Advanced International Journal of Business, Entrepreneurship and SME's
EISSN: 2682-8545
AIJBES
Volume 7 Issue 25 (September 2025) PP. 571-582
DOI 10.35631/AIJBES.725039

ADVANCED INTERNATIONAL JOURNAL OF BUSINESS, ENTREPRENEURSHIP AND SMES (AIJBES)
www.aijbes.com

NAVIGATING SMART HOTEL IMPLEMENTATION IN BATAM ISLAND, INDONESIA: STAKEHOLDER PERSPECTIVES

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Article Info:

Article history:
Received date: 30.06.2025
Revised date: 24.07.2025
Accepted date: 28.08.2025
Published date: 22.09.2025

To cite this document:

Simatupang, D. T., Azmi, A., Sulaiman, S., & Abdullah, A. (2025). Navigating Smart Hotel Implementation in Batam Island, Indonesia: Stakeholder Perspectives. *Advanced International Journal of Business Entrepreneurship and SMEs, 7* (25), 571-582.

DOI: 10.35631/AIJBES.725039

Abstract:

The hospitality industry is undergoing a significant transformation driven by rapid technological advancements, resulting in the emergence of smart hotels as a new paradigm in accommodation services. These hotels integrate a range of cutting-edge technologies, including Artificial Intelligence (AI), the Internet of Things (IoT), big data analytics, and mobile applications, to enhance guest experiences through personalization and convenience, optimize operational efficiency, and promote sustainable and environmentally responsible practices. This shift is reshaping guest expectations and industry standards globally, creating opportunities for competitive advantage. Batam Island, Indonesia, as a rapidly developing tourist destination and a critical gateway for international visitors, presents a relevant and strategically significant setting to explore the adoption and implementation of smart hotel technologies. The island's evolving tourism landscape, coupled with its socio-economic and infrastructural characteristics, underscores the importance of understanding how these innovations are integrated within emerging market settings. This study aims to investigate the implementation of smart hotels in Batam by focusing on the socio-technical challenges inherent in this process, including infrastructural constraints, cultural considerations, and stakeholder readiness. Although extensive research has explored smart hotel implementation in developed economies, emerging markets such as Indonesia remain underrepresented in the literature. In order to identify the main challenges and

Advanced International Journal of Business, Entrepreneurship and SME's
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their roles in advancing the implementation of smart hotel technologies, this study will use a qualitative methodology to gather the lived experiences and perspectives of stakeholders, including internationally chain hotel managers of four and five star hotels that have implemented smart hotels and government officials with experience creating regulations on smart hotels. The findings are expected to provide critical insights into stakeholder engagement, infrastructural and cultural barriers, and strategic opportunities specific to Batam Island, offering valuable contributions for academic and industry practitioners seeking to advance smart hospitality practices in similar emerging contexts.

Keywords:

Smart Hotel, Tourism Technology, Technology Adoption, Stakeholder's Perception, Smart Hotel Implementation.

Introduction

The hospitality industry is undergoing a significant transformation driven by rapid technological advancements, resulting in the emergence of smart hotels as a new paradigm in accommodation services (Gupta et al., 2024). These hotels integrate a range of cutting-edge technologies, including Artificial Intelligence (AI), the Internet of Things (IoT), big data analytics, and mobile applications, to enhance guest experiences through personalization and convenience, optimize operational efficiency, and promote sustainable and environmentally responsible practices (Zhang & Cheng, 2024). This shift is reshaping guest expectations and industry standards globally, creating opportunities for competitive advantage. Smart hotels redefine conventional hospitality models through the integration of intelligent systems for energy management, room automation, personalized services, and seamless digital interactions. As global tourism recovers and evolves, destinations that implemented smart hospitality solutions are well positioned to gain a competitive advantage by providing modern, eco-friendly, and efficient accommodation.

Batam Island, Indonesia, as a rapidly developing tourist destination and a critical gateway for international visitors, presents a relevant and strategically significant setting to explore the adoption and implementation of smart hotel technologies. Batam has excellent transportation infrastructure, including an international airport and five international ports. These multiple access points allow passengers from different countries to reach Batam and continue their journey to other parts of Indonesia (Faturachman et al., 2022). As a tourist destination, Batam's strategic position is not only as a contributor to regional income or job creation in the tourism and creative economy sectors but also plays an important role in the investment aspect in the Riau Islands Province (Indrawati et al., 2021). The island's evolving tourism landscape, coupled with its socio-economic and infrastructural characteristics, underscores the importance of understanding how these innovations are integrated within emerging market settings (Praharaj et al., 2023; Markovic & Gjurasic, 2020; Nindito et al., 2020).

Meanwhile, tourism statistics data in Batam have continued to demonstrate favorable results, with Batam ranking as Indonesia's second-highest tourist arrival. In addition, the government has also taken various steps to encourage the acceleration of the smart hotel program in Batam, starting from the national policy through the Ministry of Tourism and Creative Economy (Kemenparekraf) by establishing Smart Tourism as one of the priorities in the 2020-2024 National Tourism Development Master Plan, which includes the development of smart hotels.

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EISSN: 2682-8545
Volume 7 Issue 25 (September 2025) PP. 571-582
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The Ministry of Tourism and Creative Economy (2022) stated that this program aims to integrate digital technology in the tourism sector, including hotels, to improve the quality of services and tourist experiences. Despite all of that, the transition to smart hotels has various challenges, such as infrastructural constraints, cultural considerations, and stakeholder readiness.

This research aims to investigate the implementation of smart hotels in Batam by focusing on the socio-technical challenges inherent in this process, including infrastructural constraints, cultural considerations, and stakeholder readiness. Although extensive research has explored smart hotel implementation in developed economies, emerging markets such as Indonesia remain underrepresented in the literature.

This study seeks to address these gaps by investigating the opportunities, challenges, and strategic routes for smart hotel implementation in Batam Island from a stakeholder perspective. Key research questions include:

i. How do the stakeholders perceive the smart hotel implementation in Batam?
ii. To what extent has smart hotel been implemented in Batam?
iii. What are the factors contributing to the implementation of smart hotels in Batam?
iv. What are the challenges in implementing smart hotels in Batam?
v. What is the proposed model of smart hotels implementation in Batam?

By employing a qualitative methodology, this study captures the lived experiences and perspectives of key stakeholders, including hotel managers, policymakers, and tourism authorities, to identify the main challenges and their roles in facilitating the implementation of smart hotel technologies. The findings will provide critical insights into stakeholder engagement, infrastructural and cultural barriers, and strategic opportunities specific to Batam Island, offering valuable contributions for academic and industry practitioners seeking to advance smart hospitality practices in similar emerging contexts. Finally, this study not only improves understanding of smart hotel dynamics in emerging countries, but it also acts as a strategic guide for Batam's hospitality sector in terms of leveraging digital innovation, increasing competitiveness, and aligning with Indonesia's vision for a tech-driven economy.

Literature Review

Introduction to Smart Hotels and Their Global Landscape

The hospitality industry is on nearing of a significant technological revolution, driven by rapid advances in digital infrastructure, artificial intelligence (AI), the Internet of Things (IoT), and big data analytics. This paradigm shift has given rise to the concept of the "smart hotel," a technologically integrated establishment that is intended to improve the guest experience, optimise operational efficiency, and promote environmental sustainability. A smart hotel is distinguished by interconnected systems that anticipate and respond to guest requests, automate procedures, and provide valuable data for informed decision-making, in contrast to typical hotels, which may have isolated technology aspects (Han et al., 2021; Voronova et al., 2020). These integration objectives to provide a seamless, personalised, and efficient interaction between the hotel environment and guests, from pre-arrival to post-departure, instead of to only providing convenience.

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The development of hotel technology has been a steady process, with a marked increase during the last two decades. At first, technology mostly streamlined administrative work by supporting back-office operations with Reservation Systems and Property Management Systems (PMS) (Kamran et al., 2023). Nevertheless, with the rise of mobile devices and the internet, emphasis turned to technologies that interact with guests, like digital check-in/check-out, online booking platforms, and in-room entertainment systems. The current wave, driven by AI and IoT, allows for significantly more automation and personalization. Hotels are now using AI for sophisticated data analysis, personalized recommendations, and predictive maintenance to improve service delivery and pricing, while guests may manage room temperature, lighting, and entertainment using mobile applications or voice commands (Li et al., 2020; Buhalis & Moldavska, 2021). This continuous advancement in technology emphasizes how important it is for the hotel industry to innovate and adapt in a world that is constantly transforming.

The implementation of smart hotel technologies is growing worldwide, though at various rates in different places. In order to improve customer loyalty and cut operational expenses, there has been a lot of investment in sophisticated automation and AI-driven solutions in North America and certain areas of Europe (Yu et al., 2021; Choi & Kim, 2022). The Asia Pacific region is experiencing a significant drive toward the development of smart hotels, particularly in nations like China, Singapore, and South Korea, due to rapid urbanization, a technologically proficient consumer base, and the rise of developing economies (Program, 2022). The pressure from competitors to distinguish services, the possibility of significant long-term operational efficiencies, and changing guest expectations for seamless and personalized digital experiences are the main forces behind this worldwide trend. Nonetheless there are challenges inherent in this worldwide movement, including the high upfront costs of investment, the difficulties of integrating various technologies, worries about data privacy and security, and the necessity of extensive employee training and change management (Wang et al., 2021; Lynn et al., 2020). It is important to understand these global dynamics to analyze the particular circumstances of smart hotel implementation, particularly in developing tourism locations like Batam Island, Indonesia.

Smart Hotel Implementation: Benefits and Challenges

Smart hotel technologies have many advantages that have the potential to completely change the hospitality industry, but they also come with a number of challenges that must be carefully considered.

Benefits of Smart Hotel Implementation

Enhanced Guest Experience: Smart hotels significantly improve the guest experience by providing previously unprecedented levels of personalization and comfort. This includes seamless contactless check-in and check-out through digital kiosks or mobile apps, smartphone keyless room entry, and AI-powered concierge services that offer responsive assistance and personalised recommendations (Deri & Ragavan, 2023). Smart room controls for entertainment, lighting, temperature, and even curtain automation let guests customise their surroundings for optimal comfort and create a "home-away-from-home" atmosphere (Sirivadhanawaravachara, 2025; Gøthesen et al., 2023). Additionally, proactive services like automatic housekeeping warnings when a room is empty can be made possible by the integration of IoT sensors.

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Operational Efficiency: Smart technologies not only increase guest satisfaction but also significantly lower expenses and increase operational efficiency in hotels. Routine procedures like check-in and check-out, as well as some aspects of housekeeping management, can be automated to cut down on manual labour and save money (Kamran et al., 2023; Kozmal, 2020). Real-time monitoring and optimisation of energy consumption via smart energy management systems, frequently connected with the Internet of Things, can result in substantial utility cost savings and increase sustainability (Almudayni et al., 2024). Through the use of sensor data, predictive maintenance capabilities enable hotels to handle possible equipment problems before they become serious, reducing downtime and unforeseen repair expenses (Deri & Ragavan, 2023). Moreover, hotel management can gain important insights into guest preferences, operational bottlenecks, and revenue optimisation potential through detailed data analytics gathered by smart systems (Amirulloh et al., 2024).

Competitive Advantage: A successful implementation of a smart hotel is a significant differentiator in a competitive market. Hotels that embrace advanced technology can attract tech-savvy guests, enhance their brand image as innovative and modern, and gain a distinct edge over competitors offering traditional services (Tan, 2021). The ability to provide personalized experiences and transparent services promotes the honesty of guest greater and a positive, priceless word for long -term success (Guerrini et al., 2023).

Sustainability: Environmental sustainability is significantly enhanced by smart technologies. Hotel carbon emissions can be decreased by the use of waste management systems, automatic lighting, and energy-efficient smart thermostats. In line with the increased demand for environmentally responsible travel worldwide, hotels could identify areas for development by using real-time resource consumption monitoring (Langgat et al., 2023; Menegaki, 2025).

Challenges of Smart Hotel Implementation

The road to smart hotel implementation is fraught with difficulties that necessitate careful preparation and execution, notwithstanding the apparent advantages.

High Initial Investment Costs: Frequently, a large initial capital expenditure is required for the purchase and installation of sophisticated smart technologies, such as IoT sensors, AI systems, and a solid IT infrastructure. It can be a significant hurdle to rationalize this expenditure with a clear return on investment (ROI), especially for smaller hotels or ones with constrained resources (Fan et al., 2022).

Technological Complexity & Integration: Smart hotels implementation depend on the flawless integration of numerous, distinct systems, such as guest communication platforms, PMS, energy management, in-room controls, and security. Achieving this integration can be extremely challenging, resulting in data silos, vendor lock-in, and compatibility problems if not done carefully (Zeng et al., 2021). Maintaining dependable network connectivity (such as Wi-Fi 6) is also essential for seamless functioning (Desai et al., 2023).

Data Security & Privacy Concerns: Data security and privacy are major issues due to the vast volume of guest data used for operational insights and personalization. In order to protect sensitive guest data and maintain trust, hotels must adhere to international data protection laws and invest in strong cybersecurity measures (Guerrini et al., 2023; Zhang, 2023). A hotel's reputation can be seriously harmed by just one data breach.

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Staff Training & Resistance to Change: New technologies sometimes require hotel employees to get extensive training (Tavitiyaman et al., 2023). Employees may oppose new systems because they worry about losing their jobs, do not comprehend them, or think they will have more work. Clear communication, thorough training programs, and efficient change management techniques are necessary to guarantee employee support and efficient use of the new technologies (Dwivedi et al., 2023).

Maintenance & Updates: Investing in smart hotel technologies is a continuous process. It needs continuous maintenance, frequent software updates, and occasional hardware replacements to stay productive and competitive. This requires ongoing funding allocation as well as access to knowledgeable IT staff or outside assistance (Gao & Yang, 2022).

Guest Adoption & Digital Divide: Although many modern tourists are tech-savvy, a subset of visitors may be hesitant to engage with smart technologies. Hotels must find a balance between automation and human interaction to satisfy a variety of visitor preferences and avoid offending specific demographics (Dwivedi et al., 2023). If technology is implemented poorly, there is also the danger of fragmented experiences (Reig et al., 2023).

Contextualizing Smart Hotel Implementation in Indonesia and Batam Island

It is necessary to comprehend the broader national and regional context in order to analyse Batam Island's smart hotel implementation.

Hospitality Industry in Indonesia

Indonesia's tourism and hospitality industry is a major contributor to the national economy, with a wide range of attractions, including cultural heritage and natural landscapes. The industry has been expanding quickly, as seen by the rise in demand for both local and international travel (Gidebo et al., 2021). Due to post-pandemic changes in visitor expectations for safety, cleanliness, and contactless services, Indonesian hotels have embraced digital transformation more and more in recent years (Amirulloh et al., 2024). Digital technologies like chatbots driven by AI, cloud-based property management systems, and Internet of Things (IoT) sensors for cleanliness monitoring are becoming more popular as a way to increase operational effectiveness and guest happiness (Gao & Yang, 2022). Several Indonesian hotels and resorts are now providing real-time customization, mobile-centric services, and sophisticated revenue management systems as standard features (Sirivadhanawaravachara, 2025). The cost of implementing sophisticated systems and the necessity for competent personnel to operate these technologies efficiently are two of the continuing challenges (Lakhno et al., 2021). Cultural differences and different levels of technological preparedness among Indonesia’s diverse regions may also affect the rate and character of technology implementation.

Tourism and Hospitality Landscape in Batam Island

Batam Island holds a unique strategic position within Indonesia's tourism landscape due to its close proximity to Singapore and Malaysia. It acts as a hub for business travelers, a destination for MICE (Meetings, Incentives, Conferences, and Exhibitions) activities, and a well-liked weekend retreat for tourists from Singapore and Malaysia (Indrawati et al., 2021; Fajrah & Zetli, 2020). The island provides a variety of hotel options to suit different types of tourists, ranging from low-cost hotels to upscale resorts. Batam's hotel industry is highly competitive, therefore it takes constant innovation to draw in and attract guests.

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The Indonesian government, specifically the Ministry of Tourism and Creative Economy and the Batam Development Agency (BP Batam), has been aggressively working to increase foreign visitor numbers to the Riau Islands, which include Batam, with the goal of making a substantial contribution to the country's tourism goals (Kemenparekraf, 2024). In order to enhance traffic flow, promote economic development, and increase mobility for tourists and investors, BP Batam is dedicated to improving infrastructure, such as the planned construction of nine strategic road segments in 2025 (BP Batam, 2025). The Riau Islands are targeted by the Ministry of Tourism and Creative Economy to account for a significant proportion of foreign tourists nationwide, with the goal of attracting three million visitors from the area by 2024-2025 (Kemenparekraf, 2024). The need for contemporary hotel experiences in Batam is also fueled by the inflow of foreign visitors, many of whom are used to tech-enhanced services. This entails enhancing promotions, enhancing interconnections, and creating international standard tourism plans that include golf and other events. This environment creates great chances for the effective deployment of smart hotel technologies, which meet changing traveler needs and improve the island's competitive advantage.implementation.

Research Methodology

This study uses a qualitative approach to investigate the various perspectives of important stakeholders in implementing smart hotels in Batam Island, Indonesia's (Musleh et al., 2023). The use of qualitative methods is the most suitable given the exploratory nature of the research question and the requirement for a thorough comprehension of stakeholder experiences and perspectives (Creswell & Poth, 2017). This method enables a thorough analysis of the organizational and social factors affecting technology implementation in the particular setting of Batam's hospitality industry (Yin, 2018).

Participants

There are 12 participants in all who were carefully chosen to reflect the wide range of stakeholders involved in Batam's implementation of smart hotels. The participation group consists of:

General Managers (8): These participants are in charge of making important decisions at several hotels in Batam, and they offer valuable insights into the realistic difficulties, challenges, and strategic concerns surrounding the use of technology.

Government Officers (4): These participants represent relevant government agencies involved in tourism development, economic planning, and potentially technology initiatives within Batam. Their perspectives offer valuable context regarding policy frameworks, regulatory environments, and the broader vision for Batam's future as a tourism destination.

Data Collection

Semi-structured interviews will be utilized for collecting information (Fadli, 2021). The researcher will explore the subject matter in a flexible yet focused way using this method, which allows them to investigate developing themes and collect detailed, descriptive information (Brinkmann, 2013). A semi-structured interview guide created, with open-ended questions intended to get comprehensive narratives of participants' experiences, ideas, and opinions on the implementation of smart hotels. The interview will guide address subjects like:

i. Participants' knowledge of related technological developments and "smart hotels"

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EISSN: 2682-8545
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ii. The possibility of smart hotel development in Batam, as well as potential prospects and future trends.
iii. Factors that influence the implementation of smart hotel technology.
iv. The benefits and challenges of Batam's smart hotel implementation as perceived.
v. Specific needs, challenges, and opportunities for smart hotel implementation models in the regional context of Batam in order to conceptualise a smart hotel concept in Batam.

The interview guide will be pilot tested with one or two people to make sure it was clear, pertinent, and thorough (Chi & Qu, 2007). The interviews will be held either in person or via video conferencing, depending on logistical factors and the availability of the participants. Every interview will be between sixty and ninety minutes. All interviews will be audio recorded with the participants' permission to guarantee precise transcription and enable in-depth analysis.

Data Analysis

Thematic analysis will be used to examine the data that has been gathered (Braun & Clarke, 2006). This consists of a methodical process of theme development, coding, interpretation, and data familiarization. The transcripts will be thoroughly examined to identify important topics, recurrent themes, and notable differences in the perspectives of the various stakeholders. Software for analyzing qualitative data, such as NVivo, will be used to improve efficiency and accuracy of the study. Illustrative quotes from study participants used to support and contextualize the identified themes while presenting the results.
Besides, this study adheres to ethical research principles. Informed consent will be obtained from all participants before the interviews. Participants are assured of anonymity and confidentiality. They will be informed of their right to withdraw from the study at any time (Wiles et al., 2008). The study protocol will be reviewed and approved by an appropriate ethics review board.

Expected Result

This study expects to reveal key stakeholder perceptions regarding smart hotel implementation in Batam, highlighting both opportunities and challenges. The findings will likely demonstrate varying levels of smart hotel implementation, influenced by technological, economic, and regulatory factors. Key factors such as guest demand, cost efficiency, and competitive advantage will be identified, alongside challenges like high investment costs, infrastructure limitations, and workforce readiness. Based on these insights, the study aims to propose a practical implementation model tailored to Batam’s unique hospitality landscape, offering strategic recommendations for stakeholders to optimize smart hotel integration effectively. The results will contribute to both academic discourse and industry practices in smart tourism development.

Implication of the Study

The implications of this study are multifaceted and provide valuable insights for multiple stakeholders involved in smart hotel development in Batam Island. To make better investment decisions, create efficient implementation strategies, and create focused training programs that address staff resistance and skill gaps, hotel managers in Batam will be able to use the findings to gain a nuanced understanding of stakeholders' perceptions, benefits, and challenges. The proposed model for the implementation of smart hotels will act as a useful guide, leading them through the stages of strategic planning, technology selection, and guest interaction.

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Furthermore, the study proposes policy frameworks, incentives, and infrastructure development in Batam, Indonesia, to encourage the implementation of smart hotels and support Batam's digital tourism goals. Academically, this research enhances the literature on smart hotel implementation in emerging tourism markets like Batam Island, providing a foundation for future comparative studies and deeper explorations. However, to strengthen the validation of these findings and enrich insights into the hospitality industry, further research should be conducted quantitatively, comparing hotel management practices across regions, and exploring the adoption of specific technologies such as AI or IoT to deepen the analysis.

Conclusion

Through an investigation of all the perspectives of stakeholders, this study thoroughly investigates the state of smart hotel implementation on Batam Island. The study concludes that although smart hotels are generally accepted, there are wide variations in their actual implementation, which frequently correlates with a hotel's size and financial capacity. According to the study, the primary factors influencing decisions are a combination of guests' need for modern experiences, competitive pressures, and the need for operational efficiency. However, there are many challenges in the way of fully integrated smart hotels, including expensive initial costs, multifaceted technological integration, serious data security issues, and the crucial requirement for qualified human resources. Therefore, to support Batam move towards a more competitive and technologically advanced hotel sector, this study proposes a contextually appropriate model that describes important processes for the island's implementation of smart hotels.

Conflict of Interest Declaration

We certify that the article is Simatupang, D. T, Azmi, A, Sulaiman, S. and Abdullah, A. original work. The article has not been published elsewhere, nor it is under consideration for publication for other journals. There is no conflict of interest in the subject matter discussed in this manuscript.

Acknowledgements

The authors would like to thank Faculty of Hotel and Tourism Management at UiTM Cawangan in Pulau Pinang and Faculty of Accountancy at UiTM Cawangan in Perlis for providing the essential resources and research opportunities. Finally, we are grateful to our family and loved ones for their patience and unwavering support during the research and writing process.

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EISSN: 2682-8545
AIJBES
Volume 7 Issue 25 (September 2025) PP. 571-582
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