The impact of Artificial Intelligence on improving tourism service quality in The Egyptian destination

Israa Samy Shalan HebatAllah Gaafar Bassam Al-Romeedy Abd ElFattah Shawaly
Tourism Studies Department, Faculty of Tourism and Hotels - University of Sadat City

Abstract

Artificial Intelligence (AI) can easily be integrated into tourism businesses, allowing them to quickly analyze massive amounts of data. This analysis can assist tourism operators in making business decisions and personalizing the tourist experience. This research investigates the impact of AI on improving tourism service quality in The Egyptian destinations. The survey utilized convenience sampling for participant selection; a total of 500 questionnaires were distributed to tourists in the Egyptian destination, resulting in 415 valid responses, with 249 respondents reporting previous experience with AI applications in the tourism and hospitality industry. The study utilizes the SERVPERF model to examine AI's influence on key service quality dimensions, including tangibles, reliability, responsiveness, assurance, and empathy. The findings reveal that AI contributes significantly to enhancing service quality and customer satisfaction. The research provides recommendations for increasing AI implementation and highlights areas for future exploration.

Keywords: Artificial Intelligence (AI), Tourism Service Quality, SERVPERF Model, Customer Satisfaction

1. Introduction

Egypt's economy is based mostly on tourism, which is boosted by the country's stunning natural surroundings, historical sites, and rich cultural legacy. Artificial intelligence AI integration has revolutionized the delivery of tourism services in recent years, providing notable enhancements in service quality. Tourism services are becoming more efficient, responsive, and personalized thanks to AI technology, which ranges from sophisticated chatbots and personalized recommendation systems to sophisticated data analytics. These developments are revolutionizing not just the traveler experience but also the way service providers operate, allowing for more efficient resource management and marketing tactics (Farahat et al., 2022).

Using state-of-the-art technological solutions can improve visitor experiences by simplifying procedures, increasing convenience, and raising overall service quality. Examples of these technologies include mobile apps, virtual reality experiences, online booking systems, and gamification (Thakur et al., 2023). Mobile check-in options and AI-powered booking platforms expedite the procedure, cutting down on wait times and improving convenience—all of which enhance the customer experience (Sigala, 2020).

Businesses in the tourism industry may make better decisions by using AI to extract insights from data about client preferences, trends, and areas for improvement. This increases satisfaction by customizing the experience for each person (Soonthodu & Wahab, 2022). Recognizing each traveler's unique requirements and preferences can make

a big difference in how satisfied they are. Providing customized experiences, individualized advice, and attentive service can leave a good impression that lasts (Hsu et al., 2022).

AI - driven Chatbots offer round-the-clock customer care, responding to questions and addressing problems. By offering real-time support, they improve the overall quality of service (Sigala, 2020). Language barriers are eliminated by AI-powered translation technologies, increasing foreign travelers' access to locations and services and, as a result, enhancing their travel experiences (Samala et al., 2022). AI enhances the tourism sector's operations, including demand- and seasonally-driven pricing strategies and inventory control. This can save costs for tourists as well as maximize income for tourism-related enterprises, all of which can lead to higher-quality services (Wen et al., 2022).

Despite the fact that the use of AI in tourism destinations is becoming more prominent in dealing with tourism service quality, tourist data and real-time solutions, the capacity to give alternatives and plans for travelers. There is a shortage and limitation in using AI to enhance tourist service quality (Hsu et al., 2022).

The objectives of this research are to A) Display the relationship between AI and tourism service quality. B) Analyze the advantages and disadvantages of AI applications in tourism industry. D) Identify the SERVPERF dimensions. E) Analyze correlation between AI and the tourism service quality. This research will show how the integration of artificial intelligence technologies in the tourism sector in Egypt could affect service quality according to SERVPERF model (tangibility, reliability, responsiveness, assurance, and empathy) from the perspective of tourists, which may help tourism industry in improved tourism service quality, a better visitor experience, the well-being of locals, increased effectiveness and competitiveness of enterprises and destinations, and overall competitive service sustainability.

The Study hypotheses: ***there are influences of AI applications on the SERVPERF dimensions in tourism*.**

H.1 The AI application influences the tangibles.
H.2 The AI application influences the reliability.
H.3 The AI application influences the responsiveness.
H.4 The AI application influences the Assurance .
H.5 The AI application influences the Empathy.

2. The importance of tourism Service Quality

Based on developments in the tourism sector up to that time, the following provides a basic summary of the tourism service quality in influencing travelers' perceptions and expectations.

A. Customer Satisfaction

After utilizing each service, tourists report differing degrees of satisfaction or dissatisfaction based on how effectively their needs were met or exceeded. Good service quality makes customers happier, which encourages recurring business and loyalty. Long-term success is influenced by pleased customers, who are more probable to come back to the establishment again and refer others to it (Azhar et al., 2019). Travelers today anticipate individualized experiences due to the widespread use of digital technology. This

has made it necessary to reconsider how services are delivered and include technology in order to improve customer encounters' efficiency, ease, and personalization (Sigala, 2017).

B. Positive Word-of-Mouth and Reviews

Positive word-of-mouth referrals and online reviews—produced by outstanding customer service—have an impact on potential travelers' decision-making. Positive reviews serve as powerful endorsements, attracting new clients (Zeithaml et al., 2018). Considering that many travelers turn to social media and internet reviews to get information and confirmation. Taking care of one's online reputation and responding to customer comments has a big influence on how good a service is perceived (Xiang et al., 2017).

C. Competitive Advantage

The significance of health and safety in tourism has been highlighted by the COVID-19 epidemic. In the post-pandemic period, health procedures and strict cleanliness measures have emerged as critical factors influencing service quality. It is now essential for business continuity and consumer trust to maintain service quality during difficult times (Zenker & Kock, 2020). Reputably excellent service-oriented destinations are better prepared to manage unforeseen circumstances or emergencies. Strong bonds and favourable opinions about visitors can support crisis recovery (Zeithaml et al., 2018).

Cultural diversity and sensitivity have become more important since the tourist sector serves a varied range of international clients. Visitors anticipate that companies in the tourist industry will be welcoming and cognizant of their cultural heritage. Real experiences, such as those involving regional food, customs, and culture, are becoming more and more popular. Immersion in a rich cultural environment is something that tourists look for in a high-quality service experience (Kock et al., 2019). A destination's image is enhanced by providing high-quality services, which present the area as friendly, accommodating, and able to satisfy visitors' requirements and expectations (Alegre & Garau, 2010).

D. Employee Motivation and Performance

Tourism organizations may increase employee motivation by developing thorough reward systems, offering career growth possibilities, building a great work culture, investing in training programs, and promoting employee feedback. These tactics promote excellent performance, motivation, and devotion to the organization, making staff feel appreciated and heard (Lin, 2023).

E. Economic Impact

The quality of tourism services has a direct impact on how much money travelers spend. Content travelers are more likely to spend money on lodging, food, shopping, and entertainment, which boosts the local economy and creates income (Alegre & Garau, 2010). Tourism plays a vital role in developing countries since it generates employment and increases national wealth. The quality of the services provided by the tourism industry has a significant influence on its economic impact (Li et al., 2024).

3. The pros and cons of AI applications in tourism industry

Nowadays, the rise of the internet and AI has brought about significant changes in all areas of life, including the tourism sector. So those are some of the pros and cons of AI applications (Tella, 2023).

The pros of AI applications in the tourism industry

AI can easily be integrated into the tourism business, allowing them to quickly examine massive amounts of data. This data analysis can assist tourism operators in making business decisions and personalizing the tourist experience.

A. Making the right and quick decisions

By automating particular processes, AI can have an impact on decision-making. When conducted by humans, these jobs are frequently time-consuming and may not produce the greatest results. By automating some procedures, AI can make choices more rapidly and correctly than humans. Airlines, for instance, can use AI to optimize ticket prices by analyzing demand, rivalry, and other factors in real-time, resulting in more effective pricing decisions (Chimera, 2023). According to ChatbotGuide.org (2023) the chabot, at Booking.com can answer nearly half of users' questions about accommodations after they've made a reservation. If it is unable to respond appropriately, it connects the client to an employee of the customer service team.

B. 24/7 availability

Outside of regular business hours, Chatbots powered by AI can respond to inquiries. So customers are able to connect with the company at their convenience without putting additional strain on the employees or necessitating additional employment (infinity, 2023).

Furthermore, a robot does not need to rest, eat, drink, or do anything other than work. If they do not malfunction, they are always ready to perform their job. They merely carry out their responsibilities without complaint (Tella, 2023).

C. Digital support

Digital support is another advantage of AI. It is also offered via AI-powered applications. When service providers employ conversational AI to provide their clients speedy, accurate, and personalized care whenever and wherever they need it, ordinary support can be transformed into exceptional care, which is referred to as digital support (IBM, 2023). Digital support assistants in the daily routine. AI-based digital assistants, such as GPS from Google, Grammarly, Amazon's Alexa and others, have several real-world uses. Google Maps assists in getting from one location to another, while Alexa does voice searches to provide users with results. Grammarly is another intriguing digital helper that helps in using proper grammar in written work. It allows users to improve their writing skills by auto-correcting the content (Intellipaat, 2023).

D. Automate routine operations

AI workflow automation is a technique for starting and managing tiresome or repetitive processes. Projects like data entry, processing, and analysis may fall under this category. By letting machines handle these tasks rather than people, AI workflow automation aims to increase effectiveness and productivity. This may free up employees to concentrate on work that is more complicated and tactical. E.g. Instead of asking others for directions, utilize Google Maps (Harris, 2023).

E. Error- free data

AI-based machines are more effective than humans at carrying out tasks because they are learning to do this with fewer errors and losses. Complex mathematical constructs are implemented via algorithms used to create AI-based models in order to help conduct activities more accurately and efficiently, which aids in the solution of challenging real-world situations (Intellipaat, 2023).

The cons of AI applications in tourism industry

There are significant disadvantages to AI. Here are a few of them.

A. AI and creativity

AI was created to be exact, follow directions, and accomplish predetermined objectives. Because of this, AI struggles to be creative. Finding innovative solutions to issues that other individuals might not have imagined is the essence of creativity. Because AI is designed to accomplish a particular goal and accomplish its targets, it cannot consider an issue from a variety of viewpoints or develop unanticipated solutions. AI won't be able to act creatively as a result (Leos, 2022). AI algorithms are developed to enable machines to learn by analyzing data. However, any duplication in the data can lead to learning failures and unpredictable outcomes. AI-generated findings may be inaccurate and result in significant losses due to a lack of development (Intellipaat, 2023). For instance, since AI relies on human input to make decisions, it is easy to provide it with biased or inaccurate data, leading to decisions that are insignificant, biased, or unsuitable. Therefore AI and creativity are two very distinct ideas (Fomby, 2019).

B. High costs to implementation

AI systems can range in price from $6,000 to $300,000, and in certain cases, up to millions of dollars. Algorithms are a vital component in the development of AI, and their accuracy rate has a substantial impact on cost. For example, a tourism organization will pay a high sum to develop a face recognition system with 99% accuracy (Staff, 2022).

These hefty expenses may prevent many organizations, particularly small and medium-sized ones, from using AI. In the near run, it may be difficult to justify the expense due to this financial strain, which might also postpone the return on investment. Consequently, even though AI has the potential to greatly improve operational effectiveness and service quality, the high implementation costs continue to be a major disadvantage (Staff, 2022; Reilly, 2023).

C. Unreplicable in Humans

A lot of occupations are being replaced by AI apps in work environments; however they can only be used for routine activities that don't require complex reasoning. Organizations are already working on integrating AI and human capabilities to increase efficiency and creativity (Dwivedi et al., 2023).

These are some of the pros and cons of AI. Every new discovery will have advantages and disadvantages, but it is up to us as humans to handle this and use the benefits of the discovery to better the world. AI has great potential benefits. Humans must play a significant role in avoiding the "rise of the robots" from becoming out of control. Some argue that AI, in the wrong hands, has the potential to destroy human civilization.

However, none of the AI applications developed at that level were capable of exterminating or subjugating humanity (kumar, 2019).

4. The SERVPERF model and AI in tourism industry

The SERVQUAL model, a multi-item scale for evaluating the quality of services, established in 1998 by Parasuraman, Zeithaml, and Berry, is the origin of all service quality models. This model serves as the foundation since it provides a solid framework for services in overall. Similar to SERVQUAL, the SERVPERF model evaluates service performance by concentrating on important aspects. Customers assess several aspects of tourism service quality, which are represented by these five dimensions. The SERVPERF model has the following common dimensions: (Parasuraman et al., 2015, Rezaei et al., 2018, Meerschman & Verkeyn, 2019, Babić-Hodović et al., 2019)

Reliability

The capacity of tourism service providers to reliably and accurately supply the services they have promised is known as reliability. To ensure a hassle-free trip, tourists demand dependable services like bookings, transportation, and lodging.

Responsiveness

The effectiveness and speed with which tourism service providers attend to the demands and concerns of visitors is measured by responsiveness. Providing tourists with timely answers to their questions, requests, and grievances will greatly increase their satisfaction and loyalty.

Assurance

The ability of tourism service providers to inspire confidence and trust in visitors is one aspect of assurance, along with their expertise, politeness, and credibility. Particularly when it comes to matters like information accuracy and travel safety, tourists must feel comfortable and confident in the service providers.

Empathy

The ability of tourism service providers to comprehend and meet the unique requirements, interests, and concerns of each visitor is reflected in their empathy. Customer loyalty can be increased, and unforgettable experiences can be created with personalized and sympathetic service.

Tangibles

The physical and tangible components of a tourism service, such as the facilities' look, cleanliness, and availability of contemporary equipment, are referred to as tangibles. When it comes to influencing travelers' initial perceptions and level of pleasure, tangibles are quite important.

6. The effect of AI usage on service quality

By concentrating on the dimensions with the greatest gaps, the model assists service providers in identifying areas that require development. All of these factors together contribute to the overall quality of tourism services by filling in the gaps and meeting or surpassing consumer perceptions. They also have a major impact on visitors' satisfaction and likelihood of returning or recommending a destination or service provider (Babić-Hodović et al., 2019). The tourism business can greatly enhance service quality by combining AI with the SERVPERF framework (Fahim, 2019).

AI-Enhanced Customer Feedback and Surveys

Use sentiment analysis software or Chatbots driven by AI to gather and examine feedback from customers. This can facilitate more effective measurement of the five SERVPERF dimensions. For instance, Marriott International gathers customer feedback and improves the quality of their services with Chatbots driven by AI (Newgen, 2023).

a. Personalized Recommendations

Make use of AI algorithms to offer individualized trip suggestions based on user interests. This illustrates a comprehension of the needs of the consumer, which raises the "Empathy" dimension. For example, Airbnb employs AI to recommend lodgings based on customer interests and activity (Julian, 2023).

b. Chatbots for Instant Responsiveness

Employ AI Chatbots to respond to consumer enquiries right away, improving the "Responsiveness" factor. Well-known online travel company Expedia uses AI Chatbots to provide prompt customer service (Skift, 2023).

c. AI-Powered Virtual Assistants

By supplying precise and current information, fostering trust, and providing clients with individualized support, AI virtual assistants can greatly improve the "assurance" component of service quality in the tourism and travel industry. Use AI virtual assistants in hotel rooms or on travel websites. For example, the Wynn Las Vegas hotel makes use of Alexa from Amazon to improve visitor experiences (Alexa, 2023).

7. Methodology

To meet the study's objectives, a survey questionnaire was developed and distributed to tourists who have experience using artificial intelligence in tourism. Convenience sampling was employed for participant selection. As defined by Edgar and Manz (2017), convenience sampling is a commonly used non-probabilistic method, targeting samples that are easily accessible, either by location or through online services.

The questionnaire consisted of three parts;

The first one focused on profile and travel information. Which include Demographic data such as; gender, age, level of education, nationality and travel experience, which were developed based on Fahim (2019).

The second part consisted of 6 items demonstrating the Awareness of AI application (AI awareness rating, AI using experience, AI applications), which were developed based on Babić-Hodović et al. (2019) and Fahim (2019).

The third part focused on Tourism service quality in the Egyptian destination displays 5 dimensions; tangibles, which refers to physical Facilities, equipment, Personnel, and Communication Materials; Reliability, which refers to Ability to Deliver Promised Services Dependably and Accurately; Responsiveness, which refers to Willingness to Help and Provide Prompt Service; Assurance, which refers to Knowledge, Competence, and Courtesy of Staff; Empathy, which refers to Caring and Individualized Attention Provided to Customers. The researcher was guided by the study of Abdalla et al. (2015), Attallah (2015), Babić-Hodović et al. (2019), Fahim (2019), and Gebremichael and Singh (2019).These items were displayed on a 5- Point Likert Scale, rated from (1) strongly disagree to (5) strongly agree.

A total of 500 tourist questionnaires were distributed, with 415 being returned. Of these, 249 respondents indicated prior experience with AI applications in the tourism and hospitality industry, while 166 reported having no such experience. To analyze the study data and test hypotheses, the researcher used smart pls 4 and the statistical package for Social Science (SPSS) for Windows V .22.0. The data was checked and verified for recording errors and accuracy of data entry before further analyses was performed. The following statistical tests were used:

1- Validity and Reliability Tests:

a. Explanatory Factor Analysis (EFA): EFA was used to identify the underlying structure of the data by reducing the number of variables into a smaller set of factors. This helped in understanding the key dimensions that contribute to the constructs being measured (Watkins, 2018).

b. Confirmatory Factor Analysis (CFA): CFA was employed to validate the factor structure identified through EFA. This test confirms whether the data fits the hypothesized measurement model, ensuring the constructs are well-defined and accurately represented (Brown, 2015).

2- Frequencies, percentages, means and standard deviation: to describe the characteristics of the sample, and to determine the responses of the sample members towards all the axes of the study tool.

3- Pearson Correlation Coefficient: to determine the strength and direction of the relationship between the study variables.

4- Simple linear regression: to indicate the effect of independent variable on dependent variable.

5. Results

Table (1) Demographic and travel information

Demographic and Travel Information		**Freq.**	**%**
Gender	Male	261	62.9%
	Female	154	37.1%
Age	Less than 30 years old	86	20.7%
	30 - 40 years	275	66.3%
	More than 40 years	54	13%
Education	Secondary school or technical education	122	29.4%
	University qualification	138	33.3%
	Postgraduate studies	155	37.3%
Nationality	Egyptians	290	69.9%
	Non-Egyptians	125	30.1%
Have you traveled for tourism?	Yes	415	100%
	No	0	0%
If yes, how many times**?**	Once	45	10.8%
	Twice	120	28.9%
	Three times	129	31.1%

	More than three times	121	29.2%
Total		**415**	**100%**

Table (1) provides a comprehensive overview of the demographic and travel information gathered from the surveyed individuals. This table shows various characteristics of the respondents, including their gender, age, education level, nationality, and travel frequency.

Explanatory Factor Analysis for Tourism Service Quality

Table (2) Kaiser-Meyer-Olkin and Bartlett's Test

	KMO	0.752
Bartlett's Test	Approx. Chi-Square	25079.35
	df	0.970
	Sig.	0.000

As shown in Table (2), the KMO value is 0.752, which is higher than 0.60. Additionally, the significance level in Bartlett's test is 0.000, which is less than 0.05, confirming that the sample is suitable for factor analysis.

Table (3) Explanatory Factor Analysis for Tourism Service Quality

statements	**Tangibles**	**Reliability**	**Responsiveness**	**Assurance**	**Empathy**
The design and visual elements of the AI interface enhance my engagement.	0.732				
The AI presents information in a visually appealing and understandable format.	0.744				
I rely on the AI's map functionalities to enhance my exploration of tourist destinations.	0.733				
I find value in the customization options provided by the AI based on my preferences.	0.769				
I can depend on the AI's offline capabilities for essential travel information.	0.824				
The AI seamlessly integrates with other travel-related applications for a comprehensive experience.	0.744				
The AI's suggestions align with my preferences and interests.		0.847			

statements	Tangibles	Reliability	Responsiveness	Assurance	Empathy
The AI provides timely and up-to-date information about tourist destinations.		0.811			
The AI effectively addresses any issues or concerns I encounter during my travel.		0.873			
The AI customizes recommendations based on my individual preferences.		0.855			
The AI accurately understands and responds to my queries in natural language.		0.829			
Overall, I am satisfied with the reliability of AI in enhancing my tourism service experience.		0.882			
The AI responds promptly to my queries and requests regarding travel information.			0.744		
The AI is accessible and responsive across various communication channels (e.g., chat, email).			0.823		
The AI is available at any time of day, contributing to a seamless travel experience.			0.843		
The AI proactively suggests relevant information or recommendations without waiting for my input.			0.744		
I find the AI's responses to be concise and helpful for planning my travel.			0.776		
The AI actively incorporates user feedback to enhance its overall responsiveness.			0.744		
The AI ensures a secure environment for handling my travel-related data.				0.79	
The AI provides transparent explanations for its recommendations and decisions.				0.868	
The AI respects my privacy concerns				0.744	

statements	Tangibles	Reliability	Responsiveness	Assurance	Empathy
when assisting with travel-related information.					
The AI complies with relevant laws to ensure a secure service.				0.777	
The AI empowers me to control over my data and preferences within the AI system.				0.852	
I believe the AI is continuously monitored and improved to enhance its reliability.				0.79	
I feel that AI considers my individual tastes and interests in its recommendations.					0.806
The AI communicates in a way that reflects empathy and understanding of my travel concerns.					0.810
I feel supported by the AI in addressing any travel-related issues.					0.915
The AI provides personalized assistance and suggestions when unexpected situations arise during my journey.					0.917
I perceive the AI as proactive in addressing my potential requirements during travel.					0.762
I feel that AI respects and understands diverse cultural aspects relevant to my travel.					0.889

The analysis highlights five key factors contributing to AI's role in enhancing service quality:

Tangibles: This factor focuses on the physical and interactive elements of the AI system, emphasizing the importance of valuable customization options (0.769) and offline capabilities (0.824).

Reliability: AI's ability to provide consistent, dependable service is crucial. Key aspects include delivering accurate information (0.811), customizing recommendations (0.855), and ensuring overall reliability for user satisfaction (0.882).

Responsiveness: This factor measures AI's promptness and efficiency in responding to user needs, including accessibility via various channels (0.823), 24/7 availability (0.843), and proactive suggestions (0.744).
Assurance: AI ensures a secure, trustworthy environment through data security (0.79), transparency in recommendations (0.868), and privacy protection (0.744).
Empathy: AI demonstrates understanding and sensitivity by offering personalized assistance in unexpected situations (0.917), proactively addressing needs (0.762), and respecting diverse cultural contexts (0.889).

Confirmatory Factor Analysis

Table (4) Model Fit Indices

Index	Saturated Model	Estimated Model
SRMR	0.061	0.041
d_ULS	1.961	1.231
d_G	0.782	0.619
Chi-square	1.390.320	1.175.641
NFI	0.911	0.935

Confirmatory factor analysis (CFA) was utilized for the study's variables. Table (3) the model fit indices indicate that the estimated model fits the data well, even better than the saturated model in certain respects. The lower SRMR, d_ULS, and Chi-square values, along with the higher NFI, collectively suggest that the estimated model is a good representation of the data, offering a robust fit.

Table (5) Confirmatory Factor Analysis for Tourism Service Quality

Tourism Service Quality	**Loading**	Cronbach's alpha	Composite Reliability	Average Variance Extracted (AVE)	Full collinearity VIF
A. Tangibles		0.885	0.922	0.571	1.362
TAN.1	0.746				
TAN. 2	0.751				
TAN. 3	0.705				
TAN. 4	0.783				
TAN. 5	0.812				
TAN. 6	0.779				
B. Reliability		**0.952**	**0.959**	**0.721**	**1.668**
REL.1	0.849				
REL.2	0.801				
REL.3	0.864				
REL.4	0.862				
REL.5	0.837				
REL.6	0.871				
C. Responsiveness		0.741	0.706	0.531	1.78

Tourism Service Quality	**Loading**	Cronbach's alpha	Composite Reliability	Average Variance Extracted (AVE)	Full collinearity VIF
RES.1	0.792				
RES.2	0.847				
RES.3	0.849				
RES.4	0.787				
RES.5	0.776				
RES.6	0.791				
D. Assurance		0.716	0.793	0.585	1.974
ASS.1	0.786				
ASS.2	0.870				
ASS.3	0.756				
ASS.4	0.781				
ASS.5	0.857				
ASS.6	0.794				
E. Empathy		0.918	0.939	0.755	2.322
EMP.1	0.827				
EMP.2	0.819				
EMP.3	0.918				
EMP.4	0.906				
EMP.5	0.758				
EMP.6	0.890				

The dimension of Tangibles shows factor loadings ranging from 0.705 to 0.812, indicating good item correlation. The Cronbach's alpha is 0.885, composite reliability is 0.922, and AVE is 0.571, demonstrating strong internal consistency and convergent validity. The full collinearity VIF is 1.362, which is well within acceptable limits, indicating no multicollinearity issues.

The Reliability dimension has factor loadings between 0.801 and 0.871, with a Cronbach's alpha of 0.952, composite reliability of 0.959, and AVE of 0.721. These values indicate excellent reliability and validity. The full collinearity VIF of 1.668 is also within acceptable limits.

The Responsiveness dimension exhibits factor loadings from 0.776 to 0.849. Despite having a lower Cronbach's alpha of 0.741 and composite reliability of 0.706, the AVE of 0.531 indicates acceptable convergent validity. The full collinearity VIF of 1.78 suggests no significant multicollinearity.

Assurance dimension is with factor loadings ranging from 0.756 to 0.870, Assurance has a Cronbach's alpha of 0.716 and composite reliability of 0.793, indicating moderate reliability. The AVE is 0.585, showing sufficient convergent validity. The full collinearity VIF is 1.974, which remains within the threshold, indicating no collinearity concerns.

The Empathy dimension shows strong factor loadings from 0.758 to 0.918. The high Cronbach's alpha of 0.918, composite reliability of 0.939, and AVE of 0.755 indicate excellent reliability and convergent validity. The full collinearity VIF is 2.322, which is slightly higher but still within an acceptable range, indicating minor multicollinearity.
Overall, the results demonstrate that the measurement model for tourism service quality is reliable and valid, with all constructs meeting the necessary criteria for CFA.

Table (6) the respondents' awareness of using Technology

	Frequency	Percent	Mean	SD
Very aware	54	13		
Aware	194	46.8		
Neither aware nor unaware	116	28		
Unaware	13	3.1		
Very unaware	38	9.1		
Total	**415**	**100.0**	**3.51**	**1.05**

The moderate mean value reflects that while there is substantial awareness within the surveyed population, there is a range of familiarity from less to more aware. This insight is crucial for understanding the overall technological literacy and readiness of the participants to engage with and adopt new technological advancements.

Table (7) the respondents' use of AI applications in their daily life

	Frequency	Percent
Yes	180	43.4
No	235	56.6
Total	**415**	**100.0**

A majority of respondents (56.6%) indicated that they do not use AI applications in their daily lives. This distribution highlights a notable division in the adoption of AI technologies among the surveyed population.

Table (8) the respondents' experience of AI Applications in the tourism and hospitality industry

	Frequency	Percent
Yes	249	60%
No	166	40%
Total	**415**	**100.0**

A majority of respondents (60%) reported that they have previously used AI applications in tourism, while 166 respondents (40%) indicated they had not.

Table (9) An overview of AI applications adopted within the tourism and hospitality industry

AI application	Frequencies	Percentage	Rank
Chatbots	131	52.6%	5
Social media	159	63.9%	3

Google Maps	210	84.3%	1
Language Translator	151	60%	4
Facial recognition	85	34.1%	8
Internet of Things	118	47.4%	6
Blockchain	0	0%	10
Robots	116	46.6%	7
QR code	183	73.5%	2
Other	7	3%	9

Regarding adoption and utilization of AI Applications in the Tourism and Hospitality Industry, The results showed that Google Maps emerges as the most prevalent tool, respondents utilizing it for navigation and location-based services. QR codes follow closely behind, often employed for convenient access to menus, promotions, and attraction details. Social Media Platform playing pivotal roles in travel inspiration, planning, and sharing experiences. Language Translator apps facilitate communication in multilingual environments, enhancing the travel experience. Chatbots is serving as valuable aids in customer service and booking inquiries. Conversely, blockchain technology did not register any usage among the respondents, indicating limited adoption or applicability in the industry at the time of the survey.

Table (10) Areas of Experiencing AI Applications

Areas of experience	**Frequency**	**Percent**
travel agents	47	5.2
Airlines	72	28.9
Others	130	52.2
Total	**249**	**100.0**

Among the options provided, airlines stood out, with 28.9% of people mentioning seeing AI there. Travel agents came next, with 5.2%.

Table (11) The Implementation of AI in Tourism Services in Egypt

Scale	**Frequency**	**Percent**	**Mean**	**SD**
largely applied	7	2.8	3.88	0.874
Applied	6	2.4		
Neutral	51	20.5		
Rarely applied	130	52.2		
Not applied	55	22.1		
Total	**249**	**100.0**		

The standard deviation of 0.874 indicates variability in responses, highlighting differing opinions among respondents regarding the extent of AI usage. This variability points to diverse experiences and perceptions of AI integration within the tourism sector in Egypt.

Table (12) provides descriptive statistics for the SERVPERF dimension,

Statements	Mean	SD	T	Rank

1	The design and visual elements of the AI interface enhance my engagement.	3.66	.959	60.2	4
2	The AI presents information in a visually appealing and understandable format.	3.9	1.193	52.8	3
3	I rely on the AI's map functionalities to enhance my exploration of tourist destinations.	2.9	.841	55.5	6
4	I find value in the customization options provided by the AI based on my preferences.	3.5	1.037	54.2	5
5	I can depend on the AI's offline capabilities for essential travel information.	4.0	1.109	57.9	2
6	The AI seamlessly integrates with other travel-related applications for a comprehensive experience.	4.4	.846	82.9	1
Tangibles		**3.7**	**.6430**	**92.7**	
Statements		Mean	SD	t	Rank
7	The AI's suggestions align with my preferences and interests.	3.38	1.14	46.8	4
8	The AI provides timely and up-to-date information about tourist destinations.	3.72	1.05	55.6	3
9	The AI effectively addresses any issues or concerns I encounter during my travel.	3.96	1.19	52.4	1
10	The AI customizes recommendations based on my individual preferences.	3.33	.941	55.9	5
11	The AI accurately understands and responds to my queries in natural language.	1.83	.877	32.9	6
12	Overall, I am satisfied with the reliability of AI in enhancing my tourism service experience.	3.9	1.06	59.0	2
Reliability		**3.37**	**.482**	**110.3**	**.000**
Statements		Mean	SD	t	Rank
13	The AI responds promptly to my queries and requests regarding travel information.	3.6	.993	57.3	2
14	The AI is accessible and responsive across various communication channels (e.g., chat, email).	3.1	.831	59.1	5
15	The AI is available at any time of day, contributing to a seamless travel experience.	3.8	1.29	46.9	1
16	The AI proactively suggests relevant information or recommendations without waiting for my input.	2.7	1.21	35.1	6
17	I find the AI's responses to be concise and helpful for planning my travel.	3.2	.817	62.0	4

18	The AI actively incorporates user feedback to enhance its overall responsiveness.	3.58	.899	62.8	3
Responsiveness		**3.34**	**.503**	**104.**	
Statements		Mean	SD	t	Rank
19	The AI ensures a secure environment for handling my travel-related data.	3.64	.969	59.2	5
20	The AI provides transparent explanations for its recommendations and decisions.	3.98	1.20	52.1	3
21	The AI respects my privacy concerns when assisting with travel-related information.	3.84	1.29	46.8	4
22	The AI complies with relevant laws to ensure a secure service.	3.12	.963	51.0	6
23	The AI empowers me to control over my data and preferences within the AI system.	4.06	1.11	57.4	2
24	I believe the AI is continuously monitored and improved to enhance its reliability.	4.44	.864	81.1	1
Assurance		**3.85**	**.699**	**86.8**	
Statements		Mean	SD	t	Rank
25	I feel that AI considers my individual tastes and interests in its recommendations.	3.72	1.44	40.4	3
26	The AI communicates in a way that reflects empathy and understanding of my travel concerns.	3.1	.814	60.0	6
27	I feel supported by the AI in addressing any travel-related issues.	3.9	1.24	49.4	2
28	The AI provides personalized assistance and suggestions when unexpected situations arise during my journey.	3.6	1.00	56.5	5
29	I perceive the AI as proactive in addressing my potential requirements during travel.	3.7	.958	60.2	4
30	I feel that AI respects and understands diverse cultural aspects relevant to my travel.	4.1	.756	86.3	1
Empathy		**3.7**	**.510**	**123.9**	

Table (12) figured out that Assurance is the most positively perceived dimension, showing that tourists feel a strong sense of trust and confidence in the services provided. However, both Reliability and Responsiveness are identified as needing improvement, highlighting issues with consistency in service delivery and promptness in addressing tourists' needs and concerns.

Table (13) The relationship between the AI application and service quality from the

tourist's perception

		Tangibles	Reliability	Responsiveness	Assurance	Empathy	Quality of tourism services
The AI application in tourism services	**(R)**	.458**	.152*	.394**	.440**	.328**	**.474****
	Sig	.000	.017	.000	.000	.000	**.000**

** Correlation is significant at the 0.01 level (2-tailed).
*Correlation is significant at the 0.05 level (2-tailed).

Table (14) Effect of AI application on the Quality of Tourists services

Model	Unstandardized Coefficients		Standardized Coefficients	Adjusted R square	t	Sig.
	B	Std. Error	Beta			
Application of AI	2.699	.110		.222	24.494	.000
	.247	.029	. .474		8.460	.000

a. Dependent Variable: quality of tourism services

Table (15) Effect of AI application on tangibles

Model	Unstandardized Coefficients		Standardized Coefficients	Adjusted R square	t	Sig.
	B	Std. Error	Beta			
Application of AI	2.499	.163		.209	15.320	.000
	.350	.043	.458		8.088	.000

Dependent Variable: tangibles

Table (16) Effect of AI application on reliability

Model	Unstandardized Coefficients		Standardized Coefficients	Adjusted R square	t	Sig.
	B	Std. Error	Beta			
Application of AI	2.499	.163		.019	22.486	.000
	.350	.043	.458		2.410	.017

Dependent Variable: reliability

Table (17) Effect of AI application on responsiveness

Model	Unstandardized Coefficients		Standardized Coefficients	Adjusted R square	t	Sig.
	B	Std. Error	Beta			
Application of AI	2.481	.132		.152	18.814	.000
	.236	.035	.394		6.738	.000

Dependent Variable: responsiveness

Table (18) Effect of AI application on assurance

Model	Unstandardized Coefficients		Standardized Coefficients	Adjusted R square	t	Sig.
	B	Std. Error	Beta			
Application of AI	2.509	.179		.190	14.011	.000
	.365	.047	.440		7.690	.000

Dependent Variable: assurance

Table (19) Effect of AI application on empathy

Model	Unstandardized Coefficients		Standardized Coefficients	Adjusted R square	t	Sig.
	B	Std. Error	Beta			
Application of AI	2.955	.137		.104	21.507	.000
	.199	.036	.328		5.457	.000

Dependent Variable: empathy

The regression analysis results which reveal that AI significantly influences various dimensions of tourism service quality, with varying degrees of impact. AI shows a substantial effect on tangibles (Beta = 0.458, Adjusted R^2 = 0.209) and assurance (Beta = 0.440, Adjusted R^2 = 0.190), highlighting its critical role in improving physical aspects and confidence-related elements of service. The effect on responsiveness (Beta = 0.394, Adjusted R^2 = 0.152) and empathy (Beta = 0.328, Adjusted R^2 = 0.104) is also significant, indicating that AI contributes positively to these dimensions. However, the impact on reliability (Beta = 0.458, Adjusted R^2 = 0.019) is relatively modest, suggesting that other factors play a more substantial role in determining this aspect of service quality. This comprehensive analysis underscores the importance of integrating AI technologies to enhance the overall quality of tourism services. At the same time, it suggests the need for a multifaceted approach to fully optimize each dimension of service quality.

The results demonstrated that AI applications significantly impact various dimensions of service performance in the tourism sector, particularly enhancing physical aspects, responsiveness, and customer confidence. AI is effective in improving the tangibles of service, ensuring promptness in customer assistance, and boosting assurance. However, the influence of AI on empathy and reliability is less pronounced, indicating room for improvement in addressing individual customer needs and ensuring consistent service delivery. Overall, AI plays a crucial role in elevating service quality, though its impact varies across different service dimensions.

6. Conclusion and Recommendations

This research investigates how the integration of artificial intelligence technologies in the tourism sector in Egypt could affect service performance (tangibility, reliability, responsiveness, assurance, and empathy) from the perspective of tourists. The results underscored that the significance of various dimensions of service quality, facilitated by AI applications, played a crucial role in shaping tourists' perceptions of tourism services. Enhancing tangibles, reliability, responsiveness, assurance, and empathy within AI applications can collectively improve the overall quality of tourism services experienced by tourists.

Regarding the adoption and utilization of AI Applications in the Tourism and Hospitality Industry, The results showed that Google Maps emerges as the most prevalent tool, respondents utilizing it for navigation and location-based services. This goes in line with the study conducted by Phuangsuwan et al. (2024) that indicated that Google Map application simplifies locating tourism businesses, making reservations, and placing orders for users. Additionally, Google Maps recommends nearby businesses that may interest the user based on their location and preferences.

QR codes follow closely behind, often employed for convenient access to menus, promotions, and attraction details. Social Media Platform playing pivotal roles in travel inspiration, planning, and sharing experiences. Language Translator apps facilitate communication in multilingual environments, enhancing the travel experience.

Chatbots is serving as valuable aids in customer service and booking inquiries. These findings agreed with Nicolescu & Tudorache (2022) who advised that the most influential factors when using Chatbots for customer service are response relevance and problem resolution, which usually result in positive customer satisfaction, increased probability for Chatbots usage continuation, product purchases, and product recommendations.

Conversely, blockchain technology did not register any usage among the respondents, indicating limited adoption or applicability in the industry at the time of the survey. These results supported the findings of Erol et al. (2022) who declared that the two biggest obstacles to blockchain adoption in the travel and tourism sector are "lack of technical maturity" and "lack of interoperability."

The diverse array of AI applications highlighted the industry's commitment to leveraging technology to enhance customer experiences and streamline operations. As the applications of AI in tourism services increase, the perceived quality of tourism services by tourists tends to improve. This is also consistent with the study by Samala et al. (2020) which highlighted that AI certainly enhances tourism experiential services however cannot surpass the human touch which is an essential determinant of experiential tourism.

According to the Implementation of AI in Tourism Services in Egypt,

The analysis of the Tangibles dimension in AI interfaces for tourism revealed a generally positive perception among users. Participants highly value the seamless integration of AI with other travel-related applications, which significantly enhances their travel experience.

The results indicated a moderate level of agreement among respondents regarding the reliability of AI-driven tourism services. Participants highly valued the AI's ability to effectively address issues or concerns during their travels, reflecting a strong perception of reliability in this aspect.

The results showed a moderate level of agreement among respondents regarding the responsiveness of AI-driven tourism services. Participants highly value the AI's 24/7 availability, which significantly enhances their travel experience by providing continuous support. However, there is less satisfaction with the AI's proactive behavior, as it appears less effective in offering relevant information or recommendations without user input. This suggests that while the AI's constant availability is appreciated, its responsiveness in anticipating and providing information proactively could be improved.

Regarding to the sample’s responses to Assurance, the results indicated a generally positive perception of AI's assurance capabilities among respondents, with high confidence in the AI's continuous monitoring and improvement to enhance reliability.

The results indicated a moderately positive perception of the AI's empathetic capabilities. Respondents highly valued the AI's ability to respect and understand diverse cultural aspects relevant to their travel, showing strong agreement on the AI's cultural sensitivity.

The results figured out that Assurance is the most positively perceived dimension, showing that tourists feel a strong sense of trust and confidence in the services provided. However, both Reliability and Responsiveness are identified as needing improvement, highlighting issues with consistency in service delivery and promptness in addressing

tourists' needs and concerns. This is substantiated by Chiang & Trimi (2020) who have revealed that customers' top priorities for tourism's service quality are assurance.

The results demonstrated that AI applications significantly impact various dimensions of service performance in the tourism sector, particularly enhancing physical aspects, responsiveness, and customer confidence. AI is effective in improving the tangibles of service, ensuring promptness in customer assistance, and boosting assurance. However, the influence of AI on empathy and reliability is less pronounced, indicating room for improvement in addressing individual customer needs and ensuring consistent service delivery. Overall, AI plays a crucial role in elevating service quality, though its impact varies across different service dimensions.

Regarding testing the Study Hypotheses, the hypothesis explored the impact of AI applications on the SERVPERF dimensions within the tourism sector.

The influenced-on tangibles, responsiveness, and assurance were high to moderate, suggesting that AI enhances physical aspects of service, improves promptness and willingness to help customers, and boosts customer confidence in the service provided.

The influence on empathy and reliability were moderate to minor, indicating that while AI contributes to understanding and caring for individual customer needs and consistent service delivery, the impact is less pronounced in these areas.

It is recommended that travel agencies and airlines should combine AI automation with personalized human service delivery. By integrating AI with human touch points, these organizations can create a unique customer experience that balances technological efficiency with personalized care, Tourism organizations should collaborate with AI developers to improve the emotional intelligence of AI systems. By enhancing AI's ability to understand and address customer concerns empathetically, organizations can improve customer satisfaction and foster loyalty. And AI solution providers in the tourism industry should enhance the ability of AI systems to offer personalized recommendations and anticipate customer needs. This improvement is especially crucial for airlines and hotels, where customer satisfaction is heavily dependent on the provision of timely and relevant information.

By implementing these recommendations, tourism entities can enhance AI adoption across the industry, improve operational efficiency, and address employee concerns, ultimately leading to a more seamless and innovative tourism experience. This paper investigated the influence of AI applications on the SERVPERF dimensions: Tangibles, Reliability, Responsiveness, Assurance, and Empathy. There are many other concerns that can be studied in future research, including the long-term effects of AI on employee roles, the ethical implications of AI in tourism, and the potential for AI to transform the industry in areas like sustainability and personalized travel experiences. Future studies could also explore the specific impact of AI on customer satisfaction across different types of tourism services, as well as the role of emerging technologies, such as AI-driven virtual reality (VR) and augmented reality (AR), in enhancing the tourism experience.

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تأثير الذكاء الاصطناعي على تحسين جودة الخدمة السياحية في المقصد السياحي المصري

اسراء سامي شعلان هبة الله علي جعفر بسام سمير الرميدي عبدالفتاح سليمان شوالي
قسم الدراسات السياحية – كلية السياحة والفنادق – جامعة مدينة السادات

الملخص

يمكن دمج الذكاء الاصطناعي بسهولة في الأعمال السياحية، مما يسمح لهم بتحليل كميات هائلة من البيانات بسرعة. يمكن أن يساعد هذا التحليل مشغلي السياحة في اتخاذ قرارات تجارية وتخصيص تجربة السائح. يبحث هذا البحث في تأثير الذكاء الاصطناعي على تحسين جودة الخدمة السياحية في الوجهات المصرية. تم استخدام أسلوب العينة العشوائية المريحة لاختيار المشاركين؛ تم توزيع 500 استبيان سياحي، نتج عنها 415 استجابة صالحة، مع 249 مشاركًا أبلغوا عن خبرة سابقة مع تطبيقات الذكاء الاصطناعي في صناعة السياحة والضيافة. يستخدم البحث نموذج SERVPERF لفحص تأثير الذكاء الاصطناعي على أبعاد الجودة الرئيسية للخدمة، بما في ذلك العناصر الملموسة، والموثوقية، والاستجابة، والضمان، والتعاطف. أظهرت النتائج أن الذكاء الاصطناعي يساهم بشكل كبير في تعزيز كفاءة الخدمة ورضا العملاء، على الرغم من التحديات مثل التكلفة والتبني غير المتسق. يقدم البحث توصيات لزيادة تطبيق الذكاء الاصطناعي ويسلط الضوء على مجالات للاستكشاف المستقبلي، مثل الآثار الأخلاقية للذكاء الاصطناعي وتأثيره طويل الأمد على القوى العاملة في قطاع السياحة .

الكلمات المفتاحية: الذكاء الاصطناعي، جودة الخدمة السياحية، نموذجSERVPERF ، رضا العملاء.