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The Effect of IOT (Internet of Things) on Green Operation for Two Hotels in Palangkaraya 2025

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ABSTRACT

The integration of Internet of Things (IoT) technology and green principles offers promising prospects for the tourism industry to improve destination quality and operational efficiency. IoT provides innovative solutions in tourism governance, including the application of digital technology in the hospitality sector. Through a network of interconnected sensor devices and communication systems, IoT enables comprehensive information collection, real-time monitoring, and management of various operational aspects. This research also examines study findings related to the influence of employee behavior on customer service performance. Good hotel operations require assurance of data privacy and security, resolution of technology compatibility issues, and significant investments supported by environmentally sound management governance (green operations). Implementation of green operations is proven to have a significant and positive impact on environmental performance. The study concluded that the full implementation of internal green management mediated the relationship between stakeholder pressure and environmental performance outcomes. Although the integration of IoT and its green effect faces challenges, its potential benefits in developing Palangka Raya City as a tourist destination make it a strategy with great potential for future progress.

INTRODUCTION

The concept of the Internet of Things (IoT) generally works by connecting intelligent objects that can interact with other objects, environments, and intelligent computing devices through the internet and wireless networks. Various applications of IoT are seen in many aspects of human life. Industry 4.0 technologies, which include IoT, Artificial Intelligence (AI), and big data analytics, have transformed supply chain management by enabling real-time data exchange and decision-making. In its application, IoT identifies, finds, tracks, monitors objects, and triggers related events automatically and in real time, accurately according to the data needed. IoT is implemented alongside the development of computer networks, the internet, technology, and other communications. The participation of IoT has a significant effect on the economic, operational, social, and tourism sectors, as well as on individuals' lives. The use of

Internet of Things (IoT) technology in tourism has become a hot topic in various hospitality industries. In this industry, IoT helps improve efficiency and quality in supply chain management and enhances organizations' ability to face global challenges. In line with Industrial Revolution 4.0, there is a transition to digital supply chains to support new production models, tourism transportation modes in hospitality, customer experience, and relationships. The implementation of the digital supply chain is highly influenced by the development conditions of a country, especially Indonesia, an Asian tourism paradise.

The Internet of Things (IoT) connects intelligent devices that can interact with other objects, environments, and computing systems through internet and wireless networks, enabling real-time identification, tracking, and monitoring of operational aspects. In the hospitality sector, IoT integration supports efficiency, enhances service quality, and promotes sustainable operations. Previous research by Car et al. (2019) highlighted that IoT adoption in tourism offers opportunities for operational efficiency and improved customer experience but also identified challenges such as high implementation costs and compatibility issues between systems. Similarly, Gajić et al. (2024) found that integrating IoT with sustainability strategies in hotels significantly improves operational performance and environmental outcomes; however, their study focused primarily on large-scale urban hotels, leaving limited insights into smaller or remote-area hospitality operations. This research addresses these gaps by examining the application of IoT for green operations in two hotels in Palangkaraya, a region distant from Indonesia’s main tourism hubs.

The purpose of this research is to analyze the role of IoT in improving efficiency, visibility, responsiveness, and influence in modern and digital ways to identify challenges of technological advancement globally. IoT is needed to overcome these challenges and evaluate the impact of implementing IoT in green operation in areas far from the capital, namely Palangkaraya. The participation of IoT in developing hotel sophistication impacts cost reduction, increases customer satisfaction, and enhances competitiveness. The research method used in this study is a literature review with stages that follow a qualitative approach. The findings are expected to offer practical benefits for hotel managers in remote areas, guide policymakers in formulating inclusive digitalization strategies, and contribute to academic discourse on sustainable tourism technology implementation.

RESEARCH METHOD

This research employed a qualitative approach with a case study design to explore the integration of *Internet of Things (IoT)* technology in supporting green operations within two hotels in Palangkaraya. The qualitative approach was chosen because it allowed for an in-depth understanding of phenomena that cannot be measured quantitatively, focusing on meaning, context, and interpretation (Bhandari, 2020). The case study method, as defined by Yin (2018), enabled the investigation of contemporary real-life cases through detailed contextual analysis of a limited number of events or conditions.

Qualitative research refers to investigative techniques that rely on non-statistical and non-numerical data collection methods, providing a lens for studying phenomena that are not quantitatively measurable (Bhangu et al., 2023). It involves collecting and analyzing non-numerical data to understand concepts, opinions, or experiences and is often used in the humanities and social sciences (Bhandari, 2020).

The descriptive qualitative research method is based on the philosophy of postpositivism and is used to study natural conditions. Researchers act as key instruments, employing purposive and snowball sampling, triangulation in data collection, and inductive data analysis. The results emphasize meaning rather than generalization (Judging, 2022).

Qualitative research focuses on understanding phenomena deeply through flexible and contextual approaches, prioritizing meaning and interpretation over numerical measurement. This approach enabled the researcher to thoroughly examine how intelligent technology (*IoT*) was integrated to support sustainable development in Palangkaraya's tourism sector.

RESULTS AND DISCUSSION

The results of data collection came from the transcript of the interview results held on April 11 at the SBL Hotel and on April 21 at the LAQ Hotel. Then the interview results are tidied up in the form of a table.

INTERVIEW HOTEL SBL

CHAPTER 1

Table 1. Integration of IoT Systems in Hotel Operations at SBL and LAQ Hotels in Palangkaraya

TOPIC	No	Question	SBL Hotels Answers	LAQ Hotel Answers
INTEGRATION	**1**	For what year has the hotel been established since and by whom?	SBL Hotel was established in 2012 SBL Hotel was established by WTH	LAQ Hotel was established on June 8, 2009 by J
	2	What is the maintenance system in the hotel?	For maintenance here we already have direct vendors, but for direct maintenance there are IT and service staff who are on standby at the hotel	XPERT software for maintaining system, transactions, accounting, room monitors, sales, POS, office and office. XPERT is implemented from the hotel standing and is included in the owner's plan and has been familiar with the owner expert for a long time in June 2009.

3	If the maintenance system in the hotel environment is already using or using digitalization and is integrated, can I know what the digital system is called?	The system in hotels has been set and customized based on cases that have occurred before, especially cases related to staff who are not very tech-savvy. The hotel setting and custom system targets staff who are not too tech-savvy. Hotels use Ruijie Cloud software with Mikrotik support applications. Ruijie cloud acts as a hotel facility monitoring tool that is user-friendly and easy to use hotel staff. Ruijie can be accessed through an application on a smartphone that can be downloaded on the Appstore. To process and analyze Ruijie monitor data, the hotel uses the Mikrotik application which acts as a Ruijie Cloud support application	LAQ Hotels uses the Property Management System (PMS) X-PERT as a hotel facility monitoring tool and Kaspersky as an antivirus and firewall. The hotel also uses E-connect as a security monitor application through CCTV which can be accessed through Computers and Smartphones
4	Is the digitalization used by the hotel integrated with IOT and has been updated to follow the hotel standards used in Indonesia	Our hotel has followed the standards and has its own code of conduct for privacy and data use. The hotel has followed the standards of Kominfo's radio frequency rules. Rules such as radio frequencies that cannot be used, and radio channels that can be used, have been followed according to the procedures set by Kominfo	Digitalization at LAQ Hotels has followed national standards

	5	If so, if it has been integrated with the iot system, will it make it easier for the hotel to operate the maintenance of the hotel's security aspect?	Yes, it is very easy, especially for monitoring, and maintenance is very helpful. So a good monitoring system can be monitored from anywhere, you	Hotels see many benefits from the integration of IoT systems. The Point of Sales software, which has been integrated with the hotel's front office, allows hotel operations to run more smoothly. X-PERT Software Property Management System (PMS) also makes accounting, room monitoring, and warehouse management easier

Source: Primary data from interviews with SBL and LAQ Hotel management, 2025

CHAPTER 2

Table 2. Types of IoT Systems and Technology Providers Used in SBL and LAQ Hotels

TOPIC	No	Question	Hotel SBL Answers	Hotel LAQ Answers
TYPES IOT	**1**	If hotels use IoT systems in their operations, can you tell us what types of systems are being used?	SBL hotels use a cloud system from Ruijie as a network management platform that acts as a monitoring device for hotel facilities. Then the cloud monitor data is processed with Mikrotik's RouterOS which functions as a router, bridge, firewall, bandwidth setting, wireless Access Point or Client and networking functions as well as several server functions, so it is suitable for network or internet routing in the office and even used by ISPs and hotspot providers SBL hotels use HR Talenta software as an employee database management tool and Power Pro Hotel Systems for employee data analysis and statistics	Hotel LAQ uses Property Management System (PMS) X-PERT software for maintaining systems, transactions, accounting, room monitors, sales, POS, offices and offices For monitoring and security, the hotel uses Big Vision CCTV which is connected to E-connect software which can be accessed via computers and smartphones
	2	For the systems in IOT that are being used in hotels, who are the providers involved and how the technology is used and how does it work?	SBL hotels use a cloud-based IOT system that uses Ruijie as its provider Ruijie is a cloud-based platform that allows users to remotely manage network devices such as access points, routers, and switches, both through mobile and web applications.	Property Management System (PMS) X-PERT software di provide oleh PT XPERTINDO MULIASISTEMA Big Vision CCTV yang dapat dimonitor dengan software E-connect yang bisa di akses melalui komputer dan smartphone dari provider E-Connect Technology Kaspersky Antivirus software yang di provide dari Kaspersky Labs.

Source: Primary data from interviews with SBL and LAQ Hotel management, 2025

CHAPTER 3

Table 3. Identified Obstacles and Challenges in IoT Implementation at SBL and LAQ Hotels

TOPIC	No	Question	SBL Hotel Answers	Hotel LAQ Answers
OBSTACLES AND CHALLENGES OF IOT USE	**1**	As long as the use and application of the iot system will not always run smoothly or smoothly, do you think you have ever experienced problems and can you explain what the obstacles are?	The obstacles for IOT operations in hotels are more from the providers and support technicians who are often slow to respond in handling complaints about internet stability and software updates which are sudden and quite time-consuming.	Managers and staff do not experience problems in the IOT hardware that has been implemented in the hotel's performance. Many IoT obstacles in hotels arise from IOT providers such as slow networks and software updates that are sudden, time-consuming and stop software work while running.
	2	Does this obstacle affect other digitized money systems that are being run at the hotel?	From financial management, Alhamdulilah there is none.	Obstacles in the financial system at LAQ hotels arise from human error such as small differences in the final calculation of the daily audit. Because there are reports that are still handled manually by accounting staff, then the data from the report is processed again with Point of Sales (POS) software. So financial management at LAQ Hotel is still half manual/offline
	3	How do hotels deal with/overcome transaction errors with IOT systems and manually/offline for the same result?	SDA	The solution for LAQ hotel staff in overcoming transactions in a scenario where the IOT server is down is to use offline/manual cash transactions which are then input into different bookings, separate from digital bookings for a while. As for the final audit report, system booking reporting and offline booking are made one to facilitate data search.

Source: Primary data from interviews with SBL and LAQ Hotel management, 2025

CHAPTER 4

Table 4. Benefits of IoT Implementation for Operational Efficiency, Security, and Error Reduction in Hotels

TOPIC	No	Question	SBL Hotel Answers	Hotel LAQ Answers
MANFAAT IOT	**1**	How IOT affects improving operational efficiency in hotels	IoT is very influential in improving efficiency by reducing the cost of human resource recruitment, and saving on infrastructure development costs that require a lot of funds.	The integration of the IOT system is very helpful for hotels. Hotel operations become smoother with the help of Point Of Sales software that has been integrated with the hotel's front office. Room monitoring, accounting and warehouse management are also facilitated with X-PERT's Property Management System (PMS) software.
	2	What are the contributions of IOT in improving the security of hotel systems and databases?	IoT acts as a backup to anticipate external and internal threats. Hotels use three methods, namely online, offline and plot. Plot is data storage using an external hard disk The security of the hotel's master data storage is also NAS (Network Attached Storage) which is data storage connected to the network. The NAS acts as a storage and backup of hotel data and the data backup on the NAS runs automatically	Security at the LAQ Hotel still mostly depends on CCTV and security who have alternating shifts from morning-noon-night. Data security in hotels uses antivirus and firewall from Kaspersky software.
	3	Is IOT useful in reducing human errors that are often made by customers or hotel employees?	IOT does not have a significant influence on reducing human error in hotel performance, because each user's technological knowledge is different and the software used in the hotel will always be updated and changed.	The benefits of IOT in reducing human error in hotel rooms are very much felt with the help of POS (Point Of Sales) and PMS (property management system) software. The IOT software allows employees and managers to monitor the status of rooms and guest data directly and in real time. Compared to manual monitors where cleaning service staff have to visit the room directly. IOT software has been proven to improve efficiency and save hotel staff operational time.

4	What is the approximate budget for the installation of the IOT system and its security system? Is it burdensome for hotels	Around 150 million	The installation fee is a conversation with the hotel owner and the software expert owner himself
5	What are the risks of using IOT software in hotels?	Dependence on fast and stable internet. The use of IoT in hotels, such as smart locks, smart thermostats, automatic lighting systems, and energy monitoring, does bring a lot of convenience. However, there are some risks to consider. First, there is a data security risk. Because IoT collects a lot of hotel guest and operational data, if not properly maintained, it can be vulnerable to cyber attacks such as hacking or identity theft. Second, the risk of device vulnerability. Many IoT devices have weaker security systems than traditional computers or servers, so they can be an entry point for attackers into the hotel network. Third, there is a risk of dependency on the system. When the IoT system experiences a disruption or failure, hotel operations such as room access, air conditioning systems, or even electrical control can be disrupted. Fourth, the risk of guest privacy. If monitoring systems such as cameras, motion sensors, or behavioral data collection are not managed transparently, this could violate guests'	The risk of using IOT software in LAQ hotels occurs on its own IOT server. Hotel staff must manually input data if the server is down. However, problems like this are rare and if they do, they will be dealt with immediately by IT and Engineering staff. Because the performance of staff in hotels is already heavily dependent on IOT software, server downs will greatly hamper the hotel's financial and operational systems. One of the most burdened parties from hotel management in the event of server downs is IT and Engineering staff, because they will always be pressured to immediately repair the server quickly.

	privacy rights and adversely affect the hotel's reputation. And finally, compatibility and maintenance risks. IoT devices from different vendors can sometimes be difficult to integrate with each other, and require additional maintenance costs to keep them secure and function optimally.	

Source: Primary data from interviews with SBL and LAQ Hotel management, 2025

Green Operation Two Hotels in Palangkaraya

During the interview at the SBL and LAQ Hotels in Palangkaraya, in the operation of the two hotels is different in terms of the ability of the internet of things to integrate several technologies such as internet and wireless in the form of Ruijie, Mikrotik, Talenta software and Powerpro data system, it has been proven to show efficiency in increasing the comfort for SBL Hotels to carry out various activities inside or outside the hotel room. Green operation is an operational management strategy carried out by companies with the main focus on reducing negative impacts on the environment and encouraging the contribution of good work quality according to Kusumo, B.W. (2024) Business Performance Implications of the Implementation of Green Supply Chain Management. Meanwhile, LAQ uses a simple digitization system in the form of XPERT (PMS) and Kaspersky which helps the performance of the IOT system with manual assistance.

Green Employee Behavior

Work processes or actions that aim to encourage the company's employees to contribute to realizing a quality living environment according to Munawarah, M, Syaripuddin, S, Yumna, M., & Simahatie, M (2025) in the Implementation of Green Human Resource Management which ultimately forms a positive experience for guests during their stay. As the results of this study also show that the internet of things (IOT) was found to have an effect on the guest experience in the form of humane and comfortable service carried out by SBL and LAQ Hotel staff. As explained by Kim et al. (2021), guest experience is created from the values of guest experience related to the quality of products or services received during their stay at the two hotels, as seen from ecommerce reviews in the form of Traveloka, Agoda, Tiket.com, and customers that researchers met during interviews.

Green Effect

Based on the results of in-depth interviews with the two speakers, namely the SBL and LAQ Hotels, which the researcher seeks to uncover that there are many differences between the interior of the LAQ hotel with Asian and minimalist architecture than SBL

which tends to carry a modern theme according to the European architectural style with its big name in the capital, this is in accordance with the opinion of Lily Nur Indah Sari Nasution, Siti Alhamra Salqaura, Haryaji Catur Putera Hasman in "The Influence of Green Products and Green Promotion on Tupperware Purchase Decisions in the Community in Tapian Dolok District (2023) Green Effect can be interpreted as the effect or impact caused by the application of environmentally friendly concepts, both in products, production processes, promotions, and other business activities, which aims to reduce environmental damage and improve environmental sustainability.

CONCLUSION

This study investigated the integration of Internet of Things (IoT) technology in supporting green operations at two hotels in Palangkaraya—SBL Hotel and LAQ Hotel. Findings revealed that while SBL Hotel implemented a more advanced and structured IoT system, both hotels complied with national digitalization standards. SBL Hotel excelled in operational and maintenance aspects of green practices, whereas LAQ Hotel demonstrated stronger green effects in room themes and guest environment. IoT integration enhanced monitoring, operational efficiency, and customer satisfaction; however, SBL Hotel's heavy reliance on digital systems without physical backups posed potential risks during system failures. Both hotels met green employee criteria that fostered positive guest experiences. The use of simple, cost-effective IoT devices like DHT11 sensors effectively monitored room temperature and humidity in real time. Overall, IoT adoption in hotels outside Indonesia's main tourism hubs improved operational performance and sustainability, but future research should explore strategies for improving system reliability, data backup solutions, and the development of inclusive digitalization policies tailored to remote hospitality settings.

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