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The Impact of Implementing the Internet of Things (IoT) on Customer Satisfaction: Evidence from Egypt

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Today, the Internet of Things (IoT) is considered a very important issue in designing and mentoring services in tourism and hospitality. In the digitalization era achieve customer satisfaction is becoming difficulty especially during the pandemic of Covid-19 in tourism and hospitality industry. For that, hotel and airline industry is seeking to innovate in the services it provides to customers. IoT is one such innovation, which has been reviewed in many studies and scientific research. This research aims to identify the impact of IoT on customer satisfaction in hotel and airline industry in Egypt. The methodology of this research is based on a quantitative approach to achieve its aim and to test the research hypotheses. A convenience sample technique was chosen to collect data from five-star hotels guests in Cairo and airlines passengers. Questionnaire forms are used for collecting data in the current research. The total number of questionnaires forms distributed was 400 forms out of which only 300 have been returned back with response rate 75%. SPSS (version, 26) software was used for analysis data. The results of this research reported that the IoT has a positive impact on customer satisfaction in hotel and airline industry. The results of this research were significant at $p \leq 0.05$, which indicated that IoT variables of application, security, and cost have a statistically significant impact on customer satisfaction. This research studied the impact of IoT on customer satisfaction in hotel and airline industry in Egypt. This study is useful for many researchers, academics, and practitioners in the tourism and hospitality industry, as it contributes to recognizing the importance of IoT and its enormous potential, especially in the hotel and airline industry.

Introduction

The concept of the IoT appeared in 1999 (Marek & Woźniczka, 2017). It played a major role in establishing a system for communication among different devices, opening communication channels not only among people but also between institutions and different networks (Abdel-Basset et al., 2019), In addition to collecting data through various devices and storing them. The IoT plays a major role in improving operational efficiency due to its superior ability to collect huge data (Song & Li 2020). The Internet is one of the most important inventions widely used by humans in various industries (Nasereddin & Faqir, 2019). Its main objective is to spread knowledge and facilitate communication around the world in various fields (Nasereddin & Faqir, 2019). The Internet is used for almost everything. Despite this, it is considered a huge challenge for many who work without it. In recent years, the IoT has emerged, leading to a new industrial revolution that will eventually change the way of live in the world (Li, 2021). On the other hand, the IoT is advocated in all aspects of life, especially after the Corona pandemic (Yu, 2021). The IoT is a growth of a network based on the Internet or is a huge network formed by connecting many sensors of information to the Internet (Verma et al., 2021). However, the IoT implementation process is still in the early stages of development and implementation, but it can solve the problem of accurate data collection in the tourism and hospitality industry (Yu, 2021). In addition, these technologies can be applied in many industries such as tourism and hospitality to reach convenient service delivery and customer satisfaction (Verma et al., 2021).

On the other hand, the IoT is considered a great revolution in a number of fields that will save time and effort (Hussein et al., 2018). Certainly, the IoT revolution will save time and effort. This makes the tasks easy to carry out as it enhances customer service (Vallabhuni, et al., 2020). The hotel and airline sector rely on heavily on providing excellent service quality to customer service, which leads to enhanced operational efficiency, increased profitability and customer loyalty (Nasereddin & Faqir, 2019). However, the study of Ratna (2020) reported that there are several obstacles to IoT implementation such as; security, costs, infrastructure and the standard of IoT. Therefore, this research aims to identify the impact of IoT on customer satisfaction in hotel and airline industry in Egypt. In order to achieve this aim, there are three objectives that must be identified: firstly, the impact of IoT application on customer satisfaction; Secondly, the impact of IoT costs on customer satisfaction; thirdly, the impact of IoT security on customer satisfaction.

Literature Review

Internet of Things (IoT)

Recently, our life becomes full of internet products and artificial intelligence for examples voice and face recognition and unmanned planes (Yerpude & Singhal, 2018). Applications of Information Technology (IT) concerning Artificial Intelligence (AI), virtualizations, cloud architecture and the IoT are included in all aspects of our life and all domains (Yang et al., 2021). The IoT is one of the Internet of Product. It consists of sensors and related technologies such as RFI (Yu, 2021). IoT is a huge number of gadgets connected and recognized on the Internet. IoT allows attributes to

be discovered and controlled remotely (El-Wahab & Ahmed, 2017). IoT is related to "the connection of things" using sensing devices or RFID tags to detect and information transmit and automatic control by communication technology (El-Wahab & Ahmed, 2017). The study of Hussein et al. (2018, p.2) defined IoT as "the process and technological framework that explains the interaction, interconnection and interdependence among data, people, and associated electronic objects over the internet". As well, the International Telecommunication Union (ITU) defined IoT as "a global arrangement for the information society, empowering advanced services by communicating (physical and virtual) things based on prevailing and developing interoperable Information and Communication Technologies (ICT) (Verma et al., 2021, p.2). On the other hand, Zhou et al. (2021) mentioned that the IoT is depending on using the internet as a platform and information-sensing devices such as radio frequency identification devices, global positioning systems, infrared sensors, and laser scanners to connect items to the internet in accordance with agreed protocols for information exchange and communication to achieve intelligent identification.

Consequently, IoT is rapidly expanding as a new concept in wireless communications. Its concept is prevalent in many aspects of our lives such as "Radio Frequency Identification (RFID) labels, actuators, sensors, and smartphones" (Faqir, 2019). IoT is like many other technologies that facilitate interactive communication with each other through unique addressing systems (Atzori et al., 2010). The study of Gulliksson and Riis, (2017) reported that IoT is "the ability to connect any electronic device (thing) to the Internet such as televisions, cameras, phones, and many other household appliances". IoT technology will help the business leader to take good care of their business, monitor what is happening in their business, and better understand how their customers are performing. By integrating information from the IoT with systems, businesses will be able to simplify their work structure and improve customer satisfaction, as well as, discover new business opportunities and forecast risks in the severely competitive marketplace (Faqir, 2019).

IoT Application, Costs and Security

The technology of the Internet of IoT is used around the world and it is implemented in different domains such as mentoring the product flow, supply chain, building management, healthcare and security framework (Sharma & Gupta, 2021). Tourism and hospitality customers are not looking for product quality only but also the technologies they use. IoT customer's perspective refers to; security, smart services (smart homes, smart buildings, smart cities, smart health, smart transportation, smart industry), healthcare and innovation (Ivanov et al., 2017; Lee, 2019). IoT is implemented in different sectors such as; cities, hospitality, tourism, healthcare and transportation. Tourism and hospitality industry is distinguished by its interrelation with many sectors due to its diversified activities as it deals with a variety of services such as transportation and museums (Lee, 2019; Vallabhuni, et al., 2020; Li, 2021). The main areas in tourism that the IoT can contribute are personalization and the improvement of the traveler experience (Sharma & Gupta, 2021).

In term of IoT security is considered the main issues and critical point in IoT application in tourism and hospitality industry. It must be overcome in order to

implementing the IoT the world. Faqir (2019, p.8) mentioned that “security play a main role in human lives, in IoT the security mean the defense of any electronic threats and hacks which may affect the IoT application and privacy of its users”. As well, security is considered the main issue for building and designing its applications in different domains. Customers and stakeholders will not use or adopt the application of IoT without guaranteed security and privacy of it (Faqir, 2019). The flexibility, cost and security of IoT applications play an important role for collecting and transferring data from different environments and affect decision making (Ahmed & Ahmed, 2019). Implementing IoT can help the organization to increase the efficiency and save time by reducing the staff interventions (Mostafa et al., 2019).

IoT in Hotel Industry

Information technology plays an important role in enhancing and personalizing the hotel guest experience (Sharma & Gupta, 2021). Planning the daily itinerary, searching the data, and finding activities and places close to the hotel are some of the things that can enhance guest’s experience. IoT applications in hotels are including smart room, automated service of check-in and check-out, room automation, and smart room maintenance (Basana et al., 2021; Verma et al., 2021). As well as, Yang et al. (2021) reported that the electronic key card that is sent to the hotel guest’s by phone to unlock the room is considered one of the main IoT applications implemented in hotels. Also, the hotels can monitor the health status of their guests by using the health history with sensors (Car et al., 2019). In addition, the security of guests and hotel is very important issue and requires more attentions by hotel management. The hotel can introduce detectors to carry out tasks and intelligent operations, for example, tracking a visitor's location, transmitting personal messages (Basana et al., 2021).

Several hotels around the world began operating their smart guestrooms that provide a customized feel of the room, and voice-activated tools that adjust and operate according to guests (Car et al., 2019). Virtual assistant interfaces help visitors by interacting with them and enhancing their stay experience. Sensors inserted into kitchens can check the expiration date of cooking and beverage essentials and help kitchen staff plan use accordingly (Kumar, 2020). A sensor integrated with AI can recommend recipes with items available to kitchen staff (Verma & Shukla, 2019). As well as, the smart hotel can also use the IoT for environmentally friendly management practices within the hotel, including recycling and reusing waste, energy saving, plant feeding and maintenance (Car et al., 2019). The IoT implemented in the hotel within the city can collect internal and external information, for example, the location of the guest, the availability of the required facilities for the guest, the climate condition, the street conditions and the traffic condition of the air terminals. This data may not directly affect the guests' stay experience, but it will affect the overall impression of the traveler (Stylos et al., 2021).

IoT in Tourism Industry

Tourism suppliers are now aware of the importance of technology in providing good service to their customers (Car et al., 2019). Smart tourism is relatively based on implementing modern technologies such as IoT. The study of Car et al. (2019)

reported that IoT has huge potential, particularly as a tool that can provide solutions in the process of creating and offering satisfied tourism products and services to customers. By advocating IoT technology, the tourism industry can achieve increased operational efficiency and provide more personalized guest experience (Ivanov et al., 2017). The application of this technology will fundamentally change business model (Thoomkuzhy & Thangiah, 2021). In this regard, this technology will enable airlines to save time and effort. In terms of increasing the quality of baggage handling during flights and facilitating the process of checking in large numbers of passengers (Car et al., 2019). Quality control is an essential as part of an interconnected data network and the Internet provides the opportunity to perform a full audit and identify certain action such as the potential for malfunction or damage (Choi, 2019). Additionally, IoT plays an important role within the airport, as it helps in allowing or denying passengers' entry or exist through sharing information between customs and immigration accordingly, this will make traveling more easily, reduce flight missed and transit period (Car et al., 2019; Ivanov, 2019).

Customer Satisfaction

Customer satisfaction is crucial for achieving profitability for different business through reducing operation costs and increasing profit (Choi, 2019). Customer satisfaction is the end result of evaluation procedures. It is the feedback of customer evaluation about the service provided, therefore, is ultimately determined according to psychological satisfaction according to consumer expectations (Faqir, 2019). If the original expectations of customers are met or even exceeded, customers tend to feel satisfied (Mostafa et al., 2019). For that, the majority of businesses try to understand the customers' needs and wants to keep them satisfied and happy (Nasereddin & Faqir, 2019). According to Yerpude and Singhal, (2018) there are other inherent advantages that an organization can gain through the use of IoT technology concerning achieving a higher level of customer satisfaction which leads to customer retention. In other words, customer satisfaction is directly attributable to the customer's interaction and the experience the customer receives. Thus, the benefits shown of using IoT technology are those that have a direct impact on the customer experience and dominate over customer satisfaction (White et al., 2017).

Conceptual Framework and Hypotheses Development

The research framework aims to illustrating the study variables (see Figure1). It shows that there is a relationship between the IoT variables (application, cost and security) and customer satisfaction in hotel and airline industry. This research developed and tested the following hypotheses:

Hypothesis a1 (Ha1): IoT application will positively impact on customer satisfaction.

Hypothesis 01 (Ho1): IoT application will not positively impact on customer satisfaction.

Hypothesis a2 (Ha2): IoT costs will positively impact on customer satisfaction.

Hypothesis 02 (H02): IoT costs will not positively impact on customer satisfaction.

Hypothesis a3 (Ha3): IoT security will positively impact on customer satisfaction.

Hypothesis 03(H03): IoT security will not positively impact on customer satisfaction.

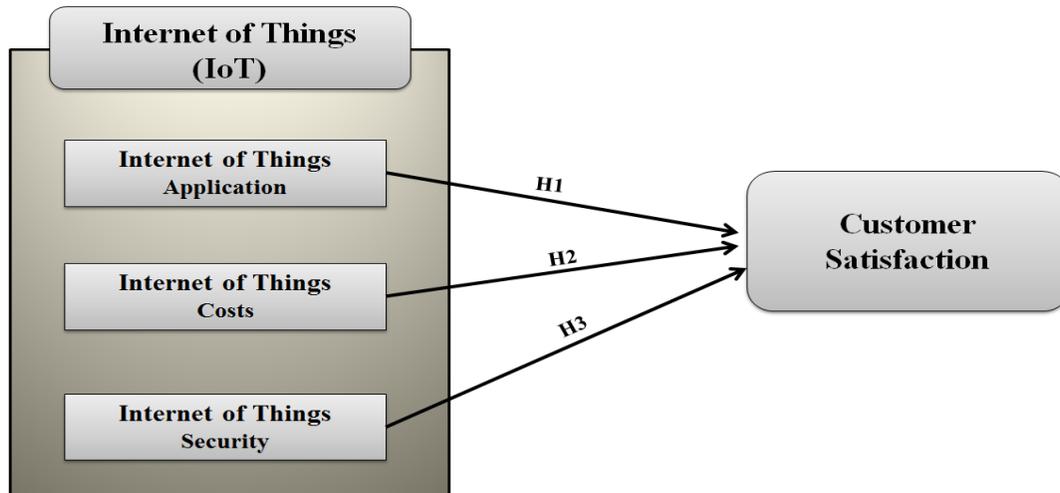


Fig.1. Conceptual framework and hypotheses development

Methodology

The research used a quantitative approach. Data was collected through distributing questionnaire forms to identify the impact of IoT on customer satisfaction at Five-Star hotel in Cairo and airline industry in Egypt. Sample of 18 Five-star hotel guests in Cairo selected to be the sampling frame (EHA, 2021), and EgyptAir passengers. The researchers selected Cairo to be the sampling due to their geographical convenience for the researchers and it delivers a unique hospitality service, also EgyptAir which is the largest airline company in Egypt. A convenience sample technique was chosen in this research. A pilot study was conducted among 20 participants from hotel guests and airline passengers to ensure the reliability of the initial survey and to explore any potential misunderstandings among respondents regarding the wording of attributes or the length of the questionnaire. Questionnaire form involved 7 sections including respondents' demographic profiles, the previous experience in Applying IoT, Facilities of IoT, application of IoT (7 attributes), IoT cost (6 attributes), IoT security (5 attributes) and customer satisfaction (14 attributes). The questionnaire attributes were modified from Nasereddin and Faqir, (2019), Faqir et al. (2019) and Sharma and Gupta, (2021). All study variables were measured by a five point of Likert scale ranging from (1) strongly disagree to (5) strongly agree. Questionnaire forms were distributed online. Total number of questionnaire form distributed was 400 forms out of which only 300 forms have been returned back and valid to analyze with response rate 75%. SPSS (version, 26) software was used for data analysis.

Results and Discussions

Validity and Reliability

In terms of the validity of this research, the questionnaire was piloted on a sample of 10 guests from hotel and 10 passengers from airline to check the content validity. The participants' comments have been considered in the final form of questionnaire. The reliability was checked by using the Cronbach's Alpha coefficient see table 1.

Table 1

Cronbach's alpha of IoT variables and customer satisfaction

Variables	No. of attributes	Cronbach's Alpha
Application of IoT	7	0.850
IoT cost	6	0.790
IoT security	5	0.830
Customer satisfaction	14	0.810

As noticed from Table (1) application of IoT achieved the highest reliability score ($\alpha = 0.85$) for seven attributes, followed by IoT security ($\alpha = 0.83$) for five attributes, then customer satisfaction attributes had the reliability value of ($\alpha = 0.81$), and IoT cost had a reliability value of ($\alpha = 0.79$) for six attributes.

Descriptive Analysis

The following table (2) illustrated participants' profile regarding, (60%) of the respondents were males while (40%) of them were females. (38.3%) of the respondents were aged between 20-34 years, (33.3%) of the participants were aged between 35-44 years and (28.4%) of the participants were aged between 45-60 years. The largest groups (55%) of respondents were Egyptians. the second group (45%) of respondents were foreigners. More than half of the respondents (65%) held university degree, followed by postgraduate education (35%).

Table 2

Descriptive statistics of the participants (n=300)

Attributes	Category	Frequency	Percent
Gender	Male	180	60
	Female	120	40
Age	20-34	115	38.3
	35-44	100	33.3
	45-60	85	28.4
Nationality	Egyptian	165	55
	Foreigners	135	45
Education level	University degree	195	65
	Postgraduates	105	35

IoT Facilities

The results of the research indicated that there are many facilities for the application of the IoT that helps customers to use the services and facilities available in hotels and airlines. The results showed that (68%) of the participants possessed smartphones followed by (63.3%) who preferred e-gate. (61%) of the participants used free WIFI. (59%) of the participants were familiar with e-payment facilities. The table also declared that (55%) the participants were accustomed to self-check in. The lowest rates of the participants (33%, 31.6%, 30%, and 26.8%) were expert in using robots, automated service, virtual reality and sensors respectively (see Figure 2).

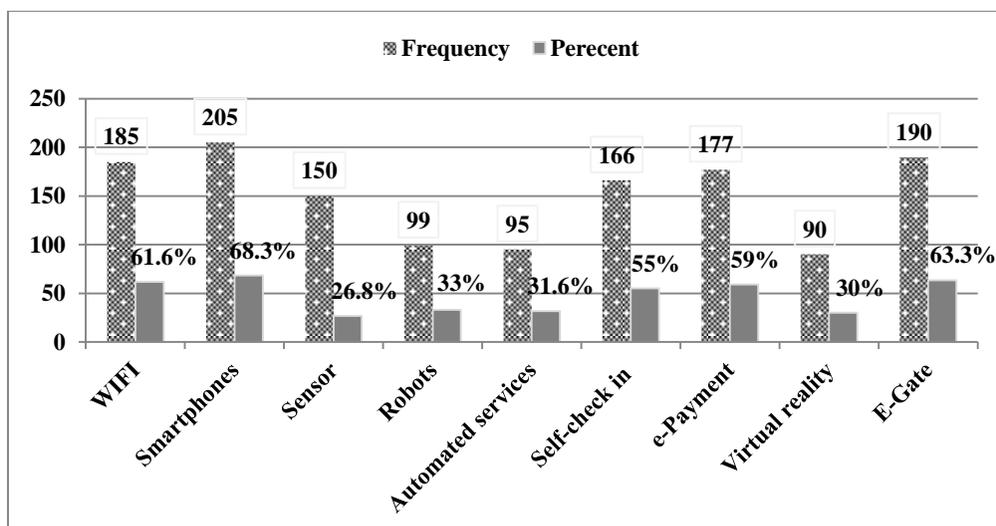


Fig.2. IoT facilities

Independent Variables

Application of IoT

The result in the following table (3) showed that, the mean scores for application of IoT in hotel and airline industry range from 3.66 to 4.62. The standard deviations for the responses to the attributes ranged from 0.51 to 0.83 displays a reasonable level of variability. The results reported that the grand mean of the application of IoT was 4.12, ranging from (1) strongly disagree to (5) strongly agree at Likert scale, this mean is situated in the choice number (4) agree. These mean statistics explained the agreement of the participants for application of IoT in hotel and airline industry. The research results matched with the literature review and reflected that study of (Sharma & Gupta, 2021; Pelet et al., 2021) who reported that the majority of tourism and hospitality suppliers provide facilities for implementing IoT.

Table 3

Mean and standard deviation of IoT application

Application of IoT	Mean	Std. Deviation	Rank
1. IoT services provide increased scalability.	3.75	0.83	6
2. IoT facilities are suitable for all customers.	4.21	0.62	4
3. Wi-Fi connections cover all areas.	4.62	0.51	1
4. Mobile connections provided are strong.	4.33	0.72	3
5. The mobile application helps to facilitate the available customer services.	3.89	0.52	5
6. IoT applications are available and easy to use.	3.66	0.72	7
7. Using the offered IoT services is easier than doing it with employees.	4.42	0.76	2
Total statistics of all variables	4.12	0.98	

IoT Costs

The result in the following table (4) showed that, the mean scores for IoT cost in hotel and airline industry range from 3.70 to 4.12. The standard deviation for the responses to the attributes ranging from 0.65 to 1.12 displays a reasonable level of variability. The results reported that the grand mean of IoT costs was 4.05, ranging from (1) strongly disagree to (5) strongly agree at Likert scale, thus, this mean is situated in the choice number (4) agree at Likert scale. The study results matched with the Mostafa et al. (2019) who mentioned that implementing IoT can help the organization to increase the efficiency and save time by reducing the staff interventions.

Table 4

Mean and standard deviation of IoT costs

IoT Costs	Mean	Std. Deviation	Rank
1. IoT is very important for reduce cost.	4.10	0.93	2
2. The mobile application is used to manage IoT devices.	3.83	1.12	5
3. IoT service provides cost savings.	4.02	0.76	4
4. IoT is a time saver.	4.12	0.65	1
5. The use of mobile applications helps reduce the cost to the customer.	4.05	0.82	3
6. IoT offers financial advantages through automated energy savings.	3.70	0.69	6
Total statistics of all variables	4.05	0.79	

IoT Security

The results in table (5) showed that, the mean scores for IoT security in hotel and airline industry ranging from 3.77 to 3.99. The standard deviation for the responses to the attributes ranged from 0.75 to 1.02 displays a reasonable level of variability. The results reported that the grand mean of IoT security was 3.91, ranging from (1) strongly disagree to (5) strongly agree at Likert scale, this mean is situated in the choice number (4) agree at Likert scale. The study results reflected the literature review, considering the importance of IoT security in building and designing its applications in different domains (Sharma & Gupta, 2021; Pelet et al., 2021). Customers and stakeholders will not use or adopt the application of IoT without guaranteed security and privacy of it (Faqir, 2019)

Table 5

Mean and standard deviation of IoT security

IoT security	Mean	Std. Deviation	Rank
1. Personal device security is acceptable.	3.93	1.02	3
2. Personal device passwords are updated regularly.	3.99	0.99	1
3. Customer's personal information is secured.	3.89	0.87	4
4. IoT device software is updated regularly.	3.98	0.75	2
5. IoT software is more secure.	3.77	0.82	5
Total statistics of all variables	3.91	0.85	

Dependent Variable***Customer Satisfaction***

Table 6 presented the mean, standard deviation of customer satisfaction. The results in the following table also showed the mean scores for customer satisfaction ranged from 3.75 to 4.10. The standard deviation for these attributes ranging from 0.84 to 1.11, displays a reasonable level of variability. The results also reported that the grand mean customer satisfaction was 3.90, which means that the most common answer was being closed to value (4). These mean statistics suggest the agreement of the participants for studies attributes related to customer satisfaction. According to Sharma and Gupta (2021) customer satisfaction is considered one of the most important indicators to the success of IoT application in tourism and hospitality industry. As results, all businesses are seeking to understand what their customers need to keep them happy and satisfied (Nasereddin & Faqir, 2019). So, the results of the current study were consistent with the literature review, which reported that the IoT directly impacts on customer satisfaction.

Table 6

Mean and standard deviation of customer satisfaction

<i>Customer satisfaction</i>	Mean	Std. Deviation	Rank
1. IoT applications are easy to use.	4.10	0.84	1
2. IoT applications are effective and useful.	3.85	0.81	9
3. I prefer dealing with an organisation implemented IoT applications more than others.	4.09	1.01	2
4. Most people I know use IoT applications.	3.81	1.06	11
5. A wide range of IoT services are available for use.	3.75	1.05	14
6. The use of IoT applications will improve the service.	3.92	1.13	6
7. Going through the service was quick and easy.	3.99	1.10	3
8. I will continue to visit the organisation using IoT facilities.	3.88	1.03	8
9. I will recommend the organisation which use IoT facilities to my friends.	3.98	1.07	4
10. I am satisfied with the services provided by the organisation using IoT.	3.78	1.02	13
11. IoT services meet my needs.	3.95	1.11	5
12. The staff helps the elderly and people with special needs.	3.83	0.87	10
13. The staff is friendly and facilitates your needs.	3.80	0.91	12
14. Using IoT will help improve services and performance.	3.89	0.87	7
Total statistics of all variables	3.90	1.07	

Testing the Research Hypotheses

Hypothesis a1 (Ha1): IoT application will positively impact on customer satisfaction.

Hypothesis 01 (Ho1): IoT application will not positively impact on customer satisfaction.

Multiple regressions are used for testing the first hypothesis. The results in the following table (7) showed the R, R², adjusted R², and the standard error of the estimate, which can be used to determine how well a regression model fits with the research data. The determination coefficient (R²) was (0.882) with a percentage (77%), this means that the changes that occur in the dependent variable are due to the changes that occur within the independent variable. Additionally, regression analysis in the following table showed that the constant coefficient B = 2.032, Sig. = 0.002 at a significant level lower than (0.05). Therefore, the study refused the null hypothesis and accepted the alternative one stated that the IoT application positively impact on customer satisfaction.

Table 7

Multiple regression analysis of IoT application

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.260 ^a	0.882	0.077	0.25163

a. Predictors: (Constant), application

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.322	0.486		9.379	0.012
	application	2.032	0.566	0.087	7.352	0.002

a. Dependent variable: customer satisfaction

Hypothesis a2 (Ha2): IoT costs will positively impact on customer satisfaction.

Hypothesis 02 (H02): IoT costs will not positively impact on customer satisfaction.

Multiple regressions are used for testing the second hypothesis. The results in table (8) showed the R, R², and adjusted R². The determination coefficient (R²) was (0.768) with a percentage (86%), this means that the changes that occur in the dependent variable are due to the changes that occur within the independent variable. Additionally, regression analysis in the following table showed that the constant coefficient B = 1.523, Sig. = 0.000 at a significant level lower than (0.05). Therefore,

the study refused the null hypothesis and accepted the alternative one stated that the IoT costs positively impact on customer satisfaction.

Table 8

Multiple regression analysis of IoT cost

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.305 ^a	0.768	0.086	0.14654
a. Predictors: (Constant), costs				

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.131	0.573		6.680	0.001
	costs	1.523	0.374	0.096	10.271	0.000
a. Dependent variable: customer satisfaction						

Hypothesis a3 (Ha3): IoT security will positively impact on customer satisfaction.

Hypothesis 03 (H03): IoT security will not positively impact on customer satisfaction.

Multiple regressions are used for testing the third hypothesis. The results in table (9) showed the R, R², and adjusted R². The determination coefficient (R²) was (0.655) with a percentage (75%), this means that the changes that occur in the dependent variable are due to the changes that occur within the independent variable. Additionally, regression analysis showed that the constant coefficient B = 1.456, Sig. = 0.002 at a significant level lower than (0.05). Therefore, the study refused the null hypothesis and accepted the alternative one stated that the IoT security positively impact on customer satisfaction.

Table 9

Multiple regression analysis of IoT security

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.175 ^a	0.655	0.753	0.24427
a. Predictors: (Constant), security				

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	0.898	0.134		7.698	0.000
	security	1.456	0.056	0.123	8.799	0.002

a. Dependent variable: customer satisfaction

As mentioned earlier, the results of this research showed that there is statistically significant impact of IoT variables on customer satisfaction in hotel and airline industry, this refers to the rejected of the current study null hypotheses and acceptance the alternative one for all research hypotheses. Consequently, IoT plays a major role in improving operational efficiency (Song & Li 2020). It is considered one of the most important inventions widely used by humans in various industries (Nasereddin & Faqir, 2019). On the other hand, the study of Yerpude and Singhal (2018) reported that IoT helps to save time and effort this makes the tasks easy to carry out as it enhances service quality (Hussein et al., 2018; Vallabhuni, et al., 2020). The hotel and airline suppliers rely heavily on providing excellent service quality to customer (Car et al., 2019), which leads to enhanced operational efficiency, increased profitability and customer loyalty through implementing IoT in their operation (Ahmed & Ahmed, 2019; Nasereddin & Faqir, 2019).

Conclusion and recommendations

This research seeks to identify the impact of IoT on customer satisfaction in the hotel and airline industry in Egypt. The results showed that the IoT dimensions (application, costs, security) have a positive impact on customers' satisfaction. It showed that IoT makes service easy and it has many advantages for the hotel and airline industry such as, reducing costs, improving service quality, increasing staff efficiency and achieving customer satisfaction. Additionally, the results showed that the IoT in the hotel and airline industry has enormous potential for implementation. Since the IoT allows devices to connect at the same time, it presents many opportunities in the hotels and airlines industry. Furthermore, IoT technology can improve service quality in the hotels and airlines industry. The current study contributed to the literature reviews and presents a new idea related to using IoT variables (application, costs and security) and its impact on the customer satisfaction in the hotel and airline industry in Egypt. This research is useful for many researchers, academics, and practitioners in the tourism and hospitality industry, as it contributes to recognizing the importance of the IoT and its enormous potential, especially in the hotel and airline industry. As well, this research can be used by other sectors of tourism and hospitality through the implementation of different IoT services. This study only includes data gathered from guests in Cairo Five-star hotel and EgyptAir passengers. Therefore, future research should address more hotels and other airline company in Egypt; it also should undertake to test the findings of this study.

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تأثير تطبيق إنترنت الأشياء (IoT) على رضا العملاء: شواهد من مصر

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المخلص	معلومات المقالة
<p>تهدف هذه الدراسة الى التعرف على تأثير إنترنت الأشياء (IoT) على رضا العملاء في صناعة الفنادق والطيران في مصر. اعتمدت هذه الدراسة على المنهج الكمي التحليلي لتحقيق أهداف الدراسة. حيث تم استخدام اسلوب العينة المناسبة (A convenience sample) من عملاء الفنادق الخمس نجوم بالقاهرة والمسافرين. وتم جمع البيانات الميدانية من خلال استمارة استبيان لقياس الهدف من البحث واختبار فرضياتها حيث تم توزيع ٤٠٠ استمارة استبيان وبلغ عدد الاستمارات الصالحة ٣٠٠ استمارة بمعدل استجابة ٧٥٪. وتم استخدام برنامج SPSS (الإصدار، ٢٦) لتحليل البيانات بعد التأكد من صدق وثبات البيانات، تم إجراء التحليل الوصفي والتحقق من ارتباط المتغيرات واختبار التأثير بواسطة الانحدار المتعدد. أشارت نتائج الدراسة الى أن إنترنت الأشياء (IoT) له تأثير إيجابي على رضا العملاء في صناعة الفنادق والطيران. وأظهرت النتائج أن متغيرات إنترنت الأشياء المتمثلة في التطبيق والأمن والتكلفة لها تأثير هام من الناحية الإحصائية على رضا العملاء. ساهمت هذه الدراسة في التعرف على تأثير إنترنت الأشياء (IoT) على رضا العملاء في صناعة الفنادق والطيران في مصر. وتعتبر هذه الدراسة مفيدة للعديد من الباحثين والأكاديميين والممارسين في صناعة السياحة والضيافة، حيث إنها تساهم في التعرف على أهمية إنترنت الأشياء وإمكاناتها الهائلة، خاصة في صناعة الفنادق والطيران.</p>	<p>الكلمات المفتاحية إنترنت الأشياء (IoT)، رضا العملاء، الفنادق، صناعة الطيران، مصر.</p> <p>(JAAUTH) المجلد ٢٢، العدد ٢، (يونيو ٢٠٢٢)، ص ٣٦٥-٣٨٠.</p>