Applying Internet of Things and its Impact on Enhancing Tourism Services in Egyptian Tourist Destination

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Abstract

The Internet of Things (IoT) is perceived as an evolving trend in the tourism industry. IoT will help destinations, airlines, hotels, museums, and travel agencies personalize their services for tourists and guests. Moreover, it has several advantages for them, such as cost savings, increased productivity, greater efficiency, and customized and differentiated services. The purpose of this study is to identify the impact of applying Internet of Things technology on enhancing tourism services in the Egyptian tourist destination and explore the challenges that face the application of the Internet of Things in the Egyptian tourist destination. To achieve the aims of the study, the methodology of this research was based on a quantitative approach. A questionnaire form was created and directed to a sample of Egyptian and foreign tourists in Hurghada and Luxor City. The questionnaire was distributed to a random sample of four hundred (400) visitors to Hurghada and Luxor, whether foreigners or Egyptians. 353 (88.25%) of them were retrieved. The statistical analysis of the responses was carried out via SPSS v25. Data has been collected through questionnaires that were prepared in an approach that is relevant to the situation so as to decrease invalid responses. The results showed the obstacles that faced the application of Internet of Things technology in tourist service are: "public awareness of Internet of Things technology," "lack of infrastructure," and "Privacy and security. The research recommended security procedures must be implemented at all layers of the IoT architecture.

1. Introduction

The internet has grown and penetrated every facet of human life since its debut in the 90s. It has become an essential part of our everyday life. The Internet of Things (IoT) refers to the concept of items exchanging data across a network without the need for human involvement. The Internet of Things empowers and transforms large items into smart objects capable of exchanging information by modifying their underlying technologies, which include pervasive computing, embedded devices, communication technologies, sensor networks, protocols, and applications (Mustafa et al., 2022).

The Internet of Things (IoT) is an important focus of successful Internet growth due to the extensive use of devices, mobile phones, and RFID tags. Because the tourism industry is constantly evolving, the use of Internet of Things technology in tourism projects appears to have great potential in the future. Smart tourism uses the Internet of Things to improve information exchange and meet the needs of tourists (Bi and Liu, 2022).

The tourist sector revolves around user requirements, and the latest trends and technology are an effective way to achieve those objectives. IoT technology is having a multidimensional impact on the tourism industry, as visitors become more mobile and adaptable during their travel and lodging experiences. The industry has started to transform rapidly. The end consumer, who has been a tourist, visitor, or guest in many regions, has already begun to demand that services be benchmarked and positioned in such an advanced way using IoT. This expectation and accompanying development will transform these pleasures into a requirement (Verma and Shukla, 2019).

Research Problem

With the advancements in IoT technologies and the diversification of use cases, interconnected technologies have become an increasingly important part of users' personal lives. The resulting implications have sparked more interest in recent years. In this context, the main issue of this study is the importance of the application of internet of things technology and its impact on enhancing tourism services, and understanding the barriers that prevent the adoption of IoT in tourism services. Therefore, this study highlights the assessment of all tourism services that provided tourists during their journey, comparing all tourism services to reach an accurate result, and highlight the shortcomings for each service with the help of a structured questionnaire.

Research Importance

The significance of this research returns to highlight the impact of the Internet of Things on enhancing tourism services, where The Internet of Things is gaining popularity, and its use is increasing at a rapid speed in the aftermath of the epidemic, as everything has been moved to the virtual platform. Because of its growing popularity and ability to predict possible disruptions in multiple industries, it is expected to benefit the travel and hotel sectors as well. This business is an intricate partnership of numerous stakeholders and their subordinates working together to provide the best visitor experience possible. This experience includes the local population, tourist attractions,

transportation facilities, accommodations and lodging, food and beverages, public places, and services provided, among other things. The visitor is the end consumer in this cycle searching for a nice experience, and by utilizing this cutting-edge technology, destinations can give travelers the lavish experience they demand while also protecting their health during these challenging times. The study's value arises from the Internet of Things' role in boosting tourism services in Egyptian tourist sites (Hurghada and Luxor).

Research Objectives

This study aims to identify the impact of applying Internet of Things technology in enhancing tourism services in the Egyptian tourist destinations (Hurghada and Luxor). This aim is divided into four objectives as follows:

1. Identifying the extent to which the Internet of Things is applied in the Egyptian tourist destination.

2. Assessing the effect of applying the Internet of Things on the experience of tourists in the Egyptian tourist destination.

3. Highlighting the problems facing the application of the Internet of Things in the Egyptian tourist destination.

4. Introducing ideas and suggestions to maximize the internet of things impact on tourist experience in the Egyptian tourist destination.

Research Questions

To answer the research questions

There are four supporting questions which would be addressed through which are presented in the following

1. To what extent is Internet of Things technology applied in the Egyptian tourist destination?

2. What is the effect of the Internet of Things on the tourist's experience in Egypt?

3- What are the problems facing the application of Internet of Things technology in the Egyptian tourist destination?

4. How to maximize the internet of things impact on tourist's experiences in Egypt?

2. Literature Review

2.1. Internet of Things Definitions

The Internet of Things involves networking of all types of devices. The concept is based on three concepts; always (anytime), everywhere (anyplace), with everything (anything). The potential lies in this technology, which makes the Internet Things are also referred to as the Internet of everything (Schatten et al., 2016).

The Internet of Things (IoT) is the next generation of the internet, enabling the connection, identification, and access of any physical thing over the internet (Shammar and Zahary, 2019).

The Internet of Things refers to a network of devices connected to the internet in order to collect and transmit data and facilitate processes with the aim of providing better and more personalized service. Smart devices transmit data to and from the internet to create a customizable experience (Weldhen, 2022).

2.2. Internet of thing Benefits

Internet of Things makes communication fast and easier in the modern era of digital networking, doing business via phone or e-mails are satisfactorily way. There are many benefits of internet of things

1. Easy access and interaction

The internet of things (IoT) connects objects in everyday life by embedding internet-connected gadgets and exchanging their data online. Smart technology that uses IoT data opens up new potential for the travel and hospitality industries. The Internet of Things offers easy access and interaction with a wide range of information for situations such as transit, attractions, tours, shopping, and hotels (Wise and Heidari, 2019).

Staff and team managers can connect instantly without leaving their office when there is internet access available. The extensive research of internet devices, applications, and social networking platforms, as well as internet communication providers, has resulted in a paradigm challenging solution. The contribution of these applications' platform allows users to communicate as if they were right next to one another with highly featured quality video and audio conferencing (Ali et al., 2019).

2. process all of the data

Location and geographic context-aware services have emerged as a new and rapidly growing economic sector. These services are critical in the development of IoT scenarios, smart environments, and proactive solutions. Smart tourism is one of the most intriguing application areas. In many cities, social issues such as non-security, fraud, and a lack of proper resource information are the most significant barriers to tourism. Smart tourism design may assist travelers acquire and interpret all of the data involving users, transforming it not only into helpful information but also into individualized knowledge (Peng et al., 2020).

Objects have become smart with internet of things, as they are involved in the collection and processing of data to obtain meaningful information for more efficient processes and decision making that improve the society and businesses. To development of IoT both now and in the future system intelligence is key (Chinanu et al., 2020).

3. Makes activities intelligent

After computers, the Internet, and mobile communication networks, the Internet of Things is another major change in the development of science and technology. It mixes virtual information and reality to make some behaviors and activities in real life intelligent, convenient and efficient (Zheng et al., 2021).

4. Advanced information compilation

Today's information collection under-goes restrictions in plans for practical usage, recent statistics have the problem of ambiguity and fundamental errors in accuracy. While, internet of things smashes it down into those gaps and then puts it right where people desire for investigating our planet, achieving a productive engagement and rich (Ramasamy and Kadry, 2021).

2.3 Internet of Things Applications in Tourism Services

Following the advancement of current technologies, the use of IoT in the tourism industry is now unavoidable in order to develop, modify, and upgrade the industry. During the trip planning phase, IoT offers travelers with tailored information, allowing them to make intelligent and educated travel decisions, such as deciding on the method(s) of transportation. It also ensures an effective transaction-oriented procedure such as reservation-making and payment-taking, as well as a cross-platform for travelers to engage with service providers (Huang et al., 2017).

Using IoT, it is possible to track whereabouts and information (Geo-location technologies) that enrich travel experiences, from route planning to accommodation and journey planning. Tourists desire the comfort and security of knowing that if they fall

into problems at any point along their travel, they may contact someone who can assist them. Ubiquitous smart devices assist travelers in recording time, speed/pace, distance, position, and elevation, as well as allowing quick communication with others who have taken the same route or checked into the same destination. Furthermore, the mining of travel experience data will help travel brokers or tour operators to co-design tourism spot packages and build attractions and experiences that better suit arriving guests to boost loyalty, engage customers, and enroll visitors (Car, et al., 2019).

Patients' health will be monitored remotely and continually using internet of things technology when they are on vacation or recovering from a medical treatment. The vacation phase of post-treatment will include teleconsultation for medical procedures to ensure continuity of care. Data collected on such tourists can boost industry competitiveness by generating and providing reliable and valid statistical reports on quality, safety, and health outcomes, in addition to enabling healthcare providers to adopt best practices, processes, and cost management effectiveness, and generate new market segments that include more than just travel for travel insurance (Car et al., 2019).

An excellent use for the internet of things is to streamline consumers' experiences as much as possible across all aspects of the travel industry (Seamless Travel). In airports, this may entail employing sensors to convey information to passengers' smartphones, alerting them when their luggage is approaching and allowing them to identify it more quickly. Hotels may make the check-in procedure easy by delivering electronic key cards to customers' phones that, when used, instantly check them in without them having to stop at the front desk (Ordonez et al., 2020).

It turns out that combining different services at a destination is a tourism activity if it includes smart airports, smart airlines, smart travel, smart guests, smart hotels, smart restaurants, smart facilities, and smart landmarks, resulting in smart tourism based on the Internet of Things. Smart tourism destinations that use IoT and sensor actuators will allow you to find information about anything you need on your smartphone. Taxi ordering, event venue search or silent location, and security safety preferences can all be communicated to manufacturers or service providers in order to improve the tourist experience. In activities where a group of people is involved, such as mountain tracking, connectivity can ensure a complete leisure experience with the information of the proper site temperature and options of several services. The information about the traffic, parking, birds in wildlife parks, animals in the zoo, and shows in the auditorium all will be available with the choice of the tourist (Verma, et al., 2021).

The phrase "smart tourism" refers to how integrated technology, real-time data, and physical infrastructure have been blended into a single complex environment, similar to a city, resulting in remarkable successes. Smart tourism is customer-focused and attempts to fully meet tourists' needs in terms of food, lodging, travel, shopping, and entertainment. The major purpose is to use the system to increase the tourist experience and improve resource management efficiency in order to maximize both the destination's competitiveness and tourist satisfaction while also assuring long-term sustainability. Smart tourism is not just the application of information and communication technologies, but also an ecosystem that allows tourists, destination management organizations, and other stakeholders in the tourism industry to interact, resulting in the co-creation of value between tourists and providers (Ari, 2022).

2.3.1 Role of Internet of Things in Hotels Industry

Information and communication technologies (ICT) are critical to hotel management and company performance. The availability and integration of ICT have a considerable positive influence on operational productivity, as does the intensity of ICT usage.

Another relevant operational cost in hotels is theft. Many guests steal little items from the hotel, such as ashtrays, glasses, or towels, while personnel occasionally steal larger items once they are familiar with security protocols and have access to restricted zones and exits. Despite various privacy concerns related to Internet-of-Things (IoT) technology, IoT can play an important role in hotel management, both in improving the client experience and in decreasing operational costs and theft-related costs (Magalhaes et al., 2017).

The application of internet of things in the hotel industry is interested in providing the guests with personalized services to improve the guest's experience (Amer and Alqhtani, 2019). Hotels may use the internet of things to conserve energy and reduce greenhouse gas emissions. Solutions based on the Internet of Things can assist in the implementation of sustainability projects. For example, occupancy sensors can provide hotel management with critical data and alerts that can assist them in better managing and regulating energy consumption, as well as supporting sustainability initiatives, whereas the incorporation of internet of things-enabled devices in a hotel guestroom allows guests to transform a generic space into a personalized domain, known as a smart room. The capacity to monitor a heating, ventilation, and air conditioning system with sensors that give out consumption data saves time and lowers maintenance requirements.

The same idea applies to lighting controls. From a control center, management might receive information on how much energy is consumed per fixture when a light is out and when a light is on for longer than necessary (Eskerod et al., 2019).

The internet of things, along with smart video, can detect suspicious behavior in surveillance camera recordings and predict and retain the possibility of a burglary or intrusion. Another component of internet of things deployment in hotels is the use of proximity sensors for front-of-house apps to offer visitors with micro-location within the property for wayfinding or contextually relevant information. Additionally, parents can track their children's location at a vast resort. The use of micro-location for back-office processes can enable applications such as automated service request allocation to the nearest available staff, service turnaround time tracking for productivity evaluation, and asset and staff movement monitoring (Nadkarni et al., 2019).

2.3.2 Role of Internet of Things at Museums

A museum is a place where objects of historical, scientific, artistic, or cultural significance are preserved and displayed. To capture the attention of visitors, I suggest a smart museum employing an IoT device. A smart museum based on IoT is built around a wearable device that serves as the museum's guide. This wearable device will capture video of the user's movements, process the images, and send only the matched images to the cloud processing center to improve the overall system's performance. Localization information is obtained by a Bluetooth low energy (BLE) sensor installed in the museum. Furthermore, the system communicates with the cloud to save multimedia content created by the user. Finally, everyone has easy access to their arts profile and history through smart devices by using mobile applications (Sornalatha and Kavitha, 2016). The localization information can be utilized to give additional services to visitors, as well as by museum staff for maintenance. All cultural stuff is saved in the cloud and retrieved when needed by the user. The item is detected, and the associated description is retrieved from the cloud and automatically played as audio or video. This

approach has allowed museum visitors to freely explore and make the museum experience personalized (Hamza, 2017).

To protect the museum's contents from human damage, acceleration data is used to identify any touch. When the acceleration surpasses a predetermined threshold, the sensor node wakes up and transmits the current acceleration data. This value is used to determine whether the touch was for a theft attempt, vandalism, or simply an inadvertent touch. The museum management can select to get notifications and emails for each type of touch. An automatic alarm option can also be activated for theft or sabotage attempts. Sensors in museum ambiance monitoring offer numerous advantages over traditional monitoring. Some of these advantages include low cost, minor visual impact, low power consumption, high edibility, little requirement for infrastructure, ease of deployment of sensor nodes, and the ability to continuously monitor and control the museum environment (Alsuhly and Khattab, 2018).

2.4 Hurghada City

Hurghada is the capital of the Red Sea Governorate. It is one of the most prominent tourist destinations in the world. Hurghada is located south of Suez and 550 kilometers from Cairo. There are several ways to get to Hurghada by ferry from Sharm El Sheikh, including the Luxor-Cairo road and the Hurghada International Airport. Covering more than 40 kilometers of beautiful shoreline. Hurghada's dry desert climate ensures pleasant temperatures throughout the year. Hurghada City offers year-round sunlight, breathtaking coral reefs, and a plethora of fascinating things in a laid-back, easygoing setting. Despite its reputation as one of Egypt's most renowned diving locations (Red Sea Governorate, 2020).

2.5 Luxor City

Luxor located in South Upper Egypt region, which encompasses Aswan, Qena, Souhag, Red Sea, and Luxor Governorates. The governorate's total area comes to 2959.6 km², forming 0.3% of the country's total area. Luxor Governorate is Located Southern Egypt between 36- 25 North, 33-32 East, 670 KM south of Cairo, 220 KM north of Aswan (Abdo, 2020).

3. Methodology

The purpose of the fieldwork is identifying the impact of applying Internet of Things technology in enhancing tourism services in the Egyptian tourist destination. The research is trying to describe the subject of the study, analyze the data, and compare, explain, and assess, hoping to reach meaningful generalizations to increase and enrich knowledge on the subject. As the study was based on measuring each service individually by providing several statements to tourists visiting the tested cities. The total statements of the questionnaire covered the seven dimensions of the model. The field study was applied in Hurghada and Luxor cities that are the places that tourists frequent due to their distinguished geographical location. Hurghada enjoys a moderate climate and the beaches of the Red Sea, which attracts a large number of tourists; also, Luxor is one of the important tourist destinations because it is one of Egypt's most historic cities; also, it contains many historical attractions that make it one of the large

cultural centers in the world. Finally, they include all the tourist services that are evaluated in this study (hotels, museums, airports, restaurants, and travel agencies) and a comparison between them to know the impact of applying the Internet of Things technology on all tourism services.

3.1. Questionnaire Design

The study aims to identify the impact of applying Internet of Things technology in enhancing tourism services in the Egyptian tourist destination, to achieve that, this research employed a method of descriptive analytical methodology by using a questionnaire tool. The questionnaire is targeting a random sample of visitors to Hurghada and Luxor, whether foreigners or Egyptians. The questionnaire was designed after determining the required data according to the problem, objectives, and questions of the research. The questionnaire contained a series of multiple-choice questions in which the respondents were given the opportunity to choose different options that reflected their views. The questionnaire also provides a selection of closed-ended questions. In this case, the respondents were restricted to certain choices where they were asked to pick the answers.

3.2. Data Collection

The researcher used the descriptive analytical approach, where a questionnaire was prepared and distributed to a random sample of four hundred (400) visitors to Hurghada and Luxor, whether foreigners or Egyptians. 353 (88.25%) of them were retrieved. The statistical analysis of the responses was carried out via SPSS v25. Data has been collected through questionnaires that were prepared in an approach that is relevant to the situation so as to decrease invalid responses. They were distributed to visitors in Hurghada and Luxor, whether foreigners or Egyptians. These questionnaire forms were distributed during May to November 2024.

Sample Size

The target population for this study is visitors to Hurghada and Luxor, whether foreigners or Egyptians. The number of visitors to Hurghada and Luxor, whether foreigners or Egyptians, is 5420230. The researcher used the equation of Stephen K. Thompson to calculate the sample size from the next formula:

$$n = \frac{N \times p(1-p)}{\left[\left[N - 1 \times \left(d^2 \div z^2\right)\right] + p(1-p)\right]}$$

Source: (Thompson, 2014)

n) Sample size (353)
(N) Indicates Population size (5420230)
(Z) Confidence level at 95% (standard value of 1.96)
(d) Error proportion = 0.05
(p) Is the probability 50%.

As a result, a sample of is 353 visitors to Hurghada and Luxor, whether foreigners or Egyptians, were selected randomly. All the responses were obtained as valid.

3.3 Data Processing and Analyzing

The introductory step is important in order to prepare the data for analysis and allow the result to be meaningfully interpreted. This stage includes checking and coding the quantitative data. Qualitative data can be analyzed by some software packages as well as manual analytical procedures.

The collected data was processed and analyzed. This included steps like editing, coding the replies, classification, tabulating the data, and performing several statistical computations such as frequencies, percentages, and various coefficients. The appropriate statistical operations, along with the use of appropriate tests of significance, are carried out to safeguard the drawing of conclusions concerning the study. After the collection of the questionnaire lists, the researcher has analyzed all the data using the Statistical Package for Social Science (SPSS) analysis system, version (25), and used the frequencies, percent, means, standard deviation, rank, attitude, correlation analyses, Onaway ANOVA.

3.4 Validity and Reliability
3.4.1 Data Validity

To validate the data collection instrument used in this study in terms of its readability, format, and ability to measure the study's constructs, the researcher distributed the questionnaire instrument to visitors in Hurghada and Luxor, whether foreigners or Egyptians, and to those who have specializations and expertise in the field of this study. The questionnaire instrument was then updated and refined to reflect the comments and suggestions received by the domain experts. Moreover, the experts showed interest and interacted with the researcher concerning the questionnaire instrument, which adds to its validity.

3.4.2 Data Reliability

Before proceeding with further analysis, the reliability testing was led in order to ensure consistent measurement across various items in the questionnaire. Indeed, the reliability of a measure indicates the stability and consistency of the instrument. Consequently, this method determines reliability through examining the internal consistency of the research instrument, such as questions (items) in the questionnaire, which are normally presented. Cronbach's Alpha is one of the most frequently applied metrics to measure a scale's reliability, in which its index ranges from 0.0 to 1.0. Researcher should target a value closer to 1.0, as Alpha value proves that the instrument of the study is strong and consistent. However, it's important to note that in social sciences the threshold value of 0.7 is considered acceptable.

Table (1) Cronbach's Alpha Value

Variables	No. of items	Cronbach's Alpha	Validity Coefficient*
The impact of implementing/using Internet of Things technology on improving tourists' experience	8	0.920	0.959

Rating for the Internet of Things application in tourist services at the Egyptian tourist destination:	21	0.955	0.977
• Hotels	5	0.904	0.951
• Museum's	5	0.929	0.964
• Airports	5	0.920	0.959
• Restaurants	2	0.818	0.904
• Travel Agencies	4	0.928	0.963
Ways of using the Internet of Things to improve tourism services	6	0.950	0.975
The problems of applying Internet of Things technology in tourist services in the Egyptian tourist destination.	4	0.939	0.969
Total	39	0.965	0.982

* Validity coefficient = $\sqrt{}$ Reliability coefficient

In order to measure the internal consistency and reliability of the study's constructs. Cronbach's alpha (α) measure was used. The scales' reliabilities were measured and the Cronbach's Alpha of all scales in Table (1) ranged from 0.920 to 0.955, and for total questionnaire items was (0.965), this indicate an acceptable Cronbach's Alpha value for each field, whenever Cronbach's Alpha value is acceptable if it's more than (0.7).

4. Results
4.1 Descriptive analysis Research Variables

In this section, the researcher relied mainly on the descriptive analysis to get the means and the standard deviations for the study constructs along with their items. The items were measured using a Likert-type scale as follows.

Respondent Demographic Characteristics

Table (2) Demographic profile of sample elements

Variable		Frequency	Percentage (%)
Gender			
	Male	197	55.8
	Female	156	44.2
Nationality			
	Egyptian	186	52.7
	Russian	63	17.8
	Italian	22	6.2
	French	31	8.8
	German	51	14.4
age group			
	Under 25	77	21.8
	Between 26 and 50	250	70.8
	Over 50	26	7.4
Educational level			
	General Secondary	44	12.5
	Bachelor's Degree	280	79.3
	Postgraduate Studies	29	8.2

As depicted in Table (2) shows the discussion of the research findings begins with a brief demographic profile of respondents in terms of gender, the majority of the respondents were male (55.8%), rather than female respondents (44.2%) of this sample. The table shows the number of visitors to Hurghada and Luxor, whether foreigners or Egyptians to whom the questionnaire was distributed, and the destinations of Egyptian nationality are at the forefront, by percentage (52.7%). In analyzing the age bracket of Between 26 and 50 had the greatest number of respondents (70.8%), followed by the age bracket of Under 25 years old (21.8%). In analyzing the level of education, the most representative degree is Bachelor Degree with (79.30%) of the respondents, whilst (12.5%) of respondents had Middle and high school holders in the sampled as indicated in Table (2).

A) Evaluate the impact of implementing/using Internet of Things technology on improving tourists' experience

Table (3) The Impact of Implementing/using Internet of Things Technology on Improving Tourists' Experience

Variables	D	N	A	Mean	SD	Rank	Attitude
The Internet of Things makes communication faster and easier	0.8	9.9	89.2	2.88	.346	1	Agree
Smart devices and sensors help improve tourists' experience at tourist sites, such as alerting tourists when approaching an important historical landmark or providing them with details and information about the landmark and providing charging stations	0.8	16.4	82.7	2.82	.407	2	Agree
Smart sensors help monitor resource usage in tourist facilities and improve their efficiency, such as using temperature and lighting sensors to direct customers to areas with the lowest energy consumption and reduce environmental pollution.	1.7	26.3	72	2.70	.494	5	Agree
Data analysis devices help provide accurate weather forecasts, which can be used to plan tourist activities and guide tourists to the optimal places to see natural landmarks such as waterfalls and stunning landscapes.	0.8	35.7	63.5	2.63	.502	8	Agree
Smart devices collect data on visitor preferences and analyze the data to improve marketing and target offers and	0.8	26.9	72.2	2.71	.471	3	Agree

advertisements to the audience more effectively							
Smart devices facilitate the travel and navigation process for tourists, such as tracking trips and providing tourists with details about public services in the surrounding area, including restaurants, bars, and shopping centers	0.8	27.2	72	2.71	.472	4	Agree
The Internet of Things provides resorts where tourists can control all systems by voice or touch, such as controlling room temperature, lighting, and other electronic devices	0.8	29.2	70	2.69	.481	6	Agree
The availability of smart cameras and sensors ensures the safety of tourists, such as warning them of dangerous areas and alerting them to adverse weather conditions.	0.8	30.3	68.8	2.68	.485	7	Agree
Total Mean				2.73			Agree

Table (3) presents the means and standard deviations of the impact of implementing/using Internet of Things technology on improving tourists' experience, where the means ranged between (2.63–2.88) compared with the total instrument mean for the domain (2.73). The item "The Internet of Things makes communication faster and easier" ranked first with a mean and standard deviation (mean = 2.88, standard deviation = 0.346) compared with the total instrument mean and the standard deviation. The item "Data analysis devices help provide accurate weather forecasts, which can be used to plan tourist activities and guide tourists to the optimal places to see natural landmarks such as waterfalls and stunning landscapes." ranked last, reaching a mean (2.63) and the standard deviation was (0.502) compared with the mean and standard deviation of the total instrument.

B) <u>Rating for the Internet of Things application in tourist services at the Egyptian tourist destination</u>

Table (4) Rating for the Internet of Things application in Tourist Services at the Egyptian Tourist Destination Hotels

Variables	D	N	A	Mean	SD	Rank	Attitude
Integrated sensors and IoT devices help understand guest expectations and needs.	3.1	31.4	65.4	2.62	.546	2	Agree
IoT devices are available in smart accommodations, such as smart thermostats, lighting systems, and temperature sensors, to provide a more comfortable and personalized stay for tourists in hotels.	1.4	32	66.6	2.65	.506	1	Agree
Fire and motion sensors detect fire accidents or intrusions and send immediate notifications to staff and guests.	2.3	39.7	58.1	2.56	.541	3	Agree
IoT technology provides tailored services such as room temperature control.	0.8	45.9	53.3	2.52	.517	4	Agree
Wearable devices and IoT-enabled trackers have the ability to know the actual location of the person.	2.5	44.2	53.3	2.51	.549	5	Agree
Total Mean				2.57			Agree

Table (4) presents the means and standard deviations for ratings for the Internet of Things application in tourist services at the hotels, ranging from 2.51 to 2.65. Compared to the overall mean of 2.57, the statement "IoT devices are available in smart accommodations, such as smart thermostats, lighting systems, and temperature sensors, to provide a more comfortable and personalized stay for tourists in hotels." achieved the highest ranking (mean = 2.65, SD = 0.506). Meanwhile, the statement "Wearable devices and IoT-enabled trackers have the ability to know the actual location of the person." ranked last (mean = 2.51, SD = 0.549), indicating limited practical Internet of Things application in tourist services at the hotels.

Table (5) Rating for the Internet of Things Application in Tourist Services at the Egyptian Tourist Destination Museums

Variables	D	N	A	Mean	SD	Rank	Attitude
Internet of Things technology helps museums present their exhibits in a way that enhances visitor experience, satisfaction, and knowledge.	1.1	26.3	72.5	2.71	.477	3	Agree
Internet of Things technology helps tourists explore tourist attractions independently, rather than relying on tour guides.	3.4	20.1	76.5	2.73	.515	2	Agree
Smart devices and sensors help improve tourists' experience at tourist sites by providing them with details and information about the site, as	4	24.1	72	2.68	.546	5	Agree

well as providing charging stations for smart devices.							
Smart applications and internet-connected electronic devices are available to provide more interaction and virtual experiences	2.3	25.2	72.5	2.70	.505	4	**Agree**
Internet-connected devices help improve the tourist experience, such as using tablets to provide tourist information, interactive exhibits, and virtual tours	1.1	24.6	74.2	2.73	.469	1	**Agree**
Total Mean				**2.71**			**Agree**

Table (5) presents the means and standard deviations for ratings for the Internet of Things application in tourist services at the Museums, ranging from 2.68 to 2.73. Compared to the overall mean of 2.71, the statement "Internet-connected devices help improve the tourist experience, such as using tablets to provide tourist information, interactive exhibits, and virtual tours." achieved the highest ranking (mean = 2.73, SD = 0.469).

Meanwhile, the statement "Smart devices and sensors help improve tourists' experience at tourist sites by providing them with details and information about the site, as well as providing charging stations for smart devices." ranked last (mean = 2.68, SD = 0.546), indicating limited practical Internet of Things application in tourist services at the museums.

Table (6): The Problems of Applying Internet of Things Technology in Tourist Services in the Egyptian Tourist Destination

Variables	D	N	A	Mean	SD	Rank	Attitude
Privacy and security	13.6	7.9	78.5	2.65	.708	3	**Agree**
Cost	14.2	7.9	77.9	2.64	.718	4	**Agree**
Public awareness of Internet of Things technology	11	7.4	81.6	2.71	.656	1	**Agree**
Lack of infrastructure	11.6	7.4	81	2.69	.668	2	**Agree**
Total Mean				**2.67**			**Agree**

It's declared from this table that respondent's see that Problems of applying Internet of Things technology in tourist services in the Egyptian tourist destination and the most Problems are: "Public awareness of Internet of Things technology", "Lack of infrastructure" and "Privacy and security" with mean 2.71, 2.69 and 2.65 respectively.

C) Pearson Correlation analysis

Table (7) Correlation Between the Impact of Implementing/Using Internet of Things Technology on Improving Tourists' Experience and Rating for the Internet of Things Application in Tourist Services at the Hotels

		Rating for the Internet of Things application in tourist services at the Hotels
the impact of implementing/using Internet of Things technology on improving tourists' experience	Pearson Correlation	.733**
	Sig. (2-tailed).	.000

As seen in the table (7), there is a positive and significant relationship between the impact of implementing/using Internet of Things technology on improving tourists' experience and rating for the Internet of Things application in tourist services at the hotels. The value of the Pearson correlation coefficient was (.733** - sig = 0.000). These results showed that there is a strong positive relation between the impact of implementing/using Internet of Things technology on improving tourists' experience and rating for the Internet of Things application in tourist services at the hotels. This positive correlation indicates that as the impact of implementing/using Internet of Things technology on improving tourists' experience increases, ratings for the Internet of Things application in tourist services at the hotels increase.

Table (8) Correlation Between the Impact of Implementing/Using Internet of Things Technology on Improving Tourists' Experience and Rating for the Internet of Things Application in Tourist Services at the Museums

		Rating for the Internet of Things application in tourist services at the Museums
the impact of implementing/using Internet of Things technology on improving tourists' experience	Pearson Correlation	.522**
	Sig. (2-tailed).	.000

As seen in the table (8), there is a positive and significant relationship between the impact of implementing/using Internet of Things technology on improving tourists' experience and rating for the Internet of Things application in tourist services at the museums. The value of the Pearson correlation coefficient was (.522** - sig = 0.000). These results showed that there is a medium positive relation between the impact of implementing/using Internet of Things technology on improving tourists' experience and rating for the Internet of Things application in tourist services at the museums. This positive correlation indicates that as the impact of implementing/using Internet of Things technology on improving tourists' experience increases, ratings for the Internet

of Things application in tourist services at the museums increase.

5. Conclusion and Recommendations

5.1 Conclusion

This research seeks to identify the impact of applying the Internet of Things on enhancing tourism services in Egyptian tourism destinations. Conclusion has presented the results from the questionnaire that was directed to visitors to Hurghada and Luxor City, whether foreigners or Egyptians. Where the Internet of Things (IoT) is considered a very important issue in designing and mentoring services in tourism and hospitality. The conclusions can be summarized as follows:

1. The Internet of Things makes communication faster and easier, leading to improved tourists' experience.
2. The application of IoT provides a more comfortable and personalized stay for tourists in hotels through smart thermostats, lighting systems, and temperature sensors.
3. Internet-connected devices help improve the tourist experience at the museums through the use of tablets to provide tourist information, interactive exhibits, and virtual tours.
4. The importance of using the Internet of Things is evident in its easily booking hotels, flights, trains, buses, and more at any time through internet-connected devices.
5. The results of the survey showed that there are many differences based on tourists' nationality, which means that this demographic characteristic is important in order to influence, to a great extent, tourists' opinions about the impact of implementing/using Internet of Things technology on improving tourists' experience.
6. The Internet of Things provides the user with all the information that facilitates searching and accessing the tourist attraction or service at any time and obtaining the necessary information.
7. The obstacles that faced the application of Internet of Things technology in tourist service are "public awareness of Internet of Things technology," "lack of infrastructure," and "privacy and security."

6. Recommendations

According to the study methodology and results discussion, the research presents some recommendations to the tourism ministry:

1. Updating data and services related to weather forecasts, which helps in planning tourist activities.
2. Developing a framework for collaboration between public and private initiatives to promote the development and exploitation of IoT platforms.

recommendations for suppliers of tourism services:

1. Following a training policy aimed at following up on technological developments like Internet of Things technology in the tourism field.
2. Adding awareness campaigns at the city level, in general, citizens must be involved and enabled to work continuously using digital technology.
3. Security procedures must be implemented at all layers of the IoT architecture.

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تطبيق تقنية انترنت الأشياء واثرها في تعزيز الخدمات السياحية في المقصد السياحي المصري

المستخلص

اصبح انترنت الأشياء اتجاه متطور في صناعة السياحة. ساعد انترنت الأشياء الوجهات وشركات الطيران والفنادق والمتاحف ووكالات السفر علي تخصيص خدماتها للسائحين والضيوف. علاوة على ذلك، فإنه يتمتع بالعديد من المزايا لهم، مثل توفير التكاليف وزيادة الإنتاجية وكفاءة أكبر وخدمات مخصصة ومتميزة. يهدف هذا البحث الي التعرف على اثر تطبيق تقنية إنترنت الأشياء في تعزيز الخدمات السياحية في المقصد السياحي المصري واستكشاف التحديات التي تواجه تطبيق إنترنت الأشياء في المقصد السياحي المصري. لتحقيق أهداف الدراسة، استندت منهجية هذا البحث على النهج الكمي. تم إنشاء استمارة استبيان وتوجيهها إلى عينة من السياح المصريين والأجانب في مدينة الغردقة والأقصر. تم توزيع الاستبيان على عينة عشوائية من أربعمائة (400) زائر للغردقة والأقصر، سواء أجانب أو مصريين. تم استرداد 353 (88.25٪) منهم. تم إجراء التحليل الإحصائي للاستجابات من خلال برنامج SPSS v25. تم جمع البيانات من خلال استبيانات تم إعدادها بطريقة تتناسب مع الموقف لتقليل الاستجابات غير الصحيحة. أظهرت النتائج أن العقبات التي واجهت تطبيق تقنية إنترنت الأشياء في الخدمة السياحية هي: "الوعي العام بتقنية إنترنت الأشياء"، "نقص البنية التحتية"، و"الخصوصية والأمان". ومن ثم اوصي البحث بضرورة تنفيذ إجراءات امنية في جميع طبقات بنية انترنت الأشياء.