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# Comprehensive and Psychological Review and its Impact on Technology Driven Applications on Business Development and Diversities of Tourism and Hospitality Industry during Pandemic in Indian Prospective

**[1] Prerna Nandwani , [2] Deepali Bhatnagar**

[1]Lecturer, HM ,Jaipur
nandwani.prerna@gmail.com

[2]Deputy Director Amity business school, Amity University Jaipur Email: dbhatnagar@jpr.amity.edu

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**Abstract—** Around the world, businesses and people have been significantly psychologically impacted by the COVID-19 outbreak. The global demand for hospitality services is at an all-time low as a result of closed borders and restricted travel in many countries. This article focuses on the psychological impact of COVID-19 on the hospitality industry, namely on hotels and restaurants. ICT (information and communication technology) and machine learning-based pandemic prevention tactics are other areas that are explored. This work has made use of exploratory research. The impact of COVID-19 has been examined in light of recent theoretical and empirical discoveries in the hotel sector. The COVID-19 issue has an effect on many different economic sectors around the world. The tourist industry, and especially hotels, which are regarded as the primary lodging structure, are without a doubt one of the industries that have directly suffered from this crisis. The large drop in reservations, which has forced the hotel industry to evaluate its organizational performance, is a result of border closures, travel restrictions, as well as the economic crisis, which has affected consumers' standards of living. This study attempts to discuss how Covid-19's effects on new technological features of consumer trust-building. Doors have opened for receiving visitors with little to no human touch because the hospitality sector's lockdown has partially been lifted. Technology-driven artificial intelligence technologies and big data analytics have benefited the following business sectors: reservations, check-in, check-out, accommodation, food experiences, conferencing, and delivery. Digital technology has made it simpler to impose the tight social distance standards. This essay looks at how technology supported the hospitality industry throughout the pandemic. The literature review focuses on COVID-19's effects and how technology has been essential to the industry's recovery. The study looked at the benefits of maintaining safety standards in a digitally enabled setting and gave hoteliers insights into understanding the new normal in the face of social estrangement. The study highlights the potential for technology, such as chatbots, big data, and artificial intelligence, to quickly implement staff training and retain customer, employee, and partner data. It discusses how technology may be used to improve Covid-19 safety regulations in the hotel industry and promote company continuity.

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**Keywords-** E-commerce; COVID-19; Tourism Industry, Hotel Industry, Lockdown, Social distancing.

## INTRODUCTION

In many nations, including India, the tourist and hospitality sectors have long been essential for fostering economic development, job creation, and cross-cultural interaction. However, the COVID-19 pandemic presented the industry with hitherto unheard-of difficulties, upsetting travel plans, imposing travel limitations, and significantly reducing visitor arrivals. Technology-driven solutions have developed as a lifeline for the tourist and hospitality sectors in reaction to these difficulties, allowing companies to adjust, endure, and even grow in the face of adversity.

With a particular emphasis on the Indian viewpoint, this in-depth assessment and analysis aims to investigate the impact of technology-driven applications on the growth and diversification of the tourist and hospitality business during the epidemic. By examining the advancements in technology, their implementation in various aspects of the industry, and their implications on development and diversification, this study seeks to shed light

on the transformative role of technology in shaping the industry's future.

**Background of the Indian Tourism and Hospitality Industry:**
India is a nation with a sizable domestic and foreign tourist industry due to its rich cultural history, varied landscapes, and historical landmarks. India's tourism and hospitality sectors have significantly boosted the GDP, foreign exchange revenues, and employment levels of the nation. However, the pandemic provided serious difficulties for this industry, which caused a sharp fall in tourism-related activities.

**The Impact of the COVID-19 Pandemic on the Tourism and Hospitality Industry:**
When the COVID-19 pandemic first appeared, there were several travel bans, lockdowns, and safety worries, which caused the demand for tourism to drop precipitously. Numerous closures, layoffs, and income losses were experienced by lodging facilities, eateries, travel agencies, and other connected enterprises. It became critical to find novel solutions in order to maintain business operations in the sector and restore consumer confidence.

**Technological Advancements in the Tourism and Hospitality Industry**:
The rapid advancements in technology have revolutionized the way the tourism and hospitality industry operates. From online booking platforms and virtual tours to contactless check-ins and artificial intelligence-driven chatbots, technology-driven applications have played a vital role in enhancing efficiency, improving customer experience, and ensuring safety and hygiene standards.

**Online Booking and Travel Aggregators:**
Online booking platforms and travel aggregators have become the go-to choice for travelers, allowing them to compare prices, book accommodations, flights, and activities, and customize their itineraries. These platforms have enabled businesses to reach a broader audience, increase visibility, and streamline their operations, even during the pandemic.

**Virtual Reality (VR) and Augmented Reality (AR) in Tourism**:
VR and AR technologies have transformed the way tourists experience destinations. Virtual tours and immersive experiences have allowed potential travelers to explore destinations and accommodations remotely, offering a sense of reassurance during uncertain times. These technologies have opened new avenues for marketing and promotion, attracting customers and boosting engagement.

**Contactless Technology and Automation:**
Contactless technology and automation have risen to prominence in the sector to solve health and safety issues during the pandemic. For guests to have a secure and seamless stay, contactless check-ins, digital payments, and touchless interactions have become the new standard. Automation and robotics have increased efficiency while reducing human involvement in a variety of hospitality businesses.

**Artificial Intelligence (AI) and Machine Learning (ML):**
In the tourism and hospitality sectors, AI and ML technologies have been instrumental in personalised marketing, data analytics, and customer service. Artificial intelligence (AI)-powered chatbots have offered immediate consumer service and information, freeing up human resources for more difficult jobs. Additionally, organisations can now analyse enormous amounts of data, spot trends, and make data-driven decisions thanks to AI-driven algorithms.

**Challenges and Opportunities of Technology Implementation:**
While technology-driven applications have brought significant benefits to the tourism and hospitality industry, their implementation has not been without challenges. Issues such as the digital divide, data security, privacy concerns, and the need for upskilling the workforce require attention. Additionally, there is a need for strategic planning and investment to ensure equitable access to technology across all stakeholders. In 2020, the coronavirus (COVID-19) pandemic had a terrible impact on world health and the economy, and its

consequences are probably still being felt today. She made an enormous influence on many disadvantaged populations' health and welfare and will continue to do so (OECD, 2020b). Women are disproportionately impacted by crises within these groups. Indeed, no crisis has gender-neutral effects, and COVID-19 is no exception. Indeed, women typically labor in lower-skilled professions and earn less than males. They struggle everywhere with unpaid care and household duties, which forces women to leave the working force (Azcona et al, 2020; OECD, 2020a).

Since containment measures have been put in place to combat Covid-19, 72% of domestic workers—80% of whom are women—have lost their employment. Additionally, the sectors immediately impacted by the virus's transmission restrictions, such the domestic labor market or the hotel industry, are overrepresented by women (Azcona et al, 2020, WTO, 2020). Due to the fact that they are the heart of the family. The majority of those affected by the measures used to stop the disease's spread are women, more so than their male counterparts. In fact, parents are primarily responsible for child care when schools are closed, which significantly increases their domestic strain (Burki, 2020, OECD, 2020a, WANEP, 2020).Women have suffered more than males in past pandemics, such as Ebola, as evidenced by their experiences. For instance, movement limitations during the Ebola epidemic in 2014 had a significant negative impact on the livelihoods of women merchants in West Africa. Burki (2020) asserts that they were more adversely affected by unemployment and found it more challenging to get job when the crisis was over. Additionally, they frequently have to take care of cleaning and provide medical attention to the ill (Kapur, 2020; Casale and Posel 2020; Ba, 2020). They reject worthwhile employment opportunities, which has an impact on income as well. In addition, girls may be required to spend less time in school than boys do in order to assist their mothers with chores (collecting water, for example). In addition, health facilities are overburdened and women have more difficulty getting access to pre- and postnatal care as well as contraception during emergencies like Ebola or Zika (Azcona et al, 2020). These impacts, together with other non-economic ones, may put women in extremely dangerous positions, have long-term implications on women's and young girls' susceptibility, and cause them to fall farther behind their male counterparts. Therefore, it is crucial to consider gender while researching the impacts of COVID-19.

Millions of people rely on tourism for a living, and billions more may learn to appreciate the natural environment, other cultures, and their own via travel. Tourism is the third-largest export industry in the world, contributing more than 20% of the gross domestic product to some nations. The COVID-19 pandemic, which has an influence on economies, livelihoods, public services, and future prospects across all continents, particularly affects the tourism industry.

Prioritizing ways to harness the effects of tourism on the destinations visited, as well as ways to strengthen communities and more resilient businesses through innovation, digitalization, sustainability, and partnerships, should be our top priority if we are to transform.

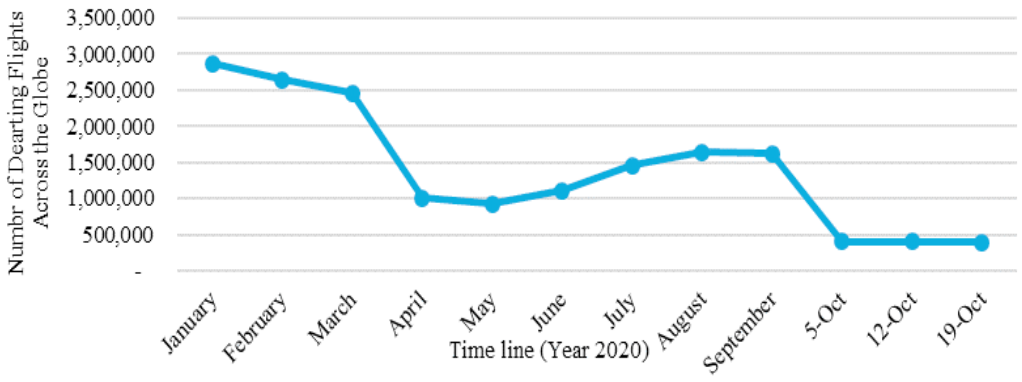


**Figure: 1 Analysis of New Cases –Global Scenario**

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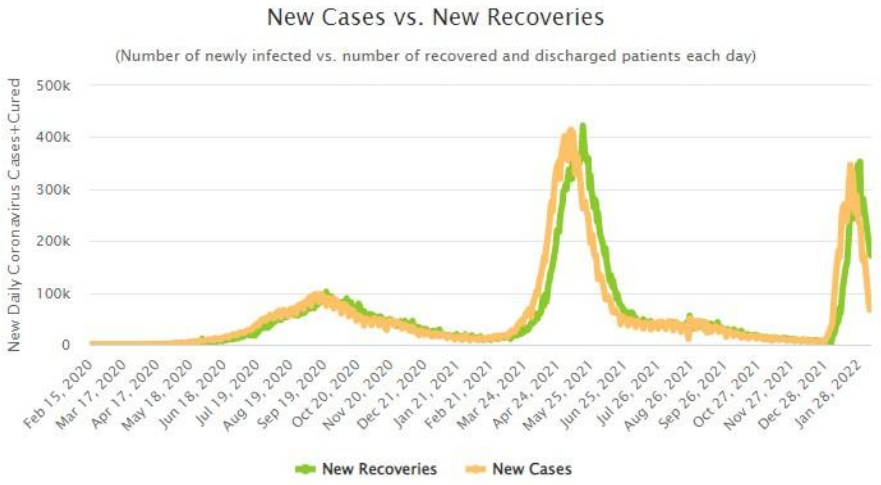


**Figure: 2 Analysis of New Cases vs Recovered Cases**

In 2019, tourism contributed 7% of global trade, employed one in ten people globally, and supplied livelihoods for millions of people throughout a complex value chain of interconnected sectors, according to data that is currently available. individuals in both developed and developing nations. International tourist arrivals decreased by 56% as a result of border closures, hotel closures, and drastically reduced air travel, and $320 billion in tourism exports were lost in the first five months of 2020, more than three times the amount of losses lamented during the global economic crisis of 2009. The following is a tabular analysis from an Indian viewpoint illustrating the impact of technology-driven applications on the growth and diversification of the tourism and hospitality business during the pandemic:

**Table-1 – Analysis on Impact on Industry**

| Technology Application | Impact on the Industry |
|---|---|
| Online Booking Platforms | Increased accessibility, broader audience reach, streamlined operations, and revenue generation during travel restrictions. |
| Virtual Reality (VR) | Enhanced destination marketing, immersive experiences, and reassurance for potential travelers through virtual tours. |
| Augmented Reality (AR) | Improved customer engagement, personalized experiences, and interactive elements in tourism and hospitality. |
| Contactless Technology | Addressed health and safety concerns, streamlined processes, and improved customer experience through touchless interactions, digital payments, and contactless check-ins. |
| Artificial Intelligence | Personalized marketing, instant customer support through chatbots, data analysis for data-driven decision-making, and improved operational efficiency. |
| Machine Learning | Advanced data analytics, trend identification, and predictive modeling for business strategies and customer service improvements. |
| Robotics and Automation | Increased operational efficiency, reduced human contact, and cost savings through automation of various hospitality operations. |

This tabular analysis offers a quick overview of the various technology-driven applications and their effects on India's tourism and hospitality sectors during the epidemic. It highlights how these technologies have aided companies in adjusting to new circumstances, surviving crises like COVID-19, and developing new opportunities.The expanded tabular study showing additional facets of India's tourism and hospitality industry's growth and diversification using technology-driven applications during the pandemic:

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**Table-2 – Analysis on Developmdng and Diversification**

| Technology Application | Impact on Development and Diversification |
|---|---|
| Online Travel Aggregators | Facilitated the growth of small and independent accommodations and experiences by providing a platform for visibility and bookings, promoting diversification in the industry. |
| Mobile Applications | Enhanced accessibility and convenience for travelers, allowing them to plan itineraries, book services, access destination information, and connect with local experiences, promoting tourism development in lesser-known regions and fostering diversification. |
| Social Media Platforms | Amplified destination promotion, enabling businesses to showcase unique offerings, engage with a global audience, and attract niche segments, contributing to the diversification of tourism products and experiences. |
| E-commerce Platforms | Enabled local artisans and handicraft sellers to reach a wider customer base, promoting cultural diversity and offering travelers authentic and unique souvenirs or products. |
| Remote Work Technology | Facilitated the rise of "workcation" or remote work combined with leisure travel, attracting digital nomads and professionals, fostering tourism diversification by stimulating demand in non-traditional tourist destinations. |
| Data Analytics and Insights | Provided valuable insights into consumer behavior, travel preferences, and market trends, allowing businesses to tailor their offerings, develop targeted marketing strategies, and identify untapped opportunities for diversification. |
| Sustainability Technology | Encouraged the adoption of sustainable practices and eco-friendly initiatives, promoting responsible tourism and diversifying offerings with sustainable accommodations, green experiences, and community-based tourism initiatives. |
| Language Translation Apps | Overcame language barriers, facilitating communication between travelers and locals, enabling more immersive experiences, and promoting the diversification of cultural exchanges and interactions. |

The impact of technology-driven applications on the growth and diversification of India's tourist and hospitality industries is further explored in this extended tabular analysis. It emphasises different technological advancements that have been crucial in boosting industry diversification, increasing tourism offers, and fostering inclusive and sustainable growth.The requirement for these funds to pay for public services, such as those for social and environmental protection, as well as to satisfy production deadlines and debt repayment has left governments scrambling to keep up.

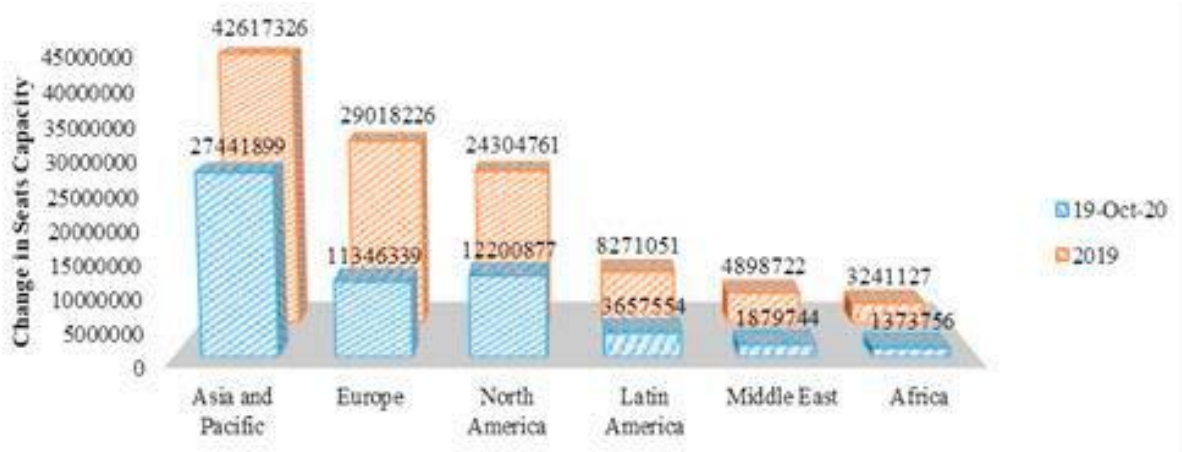


**Figure: 3 Change in the airline seat capacity across the globe**

Events in the fields of international commerce, society, and sport were all postponed in 2020. For instance, a number of events in Europe and North America, including the 2020 Summer Olympic Games and the UEFA

EURO 2020, were postponed [13]. Hotel operations and occupancy have significantly fallen as a result. Staple published a study on the financial impacts of Covid-19 on lodging and dining services [14]. The impact on housing and food services, he discovered, was more pronounced. Following the Great Depression of 1993, eight out of ten hotel rooms were statistically empty the first time around (CBRE) [15].

Figure 3 shows the occupancy of a hotel. The occupancy rate is just 40% when compared to previous years. Triple-digit declines in gross operating profit per available room (GOPPAR) are anticipated. YOY percentage in the Middle East (down 124.1%), Asia-Pacific (down 124.1%), Europe (down 131.9%), and the United States (down 122.8%). (a decrease of 115,3%). The revenue is now half what it previously was, according to STR and Oxford Economics [15]. The Pacific island, whose economy is mostly reliant on tourism, housing, and resorts, was hardest damaged. The Indonesian (Bali Island) reported that 20,000 hotel reservations had been cancelled by mid-February [16]. Figure 4 depicts the forecast for the US hotel business from 2020 to 2021. Where RevPAR stands for revenue per available room and ADR for average daily rate. Demand is expected to increase significantly in 2021 compared to 2020. The effects of Covid-19 on GDP, TRevPAR, and GOPAR are shown by nation in Table 2. Both the occupancy rate and the staffing level have significantly fallen as a result of the hotel industry's difficulty paying salaries. The hospitality industry has lost more than 3.9 million jobs, according to Oxford Economics. Over 70% of hotel employees have been laid off, according to Oxford Economics and Hotel Effectiveness [15]. In March 2020, the hotel industry in Malaysia demanded unpaid time off and reduced employee pay by 4% [18]. In Fiji, 279 hotels and resorts have closed since the outbreak, and 25,000 workers have been let go [19]. Currently, there aren't many articles in the literature about how Covid-19 is affecting the hotel and restaurant industries.

**ROLE OF ICT IN HOSPITALITY AND TOURISM**

Technology is developing quickly. The hotel industry has begun to use technology to meet client requirements. It is laying the groundwork for the Hotel Management system's empowerment. By providing the greatest rates, yield management techniques, and other advantages, it maximizes income generating. To better serve their guests, hotels are also implementing Chatbots, robotic concierges, and virtual voice assistants. Technology-based no-touch check-ins and check-outs that preserve low-touch services have been implemented. "Hilton robot concierge 'Connie' employs speech recognition and AI to answer to client concerns," claims Revfine (2020). At select airports, Knightscope robot deployment is taking place for security reasons. The Henna Hotel in Japan is the first hotel in the world to employ robots, which serve as front desk agents, customer service agents, and even luggage porters. The emergence of cutting-edge high-tech inventive solutions coupled with technological improvements is helping the hospitality industry to become contactless—the most recent technological trends will boost existing advancements and streamline the creation of custom services and experiences. By incorporating cutting-edge technology into hotel rooms, such as app platforms, visitors may place room service orders, reserve a position by the pool, and interact digitally with hotel staff members for assistance (Zain, 2021). The value of cloud-based software, which enables management and the workforce to simplify operationsand communication, was also emphasized. People having a core proficiency in digital processes will be chosen due to the ongoing growth in technological intervention. The ability to use technology will determine an employee's future. The study has looked into how hotels in India strictly adhere to physical separation and cleaning measures to protect everyone's health, including both guests and staff. In addition to the aforementioned, the practice of collecting identification cards in physical copy has been replaced by the practice of collecting all visitor identity documents or ID proofs online. Hotels do not accept photocopies of guest identification documents. When checking in, the original document is examined. Credit cards, debit cards, National Electronic Fund Transfer (NEFT), and other payment methods are used for digital transactions. To prevent interaction, restaurant, lodging, or other service feedback is delivered to guests' email addresses or phones.

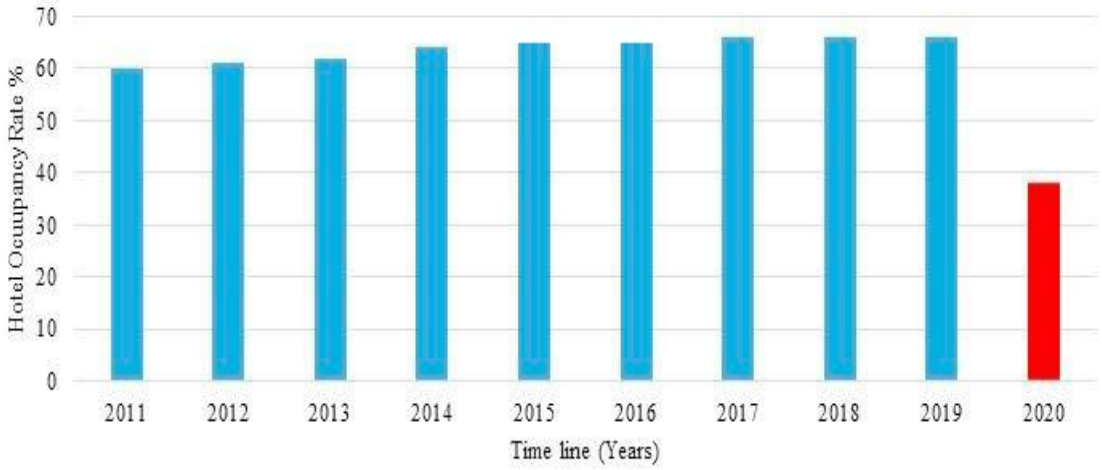


**Figure: 4 Analysis of Hotel Occupancy Rate**

The emergence of cutting-edge high-tech inventive solutions coupled with technological improvements is helping the hospitality industry to become contactless—the most recent technological trends will boost existing advancements and streamline the creation of custom services and experiences. By incorporating cutting-edge technology into hotel rooms, such as app platforms, visitors may place room service orders, reserve a position by the pool, and interact digitally with hotel staff members for assistance (Zain, 2021). The value of cloud-based software, which enables management and the workforce to simplify operations and communication, was also emphasized by Zain J. People having a core proficiency in digital processes will be chosen due to the ongoing growth in technological intervention. The ability to use technology will determine an employee's future. The study has looked into how hotels in India strictly adhere to physical separation and cleaning measures to protect everyone's health, including both guests and staff. In addition to the aforementioned, the practice of collecting identification cards in physical copy has been replaced by the practice of collecting all visitor identity documents or ID proofs online.

- Photocopies of guest identity documents are not accepted by hotels. The original document is inspected upon check-in. Digital transactions use a variety of payment mechanisms, including credit cards, debit cards, NEFT, and others. Feedback for restaurants, lodgings, or other services is sent to customers' email addresses or phones in order to avoid interaction.
- Guests are given the virtual display and information about the lodgings, food and beverage products, and other items to give customers a better knowledge of the saleable commodities.
- Why Hoteliers believe that it is advantageous to use technology to find Covid-19 issues in hotels. Hotels are introducing cutting-edge room access systems so that guests can enter hotel room doors by swiping their phones across a keyless pad on the door.
- • Automated check-in and check-out will let clients use hotel services on their mobile devices via software-based applications. Digital orders for room service will be placed via technology-driven automated kiosks rather than standing in queue. All modern gadgets have the capacity to identify users and offer services remotely. By granting guests access to the computer system, the front desk's online check-in and check-out portals have gone contactless. All payment obligations are handled through applications without ever coming in contact with the visitors.
- Hotel staff and visitors may get services securely thanks to automation technology without coming into touch. For contactless interaction, menus, etc., mobile apps and URL-based connections, also known as uniform resource locators, are being expanded.
- Technology has made it easier to detect and monitor activity, sanitize areas to maintain safety, and check staff and visitors for any potential infections. In the time office, staff members are subjected to contactless body temperature checks, sanitization via contactless dispensers, and attendance by retinal or skull

scanning.

- On biometric devices, neither punching in nor out is allowed. To avoid touching employees, several organizations now use thermal devices for facial and eye scanning in place of punching.
- The developments that may be observed at hotels include thermal scanning, automatic hand sanitizers, and service via apps. Technology has undergone a paradigm shift, and the transformation must take this transition into account.
- Installing the Arogya Setu app on employees', visitors', and suppliers' smartphones has helped in the contact tracing of affected individuals.
- Thanks to technology and user-friendly hospitality solutions, communication in the hotel sector is changing and getting simpler to manage. Communication has become easy and interactive in the Internet-powered world thanks to Voice Assistants, Chatbots, Mobile Apps, and social media.

**ROLE OF IOT AND ARTIFICIAL INTELLIGENCE**

Technology is developing quickly. The hotel industry has begun to use technology to meet client requirements. It is laying the groundwork for the Hotel Management system's empowerment. By providing the greatest rates, yield management techniques, and other advantages, it maximizes income generating. To better serve their guests, hotels are also implementing Chatbots, robotic concierges, and virtual voice assistants. Internet of Things (IoT), big data, and artificial intelligence (AI) use during COVID-19

The term "AI," which describes the intelligent behavior of machines or computers, has permeated the core operations of hotels. The application is utilized throughout the visitor's stay at the hotel (Preveden, 2018). Improved speech interactions with humanoid robots that enhance rather than substitute the quality of service are one aspect of improving revenue management.


**Fig. 5 Application of AI in Diiferent Applications**

The guest experience may be tailored with the innovation of contactless ordering and digital payment. Quick Response (QR) codes and dynamic digital menus can be used to create food experience technologies. Through the use of technology, eating can become an immersive experience that is lucrative, sustainable, and created with the goal of making the most money possible. Hotels deploy humanoid robots with artificial intelligence that mimic human speech and advise visitors on how to engage. Guests may interact with Alexa, another application, in a variety of ways to change the lighting, open the draperies, alter the temperature, switch on the music, turn on the TV, or order tea. It is possible to utilize robots to deliver laundry and other goods to visitors. During the epidemic, the hotel sector made extensive use of AI chatbots to enable visitors to ask questions and receive prompt solutions whenever they needed them. Some operations in the front desk and restaurants at Oberoi Hotels are automated using AI (Ahaskar, 2020).

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**Big Data**

For building a cutting-edge market sector or managing rate plans in contrast to the hotels' competitors, big data is an action-oriented task. The use of big data in the hospitality industry is associated with strategic marketing, revenue management, and management of the visitor experience (Yallop & Seraphin, 2020). Figure 4 shows how hotels use big data analytics to increase revenue in the hospitality industry.

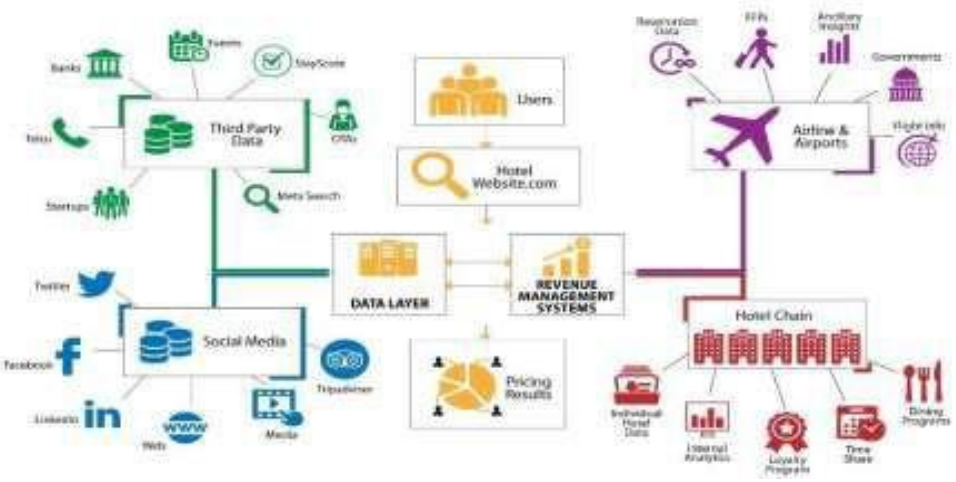


**Fig. 6: Application of Big Data Analytics in Tourism and Hospitality**

However, security is the fundamental issue with big data analytics and the necessary data storage. Maintaining the security of client data is everyone's goal in data harbouring, while being a difficult task. The Property Management System (PMS), which enables hotel staff to successfully use big data, requires that they complete training. After COVID-19, big data and AI will still be around. The most well-known company in data analytics is Marriott International (Beatrice, 2021). Marriott tracks the rivalry between its brands and hotels and conducts data analysis to uncover fresh, non-room revenue streams. Intercontinental Hotels Group (IHG) uses predictive, operational, and advanced analytics to make sure that all stakeholders are happy, comprehend guests, and foresee visitors' wants in the future (SOEG, 2021). The well-known fast-food chain KFC uses big data to analyse consumer feedback and menu preferences and boost experienced customer sales (Byteant, 2020). The use of applications for automated check-in and check-out, access to health data, and reliance on computer algorithms are some of the new requirements for hotels. Mobile applications and URL-based software will be in demand for contactless documentation.


**Figure: 7 Summary of Applications of Technology Driven Applications in Hotel Industry**

**Use of IoT in Hotels**

A "system of wireless, interconnected, and networked digital devices that can collect, send, and store data via a network without needing human-to-human or human-to-computer contact" is what is meant by the term

"Internet of Things" (IoT) (Kelly, Campbell, Gong, & Schuffham, 2020). The IoT is used in the hospitality sector to deliver integrated services like voice help, automatic door locks, and light switches that are all connected to a network (Zhu, Wang, & Cheng, 2021). IoT devices are used for daylight harvesting, which detects natural light and automatically changes the lighting in the guest rooms (Light Emitting Diode ones). IoT detects maintenance before it happens and sends notifications beforehand.

As well as storing preferences for things like lighting, temperature, and other aspects of the guest's stay, it may also record such choices. Application Programming Interfaces. Interfaces in the IoT aid in vendor consolidation and the development of a pool of compact, effective providers with coherent and complete products. Figure 5 illustrates how IoT is used in hospitals. A central server, such as a tablet or a mobile phone, may be used by the visitor to keep an eye on everything. According to Amit Dalvi of Pride Hotels, a service provider in India named IDS has created an application based on IoT solutions called FX-GEM that integrates the local PMS to help guests with prior check-ins, upload necessary documents, block off rooms, and enable mobile devices to open the guest room doors (Nath, 2020). The Indian hotel and house chain OYO wants to provide its visitors a Microsoft Azure IoT experience, which would include self- check-in by the guests, self-Know Your Customer (KYC), and IoT-enabled intelligent locks with virtual help (PTI & Standard, 2021). The operation of Cloud kitchens, which feature an online ordering website and online ordering applications to receive orders through the various meal delivery platforms, was analyzed by (Maitra & Jasleen, 2020). These online eateries accept orders through websites like Swiggy, FoodPanda, Zomato, etc. Technology developments in point-of-sale software make it acceptable on a worldwide scale.

The new normal entails less staff, hospital-level sanitization, and technology. The "New Normal" preserves social and physical distance while reducing client engagement. The new normal has become contactless, whereas the Indian hospitality business is renowned for its lavish, warm greeting, i.e., Arti, Tika, and Garland. The warmth and personalisation that formerly characterized hotel check-ins has been replaced in recent years by an emphasis on creating a secure and welcoming atmosphere for all guests.

**Drone-based meal delivery, a booking app, and a food delivery app**

Hotels and restaurants are required to have mobile applications for room and space reservations. Currently, the hotel industry lags behind in terms of high-tech innovation and application. In the hotel industry, the vast majority of transactions, bookings, and administrative tasks are still done by hand [34]. There are now very few booking software solutions, including Hotelchamp, Allora, Expedia, and Booking.com. For food delivery, hotels and eateries must have their own smartphone applications. Instead of visiting to restaurants and food courts, customers can place meal orders utilising mobile food delivery applications while at home. Currently available food delivery services include Grubhub and UberEats [35]. Another option is to modify drones and include them into food delivery smartphone applications. When a meal is delivered by drone, customers can even use credit/debit cards to pay the drone.

**Revenue management, promotions, cancellation, and booking procedures for hotels and restaurants**

A software system for the revenue management of hotels and restaurants collects and computes vast quantities of complex and distributed data on sales and purchases. To quickly determine the ideal room rate, the revenue management system in hotels uses complex and varied data. For example, the revenue management tool "Price Match" makes real-time pricing recommendations. The system tracks delayed statutory obligations (advance tax, customs duties, excise duties, bank fees, etc.) for the travel and hospitality, as well as corporate tax holidays. Machine learning facilitates tracking of travel restrictions and pandemic detection. Machine learning will aid in the study of the visitor's data and would suggest discounts in addition to offering personalised services. The personalised packages and services will reduce the costs for guests. To modify the cancellation and reservation policies, apply machine learning. The historical, present, and financial data will be used by the machine learning algorithms to advise on both a fee-based and fee-free cancellation.

**Contract tracking software, physical separation sensors, contactless payments, and digital signage**

Contract tracing software and sensors will be installed on the hotel property in order to preserve the physical separations. It will also be determined how many people can fit in the communal areas at once. Information on

the number of guests seated together, the space between tables, the number of persons per square metre, and the total number of visitors is needed for the rapid contract tracking. The implanted sensors will automatically record all visitors (patrons, suppliers, maintenance staff, etc.) to the area in a cloud-based database. Nowadays, most transactions happen online or involve tiny sums of money. The hospitality industry should utilise contactless payment systems. Web and mobile application payments prevent the spread of viruses and restrict infection. Important health and safety concepts like physical separation and cleanliness can be effectively communicated with the use of signage and display boards. The cleaning and disinfection procedures can be highlighted on digital displays, together with infographics on hand hygiene and the use of face masks by staff members and guests. The Internet of Things will be quite useful for the visitor ID scanning services. Key cards and keys should be replaced by contactless door keys that can be used with mobile apps. The implementation of facial recognition check-in and check-out minimises visitor wait times at hotel front offices. It is straightforward for them to check in and out thanks to face recognition. [36]. Using Alibaba's Fliggy travel service platform, Marriott International Hotel Group has successfully built a face recognition system [37].

**Online platforms for communication, training, and work from home using chatbots, sensors**

For both new and returning visitors, the web platforms and sensors will be updated with new rules, regulations, and guidelines. Prior to their arrival, they are informed of certain activities to take and the suggestions made by local public health officials. Websites, social media, email, press releases, and posters are the best ways to inform patrons, caterers, and sponsors of significant announcements, press releases, potential infections, and safety precautions at hotels and restaurants. Both public health experts and providers of hospitality services can monitor developments, communicate, and share information. The World Health Organisation (WHO) and the European Centre for Disease Control and Prevention (ECDC) have created pandemic standards and guidelines that may be added to internet platforms for accessibility and easy reference. The chatbot responds to voice and text messages at all times. Clients can ask the speech bot for help with opening and closing doors, turning on and off the lights, and other duties inside the reserved space. The safety and health of the personnel and guests are given first priority. An integrated system made up of field clinics, hospitals, and public health authorities with a direct line of contact is helpful to identify Covid-19 signs and take the right action [38]. In order for measures to be taken and for steps to be taken in the event that a visitor exhibits viral symptoms, the staff must receive training. Staff members can access online training on viral symptoms and signs, item handling, cart sanitization, and frequently touched areas. In order to minimise the spread of infectious diseases, a hotel should set up backup working arrangements including rotating shifts and working from home.

**Robots for guest service and housekeeping tasks**

In the hospitality sector, robots can be employed to provide clients with the services they need. In some situations when managing viral infections is necessary, a robot can take the place of humans. A three-foot robot for carrying groceries and pillows is referred to as a "Social Distancing Robot Ambassador." Some of them, like Winnie (Embassy Suites by Hilton Los Angeles International Airport North), Wally (Residence Inn by Marriott Los Angeles LAX/Century Blvd), and Hannah, have names associated with illustrious hotels (H Hotel Los Angeles, Curio Collection by Hilton, Homewood Suites by Hilton Los Angeles International Airport). Robots that assassinate viruses and bacteria are used to preserve personal hygiene. Blue Ocean Robotics' UVD robots utilize ultraviolet light to eliminate viruses and germs on their own [39]. It is important to keep track of how often the equipment, staff rooms, canteens, and work places are cleaned in between usage. To prevent face-to-face encounters, consider using a cleaning log and checklist app. A permitted chemical list, cleaning schedule, cleaning location, and shift information may all be seen on the app.

## CONCLUSION

The study examined Covid-19's effects on the hotel industry as well as potential remedies for the problem in the present and the future. The hotel industry has experienced some significant COVID-19 effects, such as decreased occupancy rates, lower pay, mass layoffs, revenue loss, and closure. The industry should implement particular relief measures and activities in order to overcome the current challenges and ensure the health of tourists and employees. Automation of many hospitality services, including as operations, human resources, and finance, is urgently needed. If financial resources are approved for ICT and machine learning for product

innovation, price innovation, distribution innovation, and fostering innovation, it will last for a very long period. These developments in technology include booking apps, food delivery apps, cleaning robots, digital signage, payment gateways, contract tracking apps, cleaning checklist applications, revenue management software systems, and online training and communication platforms. To get through this crisis, the hotel sector requires financial and economic assistance from the governments. The exact date won't be known, though, until after the virus has been confined globally and people have received immunisations. Numerous observers believe that the hotel industry will experience some sort of recovery. The study only looked at the hotel and restaurant segments of the hospitality business. Future studies will examine additional sectors, such as tourism and travel. Every aspect of the business has been impacted by the financial troubles. The absence of international visitors, the suspension of air travel, the decline in demand, and the overbooking of hotels during Covid-19 have caused a major loss for the tourist and hospitality sectors. The cancellation of meetings, weddings, conferences, and other events resulted in a loss of revenue. In order to make up for the loss of business, hotels distributed meals from their restaurants via online delivery services like Swiggy and Zomato. Although the number of Corona instances continued to rise, the ease of lockdown was made possible to save the economy while still ensuring public safety. The lockdown easing was implemented gradually, with a particular emphasis on the tourist, hotel, and food service industries. Live kitchens, frequent sanitization, standard operating procedures (SOPs), cashless transactions, protective equipment for food workers, etc. are all praised by the study in the food service industries. Since tourists prefer private transportation, the rental car or vehicle company, like zoomcar.com, has a huge chance in the tourism sector. The invisible, parasitic, and microscopic virus has totally changed the way the world views health issues. The recently discovered COVID-19 virus has had a significant impact on global economic activity. The goal of the global effort to eliminate this terrible illness is unity. In order to stop the spread of the coronavirus illness, almost every nation has put travel restrictions in place, sometimes even outright travel bans. The tourist and hospitality industries have suffered significant losses as a result of the global COVID-19 epidemic. The crisis has revealed the fragility of these sectors, putting more focus on ongoing research to develop strategies for navigating the economy during a pandemic meticulously. In order to guarantee that company recovery following lockdown proceeds in a safe and effective way, a thorough evaluation should be carried out throughout this lockdown time.

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