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Artificial Intelligence (AI) and Environmental Sustainability: Transforming Green Practices in Hotels

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Abstract

The integration of Artificial Intelligence (AI) with sustainability initiatives is reshaping the hospitality sector, particularly in India. This study explores how AI-driven technologies contribute to environmental sustainability by enhancing operational efficiency, reducing costs, and improving guest satisfaction. Key applications include smart energy management systems, AI-based waste monitoring, and water conservation technologies. Using a combination of primary survey data (n=108) and secondary research, the study examines consumer awareness, perceived effectiveness, and adoption barriers. Findings indicate that higher awareness significantly influences perceived effectiveness, while guest satisfaction strongly impacts willingness to support AI-driven sustainability. However, challenges such as high implementation costs and limited awareness remain barriers. The study highlights the need for strategic investments and awareness initiatives to accelerate AI adoption in sustainable hotel operations.

Keywords: ***Artificial Intelligence, Sustainability, Hospitality Industry, Green Practices, Energy Management, Consumer Perception***

Introduction

Green Business Practices have become increasingly popular in the recent years with companies prioritizing sustainability initiatives in their day to day working. Sustainability has emerged as a key focus area and the hotel industry is no exception to this trend. Cheng et al., 2021 stated that the growing emphasis on green technology practices emerges from the pressing need to lower the carbon footprint of the hospitality sector. This shift aims to

preserve the environment while promoting the sustainable development principles, offering a roadmap for best practices in the industry. According to (Verma and Chandra 2016), many hotel chains have incorporated sustainability as an essential component of their core corporate strategies. Hoteliers are eager to implement green business practices in their daily operations in order to safeguard the environment. The hospitality industry is at a pivotal moment tasked with balancing the growing demands of the customer for personalized experiences while tackling the urgent environmental concerns. Sustainability has recently emerged as a core focus, driving strategies and business operations in this sector. Embracing sustainability is essential for achieving high revenue and fostering long-term healthy relationship with customers. The rise of AI technologies are redefining the way hotel businesses connect with their customers, streamline operational efficiency and minimize their environmental footprint (van Riel, A. C., Andreassen, T. W., Lervik-Olsen, L., Zhang, L., Mithas, S., & Heinonen, K. (2021). By harnessing AI technologies, hotels optimize resource usage, enhance operational efficiency and create eco-friendly experiences for their guests. For instance, AI driven energy management systems can smartly control heating, ventilation and air-conditioning to minimize the energy consumption while ensuring guest comfort level (Nadkarni, S., Kriechbaumer, F., Christodoulidou, N., & Rothenberger, M. A.2023). HVAC (heating, ventilation, and air conditioning) systems account for nearly 50% of the electricity usage in hotels. For reducing the energy consumption, hotels should engage in energy management programs and utilize more advanced and better energy-efficient equipment such as lighting systems, chillers and highly-efficient motors (Chan et al., 2017). Sustainability is being embraced as an integral component of the hotel industry's business model, shaping a new paradigm with the integration of advanced technologies. It creates an ecosystem that allows the services to be customized to meet the needs of the customers (H. Alipour, F. Safaeimanesh, and A. Soosan, 2019). The integration of sustainability-focussed innovation and artificial intelligence is revolutionizing the hotel sector by improvising operational efficiency, elevating the experiences of the guests and supporting the sustainability objectives. With the landscape rapidly evolving, the hospitality industry is leveraging AI technologies to overcome environmental issues, align with changing consumer preferences and foster long term success. Through AI-powered sustainability initiatives, hotel businesses can enhance resource efficiency and gain a competitive edge. AI tools and technologies enable innovation and progress in areas such as energy optimization and waste control, allowing businesses to succeed in a fast evolving industry. By utilizing AI based systems for

monitoring energy, water and waste, hotels can optimize revenue management while also preserving the environment. (Kumar Sano, H.A., 2024).

The hotel industry has placed sustainability at the forefront, propelled by growing consumer awareness and regulatory requirements. The hotels are adopting a wide range of measures to minimize their environmental footprint with AI playing an essential role in supporting these initiatives. AI technologies and robotization are transforming hotel operations in significant ways and it has become a game-changer for this industry. The implementation of robotics and smart technologies results in cost reductions, enhanced operational excellence and lower carbon footprints which align with the global sustainability objectives. Leveraging these technologies boosts sustainability efforts and addresses the rising demand for environment friendly accommodations (Uddin, I. 2024). Leading Indian hotel chains such as Taj, Oberoi and ITC are paving the way by integrating AI technologies and sustainability, highlighting how these innovations can drive efficiency in hotel operations and foster environmental accountability. Taj Hotels make use of AI driven systems for enhancing room service and housekeeping efficiency which results in optimized resource usage and less wastage. For Oberoi and ITC group, AI plays a very crucial role in energy management and waste minimization programs. Utilizing AI systems helps streamline many operational processes, thereby addressing environmental concerns and promoting sustainability efforts of the hotels. The fusion of artificial intelligence and sustainability is driving significant transformation in the hospitality sector (Chatterjee, P., & Mahapatro, S. K. 2024).

Certain barriers and challenges also exist in the implementation of AI-driven sustainability initiatives. Overcoming challenges related to cost, technology set-up and regulatory requirement is necessary to realize the full potential of AI and sustainability. Harnessing this potential needs a very holistic approach to address issues also in terms of data protection, ethical use of AI, implementation, workforce training and compliance with laws. By working on these aspects, hotel businesses can support in the creation of a more sustainable future and also prepare the industry for sustained success, innovation, collaboration and long term growth. As the hotel sector progresses, implementing AI-driven innovation will be vital in achieving long term sustainability goals, tackling environmental concerns and meeting the rising demand for environment friendly travel. Addressing environmental issues and leveraging green technology practices offers hotels a competitive advantage by meeting three essential aspects: customer expectations, social responsibility initiatives and ethical business management.

As consumer preferences see a tremendous shift towards environmental friendly practices, considering AI-driven initiatives for boosting the sustainability can create a competitive advantage and enhance the brand positioning efforts. Utilizing AI tools for hotel sustainability provides a strategic path towards building a more eco-friendly and resilient future for the hospitality sector. By encouraging innovation, promoting collaborations and making sustainability a top priority, businesses can generate a long-lasting value and contribute positively for the betterment of environment and society. With the hospitality industry rapidly evolving, integrating AI-driven technologies has become essential for achieving sustainability. Understanding AI's role in driving sustainability efforts is necessary for shaping future decisions and operational policies. Moving forward, investments in AI-based sustainability technologies will be beneficial in minimizing the environmental footprint of hotels while also aligning with the global sustainability efforts, thereby, fostering a greener and a more eco-conscious hotel industry.

Literature Review

Smith and Johnson (2022), emphasizes AI's contribution towards optimizing the energy efficiency in hotels by regulating the heating, cooling and lighting systems on the basis of real time data, thereby leading to cost reduction and reduced carbon footprint.

(Patel et al. 2023) AI technologies have an influence on waste management, demonstrating how these advanced systems track the waste generation and identify opportunities for minimizing waste and improved recycling efficiency

Gupta and Singh (2021) highlighted how AI technologies are utilized to monitor the usage of water, detect leakage, boost efficiency and thus support the broader sustainability goals. The implementation of robotics and AI in the hotel industry can enhance the resource efficiency such as reducing the water and energy consumption through improved cleaning measures

(Gursoy & Chi, 2020).According to Tuzunkan & Sönmez (2022), AI driven robotics contributes to environmental sustainability by tailoring guest experiences and improving energy management. These systems are capable of analyzing data to optimize energy consumption and predict maintenance requirements, thereby minimizing functional inefficiencies.

According to Clark et al., 2021, AI-driven waste categorization and monitoring technologies help the hotels to effectively track the generation of waste, boost recycling

efficiency and minimize landfill dump. AI-based lighting systems that have the potential to adjust brightness according to the availability of the natural lighting can also minimize the electricity consumption of the hotels.

ITC hospices Commercial Social Responsibility Report, 2023. Many Indian Hotel chains like Oberoi, Taj and ITC have embraced AI driven sustainability initiatives. Taj Hotels have successfully integrated AI systems to enhance the operational effectiveness and sustainability initiatives. They have utilized the energy management systems to minimize their energy consumption and lower the environmental impact (Taj hospices Annual Report, 2023). The Oberoi Group leverages AI for optimizing energy consumption and waste minimization (Oberoi Group Sustainability Report, 2023).ITC hotels have adopted AI for optimizing resource usage, reflecting their commitment towards sustainability through improved energy and water conservation practices

Dienes et al.(2022) have laid emphasis on the smart thermostats and AI-driven lighting and control systems that benefit the hotels by lowering the energy waste while ensuring the comfort level of the guests. According to A. Leonidis, M. Korozi, G. Margetis, D. Grammenos, and C. Stephanidis, 2013, leveraging AI, IoT sensors and other advanced technologies can create an adaptive ecosystem that continuously analyses the surroundings and adapt its operations to offer personalized and seamless experience to hotel guests. Artificial Intelligence plays a pivotal role in enhancing the sustainability efforts of hotels. AI driven solutions are often more cost-effective, efficient and accurate than conventional human driven methods, thereby contributing to better resource utilization and lower operational costs. Moreover, they emphasize AI's capability to detect intricate patterns within vast datasets, thus allowing hotels to optimize energy and resource usage. By forecasting consumption trends, AI helps to reduce the environmental impact and promotes the implementation of sustainable practices, making it a crucial tool for modern hotel management.

Stankov et al. (2024) explores the ways in which AI and IoT technologies enhance green practices in the hotel industry by optimizing energy management, waste minimization and building green supply chains.

Kumar Sano, H.A., 2024, artificial intelligence based sustainability initiatives present great potential for continuous innovation, collaboration and making a positive impact. As AI continues to advance and with growing consumer awareness towards sustainable practices, businesses that give prime importance to sustainability as a core value will be able to create a more adaptable, diverse and sustainable industry for the times to come.

Implementing AI-driven sustainability initiatives demands a change in the organizational culture and business practices within the hotel industry. The businesses must work on prioritizing continuous training, workforce development and skill enhancement to stay updated on the evolving trends, industry best practices and developments in AI and sustainability (Beattie, M., & Wyer, S. L. 2019).

Sharma et al. (2024) conducted a systematic review of AI-based innovations in the hotel sector. Their study touched upon the ways as to how AI technologies boost operational efficiency, optimize expenses, provide personalized guest experiences as well as contribute towards sustainability efforts. Limited awareness among policymakers and stakeholders about the long term benefits of AI in driving sustainability efforts poses a concern (Smith et al., 2023). Emphasis should be on offering incentives and regulatory frameworks that boost the adoption of AI technologies for sustainability practices (Gretzel et al., 2021). According to Lee and Chen (2023), open communication regarding AI-driven eco-friendly initiatives through digital mediums enhances consumer trust. Hotels that promote such practices on their social pages tend to attract consumers who are eco-conscious and encourage brand loyalty. AI driven sustainability initiatives allow businesses in the hospitality sector to create unique guest experiences that appeal to environmentally-aware customers. By incorporating eco-conscious practices at every stage of the guest journey, from reservations to the check-out time, hotels can provide a memorable experience to their guest, thus enhancing trust and loyalty. Leveraging AI-powered sustainability initiatives in the hotel sector enables businesses to differentiate themselves, gain a competitive advantage, enhance brand image and ensure sustained profitability (Tucmeanu, Elena Roxana, Alin Iulian Tucmeanu, Madalina Gabriela Iliescu, Justyna Żywiołek, and Zahid Yousaf. 2022). Research by Ivanov and Webster (2021) found out that the hotel staff considers AI technology as a threat to their job which leads to hesitance in adoption of such technologies.

Mirzabeiki, V., He, Q., & Sarpong, D.2023, the combination of IoT devices and AI technologies will allow real time monitoring and management of hotel facilities, thereby maximizing resource efficiency and energy conservation. Utilizing smart technology in guest rooms and hotel premises will be helpful in creating a connected ecosystem that elevates guest experience, boosts operational efficiency and minimizes the environmental footprint. Adopting AI technologies for sustainability allows hotel businesses to meet regulatory standards and lower risks related to environmental violation. Committing to AI driven sustainability initiatives strengthens the long term stability and adaptability of

hotels, allowing them to navigate emerging market trends, consumer demands and environmental issues. By making sustainability a core part of their strategy, hotels can safeguard operations, develop resilience against external disruptions and ensure lasing success in a dynamic industry (Żywiołek, J. 2021).

Objectives

- To analyze the current state of sustainable practices adopted by hotels for minimizing the environmental impact.
- To examine the consumer awareness and perception of AI's role in enhancing the green practices in hotel operations.
- To assess the impact of AI driven sustainability initiatives on hotel operations, cost efficiency and customer satisfaction.
- To identify the barriers and challenges faced by hotels in adoption of the practices.

Research Methodology

This study adopts a mixed-method approach, combining primary and secondary research.

- Research Design: Exploratory and descriptive
- Sample Size: 108 respondents
- Data Collection: Structured questionnaire (5-point Likert scale)
- Sampling Technique: Purposive sampling
- Analysis Tool: Pearson Correlation

Analysis and Interpretation

Demographic variables and general information of the customers has been analyzed using percentage analysis as shown in the table below. It can be inferred that 40.7% of the male and 59.3% of the female respondents shared their perception towards AI-driven sustainability practices in the hotel. Most of the respondents (51.9%) fall in the age group of 21-30 years. 71.3% of the respondents frequently stay in hotels. Majority of the respondents (52.8%) prefer visiting chain hotels.

Table: Demographics and General Information

Factors	Options	No. of respondents	Percentage (%)
Gender	Male	44	40.7
	Female	64	59.3
	Prefer not to say	0	0
Age	Below 20 years	6	5.6
	21-30 years	56	51.9
	31-40 years	12	11.1
	41-50 years	14	13
	51-60 years	15	13.9
	Above 60 years	5	4.6
Frequency	Rarely	16	14.8
	Occasionally	15	13.9
	Frequently	77	71.3
Type of hotel	Chain hotels	57	52.8
	Boutique hotels	13	12
	Luxury Hotels	23	21.3
	Budget Hotels	15	13.9

Hypothesis Formulation:

This study aims to examine the impact of AI on environmental sustainability in the hotel sector by analyzing the consumer perceptions. The hypotheses have been formulated based on the research objectives, focusing on awareness, perceived effectiveness, guest satisfaction, willingness to support AI-driven sustainability measures and perceived barriers.

For testing these hypotheses, Pearson correlation analysis will be conducted to evaluate the strength and significance of the relationship between the key variables.

1) **Awareness of AI in Hotel Sustainability & Perceived Effectiveness of AI in Green Practices:**

   H_0 (Null Hypothesis): There is no significant correlation between the awareness of the consumer towards AI in hotel sustainability and their perception of its effectiveness in operations.

   H_1 (Alternative Hypothesis): There is a significant correlation between awareness of the consumer towards AI in hotel sustainability and their perception of its effectiveness in operations.

2) **Perceived effectiveness of AI in sustainable practices and satisfaction of guests:**

   H_0 (Null Hypothesis): There is no significant correlation between perceived effectiveness of AI in sustainable practices and satisfaction of guests.

   H_1 (Alternative Hypothesis): There is significant correlation between perceived effectiveness of AI in sustainable practices and satisfaction of guests.

3) **Guest Satisfaction and willingness to support AI-powered sustainability initiatives:**

   H_0 (Null Hypothesis): There is no significant correlation between guest satisfaction with AI-powered sustainability practices and willingness to support them.

   H_1 (Alternative Hypothesis): There is significant correlation between guest satisfaction with AI-powered sustainability practices and willingness to support them.

4) **Perceived barriers and willingness to support AI-driven sustainability practices:**

   H_0 (Null Hypothesis): There is no significant relationship between perceived barriers in adopting AI for sustainability and willingness to support such practices.

   H_1 (Alternative Hypothesis): There is a significant relationship between perceived barriers in adopting AI for sustainability and willingness to support such practices.

Table: Statistical Analysis

Hypothesis	Question Pair	Correlation (r)	t statistic	p value	Significance ($p < 0.05$)	Result (H_0 Reject/Fail to Reject)
Awareness of AI & Perceived Effectiveness	Q5, Q8	0.498	5.916	$p < 0.001$	Yes	Reject
Awareness of AI & Perceived Effectiveness	Q6, Q9	0.557	6.896	$p < 0.001$	Yes	Reject
Awareness of AI & Perceived Effectiveness	Q7,Q10	0.580	7.327	$p < 0.001$	Yes	Reject
Perceived Effectiveness & Guest Satisfaction	Q8, Q11	0.667	9.223	$p < 0.001$	Yes	Reject
Perceived Effectiveness & Guest Satisfaction	Q9, Q13	0.525	6.355	$p < 0.001$	Yes	Reject
Perceived Effectiveness & Guest Satisfaction	Q10, Q12	0.538	6.579	$p < 0.001$	Yes	Reject
Guest Satisfaction & Willingness to Support AI-driven sustainability	Q11, Q14	0.619	8.122	$p < 0.001$	Yes	Reject

Guest Satisfaction & Willingness to Support AI-driven sustainability	Q12, Q15	0.658	8.991	$p < 0.001$	Yes	Reject
Guest Satisfaction & Willingness to Support AI-driven sustainability	Q13, Q16	0.564	7.035	$p < 0.001$	Yes	Reject
Perceived Barriers & Willingness to Support AI powered sustainability	Q17, Q15	0.109	1.133	$p = 0.2599$	No	Fail to reject
Perceived Barriers & Willingness to Support AI powered sustainability	Q18, Q16	0.234	2.477	$p = 0.0148$	Yes	Reject
Perceived Barriers & Willingness to Support AI powered sustainability	Q19,Q14	-0.061	-0.629	$p = 0.5304$	No	Fail to reject

Awareness of AI in Hotel Sustainability & Perceived Effectiveness of AI in Green Practices:

- A moderate positive correlation ($r = 0.498$, $p < 0.001$) was found between AI awareness in sustainability (Q5) and its perceived effectiveness in energy efficient operations (Q8). This shows that as the awareness of the consumer regarding AI usage in hotel sustainability increases, they are more likely to view AI-powered sustainability practices as effective.
- A moderate positive correlation ($r = 0.557$, $p < 0.001$) was seen between awareness of AI tools in resource management (Q6) and perceived effectiveness of AI in managing waste (Q9). This means that as the awareness of the consumer regarding AI's crucial role in resource management increases, they are more likely view AI as effective in managing waste.
- The correlation between understanding of AI's role in lowering the environmental impact (Q7) and its perceived effectiveness in conservation of water resources (Q10) was also observed as moderate ($r = 0.580$, $p < 0.001$). This means that as the consumers gain an understanding about how AI tools help in minimizing the environmental harm, they tend to perceive AI as effective in conservation of water resources.

The results clearly show that consumers who have greater awareness about regarding AI-driven sustainability practices are more likely to perceive them as effective which leads to the rejection of the null hypothesis (H_0).

Perceived effectiveness of AI in sustainable practices and satisfaction of guests:

- A strong positive correlation ($r = 0.667$, $p < 0.001$) was seen between perceived effectiveness of AI in energy efficient hotel operations (Q8) and satisfaction of the hotel guests (Q11). This means that as the consumers perceive AI as effective in enhancing energy efficiency, they also show a higher level of satisfaction.
- There exists a moderate positive correlation ($r = 0.525$, $p < 0.001$) between AI-based waste management practices (Q9) and guest satisfaction when the hotels openly communicate their environment friendly practices (Q13). This means that when hotels utilize AI tools for waste management, guest satisfaction is higher, especially when the consumers are openly informed about sustainability practices.

- There is a moderate positive correlation ($r = 0.538$, $p < 0.001$) between AI-driven water management practices (Q10) and guest preference for hotels that use such practices for sustainability efforts (Q12).

The results show that AI-driven sustainability practices have a positive impact on the satisfaction of the hotel guests which leads to the rejection of the null hypothesis (H_0).Consumers who perceive AI as effective in the sustainability efforts report a greater satisfaction level.

Guest Satisfaction and willingness to support AI-powered sustainability initiatives:

- There exists a strong positive correlation ($r = 0.619$, $p < 0.001$) between guest satisfaction (Q11) and influence of AI-driven green practices on booking decisions (Q14). This indicates that as the guest satisfaction tends to increase, they are more likely to look at AI-driven sustainability practices when selecting a hotel.
- A strong positive correlation ($r = 0.658$, $p < 0.001$) was found between guests actively considering hotels that support AI-driven sustainability (Q12) and their willingness to pay a premium for such hotels (Q15).
- There is a moderate positive correlation ($r = 0.564$, $p < 0.001$) between guest satisfaction when eco-friendly practices are openly communicated by hotels (Q13) and their willingness to recommend hotels that utilize AI-powered sustainability (Q16).

The results clearly show that guest satisfaction has a tremendous influence on consumer willingness to support AI-driven green practices by hotels. The null hypothesis (H_0) is rejected as all p values are statistically significant.

Perceived barriers and willingness to support AI-driven sustainability practices:

- A very weak correlation ($r = 0.109$, $p = 0.2599$) was seen between perception of high cost as a barrier in implementation of AI technology (Q17) and a willingness to pay a premium for hotels utilizing AI for sustainability (Q15). This means that perception of high cost as a barrier has little to almost no impact on whether hotel guests are considering paying a premium for AI-driven sustainability. Since $p > 0.05$, this result is not significant, this means that the correlation that is observed can happen due to random chance.
- There exists a weak positive correlation ($r = 0.234$, $p = 0.0148$) between limited awareness of AI's benefits as a barrier (Q18) and the willingness to recommend hotels that follow AI based sustainability practices (Q16). This result was

statistically significant. This value of correlation indicates that there is a relationship that exists but is not as strong which means that while awareness has some role to play, other factors tend to have a greater impact on recommendations.

- A negative correlation ($r = -0.061$, $p = 0.5304$) can be seen between employee resistance to the emerging AI-driven sustainability solutions (Q19) and influence of such AI technologies on booking decisions (Q14). This weak negative correlation value suggests that the relationship is negligible as the employee resistance towards AI has little to almost no impact on whether consumers prefer AI-driven sustainability aspect while making their bookings. Since $p > 0.05$, this result is not significant.

The results indicate that the high implementation cost of AI technologies and employee resistance do not have a significant impact on the willingness of the consumers to support AI-driven sustainability solutions (fail to reject H_0). However, limited awareness of AI's benefits in hotel sustainability acts a barrier as shown by a correlation between limited amount of awareness and the willingness to recommend AI-powered hotels.

Findings

- Awareness of AI has a significant influence on the perceived effectiveness of AI in the sustainability practices of the hotels (Moderate Positive Correlation).

- AI-powered sustainability practices have a positive impact on the satisfaction level of the hotel guests (Strong Positive Correlation).

- Guest satisfaction plays a very crucial role in the willingness to support AI-driven sustainability initiatives by the hotels (Strong Positive Correlation).

- High cost in implementing AI tools and technologies and employee resistance do not significantly have an impact towards the willingness to support AI-driven sustainability but limited awareness regarding its benefits poses a challenge.

Conclusion

AI-powered sustainability is revolutionizing the hotel industry by providing environmental benefits and elevating the guest experience. Hotels that are able to effectively implement such AI technologies can establish a competitive edge, attract eco-conscious consumers and support in building a more sustainable future for the hospitality sector. This research

study explored the role of AI-driven sustainability practices in the hotel industry and its impact on shaping the consumer perception, enhancing guest satisfaction and willingness to support environmental friendly initiatives. The findings reveal a strong correlation between consumer awareness of AI-based sustainability practices and their perception regarding its effectiveness in enhancing green practices. The consumers who understand the role of AI in optimizing the energy consumption, waste minimization and water management are in a better position to appreciate its benefits in environmental sustainability.

Moreover, the analysis highlights that a positive perception of AI-powered sustainability practices has a direct influence on the satisfaction level of the hotel guests. Consumers who value eco-friendly initiatives have an enhanced experience in the hotels when such technologies are effectively implemented. Additionally, the satisfied hotel guests have a greater inclination to support AI-based sustainability efforts as seen from their booking choices, willingness to pay more for eco-friendly hotels and recommendations to their family and friends. Despite these positive and encouraging results, certain barriers do exist that hinder the adoption of AI technologies in the hotel industry. High cost of implementation, limited awareness of AI's benefits and resistance from employees could slow down the adoption of such technologies in hotel sustainability. Addressing these barriers through strategic investments, awareness programs and workforce training can help encourage broader acceptance and adoption of AI-driven sustainability solutions.

Recommendations

- Hotels should more actively promote their AI-powered green practices through informational campaigns, social media communication and in-house awareness brochures to enhance awareness regarding the role of AI in sustainability.
- Conduct comprehensive training programs to train the workforce in order to reduce the resistance related to AI technology adoption and boosting operational efficiency. These programs can help in enhancing the staff readiness towards such technologies.
- The hotel sector needs to address the barriers related to AI adoption. They should consider a phased AI implementation to reduce resistance and facilitate greater acceptance for such technologies.

- Showcasing real-time sustainability metrics through digital screens in lobbies as well as on dashboards in hotel apps can strengthen transparency and engagement among hotel guests. This can be used to inform about energy and resource savings through AI-powered initiatives.

References

Beattie, M., & Wyer, S. L. (2019). Workforce development in AI adoption. *Journal of Hospitality Management*, 45(2), 123–135.

Bulchand-Gidumala, J., et al. (2024). AI and sustainability in hospitality. *Tourism Review*, 79(1), 45–60.

Chan, E. S., et al. (2017). Energy efficiency in hotels. *International Journal of Hospitality Management*, 65, 1–10.

Chatterjee, P., & Mahapatro, S. K. (2024). AI adoption in Indian hotels. *Journal of Sustainable Tourism*, 32(3), 210–225.

Cheng, M., et al. (2021). Green practices in hospitality. *Sustainability*, 13(5), 2456.

Dienes, K., et al. (2022). Smart technologies for sustainability. *Energy Efficiency Journal*, 15(2), 345–360.

Gretzel, U., et al. (2021). Policy frameworks for AI adoption. *Tourism Management*, 83, 104242.

Gupta, R., & Singh, A. (2021). AI in water management. *Environmental Science Journal*, 29(4), 456–470.

Gursoy, D., & Chi, O. H. (2020). Robotics in hospitality. *International Journal of Hospitality Management*, 90, 102609.

Ivanov, S., & Webster, C. (2021). Employee perception of AI. *Tourism Economics*, 27(5), 1025–1041.

Lee, H., & Chen, Y. (2023). Consumer trust in AI sustainability. *Journal of Travel Research*, 62(2), 345–359.

Patel, V., et al. (2023). AI in waste management. *Waste Management Journal*, 150, 89–98.

Smith, J., & Johnson, L. (2022). AI-driven energy efficiency. *Energy Policy*, 162, 112765.

Smith, A., et al. (2023). Barriers to AI adoption. *Technological Forecasting*, 190, 122345.

van Riel, A. C. R., et al. (2021). AI in service industries. *Journal of Service Research*, 24(1), 3–20.

Żywiołek, J. (2021). Sustainability strategies in hospitality. *Sustainability*, 13(9), 5123.