costs (Hwang et al., 2022).

- Customer Service: Robots powered by AI can enhance customer experience and provide fast and efficient services, such as supplying information about flights, additional services, and guidance at airports (Oliva et al., 2022).

- Maintenance Operations: Robots powered by AI can enhance maintenance operations, augment efficiency and quality, and reduce costs (Shiwakoti et al., 2022).

- Security and Safety: Robots powered by AI can improve security and safety in airports, such as identifying explosives and hazardous materials and refining security procedures (Roumeliotis et al., 2022).
- Dispatch and Distribution Management: Robots powered by AI can enhance dispatch and distribution management processes, augment efficiency, reduce costs, and improve customer service (Neureiter & Matthes, 2023)

Strategic agility

Definition of strategic agility

Strategic agility is the capability of an organization to adjust to swift changes in its environment, seize emerging opportunities, and circumvent potential challenges. Strategic agility relies on flexibility, the capacity to learn rapidly, and the ability to make precise decisions quickly (Nouri & Mousavi, 2020). The notion of strategic agility encompasses several components, such as (Darvishmotevali et al., 2020):

A. Strategic Analysis: This refers to the capability of analyzing the organization's environment, recognizing opportunities and challenges, and updating the vision and strategy accordingly.
B. Innovation: This refers to the ability to innovate and develop new products and services, enhance processes and procedures.
C. Rapid Learning: This refers to the capacity to learn quickly, analyze data promptly, and make fast and precise decisions.
D. Decentralized Organization: This refers to the capability of organizing work in a decentralized manner and empowering employees to make appropriate decisions quickly.
E. Effective Communication: This refers to the ability to communicate effectively and exchange information quickly among employees and leaders.

Strategic agility can assist organizations in expanding, growing, and succeeding in a rapidly changing business environment. Strategic agility is deemed one of the critical factors for success in the 21st century as it enables organizations to respond to swift changes, attain flexibility, adaptability, and growth (Walter, 2021).

Importance of strategic agility in airlines

Strategic agility is a concept employed in the airline industry to enhance operational efficiency and boost profitability. Airlines are one of the most intricate and demanding industries, as they have to cope with challenges like fluctuations in the airline market, surging fuel costs, and fierce competition (Al-Romeedy, 2019). In the airline industry, strategic agility is implemented by refining internal processes, upgrading technology, streamlining operations, and reducing costs. Actions taken under the umbrella of strategic agility encompass reducing the workforce, eliminating redundant activities, simplifying operations, enhancing fuel efficiency, and optimizing flight scheduling (Rana et al., 2022).

Employing strategic agility in airlines enhances efficiency, productivity, flight scheduling, customer experience, and cost reduction. Strategic agility can assist companies in overcoming challenges in the aviation industry and achieving success and profitability in the future. In addition to the previously mentioned measures, implementing strategic agility in airlines also entails upgrading technology and utilizing digital solutions to enhance efficiency and streamline operations. For instance,

advanced technology can be utilized to improve flight management, reduce waiting times at airports, and provide a seamless customer experience (Nouri & Mousavi, 2020).

Implementing strategic agility in airlines also necessitates a concentration on enhancing maintenance operations, fleet management, inventory management, catering, and other services offered by the company. Analytics and machine learning can also be employed to enhance data analysis and make better decisions concerning scheduling, costs, and operations management. In general, implementing strategic agility in airlines improves efficiency, performance, and profitability by enhancing and simplifying operations, upgrading technology, fleet management, and enhancing customer experience. Companies that embrace strategic agility can attain a competitive edge in the market and achieve success and growth in the future (Harsch & Festing, 2020).

Requirements of strategic agility

To attain strategic agility, several requirements and practices must be implemented, such as (Doz, 2020; Joiner, 2019; Clauss et al., 2019):

A. Lifelong learning: Companies must be prepared for continuous learning and developing the necessary capabilities and skills to achieve strategic agility.

B. Customer-centricity: Companies must prioritize their customers and promptly and accurately meet their needs and requirements.

C. Innovation and creativity: Companies must have a passion for innovation and creativity and develop new products and services to meet customer needs and achieve success.

D. Quality orientation: Companies must focus on enhancing quality and providing high-quality products and services to customers.

E. Collaboration: Companies must work collaboratively and motivate employees to collaborate and share information and experiences.

F. Agility: Companies must respond quickly to changes in their environment and make swift and effective decisions.

G. Data-driven decision-making: Companies must analyze data quickly and make accurate decisions based on that data.

H. Effective communication: Companies must communicate effectively and exchange information quickly between employees and leaders.

I. Digital transformation: Companies must undergo digital transformation and utilize modern technologies to achieve strategic agility, such as artificial intelligence, cloud computing, and the Internet of Things.

J. Decentralized decision-making: Companies must organize work in a decentralized manner and empower employees to make appropriate decisions quickly.

To achieve strategic agility, it is necessary to work on all these requirements and develop the required capabilities and skills to succeed in a rapidly changing business environment. Strategic agility can assist companies in expanding, growing, and succeeding in the 21st century (Walter. 2021).

The effect of artificial intelligence applications on strategic agility

Artificial intelligence can be essential in accomplishing strategic agility in organizations due to various reasons, such as:

1- Strategic analysis: Artificial intelligence can aid in strategic analysis by rapidly and precisely analyzing data, recognizing opportunities and challenges, and updating the vision and strategy accordingly (Wamba, 2022).

2- Rapid learning: Artificial intelligence can aid in rapid learning, scrutinizing data, and making fast and precise decisions (Wang et al., 2022).

3- Effective communication: Artificial intelligence can aid in effective communication and expedite the exchange of information among employees and leaders (Awwad et al., 2022).

4- Digital transformation: Artificial intelligence can aid in digital transformation, refining processes and procedures, and innovating new products and services (Wong et al., 2022).

5- Rapid responsiveness: Artificial intelligence can aid in swiftly responding to changes in the environment surrounding the organization and making prompt and effective decisions (AlNuaimi et al., 2022).

6- Teamwork: Artificial intelligence can aid in enhancing teamwork and expediting communication between employees, enabling them to exchange information and experiences among themselves (Brock & Von Wangenheim, 2019).

In summary, artificial intelligence is one of the critical factors in accomplishing strategic agility in organizations since this technology can assist in refining processes and procedures, innovating new products and services, enhancing communication between employees and leaders, and making precise decisions based on strategic analysis and data analysis. So, the following hypothesis is assumed:

H1: Artificial intelligence affects positively strategic agility in airlines.

The effect of chatbots on strategic agility

Chatbots are becoming a popular technology in business to attain strategic agility. They can have a vital role in achieving strategic agility by delivering round-the-clock customer service, which aids in enhancing customer satisfaction and achieving strategic agility (Wang et al., 2022). Moreover, chatbots can assist in enabling effective communication with customers and promptly and accurately fulfilling their needs and requirements (Reicherts et al., 2022).

Chatbots also aid in decreasing costs associated with customer service and technical support (Awwad et al., 2022). Additionally, chatbots can assist in enhancing efficiency and expediting processes, which can lead to achieving strategic agility and improving the overall performance of the organization (Syahchari et al., 2021). Moreover, chatbots aid in gathering and scrutinizing data to recognize trends and patterns, and make decisions based on them. This also assists in achieving strategic agility. Furthermore, chatbots can decrease the expenses related to customer service and technical support, which further adds to achieving strategic agility (Chang et al., 2022). Chatbots can also aid in saving time and effort in customer service and technical support, which helps in accomplishing strategic agility (Lin & Mubarok, 2021). In this vein, It can be concluded that chatbots are one of the critical factors in accomplishing strategic agility in organizations since this technology can aid in refining customer service, enabling effective communication with customers, and enhancing the overall performance of the organization. Hence, the following hypothesis is assumed:

H2: Chatbots affect positively strategic agility in airlines.

The effect of forecasting on strategic agility

Forecasting is among the crucial factors in attaining strategic agility in organizations, as it can assist in planning and making decisions based on future expectations. The significance of forecasting in achieving strategic agility is emphasized by its role in refining planning and developing more precise and efficient future plans, thereby contributing to achieving strategic agility. Forecasting can also aid in recognizing future opportunities and challenges and determining the appropriate paths for the organization. Additionally, forecasting can assist in decreasing risks and identifying external factors that may impact the performance of the organization (Gerald et al., 2020). Furthermore, forecasting can enhance the capacity to anticipate and plan for the future, and make better decisions. It also aids in refining efficiency and the overall performance of the organization, which adds to achieving strategic agility (Felipe et al., 2020). Forecasting has a significant role in enhancing future decision-making and recognizing the appropriate actions to be taken to attain future objectives (Troise et al., 2022). Therefore, it can be concluded that forecasting is a crucial factor in accomplishing strategic agility in organizations since this method can aid in refining planning and future forecasting, recognizing opportunities and challenges, and making precise decisions based on them. Hence, the following hypothesis is assumed:

H3: Forecasting affects positively strategic agility in airlines.

The effect of robot on strategic agility

The concept of strategic agility aims to enhance organizations' adaptability to constant changes in the business environment and promptly respond to new challenges. Robots can assist organizations in accomplishing strategic agility in various ways, such as:

- Improving operational efficiency: Robots can perform routine and repetitive tasks quicker and with greater precision, enabling employees to concentrate on more strategic tasks that necessitate distinct human abilities (Panichayakorn & Jermsittiparsert, 2019).

- Improving customer experience: Robots can aid in enhancing the customer experience by delivering faster and more precise services, and refining customers' interaction with the organization (Josten & Lordan, 2020).

- Improving data analysis: Robots can assist in scrutinizing data quicker and more precisely, and recognizing patterns and trends in data that aid organizations in making more efficient strategic decisions (Puriwat & Hoonsopon, 2021).

- Improving productivity: The utilization of robots in manufacturing and production processes can enhance efficiency and diminish mistakes due to their capacity to carry out tasks consistently and precisely (Hoonsopon & Puriwat, 2019).

Hence, robots have a significant impact on attaining strategic flexibility by enhancing operational effectiveness, boosting customer satisfaction, improving analysis of data, and raising productivity levels. So, the following hypothesis is assumed:

H4: Robot affects positively strategic agility in airlines.

Methodology

Study instrument

A questionnaire was designed to collect data from a sample of employees working in EgyptAir branches. The questionnaire consisted of three main parts as follows:

- Part one: Covers demographic characteristics such as gender, age, educational level, and years of experience.

- Part two: Addresses the importance of artificial intelligence in airline companies. This section includes 17 phrases divided into three applications of artificial intelligence: chatbots (5 phrases), forecasting (5 phrases), and robot (7 phrases). Sarol et al. (2022) and Arreza (2022) were relied upon to prepare the Chatbots phrases, while Benítez et al. (2013) and Ghomi and Forghani (2016) were relied upon to prepare the Forecasting phrases, and finally, Collins and Wisz (2020) and Sukhorukov et al. (2020) were relied upon to prepare the Robot phrases.
- Part three: Addresses the assessment of strategic agility in airline companies. This section includes 18 phrases prepared through Al-Mowadiyah's (2020) study.
  The questionnaire was designed using the five-point Likert scale, which relies on the presence of five degrees between agreement and disagreement (5= strongly agree, 4= agree, 3= neutral, 2= disagree, 1= strongly disagree).

Study Population and Sample Size

The study population represents the employees of EgyptAir company in Cairo and its 14 branches located in Cairo and Giza governorates. A total of 352 questionnaires were distributed to a random sample of employees in the company and its branches during the period from March 2023 to the end of April 2023, both in paper and electronic formats. A total of 328 questionnaires were retrieved from the distributed ones. After examining the questionnaires, it was found that 16 questionnaires were invalid for analysis due to incomplete answers to all phrases, and they were therefore excluded from the analysis. Finally, 312 questionnaires were analyzed, with a response rate of 88.6% of the total distributed questionnaires.

Statistical tests

SPSS V.28 software was used to analyze the data to verify the study's objectives and hypotheses. The following statistical tests were performed:

- The reliability and internal consistency test (Cronbach's alpha) to determine the degree of stability and validity of the study tool in measuring its objective.
- Frequencies and percentages to determine the demographic characteristics of the sample of employees working in EgyptAir companies.
- Means and standard deviations to determine the direction of responses of the study sample to the questionnaire phrases.
- Correlation coefficients to determine the direction and strength of the relationship between study variables.
- Multiple regression analysis to determine the effect of independent variables on the dependent variable.
- Simple regression analysis to determine the effect of the independent variable on the dependent variable.

Results

Reliability and Internal Consistency Test (Cronbach's Alpha)

Table (1): Results of the Reliability and Internal Consistency Test (Cronbach's Alpha)

Variables	Cronbach Alpha	No. of Items
Chatbots	0.821	5
Forecasting	0.782	5
Robot	0.801	7
Artificial intelligence	0.792	17

Strategic agility	0.755	18
Total	0.769	35

The table (1) shows that the reliability and internal consistency coefficient of the study tool was 0.769. The reliability and internal consistency coefficients for Chatbots was 0.821, 0.782 for Forecasting, and 0.801 for Robot. Also, the reliability and internal consistency coefficient for artificial intelligence was 0.792, and 0.755 for the strategic agility variable. All values were higher than the acceptable value, which is estimated at 0.70, indicating a high degree of reliability and internal consistency of the study tool and its suitability for evaluating variables, as well as confidence in the results.

Demographic characteristics of sample

Table (2): Distribution of sample according to demographic characteristics

Demographic characteristics		Frequencies	Percentage
Gender	Male	183	58.7%
	Female	129	41.3%
Age	Less than 30 years	28	9%
	From 30 to less than 40 years	110	35.3%
	From 40 to less than 50 years	145	46.4%
	50 years and above	29	9.3%
Educational level	Less than bachelor	37	11.8%
	Bachelor	237	76%
	Postgraduate	38	12.2%
Years of experience	Less than 5 years	30	9.6%
	From 5 to less than 10 years	103	33%
	From 10 to less than 15 years	127	40.7%
	15 years and above	52	16.7%
Total		312	100%

The results shown in table (2) indicate that the number of males in the sample exceeded half of the sample, with 183 males (58.7%), while the number of females was 129 (41.3%). The majority of the study sample ranged in age from 40 to less than 50 years, with 145 individuals (46.4%), in addition to 110 individuals ranging in age from 30 to less than 40 years (35.3%). Furthermore, more than two-thirds of the study sample have a bachelor's degree, with 237 individuals and a percentage of 76%. Finally, there were 127 individuals (40.7%) with 10 to less than 15 years of experience, 103 individuals (33%) with 5 to less than 10 years of experience, 52 individuals (16.7%) with 15 years or more of experience, and 30 individuals (9.6%) with less than 5 years of experience.

Results of descriptive statistics

Descriptive analysis of importance of artificial intelligence

Table (3): Descriptive analysis of strategic analysis

Items	Mean	Standard deviation	rank
Importance of chatbot	**3.77**	**0.741**	**3**

1.Chatbots can improve the overall customer experience for airline passengers	3.99	0.816	1
2.Chatbots can benefit airlines in terms of cost savings and efficiency	3.71	0.955	3
3.Chatbots are well-suited to handle in the airline industry	3.65	0.736	5
4. Chatbots can help airlines provide faster and more convenient customer support compared to traditional methods such as phone or email	3.81	0.795	2
5.Chatbots can alleviate the workload on human customer support agents, allowing them to focus on more complex issues	3.68	0.985	4
Importance of forecasting	**3.85**	**0.692**	**2**
1. Forecasting can improve airlines' operations and customer experience	3.88	0.821	2
2. Forecasting can help airlines better predict demand for flights and optimize pricing strategies	3.93	0.641	1
3. Forecasting can benefit airlines in terms of cost savings and revenue generation	3.87	0.769	3
4. Forecasting can analyze external factors such as weather, traffic, and events that may impact airline operations	3.71	0.691	5
5. Forecasting can help airlines better manage their inventory and reduce waste	3.85	0.813	4
Importance of robot	**3.96**	**0.733**	**1**
1. Robot can help airlines streamline their operations and reduce costs	4.01	0.692	2
2. Robot can benefit airlines in terms of enhancing safety and security measures	4.06	0.841	1
3. It's important for airlines to invest in robot in order to remain competitive in the industry	4.00	0.765	3
4. Robot can help airlines improve their on-time performance and reduce delays	3.95	0.718	5
5. Robot can operate autonomously and adapt to changing circumstances	3.79	0.792	7
6. Robot can help airlines improve their maintenance processes and reduce downtime	4.00	0.901	4
7. Robot can interact with both passengers and airline staff in a friendly and helpful manner	3.89	0.810	6
Importance of artificial intelligence	**3.86**	**0.758**	

Table (3) shows that artificial intelligence is highly important in airline companies, with mean of 3.86 and a standard deviation of 0.758. The results also indicate that robots were the most important with mean of 3.96 and a standard deviation of 0.733, followed by forecasting with mean of 3.85 and a standard deviation of 0.692, and finally chatbots with mean of 3.77 and a standard deviation of 0.741.

For chatbots, phrase (1) "Chatbots can improve the overall customer experience for airline passengers" was the highest with mean of 3.99, followed by phrase (4) "Chatbots can help airlines provide faster and more convenient customer support compared to traditional methods such as phone or email" with mean of 3.81, while phrase (3) "Chatbots are well-suited to handle in the airline industry" was the lowest with mean of 3.65.

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For forecasting, phrase (2) "Forecasting can help airlines better predict demand for flights and optimize pricing strategies" was the highest with mean of 3.93, followed by phrase (1) "Forecasting can improve airlines' operations and customer experience" with mean of 3.88, while phrase (4) "Forecasting can analyze external factors such as weather, traffic, and events that may impact airline operations" was the lowest with mean of 3.71.

For robots, phrase (2) "Robot can benefit airlines in terms of enhancing safety and security measures" was the highest with mean of 4.06, followed by phrase (1) "Robot can help airlines streamline their operations and reduce costs" with mean of 4.013.88, while phrase (5) "Robot can operate autonomously and adapt to changing circumstances" was the lowest with mean of 3.79.

Descriptive analysis of strategic agility

Table (4): Descriptive analysis of strategic agility

	Items	Mean	Standard deviation	Rank
1.	The company can accurately identify the active and influential parties within it	3.96	0.841	4
2.	The company analyzes the data it receives from the business environment in which it operates	3.79	0.734	13
3.	The company can discover opportunities and avoid threats in the work environment	3.92	0.826	6
4.	The company is able to access the data it needs	3.98	0.817	2
5.	The company designs its systems to adapt to environmental changes	3.88	0.809	9
6.	The company gains new knowledge through its communication with the surrounding environment	3.90	0.769	8
7.	The company possesses diverse human skills to meet the requirements of the work environment	3.76	0.901	17
8.	Employees in the company can accomplish a wide range of tasks	3.91	0.766	7
9.	The company has the human capabilities to include new employees	3.99	0.703	1
10.	The company's employees have sufficient capabilities to learn new skills	3.98	0.822	3
11.	The company works to quickly and efficiently prepare employees for new positions	3.81	0.711	11
12.	Employees in the company can learn the required skills to perform their duties	3.78	0.908	15
13.	The company has fast procedures to respond to customer feedback	3.95	0.855	5
14.	The company's internal environment is flexible enough to respond to external environmental changes	3.77	0.739	16
15.	The company allocates the necessary financing in	3.71	0.866	18

its budget to update its response methods			
16. The company's response procedures align with established management plans	3.83	0.821	10
17. The company chooses the optimal alternative that aligns with its goals and directions in strategic response	3.79	0.761	14
18. The company relies on advanced technology in its strategic response process	3.81	0.766	12
Level of strategic agility	**3.86**	**0.729**	

Table (4) shows that there is a high level of strategic agility in airline, with an mean of 3.86 and a standard deviation of 0.729. The means of the strategic agility phrases ranged from 3.99 to 3.71. Phrase (9) "The company has the human capabilities to include new employees" was the highest with mean of 3.99, followed by phrase (4) "The company is able to access the data it needs" with mean of 3.98, and then phrase (10) "The company's employees have sufficient capabilities to learn new skills" with mean of 3.98. On the other hand, phrase (15) "The company allocates the necessary financing in its budget to update its response methods" was the lowest with mean of 3.71.

The results of the Pearson correlation coefficient

Table (5) shows the correlation between artificial intelligence, its applications, and the level of strategic agility in EgyptAir.

Table (5): Relationship between artificial intelligence and strategic agility

Relations	Correlation value	Sig.
relationship between artificial intelligence and strategic agility	0.732	0.000
relationship between chatbot and strategic agility	0. 642	0.000
relationship between forecasting and strategic agility	0.714	0.000
relationship between robot and strategic agility	0. 611	0.000

The results shown in This Table indicate a significant correlation between artificial intelligence and strategic agility, with a correlation value of 0.732, which is a strong positive correlation. This means that the wider the application of artificial intelligence, the higher the level of strategic agility in EgyptAir company.

The results also show a significant correlation between the three applications of artificial intelligence and strategic agility. The correlation between forecasting and strategic agility was the strongest, with a correlation value of 0.714 (strong positive correlation), followed by the correlation between chatbots and strategic agility, with a correlation value of 0.642 (moderate positive correlation), and finally the correlation between robots and strategic agility, with a correlation value of 0.611 (moderate positive correlation)

Multiple regression analysis

Table (6) highlights the impact of artificial intelligence on the level of strategic agility in EgyptAir.

Table (6): Effect of artificial intelligence on strategic agility

	B	T	Sig.	R^2	f	Sig.
Constant	3.102	21.532	0.000	0.587	175.369	0.000
Chatbot	0.458	9.715	0.000			
Forecasting	0.511	11.235	0.000			
Robot	0.374	7.539	0.000			

This Table depicts a significant effect of artificial intelligence on enhancing the level of strategic agility, with an F value of 175.369 at a significant level of 0.000. The results also show that the R2 value is 0.587, which means that artificial intelligence affects strategic agility by 58.7%. This result highlights that strategic agility increases by 58.7% through the adoption of artificial intelligence in airline companies.

This result is in line with Wamba (2022), which emphasized that artificial intelligence contributes to enhancing strategic agility by supporting strategic analysis capabilities in the workplace. Similarly, Wong et al. (2022) study explained the role of artificial intelligence in supporting the level of strategic agility by increasing the companies' capabilities to transform digitally in all their operations and activities. Therefore, H1 is accepted.

Simple linear regression
The effect of chatbot on strategic agility
Table (7) highlights the impact of chatbots on strategic agility in EgyptAir.

Table (7): Effect of chatbot on strategic agility

	B	t	Sig.	R^2	f	Sig.
Constant	0.986	7.531	0.000	0.426	201.563	0.000
Chatbot	0.652	16.874	0.000			

This Table reveals a significant effect of chatbots on enhancing the level of strategic agility, with an F value of 201.563 at a significant level of 0.000. The results also show that the R2 value is 0.426, which means that chatbots affect strategic agility by 42.6%. This result highlights that strategic agility increases by 42.6% through the adoption of chatbots in airline companies.

This result is in line with Syahchari et al. (2021), which emphasized the role of chatbots in increasing the level of strategic agility by improving companies' efficiency and accelerating processes. Similarly, Chang et al. (2022) study explained that chatbots contribute to improving strategic agility by supporting decision-making and exploiting opportunities. So, H2 is accepted.

The effect of forecasting on strategic agility
Table (8) demonstrates the impact of robot on strategic agility in EgyptAir.

Table (8): Effect of forecasting on strategic agility

	B	T	Sig.	R^2	f	Sig.
Constant	1.263	11.306	0.000	0.521	299.232	0.000
Forecasting	0.865	21.202	0.000			

This Table clarifies a significant effect of forecasting on enhancing the level of strategic agility, with an F value of 299.232 at a significant level of 0.000. The results also show that the R2 value is 0.521, which means that forecasting affects strategic

agility by 52.1%. This result highlights that strategic agility increases by 52.1% through forecasting in airline companies.

This result is consistent with Gerald et al. (2020), which emphasized the role of forecasting in reducing the risks faced by companies in the workplace, which improves their agility. Additionally, Troise et al. (2022) study explained that forecasting helps increase companies' capabilities to anticipate the future, exploit opportunities, and enhance their competitive capabilities, which improves their strategic agility. Hence, H3 is accepted.

The effect of robot on strategic agility

Table (9) illustrates the impact of robots on strategic agility in EgyptAir.

Table (9): Effect of robot on strategic agility

	B	T	Sig.	R^2	f	Sig.
Constant	0.811	5.123	0.000	0.374	165.325	0.000
Robot	0.495	11.036	0.000			

This Table highlights a significant effect of robots on enhancing the level of strategic agility, with an F value of 165.325 at a significant level of 0.000. The results also show that the R2 value is 0.374, which means that robots affect strategic agility by 37.4%. This result highlights that strategic agility increases by 37.4% through increased reliance on robots in airline companies.

This result is consistent with Puriwat and Hoonsopon (2021), who explained that robots support companies' agility by improving their ability to analyze information and use it to overcome competitors. Similarly, Hoonsopon and Puriwat (2019) explained that robots support companies' strategic agility by increasing productivity, reducing errors, and speeding up the delivery of services and products. Therefore, the fourth hypothesis is accepted.

Conclusion and recommendations

The study found a number of results related to the importance of artificial intelligence (AI) and its role in enhancing strategic agility in airline companies. The study highlighted that there are many advantages that AI can achieve in airline companies through its three applications, namely chatbots, forecasting, and robots. The results also showed that chatbots contribute to improving passenger experiences, cost savings, increasing efficiency, providing greater customer support compared to traditional methods, and reducing the workload on employees.

The study also highlighted that forecasting enhances customer experiences, predicts flight demands, develops pricing strategies, reduces costs, increases revenue and predicts all factors that affect airline operations. Additionally, robots provide many benefits to airline companies such as simplifying operations, increasing safety and security measures, improving performance, providing superior services, assisting in maintenance operations, and exciting interaction with passengers and crew.

Furthermore, the results showed that EgyptAir company has a high level of strategic agility. The company can analyze all the internal and external factors that affect its activities, analyze data and information about the work environment, discover opportunities, and face threats. The company also obtains the data and information it needs and is capable of adapting to changes in the work environment and responding to

changing work requirements through its qualified workforce with exceptional skills and experience.

Moreover, the results highlighted a significant and positive correlation between AI and strategic agility, with the strongest relationship between forecasting and strategic agility, followed by the relationship between chatbots and strategic agility, and finally the relationship between robots and strategic agility.

Finally, the results showed that AI and its three applications have a significant and positive impact on enhancing strategic agility, with forecasting having the strongest impact on strategic agility, followed by chatbots and robots.

In light of the study's results, the following recommendations can be proposed to increase the benefits of AI applications in airline companies:

1. Clarifying the primary objectives and strategies of the organization and establish how artificial intelligence can be leveraged to accomplish these objectives.
2. Allocating resources towards advanced artificial intelligence technologies and build the necessary in-house knowledge and expertise to effectively utilize these technologies.
3. Using artificial intelligence to analyze large data sets and recognize patterns and developments in the aviation industry.
4. Creating automated systems to boost efficiency and productivity in logistics operations, including logistics management and aviation technologies.
5. Employing artificial intelligence to enhance the customer experience and provide quicker and more convenient customer support, such as self-service support and intelligent customer solutions.
6. Providing relevant training to employees to manage new artificial intelligence technologies and offer them the appropriate technical assistance.
7. Encouraging a technological culture within the company and inspire employees to follow industry best practices and technological advancements in the field of artificial intelligence.
8. Enhancing communication and interaction between artificial intelligence systems, employees, and customers to build trust in the use of smart technologies.
9. Allocating the necessary financial and human resources to execute artificial intelligence projects and guarantee the expected returns from these projects.
10. Evaluating the outcomes and analyze the data connected to artificial intelligence and user experience to improve performance and develop future strategies.

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أثر الذكاء الاصطناعي علي الرشاقة الإستراتيجية في شركات الطيران: شركة مصر للطيران كدراسة حالة

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قسم الدراسات السياحية – المعهد العالي للسياحة والفنادق مدينة السادس من أكتوبر

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ملخص

ازداد التوسع في تبني تطبيقات الذكاء الاصطناعي في مختلف الشركات والقطاعات والتي من بينها قطاع الطيران نظراً للآثار الإيجابية الكثيرة المتحققه من استخدام تطبيقات الذكاء الاصطناعي في دعم الأداء والقدرات التنافسية. تهدف الدراسة إلي تقييم أثر الذكاء الاصطناعي وتطبيقاته الثلاثة (الدردشة الإلكترونية، التنبؤ، الروبوت) علي الرشاقة الإستراتيجية في شركات الطيران. لتحقيق هدف الدراسة؛ تم تصميم استبيان، وتوزيعه علي عينة عشوائية من العاملين في شركة مصر للطيران وفروعها في محافظتي القاهرة والجيزة. تم توزيع 352 استبيان، بينما تم تحليل 312 استبيان فقط صالح. أوضحت نتائج الدراسة أن الذكاء الاصطناعي يؤثر معنوياً وإيجابياً علي الرشاقة الإستراتيجية في شركة مصر للطيران. كما أبرزت نتائج الدراسة أن تأثير التنبؤ كان الأعلي علي الرشاقة الإستراتيجية، يليه تأثير الدردشة الإلكترونية، وأخيراً تأثير الروبوت.

الكلمات الدالة: الذكاء الاصطناعي، الدردشة الإلكترونية، التنبؤ، الروبوت، شركات الطيران، مصر للطيران.