Optimizing The Use of Big Data to Improve Guest Experience in International Hotels

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Abstract *This study explores the strategic use of Big Data in enhancing guest experience within international hotel settings. In the highly competitive hospitality sector, service personalization is pivotal in maintaining guest satisfaction and fostering loyalty. Adopting a qualitative case study design, this research incorporates interviews with hotel managers, questionnaires for licensed staff, and direct observation in several global hotel chains employing Big Data technologies. The findings indicate that Big Data enables the delivery of tailored services such as personalized recommendations based on guest preferences and improves operational efficiency. However, key challenges include limited infrastructure and a lack of analytical expertise among employees. Despite concerns about data privacy, staff generally support the integration of Big Data in guest services. The study concludes that effective implementation of Big Data hinges on robust infrastructure and continuous staff training. It highlights the importance of strategic data management and personalization in enhancing guest satisfaction, while providing avenues for further research in resource constrained hotel environments.*

Keywords: *big data, guest experience, service personalization, international hotels, operational efficiency.*

1. Introduction

The hospitality industry plays a pivotal role in the global economy, contributing approximately 10% to global GDP and employing over 330 million people worldwide (World Travel & Tourism Council, 2023). In this rapidly evolving sector, enhancing the guest experience is fundamental for sustaining competitiveness and achieving customer loyalty. With the rise of digital transformation, Big Data has emerged as a critical tool in understanding customer behavior and personalizing services.

Big Data in hospitality encompasses data from various sources, including transaction records, booking histories, customer reviews, and interactions on hotel apps and websites. Its adoption enables hotels to analyze guest patterns, predict preferences, and offer personalized services, thereby enhancing the overall guest experience. However, while international hotel chains in developed regions have started to capitalize on this potential, adoption in developing countries like Indonesia remains inconsistent. Infrastructure challenges, limited analytics expertise, and data governance issues hamper widespread implementation.

In the context of brilliant hospitality, digital interconnectivity and guest data analytics are becoming industry standards (Buhalis & Leung, 2018). Big Data, characterized by its high volume and variety, is increasingly vital for achieving a competitive advantage (Chen, Mao, & Liu, 2014; Jones, Hillier, & Comfort, 2016). These technologies help predict behavior, enhance guest personalization, and improve hotel competitiveness.

Despite being one of Southeast Asia's top tourism destinations, many hotels in Indonesia lag in digital innovation. A 2022 report by McKinsey revealed that fewer than 30% of Indonesian hotels effectively leverage data analytics in their service strategies. This highlights a pressing need to investigate how Big Data can be leveraged to enhance the guest experience in the Indonesian context and in global hospitality settings.

Although Big Data is increasingly embedded in global hospitality strategies, a significant gap remains between its potential and practical application. According to IBM (2021), nearly 90% of data generated by the hospitality sector is underutilized due to a lack of integration and analytical capacity. A Deloitte survey (2022) revealed that only 34% of hotel executives feel confident in their organization's data literacy.

This urgency is particularly relevant in the Indonesian context, where digital readiness among hotels varies widely. The Indonesian Hotel and Restaurant Association (PHRI, 2023) noted that only 27% of hotels in Indonesia have adopted digital data systems for service analysis. This limited use presents both a challenge and an opportunity to investigate strategic pathways for effective Big Data utilization.

Prior studies have established the foundational benefits of Big Data in the hospitality industry. Goh et al. (2017) emphasized that Big Data enables better customer targeting, while Ivanov and Webster (2019) proposed a conceptual framework for data integration. More recently, Tsai et al. (2021) identified positive impacts on customer satisfaction but also acknowledged implementation barriers.

This study diverges from prior research by moving beyond conceptual exploration to offer practical, implementationfocused strategies, especially for international hotels operating in technology constrained regions. Unlike earlier studies that focused on advanced economies, this research integrates empirical findings from emerging markets, such as Indonesia, offering broader applicability and new insights for cross regional benchmarking.

The novelty of this study lies in its structured approach to implementing Big Data in the hospitality industry. It not only identifies challenges but also proposes a three dimensional strategy model encompassing (1) human capital development, (2) infrastructure readiness, and (3) personalized service design. This model can serve as a practical roadmap for international hotels to improve data driven decision making.

This study also contributes to the innovation discourse by providing a data driven service framework, complementing the perspectives of Mariani & Borghi (2019) and Del Vecchio et al. (2018), who explored data integration in service innovation and tourism management.

The primary objective of this research is to strategize the optimization of Big Data usage in enhancing guest experiences in international hotels. This research also aims to analyze how hotels can effectively manage and utilize big data in a structured manner to enhance service quality. Thus, this research is expected to provide insights into how international hotels can adopt Big Data technology more effectively to improve the overall guest experience.

This research is expected to benefit various parties. For hotel managers, this research will provide valuable insights into how to optimize the use of Big Data in enhancing service quality and the guest experience. By utilizing data more effectively, hotels can create a more personalized and relevant experience for their guests, which in turn will increase customer satisfaction and loyalty.

In addition, this research can also provide practical recommendations for international hotels to adopt and integrate Big Data technology in their business strategies. Thus, this research not only provides academic contributions but also offers practical solutions that can be applied directly by hotels to improve their performance in an increasingly competitive market.

The implication of this research is to provide clearer direction for international hotels on how they can optimize the use of Big Data to improve guest experience. In addition, this research can also help decision makers in the hospitality industry formulate better policies and strategies in terms of data management, as well as identify new opportunities to improve hotel services through more effective data analysis.

With a better understanding of how Big Data can be used to enhance the guest experience, international hotels are expected to strengthen their competitiveness, improve their reputation in the global market, and increase guest retention through more personalized and innovative services. This research may also pave the way for further studies that delve deeper into the impact of other advanced technologies on the hospitality industry.

2. Method

Research Design

The type of research used in this study is qualitative, aiming to understand in-depth how Big Data can be utilized to enhance the guest experience in international hotels. This research will examine the perceptions, experiences, and challenges

encountered by hotels and their guests concerning the implementation of Big Data in hotel services.

The research approach used is a case study that examines the application of Big Data in several international hotels. These case studies will provide a deeper understanding of how hotels manage and optimize the use of Big Data to personalize services and improve guest experience. With this approach, it is expected to explore the challenges and opportunities associated with the application of this technology in the hospitality industry.

Location and Research Subjects

This research will be conducted in several international hotels located in major global cities, such as Jakarta, Bali, Singapore, and Dubai, that have adopted Big Data technology in their operations. The selection of these locations is based on the fact that these hotels have access to high technology and have demonstrated a commitment to innovation in guest experience.

The research subjects consisted of two main groups:

1. Hotel Managers: Those responsible for strategic decisions regarding the implementation of Big Data within the hotel. Interviews with managers will provide valuable insights into how hotels plan and execute the utilization of Big Data, as well as the challenges they encounter.

2. Hotel Guests: Guests who have directly engaged in Big Data driven service experiences. These guests will be identified through surveys and interviews to gauge their satisfaction with the personalized service and assess how the data collected by the hotel enhanced their experience during their stay.

Research Instruments

This research employs a qualitative approach with methodological triangulation, utilizing three primary data collection instruments: semi-structured interviews, direct observation, and document analysis. Triangulation is applied to enhance the validity and reliability of the findings, as it allows the researcher to cross verify data from different sources and perspectives (Creswell, 2014; Patton, 2015).

The research instruments used in this study consisted of:

1. Semi structured Interview Guide: This interview guide will be used to conduct interviews with the hotel manager and guests. Semi structured interviews were chosen in order to elicit in depth information, while remaining focused on the research objectives. Some of the questions that will be asked include:

   a) For hotel managers: "What is the process of collecting and utilizing Big Data to improve the guest experience at your hotel?"

b) For hotel guests: "Do you feel your stay at this hotel has become more personalized and relevant? If so, how would you rate the role of technology in that?"

2. Direct Observation: Observations are conducted to see firsthand how Big Data is applied in hotel operations, from check in to the guest experience during their stay. This observation will also include staff interactions with guests, as well as the use of digital systems to support service personalization.

3. Documentation: Secondary data collection from internal hotel reports, such as room booking data, guest preferences recorded in the system, and company policies regarding the use of customer data. This will provide a more complete picture of how Big Data is used in hotel service management.

Methodological standards in qualitative research justify the triangulation of instruments. Bowen (2009) supports the use of document analysis for context validation, while Kvale and Brinkmann (2009) advocate for semi-structured interviews for thematic depth. Observational rigor is ensured through techniques proposed by Angrosino (2007), enabling this study to capture real-time big data applications.

Data Collection Technique

The data collection techniques used in this research include in depth interviews, direct observation, and documentation analysis:

1. In depth Interviews: Interviews will be conducted with selected hotel managers and guests. Interviews with managers aim to gather information on the hotel's Big Data implementation policies and strategies, while interviews with guests aim to find out their experiences with the technology. Interviews will be conducted face to face or via online platforms, depending on the availability and preferences of the participants.

2. Direct Observation: Researchers will observe interactions between hotel staff and guests, as well as the use of the hotel's digital systems, such as apps or automated check in kiosks, which enable real time data collection. These observations will provide data on how Big Data technologies are applied in daily practice.

3. Documentation: Secondary data collection will be done through the study of internal hotel reports and information systems used to collect and analyze guest data. This includes historical data on guest behavior, room preferences, and digital interactions made by guests during their stay.

3. Results & Discussion

General Description of Respondents

The research involved two main groups of respondents: hotel managers and hotel guests. Respondents were selected from several leading international hotels that have adopted the use of Big Data technology to enhance the guest experience. Hotel locations include several major global cities, such as Jakarta, Bali, Singapore, and Dubai, which have access to high technology and are committed to innovation in the hospitality industry.

1. Guest Profile: The guests involved in this study were diverse, encompassing both international and domestic travelers with various travel purposes, such as business, leisure, and social events. Guest respondents were aged between 25 and 60 years old, with varying levels of education, ranging from undergraduate to postgraduate. The majority of guests were from countries such as Indonesia, Singapore, Saudi Arabia, and the United States. They are guests who actively use apps and digital devices in their travels.

2. Characteristics of International Hotels: The hotels under focus in this study are international hotels that offer comprehensive facilities and prioritize personalized guest experiences. These hotels integrate Big Data technology in various aspects of their operations, from automated check in systems and data collection of guest preferences through mobile applications, to the use of analytics to design experiences that are more tailored to guest needs.
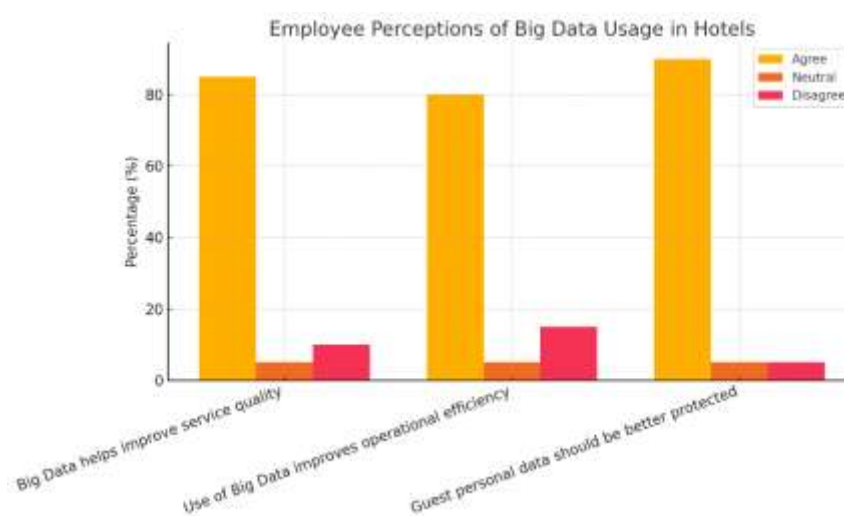
Key Findings

Figure 1. Employee Perceptions of Big Data Usage in Hotels

1. **Findings from Interviews with Hotel Managers**:

    The results of interviews with hotel managers indicate that the use of Big Data in international hotels has had a significant impact on service personalization. One hotel manager in Jakarta stated, "By analyzing guests' transaction data, we can anticipate their needs before they even express them. This creates a more pleasant experience and builds customer loyalty." Another manager in Bali added, "Big Data allows us to optimize our operations, such as determining optimal check-in and check out times, as well as offering relevant promotions to guests based on their preferences recorded in our system."

    However, some challenges were also identified, including infrastructure limitations and the need for enhanced analytics skills among hotel staff. One of the main challenges expressed was the need for continued training to optimize the use of Big Data in improving the guest experience.

2. **Findings from the Licensed Employee Questionnaire**:

    The results of the questionnaire distributed to licensed employees showed mixed levels of understanding and acceptance of the use of Big Data. Most employees agreed that the use of Big Data has improved operational efficiency; however, they also expressed concerns about privacy issues and the potential for inappropriate data use. Employees working in customer service reported that they find it easier to provide more relevant and targeted recommendations to guests, as they have direct access to guest preferences and history data.

    The following graph illustrates the results of the questionnaire, which shows how much employees accept the use of Big Data in services:

Table 1. Employee Acceptance of Big Data Usage

Question	Agree (%)	Disagree (%)	Neutral (%)
Big Data helps improve service quality	85%	10%	5%
Use of Big Data improves operational efficiency	80%	15%	5%
Guest personal data should be better protected	90%	5%	5%

From this table, it is evident that most employees recognize the benefits of Big Data in enhancing services, but also have concerns about privacy issues.

3. **Findings from Observation**:

    On the ground, observations indicate that hotels that integrate Big Data into their operations have more efficient systems and can offer more personalized services. In these hotels, guest data is collected through various channels,

including mobile apps, check in kiosks, and direct interaction with staff. This system enables hotels to offer more personalized services, such as providing room or facility recommendations based on guests' previous preference history.

On the other hand, observations also revealed a misalignment in the implementation of technology in some areas. For example, in some smaller hotels, although guest data is collected, data processing is not fully integrated with other operational systems, which limits the potential for Big Data to provide maximum added value.

Advanced hotels are also beginning to implement predictive analytics to anticipate room demand, guest preferences, and behavioral patterns (Li, Wang, & Yu, 2020). In addition, Zeng et al. (2010) emphasized the importance of social media intelligence in aligning guest experiences with digital expectations.

Overall, this research demonstrates that the implementation of Big Data in international hotels has enhanced the guest experience, both in terms of personalized service and operational efficiency. Although challenges in terms of infrastructure and analytics skills still exist, the results obtained demonstrate that, with the right approach, Big Data can be a highly effective tool in enhancing guest satisfaction and improving overall hotel performance. The use of Big Data not only improves operational efficiency but also enables hotels to deliver more customized and relevant services, which in turn increases guest loyalty and satisfaction.

Discussion Results
Interview Data and Interpretation of Interview Results

Based on interviews with hotel managers and guests, this research identified several key findings regarding the use of Big Data in enhancing the guest experience in international hotels. Interviews with hotel managers reveal that most hotels that have adopted Big Data technologies believe service personalization has improved significantly. One hotel manager in Jakarta stated, "We can provide a more personalized experience to our guests because we can access their data and customize services based on their recorded preferences." According to them, this system not only enhances the guest experience but also optimizes hotel operations in terms of room booking, check-in and check-out scheduling, and facilities management.

However, despite the clear advantages of using Big Data, some managers expressed challenges related to infrastructure limitations and the need for staff training in utilizing the data. One manager in Bali said, "We have an abundance of data, but we need more staff training to make the most of the information." This indicates that while there is significant potential in utilizing Big Data, the success of

its implementation largely depends on the management and analytical skills of the staff.

On the other hand, interviews with guests also revealed that they felt an improvement in service quality thanks to the personalization provided by hotels based on the data they have. Guests staying at hotels that use Big Data are more likely to feel that the hotel understands their needs, whether in terms of room comfort, facilities provided, or additional services such as restaurant recommendations or activities that match their preferences.

Discussion of Questionnaire Results

The results of the questionnaire administered to licensed employees provide further insight into their perceptions of the use of Big Data in hotel services. Most employees agreed that Big Data can improve service quality (85%), and a majority also agreed that its use enhances operational efficiency (80%). However, a minority also expressed concerns about the privacy and management of guests' data (90% agreed that personal data should be better protected). These concerns underscore the significance of ethical considerations in the application of Big Data technologies within the hospitality sector.

Additionally, employees in customer service reported that the use of Big Data enables them to provide more precise and personalized recommendations to guests. This suggests that with a better understanding of guest preferences, staff can provide faster and more relevant service, which contributes to overall guest satisfaction.

Analysis of Observation Results

On-the-ground observations demonstrate how Big Data is being applied in international hotels to enhance the guest experience. In some of the more technologically advanced hotels, guests can check in via mobile apps and kiosks, allowing them to avoid long queues and enjoy a more efficient check in process. During the observation, it was seen that the data collected through hotel apps and check in kiosks are used to identify guest preferences, such as room choice, special needs, or even food and beverage preferences.

Moreover, this data processing is not only done at an individual level, but also at a hotel operational level, such as room stock management and scheduling of housekeeping services, which helps improve operational efficiency. The use of Big Data to design customized promotions is also evident, where guests with specific preferences can receive special offers for services or facilities relevant to their interests.

However, not all hotels utilize Big Data in the same effective manner. Some smaller hotels or those with more limited infrastructure have not fully integrated the data collected with their operational systems. This leads to gaps in the guest

experience, where, although data is available, it is not always leveraged in a way that maximizes its benefits for guests.

Comparison with Previous Research

The findings of this study align with previous studies that have identified Big Data as having great potential for improving the guest experience through service personalization. For example, research conducted by Goh et al. (2017) also demonstrated that Big Data analysis can help hotels anticipate guest needs, provide relevant recommendations, and enhance overall guest satisfaction. A similar finding was also reported in a study by Ivanov et al. (2019), which revealed that the use of Big Data in hospitality can optimize services and increase guest loyalty.

However, the study also found that although many international hotels are adopting this technology, the implementation is not always evenly distributed. Some hotels still face difficulties in optimally utilizing Big Data due to infrastructure limitations and a lack of skills in data analysis. This suggests that while the use of Big Data offers numerous benefits, challenges related to implementation and staff training still need to be addressed to maximize the potential of this technology fully.

Practical Implications

The results of this study provide some practical implications for hotel managers in optimizing the use of Big Data to improve guest experience:

1. Staff Training and Development: One key finding is the need for staff training in utilizing Big Data to maximize its benefits. Hotel managers should provide ongoing staff training, especially those in direct contact with guests, so that they can utilize data to provide more personalized and relevant services.

2. Technology Infrastructure Management: Hotel managers must ensure that the technology infrastructure used can effectively support data collection, storage, and processing. Hotels should invest in more sophisticated systems to manage guest data effectively and efficiently.

3. Use of Data to Personalize Services: Big Data should be used to design more personalized experiences for guests. By understanding guest preferences, hotels can provide more precise recommendations, offer additional services, and even customize existing facilities in the hotel to meet guests' individual needs.

Research Limitations

While this research provides valuable insights into the use of Big Data in hospitality, some limitations need to be noted:

1. Limited Sample: This study involved only a select number of international hotels in a few major cities, so the findings cannot be generalized to the entire global

hospitality industry. Further research with a larger and more diverse sample is needed to strengthen these findings.

2. Reliance on Secondary Data: Some of the data collected through interviews and observations may be affected by the subjective biases of the respondents, both hotel managers and guests. Therefore, further research using more comprehensive and objective data will enrich the analysis.

3. Focus on Large Hotels: This research primarily focuses on international hotels that have advanced technology infrastructure, whereas smaller hotels with limited resources may face different challenges in implementing Big Data.

As such, while these findings provide meaningful insights, further research with a broader methodology and a more diverse sample is needed to gain a deeper understanding of how Big Data can be optimized within the hospitality sector.

4. Conclusion

This research reveals that the use of Big Data in the international hospitality industry has a significant impact on improving the guest experience. Through interviews, questionnaires, and direct observation, this research demonstrates that hotels that integrate Big Data can provide more personalized and relevant services, enhance operational efficiency, and foster greater guest satisfaction and loyalty. Key findings indicate that while the application of this technology has great potential, challenges related to infrastructure and staff skills in managing data are still obstacles that need to be overcome.

Based on the results of interviews with hotel managers, the use of Big Data enables hotels to gain a deeper understanding of guest preferences, which in turn contributes to more customized service offerings. On the other hand, interviews with employees reveal a high level of acceptance of this technology, despite concerns regarding privacy issues and the management of guests data.

Overall, this research offers practical insights for international hotels to optimize the utilization of Big Data, highlighting the importance of staff training and effective management of technology infrastructure. This research also opens up opportunities for further investigation into the challenges and solutions associated with implementing Big Data in hotels with limited resources.

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