

## ANALYSING IOT AUTOMATION FACILITIES IN HOTEL ROOMS: ENHANCING GUEST EXPERIENCE AND OPERATIONAL EFFICIENCY

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ABSTRACT

*The hospitality industry is not the only one that has been transformed by the Internet of Things (IoT). The guest experience, operational efficiency, and resource management have all significantly improved as a result of the incorporation of IoT technologies into hotel rooms. This research paper investigates the utilization of IoT mechanization in hotel industry, talking about its advantages, difficulties, and future possibilities. The paper likewise analyses the expected effect of IoT on the Hospitality Industry and the ramifications for hoteliers, guests, and stakeholders utilizing IoT facility parameters via Decision Matrix and Rank them appropriately. This paper sheds light on the transformative potential of IoT automation in hotel rooms by analysing existing case studies and showcasing the perspectives of industry professionals.*

**Keywords:** - Internet of Things, Automation, IoT, Hotel Industry, Hospitality, Automated Environment, Departmental Automation, Analysis, Decision Matrix.

### INTRODUCTION

The desire to provide guests with exceptional experiences has always been the driving force behind the hospitality sector. Hotels have devised novel strategies to streamline travel experiences, personalize interactions with guests, and optimize operations thanks to the Internet of Things (IoT). The scope and goals of the research are outlined as well as the concept of IoT automation in hotel rooms in this section.

The implementation of IoT (Internet of Things) automation in hotel rooms has emerged as a ground-breaking approach to enhancing the guest experience and operational efficiency in the ever-evolving hospitality sector. The Internet of Things (IoT) creates a connected ecosystem that optimizes various aspects of the hotel room experience by seamlessly integrating smart devices and systems.

For guests, IoT automation offers unrivalled comfort and personalization. Voice commands or smartphone apps allow guests to control the room's lighting, temperature, and entertainment from the moment they enter. IoT-empowered room administration and housekeeping demands guarantee quick and proficient reactions to their requirements, leaving them with a feeling of extravagance and fulfilment.

Moreover, IoT automation enables hotels to smooth out activities, fundamentally lessening energy utilization and functional expenses. Continuous information assortment and examination empower prescient support, helping staff identify and determine possible issues before they influence visitors' solace. Guest arrivals and departures are sped up by automated check-in and check-out procedures, allowing staff members to concentrate on providing exceptional service.

Additionally, Smart locks and surveillance systems, two examples of IoT-enabled safety features, increase guest safety and peace of mind. Hotels can learn a lot about their guests' preferences by using data analytics, which enables them to tailor their services and offerings to each guest's preferences.

By embracing IoT automation in lodgings, the cordiality business can accomplish extraordinary degrees of visitor fulfilment, functional effectiveness, and reasonable works on, introducing another period of remarkable and immersive hotel experiences.

### LITERATURE REVIEW

The use of Internet of Things automation in hotel rooms to improve the guest experience and make operations run more smoothly. It inspects different IoT innovations, their effect on customized guest administrations, energy management, and staff

efficiency, featuring the possible advantages and difficulties for the hospitality industry.

**IoT Technologies in Hotel Rooms:** This segment dives into the different IoT advances that are regularly conveyed in hotel rooms. Smart locks, voice-activated assistants, connected lighting systems, occupancy sensors, and personalized guest devices are a few examples. We will provide an explanation of how these technologies work together to create a smart and connected hotel room.

**Benefits of IoT Automation in Hotel Rooms:** The numerous benefits of implementing IoT automation in hotel rooms for both guests and hotel owners are discussed in this section. Advantages like upgraded visitor fulfilment, further developed energy effectiveness, diminished functional expenses, and smoothed out upkeep systems will be examined exhaustively, upheld by applicable information and contextual investigations.

**Enhancing Guest Experience through IoT:** Guest experience is a significant part of the Hospitality Industry. In this part, we will investigate how IoT robotization changes the guest experience in hotel rooms. Personalized room settings, streamlined check-in and check-out procedures, virtual concierge services, and guest-driven room customization will all be discussed.

**Improving Operational Efficiency:** Hotel management relies heavily on efficiency. How IoT automation improves operational processes like housekeeping management, predictive maintenance, inventory control, and resource allocation is the focus of this section. Additionally, it will demonstrate how IoT devices' real-time data facilitates proactive decision-making.

**Security and Privacy Concerns:** The Internet of Things (IoT) has many advantages, but it also raises security and privacy issues. This segment talks about possible weaknesses and difficulties connected with IoT execution in lodgings. It will address concerns about guest privacy, unauthorized access, and data breaches. Additionally, methods for mitigating these risks will be investigated.

**Case Studies:** Real-world case studies of hotels that have successfully implemented IoT automation in their rooms are presented in this section. The outcomes achieved, lessons learned, and practical applications of IoT technologies will be demonstrated through these case studies.

**Challenges and Future Directions:** Each technological progression faces difficulties and obstacles. The current obstacles to widespread IoT adoption in hotel rooms are identified in this section. It will also talk about how the Internet of Things (IoT) could change the hotel business in the future.

**Implications and Recommendations:** In this part, the ramifications of IoT automation in hotel rooms will be examined. Suggestions for hoteliers looking to execute IoT advancements in their foundations will be given. Also, ideas for policymakers and industry partners to encourage the mindful and secure reception of IoT in the friendliness area will be incorporated.

## OBJECTIVES

Upgrading guest experience and functional productivity are basic targets for organizations in the hospitality and service industries. Accomplishing these objectives can prompt expanded consumer loyalty, dedication, and eventually, higher incomes. Here are the fundamental objectives for each:

### Enhancing Guest Experience

- **Customer Satisfaction:** The essential objective is to guarantee that guests have a positive and vital experience during their stay or visit. This includes giving superb client assistance, customized consideration, and resolving any issues or concerns quickly.
- **Personalization:** Fitting administrations and encounters to the particular necessities and inclinations of every guest can make a feeling of uniqueness and cause them to feel esteemed. Personalized greetings, room amenities, and other recommendations are all examples of this.
- **Seamless Experience:** From booking to check-out, providing guests with a smooth and hassle-free experience helps them form a positive impression of the establishment as a whole.
- **Quality of Service:** Guaranteeing the greatest of administration in all viewpoints, including convenience, feasting, conveniences, and exercises, can fundamentally affect guest fulfilment.
- **Feedback and Improvement:** It is essential to actively solicit feedback from guests and use it to enhance facilities and services. This

demonstrates that the company is committed to continuous improvement and values their opinions.

- **Innovation and Technology:** Coordinating imaginative advancements, for example, versatile applications, self-check-in kiosks, or virtual concierge services, can improve comfort and effectiveness for guests.
- **Operational Efficiency:**
- **Cost Reduction:** By optimizing resource allocation, reducing waste, and minimizing expenses that are not necessary, operations that are streamlined can result in cost savings.
- **Productivity:** Further developing functional effectiveness frequently includes executing cycles and frameworks that support representative efficiency, prompting higher result without compromising quality.
- **Inventory and Supply Chain Management:** Managing inventory and supply chains effectively prevents stock outs and overstocks by ensuring that the right resources and products are available at the right time.
- **Time Management:** Diminishing holding up times, check-in/check-out procedures, and other time-consuming processes can improve visitor fulfilment and lead to more successful asset usage.
- **Data-Driven Decision Making:** Operational bottlenecks and areas for improvement can be identified by making informed decisions based on data and analytics.
- **Employee Training and Engagement:** Thoroughly prepared and persuaded staff can

add to worked on functional productivity through better assistance conveyance and diminished blunders.

- **Sustainability:** Not only can environmentally friendly practices and energy-saving measures save money in the long run, but they can also help the environment.

Businesses in the hospitality sector have the potential to gain a competitive advantage, cultivate a loyal customer base, and achieve long-term success if they successfully strike a balance between the goals of improving the guest experience and improving operational efficiency.

## METHODOLOGY

### (a) Problem Conceptualization

Improving guest experience and functional productivity includes decisively carrying out inventive advances, smoothing out processes, and upgrading client cooperation. Guest satisfaction can be increased by integrating personalized services, simple check-in procedures, and intuitive amenities. Automated booking, housekeeping, and inventory management systems ensure smoother operations concurrently. Compelling staff preparing and criticism systems further guide in gathering visitor assumptions. Offsetting innovation with a human touch encourages an agreeable feeling. Effective execution of these methodologies develops a critical visitor venture, empowering positive surveys and rehash business while supporting the general productivity, benefit, and notoriety of the foundation.

S. No.	IoT Facility Parameters
1	Smart Room Controls
2	Guest Recognition and Personalization
3	Smart Energy Management
4	Efficient Asset Tracking
5	Predictive Maintenance
6	Enhanced Security and Safety
7	Automated Check-in and Check-out
8	Staff Tracking and Communication
9	Environmental Monitoring
10	Guest Feedback and Surveys
11	Waste Management Optimization
12	Proactive Customer Service

Source: Authors' Analysis

In this work the starting point is framing the questionnaire and taking inputs from various guests from five properties of Kolkata to constitute initial testing attribute (mentioned on the Table 1) set base on questionnaire. Based on our questionnaire, the Decision Matrix is done on Linear scale where Rank 1 is the lowest rank for IoT facilities that less important for you as a guest and Rank 5 being the highest one for IoT facilities that most important for you as a guest.

**(b) Sample and Measures**

To distinguish and quantify the boundaries, a questionnaire transformed into prepared and was circulated to diverse to various guests of five top properties of Kolkata (like Raajkutir, The LaLiT, Hyatt Regency, Vivanta, MONOTEL). Data collection process ensures confidentiality. It is presumed that experts' perspectives, collected data,

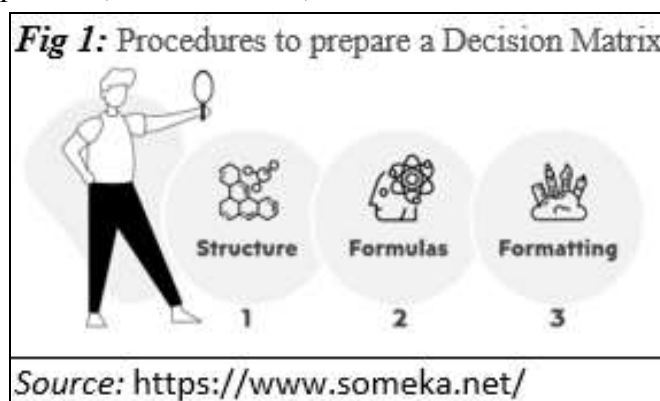
or opinion would provide a precise understanding of the Feedback Process. The subsequent procedure was carried out to validate the personnel's sincere response.

- Reasonably distinguished Entanglements of the significance of IoT offices in Hospitality Industry through the questionnaire.
- Questionnaire was coordinated appropriately.
- When collecting responses, integrity and confidentiality were maintained.

**(c) Data Analysis**

**Decision Matrix Implementation**

A decision matrix is an organized assessment instrument used to deliberately survey different choices in light of explicit models. It coordinates and looks at different choices against set variables to help direction (Explained in Fig 1).



By assigning weights to criteria and scoring each option, the decision matrix measures and positions the decisions, giving an unmistakable outline of the best choice. This approach works with genuine

direction, improves consistency, and assists people or groups settle on very much educated decisions with more noteworthy effectiveness and certainty (Explained in Table 2).

Table 2: Decision Matrix based on guests' responses

Property Name	Automated Check-in and Check-out	Smart Energy Management
Hyatt Regency, Kolkata	4.66	4.32
Raajkutir, Kolkata – IHCL SeleQtions	4.62	4.16
Vivanta Kolkata EM Bypass	4.63	4.17
The LaLiT, Great Eastern Kolkata	4.63	4.27
MONOTEL, Kolkata	4.62	4.37
<b>Average</b>	<b>4.63</b>	<b>4.26</b>

Source: Authors' Analysis

IoT facility parameters are setting up row wise and Properties names are setting up column wise and all the average values of guest respondents against a parameter and Property within are putting

respectively. All together IoT facility parameter averages are taken and rank them based on guests' reviews (Explained in Table 3).

**Table 3: IoT Facility Parameters based on Ranking**

IoT Facility Parameters	Average	Rank
Automated Check-in and Check-out	4.63	1
Smart Energy Management	4.26	2
Enhanced Security and Safety	4.24	3
Environmental Monitoring	4.22	4
Smart Room Controls	4.19	5
Guest Feedback and Surveys	4.14	6
Staff Tracking and Communication	4.13	7
Guest Recognition and Personalization	4.02	8
Predictive Maintenance	3.85	9
Waste Management Optimization	3.77	10
Proactive Customer Service	3.54	11
Efficient Asset Tracking	3.46	12

Source: Authors' Analysis

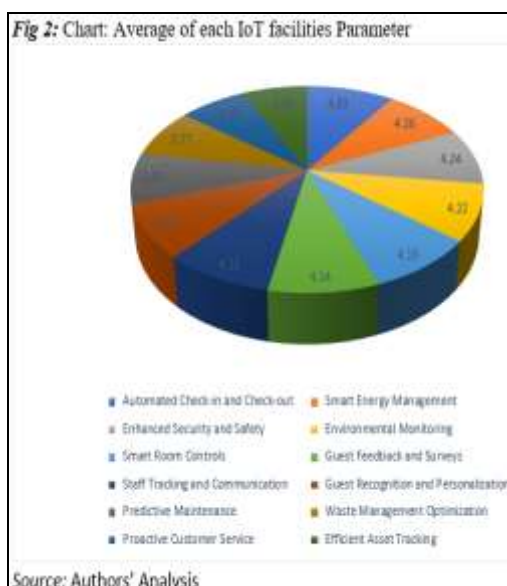
### OUTCOMES & DISCUSSIONS

This assignment is significant for Hospitality sector advancement and administration improvement. The benefits of Internet of Things (IoT) automation in hotel rooms are significant in terms of improving the guest experience and operational efficiency. By incorporating Web of Things (IoT) gadgets and innovation, lodgings can give a customized and consistent experience for guests while enhancing their inside processes. Preferable IoT facilities that are requested by the guests and rank them accordingly (Mentioned in Fig 2 & Table 3).

**Guest Experience:** Hotels can now provide individualized services that are tailored to each guest's preferences thanks to IoT automation. Using their smartphones or voice commands, guests can adjust temperature, lighting, and other room settings with smart room controls. Modified encounters can be conveyed in light of visitor

information and past inclinations, making a feeling of solace and extravagance. IoT gadgets likewise empower customized notices, like invite messages or proposals for adjacent attractions and conveniences, improving the general visitor experience.

**Operational Efficiency:** IoT automation streamlines different hotel activities, prompting expanded effectiveness and cost reserve funds. Automated energy management systems can regulate lighting and HVAC based on occupancy, reducing energy consumption. IoT sensors can send hotel staff real-time occupancy data and monitor room occupancy, allowing for more effective housekeeping and maintenance services. Also, computerized stock following oversees supplies, guaranteeing opportune restocking of conveniences and decreasing wastage.



In general, executing IoT automation in hotel rooms ends up being a mutually beneficial situation. Customers are more satisfied and likely to return due to the personalized experiences, increased convenience, and enhanced comfort. Hotels can simultaneously maximize their resources, reduce their operational costs, and build a reputation for providing exceptional service, all of which will ultimately result in increased profitability and competitiveness in the hospitality sector.

### FUTURE SCOPE & CONCLUSION

The future of IoT automation in hotel rooms lies in improving operational efficiency and revolutionizing the guest experience. Hotels can offer personalized services, effective energy

management, and streamlined operations by seamlessly integrating smart devices and AI-driven systems, thereby increasing guest satisfaction and decreasing costs.

The finishing up area sums up the discoveries of the exploration paper and features the extraordinary effect of IoT automation in hotel rooms. It emphasizes the significance of addressing security and privacy concerns while also reiterating the advantages of IoT adoption for both hotel owners and guests. In conclusion, it investigates the IoT's potential long-term effects on the hospitality sector and enhancing guest experience and operational efficiency.

### REFERENCES

1. Urvashi Sharma and Deepali Gupta; "Analyzing the applications of internet of things in hotel industry"; Journal of Physics: Conference Series; July 2021; Conf. Ser. 1969 012041
2. Nishi Priya; "IMPACT OF INTERNET OF THINGS (IOT) IN TERMS OF GUEST SERVICE SATISFACTION IN HOTEL INDUSTRY"; World Journal of Engineering Research and Technology; January 2017
3. Anthony Webster; "IT and Internet's Impact on Tourism and Hospitality Industry: Implementations of technologies for Hilton Hotels Group"; January 2018
4. Gubbi J, Buyya R, Marusic S and Palaniswami M; "Internet of Things (IoT): A vision, architectural elements, and future directions"; Future generation computer systems; June 2015; pp. 29(7):1645-60.
5. Balandina E, Balandin S, Koucheryavy Y and Mouromtsev D; "IoT use cases in healthcare and tourism." 2015 IEEE 17th conference on business informatics; Vol. 2, pp. 37-44.
6. Lee I; "The Internet of Things for enterprises: An ecosystem, architecture, and IoT service business model"; Internet of Things. 7:100078; September 2019
7. Nizetic S, Solic P, Gonzalez-de DL and Patrono L.; "Internet of Things (IoT): Opportunities, issues and challenges towards a smart and sustainable future"; Journal of Cleaner Production; July 2019
8. Angelova N, Kiryakova G and Yordanova L; "The great impact of internet of things on business."; Trakia Journal of Sciences, pp. 15(1), 406-412; 2017
9. Tripathy AK, Tripathy PK, Ray NK and Mohanty SP, "iTour: The future of smart tourism: An IoT framework for the independent mobility of tourists in smart cities"; IEEE consumer electronics magazine. Pp. 7(3):32-7; May 2018
10. Kansakar P, Munir A and Shabani N; "Technology in the hospitality industry: prospects and challenges"; IEEE Consumer Electronics Magazine; pp. 8(3):60-5, May 2019
11. Verma A and Shukla V; "Analyzing the influence of IoT in Tourism Industry"; International Conference on Sustainable Computing in Science, Technology and Management (SUSCOM), Amity University Rajasthan, Jaipur-India; February 2019
12. Buhalis D and Leung R; "Smart hospitality—Interconnectivity and interoperability towards an ecosystem"; International Journal of Hospitality Management; pp. 71:41-50; April 2018
13. Group, H. H. IT and Internet's Impact on Tourism and Hospitality Industry: Implementations of technologies for Hilton Hotels Group. Retrieved from Ivory Research.com, January 2018
14. Kadam Jeet Jain, K. H. (March 22). 6 ways in which technology is transforming the hospitality sector, March 2017.
15. Jia X, Feng Q, Fan T and Lei Q; "RFID technology and its applications in Internet of Things (IoT)"; 2nd international conference on

- consumer electronics, communications and networks (CECNet); May 2012; pp. 1282-1285
16. Madakam S, Ramaswamy R and Tripathi S; “Internet of Things (IoT): A literature review”; *Journal of Computer and Communications*; 2015; pp. 3(05):164
  17. Femenia-Serra F, Neuhofer B and Ivars-Baidal JA; “Towards a conceptualisation of smart tourists and their role within the smart destination scenario”; *The Service Industries Journal*; January 2019; pp. 39(2):109-33
  18. Neuhofer B, Buhalis D and Ladkin A; “Smart technologies for personalized experiences: a case study in the hospitality domain”; *Electronic Markets*; February 2015, pp. 25(3):243-54
  19. Buhalis D and Amaranggana A; “Smart tourism destinations enhancing tourism experience through personalisation of services”; *Information and communication technologies in tourism*; February 2015; pp. 377-389
  20. Sarmah B, Kamboj S and Rahman Z; “Co-creation in hotel service innovation using smart phone apps: an empirical study”; *International Journal of Contemporary Hospitality Management*; August 2017; pp. 29(10):2647-2667