

RE-MODELLING THE HOSPITALITY BUSINESS USING ARTIFICIAL INTELLIGENCE AS A STRATEGIC TOOL

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Abstract

There is a palpable rise of artificial intelligence (AI) application in the hospitality industry. This phenomenon is a potent competitive equalizer allowing hospitality firms to stay competitive with the changing dynamics of operative aspects. Internet of things (IoT) enabled connection of motion sensors, room control, and smart voice control are a few of the AI applications that can change hotel functions. This can relieve hotel staff from time-consuming chores. The aim of this study is to identify the usage of Artificial Intelligence in the hospitality industry. Also to see how far it is successful in Asia as compare to other countries worldwide. AI's power to enhance communication flow both inside and outside of hotels between service and guests can transform overall interactions with guests. Despite the benefits, the future cannot rely completely on hotel staff completely replaced by AI and chatbots. Instead, information management and AI-powered virtual assistants are functioning as a complementary factor in synchronizing the operations of critical elements that in turn create a streamlined hotel management system. The researcher has done a thorough literature review and found that very few people have worked in the area of usage of Artificial Intelligence as a tool in the hospitality industry.

Keywords: *Competitive Equalizer, Human Factor, Internet of Things, Operational Efficiency, Synchronicity of Information*

Introduction

The Artificial Intelligence is deploying in many industries ranging from manufacturing and service industry. The usage of Artificial Intelligence in manufacturing industry is in the field of supply chains, by way of predicting the market changes. The information get through the technology is helpful in optimizing the inventory, staffing, energy consumption and raw material supply. In the service sector artificial intelligence is the major source of innovation, various tasks being performed by the robots and thus reshaping the service sector, as a biggest threat to the humans. Digital technology is rapidly contributing a gamut of features to the tourism and hospitality industry (Martin, 2018). The tourism sector benefits from the digital revolution as the tourism business is a collaboration between a wide range of products and services.

The tourism space revolutionized by the novel and creative ideas coming through digital world. The technological space of tourism industry mainly affected by the peer-to-peer communication. Sales and marketing technologies of the tourism industry have opened up new horizons by introducing smart devices used for scheduling, administration and finances. Innovative results through booking sites stored on cloud, imparting evidence, and through digital framework experience, which unwrapped new trends in tourism industry.

There is a growing demand of special customized offers to aware customers solve their personalized needs as against of mass tourism and the customized solutions are very much popular these days in travelling line of business. Due to accessibility of detailed information of the consumers and possibility of tracking their behaviour by the tourism market stakeholders, it is possible to come up with the personalized products and services for their consumers. The hospitality industry is launching new offers based on the demographic profiling of the existing customers and the past turnover figures stored in cloud based CRM client database, useful for flexible follow-up technique. The present Tourism Industry is fast enough in adopting the technology based app, robots, and Artificial Intelligence based applications. AI certainly enhanced the pragmatic services but it cannot outstrip the human factor which is an important element of pragmatic services.

As per the study of Horsnell (1998), for the betterment of an organization's health, managers should provide quality services to their customers, and the legacy of probable service breakdown which demand the better services (Gu et al., 2019).

Literature Review

Personalized Tourism Services through Sharing Economy

As per the pricing theory digitization, suggested 10 years before, based on the principle of giving products or services for free rather offer depending

upon shared goods and resources (Anderson, 2009). The ongoing concept of shared economy, helps the owner to consume the capacity to its full use and also resulted the benefits to the society at large (Sundararajan, 2014). Tourists and the users work as collaborators for the various tasks carried out at business level by adopting the digital platform as strategy. The paper of Gu, Sheng and Yuen (2019), described that improvement in the local hospitality business is possible by push and pull factors both and drive the external demand exponentially. Push factors in Tourism Industry are derived through internal motives or causes due to which any tourist search the destination and technology helps in reducing this activity by way of providing the readymade solutions. Pull factors aroused through destinations and forces the tourist to go about it without any promotional efforts. Though Tourism Industry is revenue driving industry but the push and pull factors play a major role in the determination of the price of the Tourist services which affects the profitability of any company. With the help of Artificial Intelligence the data of Tourists can be churn out and provide a meaningful information to the travelers.

The paper of (Nicolau, 2019) Juan highlights the degree of loss aversion with respect to price and bundling strategy. In his paper the empirical study shows that the travellers booking the flight independent of hotel booking are more loss averted in comparison of those who consider it as a package deal (i.e. flight and housing booking united). That is the reason marketers tend to offer a bundle of offerings to the customers rather than a single stop solution in Tourism Industry.

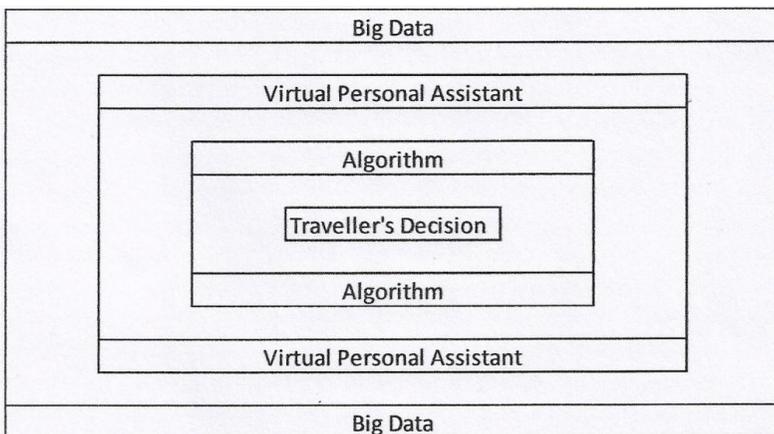
Scope of AI, VR/AR and Block Chain in Tourism Industry

Several times information of tourists with respect to their positive experiences, photos, and good remembrance for those destinations they had voyaged in past are available in abundance but it is difficult to convert in a possible format by computers or by the present technologies. Computer work on the Coding Solutions, for stocking management and amalgamate the existing evidence fruitfully by artificial intelligence. Experts of the industries, have an opinion that all the product development strategists are concentrating on the usage of objects and equipment accessible by internet. The advanced technology in the devices, capable of doing the two way communications which will appropriate for IoT (Internet of Things) structure. These future devices will be enhancing the user experience as the data handling is vigorous, custom-made diversity and entail adequate decision making power at the time of dire needs.

In the past the travel and tourism industry was entirely dependent on the personal relationship and interconnections among the various entities. The

traveller's decisions were undertaken by the few International tourism and travel enterprises, but the new travel suggestion Websites (Expedia, Orbitz, Kayak etc) are developed with an aim of making the traveller's decision easier and simpler.

New travel packages, which includes car rentals, reviews of past travellers, provides online offer packages which are user-friendly and gaining popularity rapidly in the upcoming time. The former tourism business model was working as a lonely planet, while the new ones follows the recent trends and wholesome in nature. A severe competition has commenced for the tourism recommendation as the Google is actively doing the tourism company websites ranking in internet searches along with price comparison of various offers on the online travel agency (OTA) system. The message started floating in two ways after the cookies 2.0 system has placed; and then after the consumers have become a part of the system which is essential in today's system. The businesses which are considering the customer's demands in detail and implementing in their business model, would become successful in the long-run. The progression of digital services and it's usage in travelling decisions, an information with respect to the preferences of an individual user, its identity and adjustment process is basically stored. The artificial based decision-making process replaces all the previous crucial aspects by a virtual personal assistant (VPA). The virtual personal assistant (VPA) use the big data system of individual's footprints and consumer preferences and apply algorithm on it to offer the optimal and personalized solutions to the consumers (as shown in the Fig. 1).



Source: (Zsarnoczky, 2017a).

Fig. 1: Traveller's Decision Framework

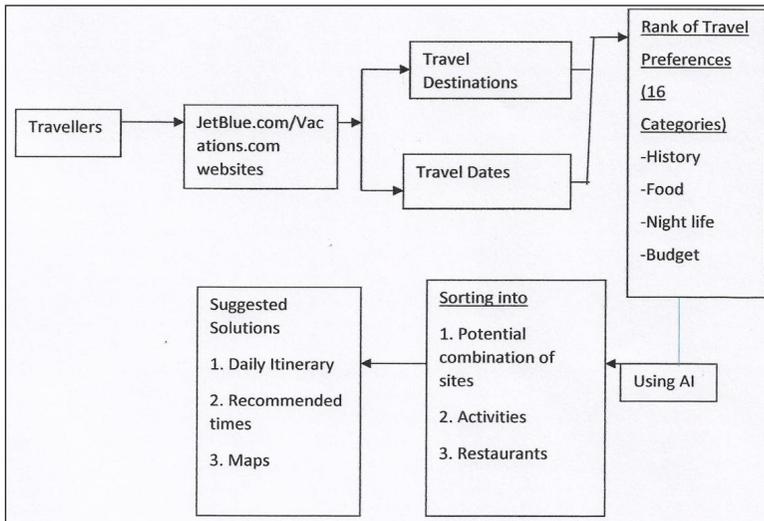
As the time changes in the world of tourism, there will be a paradigm shift in the consumer's demand and priorities, the tourism world would be altogether different from the present scenario.

The virtual reality (VR) will create an optional tourism space with the help of "glass" and the consumer would be far away from the real world. Similarly, the different technological solutions provided by the augmented reality (AR), and through augmented reality, actual life space is portrayed via digital elements. The latest technological solutions and innovations in the use of tourism, offered by VR and AR are inter-related by an advanced mechanism of payment also valid to travel industry as well.

Block chain technology used in payment system run through shared database, and all the new entries (data block) in the database is continuously recorded by it, so that counterfeiting in the data and alteration of data completely avoided. In the block chain system, one block keeps the record of the transactions and immediately result is computed with the help of stored programs. For instance, in case of buying crypto currency and transferring it to other country, so both the parties need not bear any financial loss due to exchange rate fluctuation as the transaction happen only in one minute as compared to couple of business days consumed during the few years ago. The block chain concept will revolutionize the payment options for the tourism agency as well as the consumers both. The benefits of using the block chain are enumerated as free of currency rates plus the process is independent from the intermediaries like other past payment options. As soon as the adoption of block chain comes into picture or reach towards its maturity stage, the intermediaries such as Agora, booking.com and Airbnb would face drastic reduction in their market shares because traveller will start dealing their transactions directly (Businesswire Report, 2017).

The two companies JetBlue and Utrip have partnered for creating a personalized vacation itinerary, which includes details of flight booking, hotel and other services through online portal system. The planning of travel has changed altogether due to artificial intelligence usage. JetBlue in collaboration with Utrip is transforming the vacation planning with the help of human and technology touch both. Due to an integrated effort of both the companies, it provide travellers an amazing experience, to discover the US destinations, through its online facility. Actually Utrip has a vast database of 150 tourist destinations, where all the services managed by local area people. Once any traveller register request about his/her travel plan, the jetblue.com start searching that destination with probable dates of travelling and travel preferences ranked against 16 different categories like history, food, night-life and budget so on so forth. Then AI algorithm developed by machine learning

scientists does the sorting jobs into probable grouping of sites, activities and restaurants, and base on this suggesting a solution about daily itinerary, recommended times and maps.



Source: Developed by Author.

Fig. 2: Traveller's Planning through JetMore and Utrip Online

(Kirkland, 2018) Kirkland has mentioned in his paper that the experience gets improved with the use of technology like AI. According to him, his company is investing in AI to restructure the processes in order to improve the purchasing decisions with respect to timing. Both front (hotel's digital presence) and back processes will get better off with the help of AI. Predictive analytics is working at the back of the pictures to get an output in the form of offerings to the travellers. Truly with an application of machine learning on the stored data set helps to discover the pattern of choices of the travellers and give the meaningful insights to them. The perspectives of hoteliers are different from the consumers as they are keener to apply AI for maximizing the revenue. Each business houses are working on successful revenue management on 365 days concept to earn better revenues. Having a predictive analytics in place, it is possible for them to keep price reasonable, chasing past figures of travellers, and based on the visible pattern future plans are recommended and termed as influential assistant in the world of AI. Normally with a traditional system, managers are not reacting immediately after getting the data and there is a time lag appeared in making a conclusion out of it though a person is working as a full time revenue manager. So there are chances of having a time

lag between the observing the data and finally using it for useful insights for the travel pattern and other decisions.

The hotels are addressing this issue with an “Autopilot” feature, which offers the organization some power to build uncommon alterations. Discovering a pleasing guest facing use through artificial intelligence is a lasting challenge for the hospitality industry.

The chat-bots, uses the concept of predictive analytics, to respond to travellers, solving their questions and offering suggestions, when provoked by them. Stephan Pratt, CEO at AI developer Noodle.ai, commented, “Computation beyond a human mind, involve complexity, can be best sorted out through AI.” So AI is working well for large size organizations, not for one hotel operation. With the help of AI, all sort of prediction of targeted promotions, pricing and anticipation of customer needs at scale is possible. Another viewpoint given by Angie Hospitality, CEO and founder of Voice and touch interface developer, Ted Helvey, also observed that guests of hotel demand customized services and enriched experience while staying in the hotels. This is otherwise not possible to offer consistently, with the use of current technology. The personal assistant device, able to respond on voice and touch interactions, developed with the use of guest data repository and finally provide customized solutions to the travellers.

Many hotels are finding a big challenge as to transform its present legacy system into AI based predictive system, result a lagging performance of many hotels.

The company working as mobile and channels, described the difficulty they are facing with the legacy system as many times, end up in offering concessions in bits and pieces. To overcome this problem, rationalized, “bundle”, of offerings which will have the combined effect of mobile and web solutions by software products. This offer will give a wholesome package to the travellers. Just contrary to it if any company is working with the legacy system then it is bound to offer discount in the offerings due to the silo working mechanism of every department of the hotels. Therefore, with the use of AI, company can talk in totality at the time of dealing with the travellers just like a “single brain” working in the human body. Though AI is an emerging tool hoteliers should think of investing in it, because the future business would be driven through it.

As against the notions of few, the travel industry will still run with the support of human being as the new technologies like machine language and

Artificial Intelligence is not complete on its own. Through AI the repeatable actions are going too done with fewer hurdles and the hotel staff can devote their time in higher end jobs while serving the travellers (TechLabs, Ebook).

Refurbish Balanced

The customer experience and internal processes at hotel and hospitality industry is balanced to refurbish it with the use of AI. The old processes need to reengineer with the advance technology like AI, AR and VR. The use of virtual personal assistant is progressing very fast and the slowly the hotels and tourism industry is adopting the technology as compare to humans for the daily routine tasks.

Methods

After extensive literature review, author has found that very limited researchers have worked on Artificial Intelligence in hospitality industry and its impact on profitability of the company. To see the aspects of Artificial Intelligence in Tourism and the hospitality industry, researcher has mailed the structured questionnaire to the hotels located in Asia. These hotels are dealing with both national and international tourists. Thereafter researcher has categorized the hotels in 3, 4 and 5 star hotels because as per the common perception and actual observation has realized that the normal hotels generally don't prefer much usage of technology like Artificial Intelligence in their daily operations. The data gathered through questionnaire is analysed by correlation coefficient in order to establish the relationships among the variable associated with the customer decisions while finalizing the destination. Further researcher has used regression analysis for the development of the model considering the usage as dependent variable and identification of the independent variables with a model having high degree of coefficient of determination.

Research Issue

The basic objective of the researcher was first to see the present status quo of 3, 4, and 5 star hotels, then identify the application of Artificial Intelligence in daily operations plus whether the technology can replace the human being completely or partially. To continue the same objective researcher has further gone to analyse the penetration level of technology and how to increase it in the hospitality industries through mobile apps, chat bots and voice assistant and so on so forth. The new technology Artificial Intelligence not only help in discovering the pattern of the travellers while deciding the destination, hotels but also support in predicting the potential customer's travel pattern along with the timeline.

Research Design

To target national and international hotels plus the travelling agencies dealing with national and international tourists both, descriptive research based on cross-sectional study. To get an insight of the operational part of hotels, a survey was administered through structured questionnaire in Western Region of Asia. The scholar has focussed on five causing aspects viz.; location of hotel, the type of technology used in process operations (viz. ERP, mobile APP and artificial intelligence), contribution of AI towards enhancement of customer management, operational efficiency and revenue, AI is helpful in capturing and retaining customers. The aim of this study is to develop a model based on the findings of the empirical work. The model will ultimately help the hotel and travel agencies to predict the future requirements of the prospective customers.

Results

With the help of questionnaire, cross-sectional data collected (refer the Annexure) sent through mail to the hotels and travel industries of Western region of Asia. Approximately 200 sample data collected and through snowball sampling samples are chosen for the analysis. While doing survey many of the respondents have not replied back and because of which the actual sample size reduced from 200 to 166 (83% response rate).

Analysis

The 166 sample data collected through mail survey analysed through SPSS. The procedure used for analysis is correlation coefficient to show the relationship of the variable associated with the usage rate of AI. Then best fit model is achieved by multiple regression considering five variables present in the question.

The given data set of 166 hotels classified based on category and location of hotel as shown here in Table 1.

Table 1: Classification of the Hotels based on the Category and Location

Sr. No.	Category	Location	%
1	3 Star	National	35
2	4 Star	International	45
3	5 Star	International	20

Source: Computed by author.

As per the table above it concluded that out of the sample of 166, 65% of the hotels located overseas participated in the survey and ready to share the information related to the usage of AI.

The respondents who have participated in the survey, running the hotel business for more than five years and belonging to the Five-Star categories. It is clearly visible that most of the hotels surveyed here were using technology in their operations.

Table 2: AI as an Application in Various Functions

Sr. No.	Use of AI to Streamline Operations Such as	10%	30%	50%	70%	100%	Total
1	Responds to Travellers Anticipating customer needs	90	50	30	20	10	166
2	Use of personal assistance device - like voice	20	95	45	25	15	166
3	Room service orders	25	30	95	15	35	166
4	Guests find answers to question about their reservations	5	10	35	55	95	166
5	Use of robots to improve the hotel services	85	30	45	25	15	166

Source: Computed by author.

The data fetched against the AI application for various functions with regard to travellers as shown in the Table 3, first checked through correlation coefficients.

From the table above it is clear that usage is positively correlated (0.984, $p = 0.002$) with answers about their reservations. Plus responds to traveller's anticipating customer needs are also positively correlated (0.909, $p = 0.032$) with robots in the services of hotel. Other than the above two variables, all variables are either having low or negative correlation, implies there is no significant relationship between them. From the table above, the usage of AI is negatively correlated (-0.928, $p = 0.023$) with responds to travellers anticipating needs of the consumer. So, more work is required to exploit the full utilization of technology like AI in hospitality industry. Other variables are not at not all significantly correlated either positively or negatively with AI usage.

Table 3: Correlation Calculations

		Usage	Response	Perassit	Roomser	Ansereser	Robotsume
Usage	Pearson Correlation	1	-.928*	-0.404	-0.162	.984**	-0.823
	Sig. (2-tailed)		0.023	0.500	0.795	0.002	0.087
	N	166	166	166	166	166	166
Response	Pearson Correlation	-.928*	1	0.133	-0.086	-0.850	.909*
	Sig. (2-tailed)	0.023		0.832	0.891	0.068	0.032
	N	166	166	166	166	166	166
Perassit	Pearson Correlation	-0.404	0.133	1	0.206	-0.534	-0.160
	Sig. (2-tailed)	0.500	0.832		0.739	0.354	0.797
	N	166	166	166	166	166	166
Roomser	Pearson Correlation	-0.162	-0.086	0.206	1	-0.221	0.155
	Sig. (2-tailed)	0.795	0.891	0.739		0.721	0.803
	N	166	166	166	166	166	166
Ansereser	Pearson Correlation	.984**	-0.850	-0.534	-0.221	1	-0.721
	Sig. (2-tailed)	0.002	0.068	0.354	0.721		0.170
	N	166	166	166	166	166	166
Robotsume	Pearson Correlation	-0.823	.909*	-0.160	0.155	-0.721	1
	Sig. (2-tailed)	0.087	0.032	0.797	0.803	0.170	
	N	166	166	166	166	166	166

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

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

Source: Computed by author

Abbreviations

Usage: Usage level of AI tools in hotels to streamline operations.

Response: Responds to Travellers anticipating customer needs.

Roomser: Room service orders.

Ansereser: Guests find answers to question about their reservations.

Robotsume: Use of robots to improve the hotel services.

Further on the data set of AI application analysed through multiple regression analysis. The regression model achieved by SPSS is given here in Table 4 and 5.

Table 4: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.997 ^a	.994	.991	2.838

a. Predictors: (Constant), robotsuse, roomser, perassit, response, ansreser.

Table 5: Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	15.562	7.774		2.002	.076
	Response	-.820	.066	-.713	-12.393	.000
	Perassit	.324	.055	.320	5.911	.000
	Roomser	-.192	.038	-.160	-5.107	.001
	Ansreser	.851	.072	.829	11.877	.000
	Robotsuse	.741	.073	.582	10.122	.000

a. Dependent Variable: usage.

When 166 samples analysed using multiple regression, the regression model fitted on the data set having coefficient of determination (R- square) equals to 0.991, defines the best fit model.

Further based on the value of the coefficients the regression equation is as follows:

$$Y (\text{usage}) = 15.562 - 0.82 (\text{response}) + 0.324 (\text{perassit}) - 0.192 (\text{roomser}) + 0.851 (\text{ansreser}) + 0.741 (\text{robotsuse})$$

As per the above regression model it is clear that all the four independent variables are positively related with the usage except response variable (R square = 0.991).

It is clear that Mobile App is the technology used by maximum respondents (i.e. 50%) as per the Table 6. The penetration of other technologies like artificial intelligence is still less in percentage (30%).

Table 6: Adoption of Technology in Business Operations

Sr. No.	Type of Technology	% of Use
1	ERP	10
2	Mobile App	50
3	Artificial Intelligence	30
4	Others	10

Source: Computed by author.

From Table 6, it is clear that 50% of the sample (166) is using Mobile App to enhance the business operations in the hospitality Industry. The role of AI is still needs for advancement so that more and more business hotels would start implementing it at their end. As per the response of the question on technology adoption, the interviewer has further probed the respondents about the business impacted by technology use. The responses recorded and further analysed as shown here in the Table 7.

Table 7: Contribution of AI in Businesses

Sr. No.	Impact on Businesses	%
1	Enhance Customer Management	30
2	Enhance Operational Efficiency	40
3	Enhance Revenue	30

Source: Computed by author.

From the result of Table 7, one can easily make it out that AI is helpful in enhancing efficiency of the businesses. The other components like customer management and revenue generation impacted by the use of AI.

Conclusion

Theoretical Contribution

The personalized services are generally governed through the concepts of shared economy which entail cost economy to the customers. So many companies collaborate and bring about the solutions which benefit masses at large and due to collaborations the cost is also shared by the partners. The use of AR and VR is increasing every day in each industry and the same is applicable in hospitality industry. With the help of VR, a virtual space is created to have the actual feel of desired destination with all the necessary ambience and

facilities in that virtual place. Similarly traditionally the Tourism companies were doing the financial transactions through the existing payment methods. But at present the companies are adopting block chain technology for the all sort of financial transactions which is fully transparent to the customers.

The various benefits like booking flights, hotels, creation of traveller's itinerary and providing suggestions for the attractive places to visit, done with the usage of Artificial intelligence in present time period. The AI tools are so exclusive and handy as it is accessible all 24X7, supported by many languages and give instant solutions for all the enquiries as generated by the travellers time to time.

Though many of the mobile and web applications are familiar with the simple conversational languages and quickly answer the questions raised by the travellers. After that the applications lead the consumer to fill the form to get the next level requirements either through chatbots process or through the form. By this way able to get insight about the human sentiments of the traveller and suggest back.

As per report (Robots and AI welcome guests at a hotel in Tokyo, 6th May 2018), hotels in Japan are managing their operations through robots and smart devices. The robots used for welcoming guests friendly and performing cleaning duties in the hotel premises. At Akihabara hotel in Central Tokyo, air conditioning, lighting, and curtains controlled by guests itself by using their smart phones or smart speakers.

Another very real example of automation technology adoption is Henna Na Hotel in Japan (AI in Hotels, February 26, 2019). Smart robots employed for providing services in this hotel as a first adopter. Female robot acting as a receptionist, dinosaur based robots are helpful in boarding of the guests. Churi Chan, an AI assistant help in adjusting the lighting and room temperature of the guests.

With the advancement of technology, the next generation of AI tools are in the market for extending superior services to the customers and hospitality industry with the help of chat bots (based on natural language) though complicated. AI chat bots developed which can solve multiple queries of users, so that it can result a meaningful transaction.

The chat bots are useful for many fold applications, start from plan, book, and service the travellers as per the evolving demands. It is supported by feedback and exact answers of their queries. Sometimes it shows the 360 degree

video of the stay, and selection of a resort thereafter. AI solutions are also very useful at the time of flight bookings as it filter out the options based on the query.

Implications

Due to the fluctuating and challenging needs of the travellers, it is essential to understand the guest's intention and identification of specific requirements of the travellers. The AI tools will work much more better way if we capture the demanding information about the travellers through different sources. Based on the exhaustive information, an algorithm developed and prediction of the upcoming travellers will be possible in near future.

The next generation of conversational AI application will run through successfully on contextual data is also fed in, apart from personalized services.

Limitations

The major limitations for the application of Artificial Intelligence in Asian hospitality Industry, lying in the availability of technology driven hotels and travel industries. During the survey researcher has found that maximum technology adoption is visible outside Asia and there is a paradigm shift in the revenue and customer satisfaction level.

Future Research Directions

It is observed that due to radical shift in the knowledge usage in hospitality business certain firms are struggling with the dilemma of using AI as inherent part of operational efficiency as they fear it could be less interactive and ineffectively interconnected. This is why, despite the advancements in technology, most of the firms are lagging behind. Isolated applications without proper synchronicity of information can obstruct both hotel operations and customer experience; this study aims to figure out these impending obstructions to come out with a workable model that would advocate not eliminating human completely.

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