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Utilizing Knowledge Discovery in Databases (KDD) for Hotel Guest Feedback Analysis

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Abstract−This research explores the application of Knowledge Discovery in Databases (KDD) to analyze hotel guest feedback and improve service quality at Bintang Flores Hotel in Labuan Bajo. Utilizing KDD methodologies, the study processed 589 guest reviews to identify key factors influencing customer satisfaction, including cleanliness (1.00), location (0.82), and staff service (0.71). The analysis also highlighted issues such as limited breakfast variety (0.59) and inconsistent Wi-Fi connectivity (0.41) as recurring concerns, especially for long-term guests and business travelers. The data revealed that guests staying in the Deluxe Double or Twin Room frequently rated their experience as "Excellent" or "Very Good," with couples and families expressing high satisfaction levels. In contrast, suite categories received fewer and more varied ratings, signaling areas for targeted improvement. Through KDD, the study effectively combined structured numerical ratings and unstructured written feedback to pinpoint areas needing operational enhancement. Addressing challenges related to service consistency during peak periods, infrastructure maintenance, and food variety is essential for boosting guest satisfaction. The findings support implementing targeted strategies to ensure that Bintang Flores Hotel maintains a competitive edge and meets evolving customer expectations in the hospitality market.

Keywords: Hotel; Guest; Feedback; KDD; Bintang Flores; Labuan Bajo

1. INTRODUCTION

The application of Knowledge Discovery in Databases (KDD) to analyze hotel guest feedback represents a critical advancement in understanding customer satisfaction patterns, as demonstrated in the case of Bintang Flores Hotel. This process involves extracting meaningful information from vast datasets, enabling hotel management to derive actionable insights that enhance service quality [1]. KDD facilitates more informed decision-making and targeted service improvements by systematically identifying trends and customer preferences in the feedback [2]. Moreover, using data mining techniques within KDD enhances the ability to detect subtle correlations that may not be immediately apparent through conventional analysis methods [3]. For instance, integrating natural language processing (NLP) within the KDD framework allows for analyzing unstructured text, such as guest reviews, contributing to a more comprehensive understanding of customer sentiment [4]. This approach optimizes operational strategies and offers a competitive edge in the hospitality industry by aligning services with evolving customer expectations [5]. Therefore, implementing KDD in the context of guest feedback analysis at Bintang Flores Hotel underscores its value for improving customer experience and business performance.

The urgency of this research lies in its potential to address critical gaps in data-driven decision-making within industries increasingly dependent on customer insights, such as hospitality. In an era of fierce competition, businesses must leverage advanced analytical tools to remain competitive and responsive to evolving customer preferences [6]. Failure to do so results in missed opportunities for enhancing customer satisfaction and optimizing service delivery, potentially diminishing brand loyalty and market share [7]. By utilizing sophisticated techniques like Knowledge Discovery in Databases (KDD), this study proposes a method that improves data interpretation and contributes to more strategic business operations [8]. Such tools are essential for real-time analysis, allowing businesses to adapt to customer needs rapidly. An in-depth understanding of this approach holds significant promise for transforming raw data into valuable insights, reinforcing its critical role in shaping the future of business strategy and customer relationship management. This research, therefore, underscores the pressing need for continuous innovation in data analytics to ensure sustained business success in an increasingly dynamic market environment.

This research aims to develop an efficient framework for analyzing customer feedback by applying knowledge discovery in databases (KDD), specifically within the context of the hospitality industry. Such an objective is essential in providing businesses with actionable insights derived from complex data sets, which traditional methods may overlook [9]. This research aims to reveal patterns and trends directly influencing service quality and customer satisfaction by leveraging data mining and analytical techniques. The focus on customer feedback analysis through KDD methodologies is expected to offer a deeper understanding of consumer behavior, facilitating more informed decision-making [10]. Additionally, this approach will enable hospitality businesses to continuously refine their services, aligning them more closely with customer expectations and improving overall operational efficiency [11]. Therefore, the intended outcome of this research is to establish a robust analytical toolset that empowers businesses to transform raw data into strategic insights, driving both customer satisfaction and long-term success in a competitive market.

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This research offers theoretical and practical contributions to data analytics and customer feedback management, particularly within the hospitality sector. Theoretically, it advances the understanding of Knowledge Discovery in Databases (KDD) as a sophisticated tool for extracting valuable insights from complex, unstructured data [12]–[15]. The study enriches the existing literature on data-driven decision-making frameworks by integrating data mining techniques with customer sentiment analysis [16]–[18]. In practical terms, the research equips businesses, especially in the hospitality industry, with a systematic method to transform guest feedback into actionable insights that inform service enhancements and strategic planning. This analytical framework enables real-time identification of customer preferences and pain points, allowing for immediate adjustments in service delivery that directly impact customer satisfaction and business performance [19]–[21]. Such contributions are crucial for organizations aiming to stay competitive in a rapidly evolving market, where the ability to interpret and act on data efficiently is critical to sustained success. Through these contributions, this research bridges the gap between theoretical advancements in data science and their practical applications in a business context.

Similar research in data-driven customer feedback analysis has increasingly focused on leveraging advanced data mining techniques, particularly within service-oriented industries such as hospitality and retail. Studies have explored using Knowledge Discovery in Databases (KDD) frameworks to analyze large volumes of customer reviews, intending to identify patterns that reveal underlying customer sentiment and preferences. These approaches, often incorporating natural language processing (NLP), have proven effective in handling unstructured data, such as text reviews, providing businesses with a deeper understanding of client experiences [22]. It is argued that integrating KDD with sentiment analysis and machine learning algorithms has significant potential to improve predictive capabilities, enabling companies to anticipate customer needs more accurately [21]. The outcomes of such research demonstrate the value of data analytics in optimizing service offerings and enhancing customer satisfaction. As more industries adopt these methodologies, it becomes increasingly evident that advanced analytical tools will continue to shape the future of customer relationship management, transforming raw data into a competitive advantage in various sectors.

Further research in customer feedback analysis using Knowledge Discovery in Databases (KDD) should consider expanding its application to diverse datasets and industry contexts. Future studies could deepen the understanding of customer sentiment beyond conventional review platforms by incorporating a more comprehensive range of data sources, such as social media interactions and real-time behavioral data. Including more sophisticated machine learning models, particularly those that leverage deep learning techniques, would enhance the ability to detect subtle patterns and predictive trends in customer behavior. It is also recommended that future investigations explore cross-industry comparisons to assess how different sectors might benefit from tailored data mining approaches [23]. An interdisciplinary approach that integrates insights from fields such as behavioral economics or cognitive psychology could provide a richer interpretation of data, linking customer feedback to deeper motivations and decision-making processes. Such advancements would broaden the theoretical framework of data-driven analytics and offer practical tools for businesses to improve responsiveness and adaptability in an increasingly data-centric marketplace.

2. RESEARCH METHODOLOGY

2.1 Hotel Guest Feedback Analysis

The analysis of hotel guest feedback reveals several research gaps that warrant further exploration, particularly in using advanced data analytics tools. Despite the growing adoption of sentiment analysis and natural language processing in customer feedback systems, many studies have not fully addressed the complexities of unstructured data from diverse feedback channels such as social media, surveys, and online review platforms [24]. Additionally, existing models often focus on surface-level sentiment without adequately considering the deeper, contextual factors influencing guest satisfaction, such as cultural background or long-term customer loyalty [25]. It is argued that the lack of a standardized framework for integrating structured and unstructured data sources limits the potential for comprehensive insights into guest behavior [26]. Addressing this gap requires the development of more robust methodologies that combine qualitative and quantitative data, along with machine learning algorithms capable of recognizing nuanced patterns in customer experiences. Bridging these gaps would significantly enhance the precision and predictive power of hotel guest feedback analysis, providing the hospitality industry with a more holistic understanding of customer satisfaction and expectations.

The novelty of this research lies in its innovative application of Knowledge Discovery in Databases (KDD) to the analysis of hotel guest feedback, combining advanced data mining techniques with real-time sentiment analysis for a more comprehensive understanding of customer experiences. This study distinguishes itself by integrating structured and unstructured data from diverse sources, such as textual reviews and quantitative ratings, thereby enabling a multidimensional view of guest satisfaction [27]. Using natural language processing (NLP) within the KDD framework allows for extracting nuanced insights from customer feedback often overlooked in traditional analyses. This approach enhances the precision of feedback interpretation and offers predictive capabilities to inform strategic decision-making in service delivery. This research represents a

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significant advancement in the field by addressing current limitations in analyzing unstructured feedback and introducing a method to process such data effectively. Ultimately, its contribution lies in offering a more dynamic, data-driven framework that can be applied across the hospitality industry to optimize guest experiences and business outcomes.

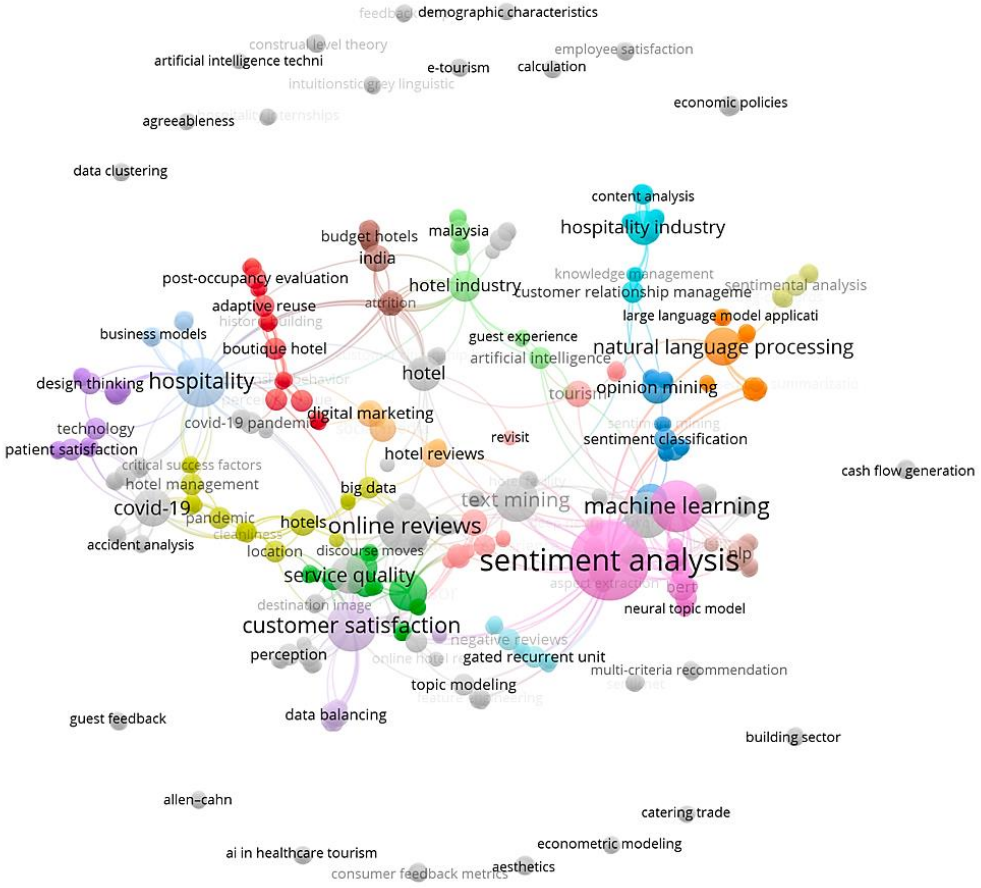

Figure 1. Landscape of Hotel Guest Feedback Research (Vosviewer)

Figure 1 illustrates the research landscape of hotel guest feedback analysis, visualized through a network map generated using Vosviewer. This map highlights the interconnectedness of various critical concepts within the field, with "sentiment analysis" emerging as a central node, surrounded by related topics such as "online reviews," "machine learning," and "natural language processing." The clustering of terms like "customer satisfaction" and "hospitality" indicates a concentrated focus on understanding guest experiences through advanced analytical methods. The dense interconnections suggest that a multidisciplinary approach, combining sentiment analysis with data mining techniques, has been pivotal in recent studies. Smaller, peripheral clusters such as "heritage tourism" and "recommendation systems" point to niche areas of exploration within the broader framework. This visualization maps the current state of research and indicates potential areas for further investigation, particularly in integrating machine learning models with customer feedback analysis to enhance predictive capabilities. Consequently, this figure provides a comprehensive overview of the evolving academic discourse in the field, underscoring the importance of advanced data-driven methodologies in optimizing guest satisfaction and service delivery.

The potential contribution of this research to the advancement of hospitality studies through the application of Knowledge Discovery in Databases (KDD) on hotel guest feedback lies in its ability to transform raw data into strategic insights that reflect guest sentiment and satisfaction. Utilizing KDD methodologies, particularly data mining and sentiment analysis, offers a sophisticated means of identifying patterns and trends within guest feedback that are often missed by conventional analysis techniques. Integrating structured and unstructured data allows for a more nuanced understanding of guest experiences, enabling hospitality businesses to enhance service quality and respond proactively to customer preferences [27]. This method facilitates real-time decision-making and provides predictive insights into guest behavior, which is crucial for maintaining competitiveness in the industry. The application of KDD in this context has the potential to set a new standard for customer feedback analysis, driving both theoretical advancements and practical applications in hospitality management. Consequently, this research contributes significantly to the evolution of data-driven strategies, ensuring that guest feedback is fully leveraged to improve customer experience and operational performance.

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2.2 Knowledge Discovery Databases (KDD)

The methodology employed in this study involves using Knowledge Discovery in Databases (KDD) to analyze guest feedback data from Bintang Flores Hotel, providing a structured approach to extracting valuable insights from complex datasets. KDD consists of several stages, including data selection, preprocessing, transformation, data mining, and interpretation, each designed to uncover hidden patterns and correlations within the feedback [28]. This method is particularly effective in dealing with structured and unstructured data, such as numerical ratings and textual reviews, ensuring a comprehensive analysis of guest experiences. By applying data mining techniques, KDD allows for identifying significant trends that can inform management decisions, such as recurring guest preferences or common areas of dissatisfaction. Implementing this method within the hospitality industry highlights its potential to improve customer service by translating raw feedback into actionable knowledge. Through the systematic application of KDD, this research contributes to optimizing service delivery, enhancing guest satisfaction, and driving strategic improvements in hotel operations.

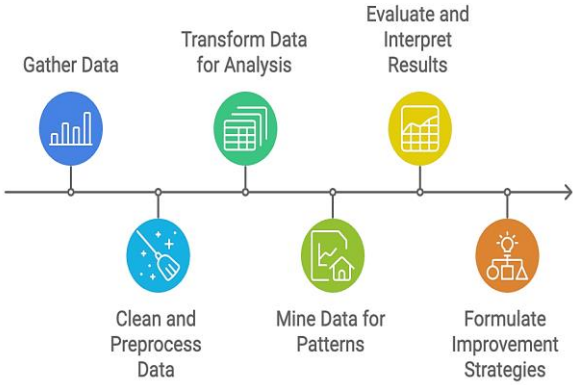

Figure 2. Knowledge Discovery Databases (KDD)

Figure 2 presents the systematic Knowledge Discovery in Databases (KDD) process, outlining key stages that transform raw data into valuable insights for decision-making. The process begins with data collection, where relevant data is gathered from various sources. This is followed by the cleaning and preprocessing phase, which ensures that the data is free from errors and inconsistencies, making it suitable for analysis. Next, the data is transformed into an appropriate format, enabling efficient analysis through data mining techniques. The core stage involves data mining for patterns and uncovering hidden correlations, trends, or significant anomalies for the research objective. The results are evaluated and interpreted to derive meaningful insights that inform business strategies. Finally, these insights formulate improvement strategies to optimize services or operations. KDD's cyclical and iterative nature emphasizes its role in continuously refining processes based on feedback and emerging data, making it an indispensable tool in modern data-driven decision-making.

2.2.1 Gather Data: Bintang Flores Hotel

The data-gathering phase at Bintang Flores Hotel is a critical initial step in the Knowledge Discovery in Databases (KDD) process, systematically collecting guest feedback across various platforms. This phase encompasses structured data, such as numerical survey ratings, and unstructured data, like written reviews from online booking sites and social media. Gathering comprehensive data ensures that the analysis reflects diverse guest experiences, providing a solid foundation for further processing and analysis. Including multiple feedback sources enhances the robustness of the dataset, allowing for a more holistic view of guest sentiment and satisfaction. By capturing this wide array of information, the hotel can better understand the nuances of customer preferences and areas that require improvement. This thorough data collection is essential for ensuring the quality of subsequent analysis and enabling more accurate and actionable insights that can drive strategic service enhancements. Thus, data-gathering is indispensable for building an informed basis for data-driven decision-making in the hospitality sector.

Bintang Flores Hotel in Labuan Bajo offers a tranquil retreat for travelers, combining luxury and comfort within a serene natural setting. Established in 2006, this 4-star hotel seamlessly integrates modern architectural design with the lush beauty of its surroundings, creating an inviting atmosphere for both leisure and business guests. With 61 elegantly appointed rooms, including deluxe and suite options, the accommodations are crafted to provide a peaceful sanctuary, ensuring a relaxing stay after a day of exploration. The hotel's welcoming policies, including free stays for children aged 6 to 12, reflect a family-friendly approach, making it an ideal vacation destination. The professional and attentive staff enhance the guest experience, offering seamless service from check-in at 2:00 PM to check-out by noon. Situated conveniently in Labuan Bajo, the property is an excellent base for exploring the region's attractions while ensuring guests can access the finest amenities. Bintang Flores Hotel blends natural beauty, comfort, and hospitality, promising an unforgettable experience for those seeking a peaceful escape or an adventurous getaway.

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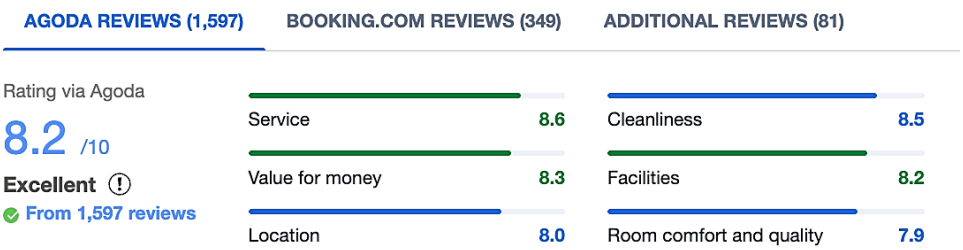

Figure 3. Rating of Bintang Flores Labuan Bajo on Agoda Platform

Figure 3 depicts the guest ratings of Bintang Flores Hotel on the Agoda platform, where the hotel has received an overall rating of 8.2/10 from 1,507 reviews, indicating a high level of guest satisfaction. The individual rating categories provide further insights, with notable scores for service (8.6), cleanliness (8.5), and value for money (8.3), reflecting the hotel's consistent performance in these critical areas. Additionally, the location receives a score of 8.0, and the facilities are rated at 8.2, contributing positively to the overall guest experience. Room comfort and quality, while slightly lower at 7.9, still suggest a satisfactory level of comfort but may indicate potential areas for improvement. These ratings, derived from numerous reviews, provide valuable feedback for the hotel's management, highlighting strengths in service and cleanliness while identifying opportunities to enhance guest comfort. Overall, the aggregated ratings offer a comprehensive view of guest perceptions, which can be leveraged to inform targeted improvements in specific service areas.

Bintang Flores Hotel in Labuan Bajo offers an array of convenience facilities designed to enhance the comfort and ease of its guests during their stay. Services such as laundry, room service, and dry cleaning allow guests to manage their clothing needs effortlessly, ensuring they can focus on relaxation and exploration. Providing safety deposit boxes adds an extra layer of security for valuables. At the same time, the concierge service is readily available to assist with travel arrangements or local recommendations, facilitating a smooth and enjoyable experience. In today's connected world, the availability of Wi-Fi in public areas and complimentary Wi-Fi in all rooms ensures that guests remain linked to work or social networks without interruption. Luggage storage services provide additional convenience, enabling guests to explore the surroundings unburdened by their belongings. An on-site convenience store further simplifies access to essential items, eliminating the need for offsite shopping. Additionally, daily housekeeping ensures that guests return to a clean and organized environment, maintaining a high standard of comfort throughout their stay. Altogether, these facilities underscore the hotel's commitment to delivering a seamless, guest-centered experience in a tranquil setting.

Figure 4. Property View of Bintang Flores Hotel in Labuan Bajo (Source: Agoda)

Figure 4 showcases the exterior and interior views of the Bintang Flores Hotel in Labuan Bajo, visually representing the property's architectural design and surrounding environment. The images depict a blend of modern facilities and natural landscaping, highlighting the hotel's emphasis on creating a serene and aesthetically pleasing atmosphere for guests. The spacious interiors, featuring contemporary design elements, reflect a commitment to luxury and comfort. At the same time, the outdoor views emphasize the hotel's proximity to lush greenery and scenic water features, which enhance the overall guest experience. The

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integration of nature within the hotel's design complements its architectural appeal and aligns with the growing trend in hospitality towards eco-conscious environments. These visual elements suggest the property is designed to cater to a clientele seeking relaxation and modern amenities in a tropical setting. Overall, the property views demonstrate the hotel's capacity to offer an experience that balances luxury with natural beauty, which is likely a critical factor in attracting guests to the destination.

Bintang Flores Hotel offers a comprehensive range of transport facilities to ensure a smooth and convenient travel experience for its guests. With airport transfer services, arriving guests are met by professional drivers who provide efficient transportation to the hotel, ensuring a comfortable and stress-free journey from the moment of arrival. For those wishing to explore the stunning landscapes of Labuan Bajo, including Komodo National Park, the hotel's tour services, led by experienced guides, offer a tailored approach to discovering the local attractions. Guests who prefer independent travel can use the complimentary on-site car park to explore nearby destinations at their own pace. The hotel's shuttle service also ensures easy access to popular local spots such as beaches, markets, and the town center, enhancing guests' mobility without needing personal vehicles. These transport facilities demonstrate the hotel's commitment to providing convenience and enhancing the overall guest experience, making it an ideal choice for adventurers and those seeking relaxation in Labuan Bajo.

2.2.2 Clean and Preprocess Data

The Clean and Preprocess Data stage involves refining raw data to ensure its accuracy and usability for analysis, as demonstrated in this study's data collection of 815 verified guest comments. During this phase, data undergoes a rigorous cleaning process, removing irrelevant, incomplete, or duplicate entries, resulting in a reduced dataset of 590 usable comments. This step is essential for eliminating noise and inconsistencies that could distort the analytical outcomes, ensuring the reliability of the data. Focusing on verified guest comments and applying stringent preprocessing techniques enhances the quality of the data, allowing for more accurate and meaningful analysis. The careful reduction of data also streamlines the subsequent stages of data mining, ensuring that only relevant, high-quality feedback is considered. Ultimately, cleaning and preprocessing ensure the integrity of the dataset, which is critical for producing reliable insights into guest experiences and satisfaction.

Table 1. Hotel Guest Data Based on Country, Visitor Type, Room Type, and Rating Description (Agoda)

Account	Country	Visitor Type	Room Type	Rating Description
Selly	Indonesia	Group	Deluxe Double or Twin Room	Exceptional
Philippe	France	Couple	Deluxe Double or Twin Room	Philippe
Phyllis	United Kingdom	Family with teens	Deluxe Double or Twin Room	Excellent
wilbertus	Netherlands	Couple	Deluxe Double or Twin Room	Excellent
SUTIMAN	Indonesia	Family with young children	Deluxe Double or Twin Room	Exceptional

Table 1 showcases a representative sample of hotel guest data, categorized by country, visitor type, room type, and rating description, providing valuable insights into guest demographics and their experiences. The table includes guests from Indonesia, the United Kingdom, and the Netherlands, with visitor types ranging from groups and families to couples, all opting for the "Deluxe Double or Twin Room." Ratings for the hotel experience vary, with most guests rating their stay as "Exceptional" or "Excellent," highlighting high satisfaction across different nationalities and visitor types. One guest from Indonesia rated their stay as "Good," suggesting that while the overall guest experience is positive, some areas may benefit from refinement. This data is instrumental in understanding the preferences and satisfaction levels of different guest profiles, providing the hotel with a clear direction for maintaining strengths and addressing potential improvements. The consistent positive ratings reinforce the hotel's reputation for quality service, especially among family and group travelers, indicating that the hotel successfully meets the diverse needs of its international clientele.

The collected data regarding stay information and guest reviews provides valuable insights into the relationship between the length and timing of a guest's stay and their overall experience, as reflected in their reviews. This dataset includes information such as the account name, duration of stay, month and year of stay, and the title and content of each review. Such data enables a deeper understanding of guest satisfaction across different periods, allowing the hotel to identify potential seasonal trends or recurring issues that may affect the guest experience. For instance, extended stays may correlate with more detailed feedback, offering the hotel a comprehensive view of the guest's engagement with services and amenities over time. Analyzing these reviews reveals patterns in guest satisfaction, providing critical feedback for improving the guest experience. This data also supports the identification of key strengths and areas needing refinement, ensuring that the hotel remains

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responsive to the evolving needs of its clientele. Ultimately, this information is vital in enhancing operational strategies and service quality.

Table 2. Length of Stay and Review Data (Agoda)

Account	Length of Stay	Month of Stay	Year of Stay	Title	Review
Selly	2 nights	Novem ber	2019	"Good hotel with seaview"	(+) pool, room, view, location,flexible check in and out (-) beach (dirty), breakfast (need more various menu)
Vandy	3 nights	May	2013	"very nice and comfortabl e hotel"	40 minutes walk to city center.. very comfortable diving center .. expensive but serious only problem: the swimming pool is open to local people on Sunday, which makes it very noisy
Phyllis	1 night	Novem ber	2018	"Lovely pool"	10 mins to airport.. Very friendly and helpful staff. Hotel taxi to restaurants. WiFi only good in reception area
wilbertus	3 nights	Decemb er	2013	"very comfi stay"	4 nights (extended our initial stay with 1 day), very friendly and willing staff. Great dive school with good equipment on site
SUTIMAN	4 nights	June	2022	"Best Four stars hotel in Labuan Bajo"	4 star hotel with affordable price and 5 star service and staffs Especially Miss Rifa, who very helpful Will come back to Bintang Flores someday

Table 2, which details the length of stay and corresponding guest reviews, highlights the importance of collecting nuanced guest feedback for assessing the overall hotel experience. Each account provides specific insights related to the duration of stay and the quality of services, ranging from positive experiences with amenities such as the pool and diving center to critiques about areas needing improvement, like breakfast variety and noise levels. For example, Selly's review after a two-night stay in November 2019 highlights strengths such as room quality and location while pointing out dissatisfaction with the beach's cleanliness and breakfast options. Similarly, Vandy's three-night stay in May 2013 emphasizes the hotel's convenience but notes the disruption caused by noise at the pool on Sundays. The diversity of feedback across different lengths of stay suggests that while short stays often focus on immediate service aspects such as check-in flexibility, longer stays allow for a more in-depth experience of the facilities, as demonstrated by Wilbertus, who extended his stay by a day due to the quality of the dive school and friendly staff. These reviews are critical for identifying consistent strengths, such as staff hospitality, and areas that require further attention, offering valuable information for continuous improvement in hotel management and service delivery.

Knowledge Discovery in Databases (KDD) is crucial for data collection and extracting meaningful insights from vast and complex datasets, particularly in service-oriented industries such as hospitality. By systematically gathering and processing data, KDD identifies hidden patterns and trends that traditional methods may overlook. This approach allows for a more accurate evaluation of customer feedback, which is essential for improving service quality and operational efficiency. Once analyzed, the data offers actionable insights into customer preferences, pain points, and satisfaction levels, which can guide management in refining their services to meet guest expectations better. Furthermore, the predictive capabilities of KDD provide an opportunity to anticipate future customer needs, allowing businesses to stay ahead of market trends. Integrating these insights into service evaluation processes leads to continuous improvement, enhancing customer experience and the hotel's competitive edge in a dynamic market environment. Thus, KDD is a powerful tool for transforming raw data into strategic service management and evaluation advantages.

2.2.3 Transform Data and Mine Data for Patterns

The stages of Transform Data and Mine Data for Patterns are critical components in the Knowledge Discovery in Databases (KDD) process, aimed at refining raw data and uncovering valuable insights. In the transformation phase, raw data is structured and formatted to ensure consistency and compatibility with the analysis tools, eliminating redundancies and addressing missing values. This step is vital for enhancing data quality, allowing the subsequent mining stage to identify meaningful patterns effectively. The mining stage involves applying sophisticated algorithms to detect trends, correlations, and anomalies within the dataset. These patterns provide deeper insights into customer behavior, preferences, and potential issues that might otherwise remain hidden. For instance, mining guest feedback data can reveal common areas of dissatisfaction or highlight frequently praised services, offering clear guidance for improving operations. By combining data transformation and mining, organizations gain a more comprehensive understanding of their datasets, enabling data-driven decisions that

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enhance service quality and customer satisfaction. Thus, these stages are indispensable for converting raw data into strategic business intelligence.

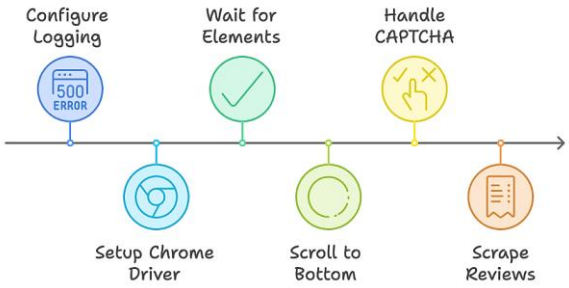

Figure 5.Web Scraping Data using Selenium and BeautifulSoup in Python

Figure 5 illustrates the process of web scraping data using Selenium and BeautifulSoup in Python, showcasing a step-by-step approach to extract information from web pages efficiently. The process begins with configuring logging to track errors during execution, followed by setting up the Chrome Driver, which acts as the browser automation tool. Once the driver is operational, the script waits for specific elements on the page to load, ensuring all necessary content is available before further actions are taken. Handling CAPTCHAs is another crucial step, as it ensures the script can bypass security checks that websites often impose to block automated scraping. After overcoming these barriers, the script scrolls to the bottom of the page to load all hidden elements, mainly when dealing with dynamically loaded content. Finally, the script scrapes the reviews, extracting the relevant data for analysis. This systematic approach demonstrates the effectiveness of combining Selenium for browser automation and BeautifulSoup for parsing HTML, allowing for the collection of extensive and detailed data for various analytical purposes, particularly in fields requiring large-scale feedback or review analysis.

Chrome Driver, Waiting Element, and Handling Captcha

```python
def setup_driver():
    chrome_options = Options()
    chrome_options.add_argument("--no-sandbox")
    chrome_options.add_argument("--disable-dev-shm-usage")
    chrome_options.add_argument("--user-agent=Mozilla/5.0 (Windows NT 10.0; Win64; x64) AppleWebKit/537.36 (KHTML, l

    service = Service(ChromeDriverManager().install())
    driver = webdriver.Chrome(service=service, options=chrome_options)
    logging.debug("ChromeDriver initialized")
    return driver

def wait_for_element(driver, by, value, timeout=20):
    try:
        element = WebDriverWait(driver, timeout).until(
            EC.presence_of_element_located((by, value))
        )
        return element
    except TimeoutException:
        logging.warning(f"Timeout waiting for element: {value}")
        return None

def scroll_and_wait(driver, scroll_pause_time=2):
    last_height = driver.execute_script("return document.body.scrollHeight")
    while True:
        driver.execute_script("window.scrollTo(0, document.body.scrollHeight);")
        time.sleep(scroll_pause_time)
        new_height = driver.execute_script("return document.body.scrollHeight")
        if new_height == last_height:
            break
        last_height = new_height

def handle_captcha(driver):
    if "captcha" in driver.page_source.lower():
        logging.warning("CAPTCHA detected. Manual intervention required.")
        input("Please solve the CAPTCHA manually and press Enter to continue...")
```

Review Scraping

```python
def scrape_all_reviews(base_url):
    driver = setup_driver()
    all_reviews = []
    current_url = base_url
    page_count = 0
    max_retries = 3

    try:
        while True:
            logging.info(f"Scraping page {page_count + 1}...")
            reviews = scrape_agoda_review_page(driver, current_url)
            all_reviews.extend(reviews)

            # Coba temukan tombol "Load more reviews" dan klik jika ada
            try:
                load_more_button = WebDriverWait(driver, 10).until(
                    EC.element_to_be_clickable((By.XPATH, "//button[contains(text(), 'Load more reviews')]"))
                )
                load_more_button.click()
                time.sleep(5)  # Tunggu konten baru dimuat
                page_count += 1
            except:
                logging.info("No more reviews to load or button not found.")
                break

            if page_count >= 100:  # Batasan halaman untuk keamanan, bisa disesuaikan
                logging.info("Reached maximum page limit.")
                break

            delay = random.uniform(3, 7)
            logging.info(f"Waiting for {delay:.2f} seconds before next request")
            time.sleep(delay)
    except Exception as e:
        logging.error(f"Error during scraping: {str(e)}")
    finally:
        driver.quit()
```

Figure 6. Code for Review Data Scraping using Selenium and BeautifulSoup

Figure 6 presents the Python code used for scraping review data by utilizing Selenium and BeautifulSoup, demonstrating a structured approach to automating data extraction from web pages. The code initializes by importing necessary libraries, such as Selenium for browser automation and BeautifulSoup for parsing HTML content. Functions are defined to set up the Chrome WebDriver, handle dynamic content loading by scrolling the page, and capture specific elements like user reviews. Error handling is also incorporated, ensuring the script remains resilient in the event of missing elements or timeouts. Additionally, logic is embedded to manage CAPTCHAs or delays in loading, allowing the script to continue functioning under various conditions. By iterating through web elements, the script extracts textual data and processes it for further analysis. This systematic use of Selenium to simulate human interaction with web pages, combined with BeautifulSoup's parsing capabilities, showcases an efficient method for collecting large amounts of data from user reviews, which can then be leveraged for sentiment analysis, market research, or service evaluation in business contexts. The code's design ensures adaptability, enabling it to be applied across various websites and datasets.

2.2.4 Evaluate and Interpret Results and Formulate Improvement Strategies

The stages of evaluating and interpreting results, followed by formulating improvement strategies, are critical for translating data insights into actionable outcomes. During the evaluation phase, the collected data is rigorously analyzed to identify patterns, correlations, and anomalies that reveal underlying issues or strengths within the service. This stage is crucial for understanding guest satisfaction levels, pinpointing operational inefficiencies, and detecting areas for improvement. Interpretation involves drawing meaningful conclusions from the data and

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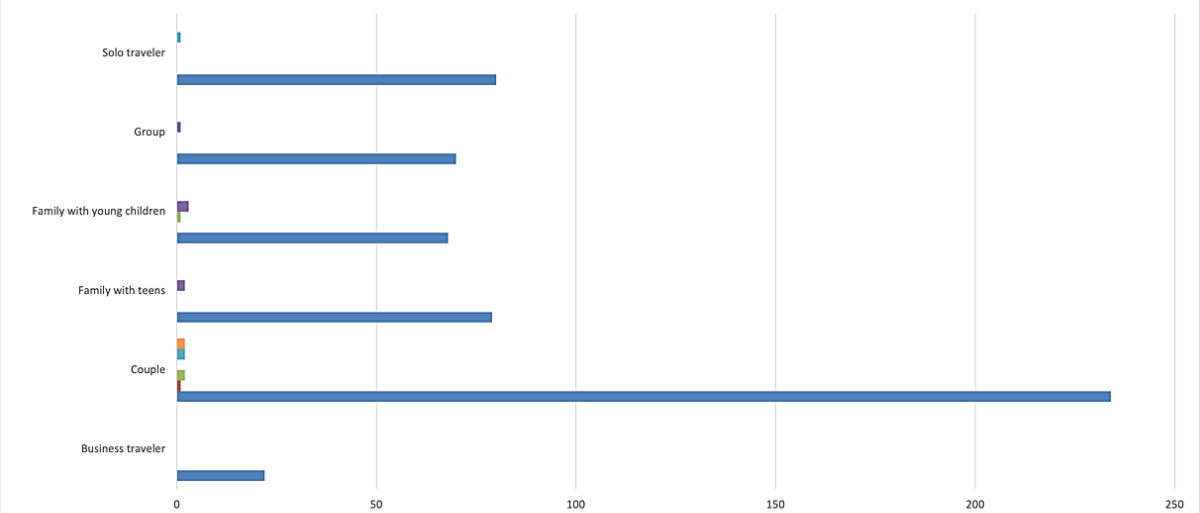
ensuring that the insights are accurate and relevant to the organization's goals. Once the results are clearly understood, strategic decisions can be formulated to address identified gaps, enhance service quality, or innovate processes. Improvement strategies might involve refining customer service protocols, updating amenities, or redesigning workflows to meet guest expectations. These strategies are not static but evolve based on continuous feedback and ongoing performance evaluation. Ultimately, the systematic approach to evaluating results and developing strategies ensures that data-driven decisions improve operational efficiency and customer satisfaction.



	Business traveler	Couple	Family with teens	Family with young children	Group	Solo traveler
Room Assigned on Arrival		2				
Junior Suite		2				1
Family Room			2	3	1	
Deluxe Suite		2		1		
Deluxe Room		1				
Deluxe Double or Twin Room	22	234	79	68	70	80

Figure 7. Room and Visitor Type (568 Account)

Figure 7 illustrates the distribution of room types and visitor types based on data from 568 accounts, offering insights into guest preferences and booking patterns. The figure categorizes visitors into various types, such as solo travelers, couples, families, and groups, while correlating this with their chosen room types, such as standard, deluxe, or suite accommodations. This distribution reveals trends in guest behavior, indicating that families and groups prefer more significant, luxurious rooms. In contrast, solo travelers and couples are more likely to opt for standard or deluxe options. The data also suggests potential relationships between visitor demographics and room choice, highlighting how specific room types appeal to different segments of the hotel's clientele. Understanding these patterns is essential for optimizing room allocation strategies and tailoring marketing efforts to target specific visitor groups. The hotel can enhance guest satisfaction, increase occupancy rates, and improve operational efficiency by aligning room offerings with guest preferences. This analysis provides valuable guidance for future resource planning and customer segmentation efforts.

Based on the data collected, guest satisfaction levels at Bintang Flores Hotel in Labuan Bajo can be interpreted as generally high, reflecting positive feedback on the hotel's products and services. Many guests have rated their experiences as "Exceptional" or "Excellent," particularly praising aspects such as room quality, the hotel's scenic location, and the professionalism of the staff. These elements seem to play a significant role in contributing to overall guest satisfaction. However, particular areas, such as breakfast variety and noise levels during local access to the swimming pool, have been noted as areas needing improvement. This suggests that while the hotel excels in delivering core services, specific operational elements may require further refinement to meet diverse guest expectations fully. The hotel can further enhance its reputation and maintain high satisfaction by addressing these minor issues and aligning service offerings with guest preferences. This analysis underscores the importance of using guest feedback to identify strengths and areas for ongoing improvement in service delivery.

3. RESULT AND DISCUSSION

The discussion in this study focuses on analyzing hotel guest feedback within the context of Bintang Flores Hotel in Labuan Bajo, highlighting the strengths and areas for improvement in guest services. The analysis reveals consistent praise for the hotel's strategic location, room quality, and staff professionalism, which are key factors contributing to overall guest satisfaction. However, some feedback identifies areas that require enhancement, such as increasing the variety of breakfast options and addressing occasional noise disturbances

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caused by public access to hotel facilities like the swimming pool. These insights emphasize the importance of continuous service improvement and adapting to guest expectations. The feedback also suggests that while core services meet or exceed guest standards, attention to finer details could further elevate the hotel's reputation. This analysis is a critical tool for shaping future strategies, enabling management to maintain competitive service standards while ensuring that guests' evolving needs are addressed proactively. Thus, the findings support a balanced approach to reinforcing strengths while systematically refining areas directly impacting guest experience.

3.1 Hotel Guest Feedback Analysis : Bintang Flores Hotel in Labuan Bajo

The analysis of hotel guest feedback at Bintang Flores Hotel in Labuan Bajo offers valuable insights into guest satisfaction and areas for potential improvement. Feedback consistently highlights the hotel's strengths, particularly in its scenic location, room quality, and the professionalism of its staff, all of which contribute positively to the guest experience. However, certain aspects, such as breakfast variety and occasional noise disturbances due to public access to the swimming pool, have been noted as areas that could enhance the overall experience. These comments reflect a generally high level of satisfaction while also pinpointing operational details that might benefit from refinement. The hotel can improve guest retention and attract new visitors by addressing these minor shortcomings and focusing on service excellence. Such feedback is critical for the hotel's management to evaluate current performance and implement targeted strategies to enhance service quality, reinforcing its reputation as a leading destination in Labuan Bajo.

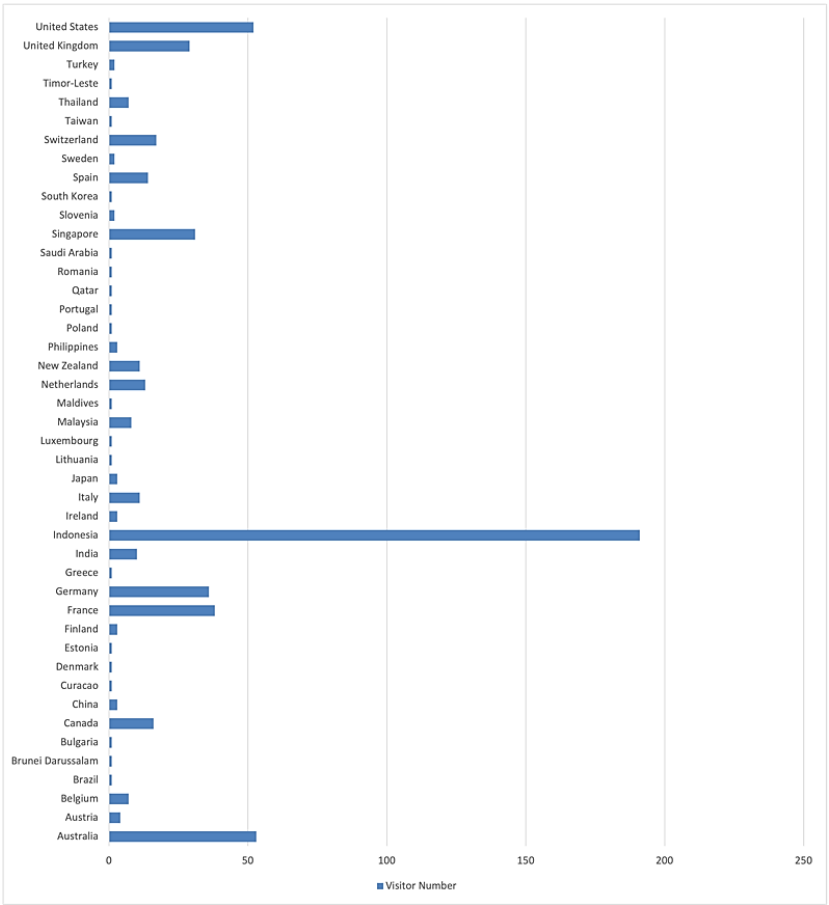

Figure 8. Hotel Guest based on Country of Origin (587 Account)

Figure 8 displays the distribution of hotel guests at Bintang Flores Hotel based on their country of origin, offering insights into the international diversity of the clientele. The data reveals that a significant portion of the hotel's guests originate from Indonesia, with over 200 visitors, making it the most significant demographic. Notable guest numbers from Australia, the United States, and several European countries like the Netherlands and Germany follow this. However, these figures are considerably smaller than the local guests. This distribution indicates that while the hotel attracts many international tourists, domestic tourism dominates the overall guest composition. The presence of guests from various regions highlights the hotel's broad appeal, suggesting that its offerings cater to local and international travelers. This data is valuable for tailoring marketing strategies, as it enables the hotel to focus on enhancing services for domestic tourists and key international markets, optimizing their approach to guest satisfaction, and further expanding their global reach.

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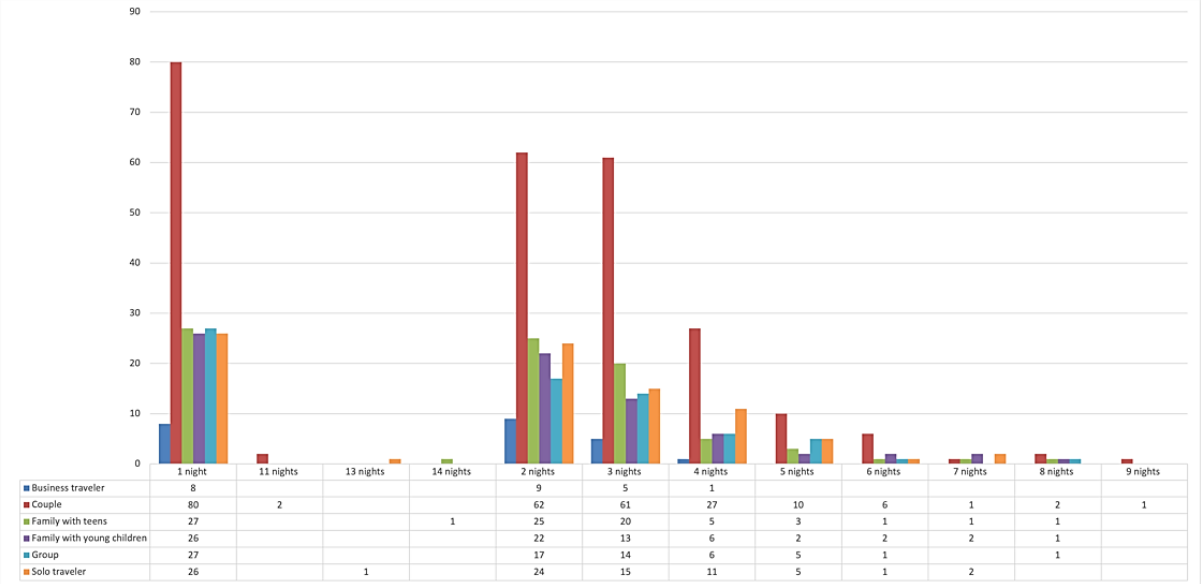
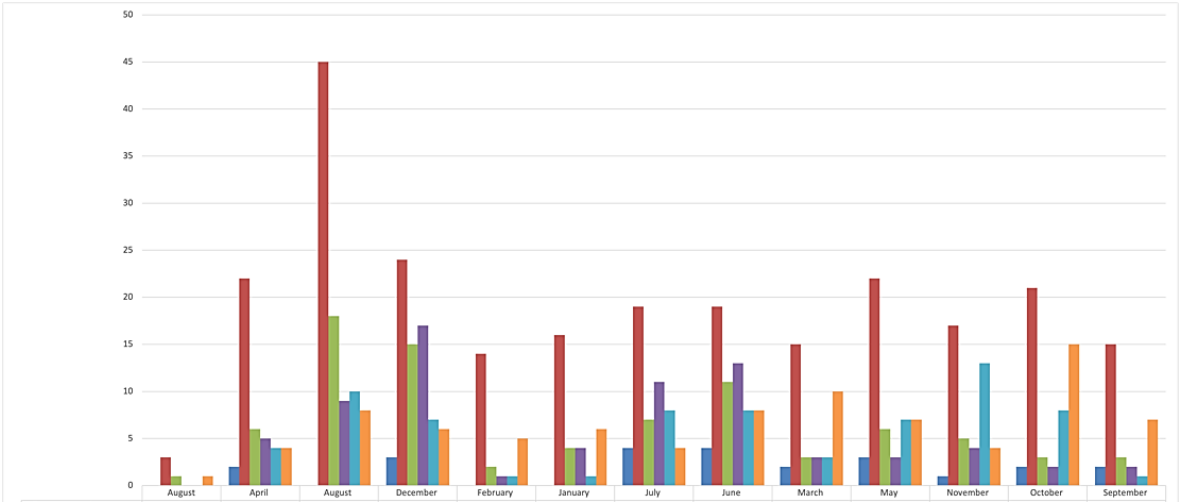


	1 night	11 nights	13 nights	14 nights	2 nights	3 nights	4 nights	5 nights	6 nights	7 nights	8 nights	9 nights
Business traveler	8				9	5	1					
Couple	80	2			62	61	27	10	6	1	2	1
Family with teens	27			1	25	20	5	3	1	1	1	
Family with young children	26				22	13	6	2	2	2	1	
Group	27				17	14	6	5	1		1	
Solo traveler	26		1		24	15	11	5	1	2		

Figure 9. Length of Stay based on Guest Type Classification (589 Accounts)

Figure 9 illustrates the distribution of length of stay among various guest types based on the classification of 589 accounts, offering insights into the relationship between guest categories and their typical stay durations. The data indicates that families with young children and couples tend to have more extended stays, particularly in the 3-4 nights category, as reflected in the significantly higher bar heights in these segments. Conversely, solo travelers and guests visiting with groups are more likely to have shorter stays, typically 1-2 nights, suggesting different motivations and needs among these guest types. The longer stays observed for families and couples may reflect their preference for extended leisure trips, often requiring more in-depth engagement with hotel services and amenities. On the other hand, shorter stays among solo and group visitors may indicate more transient purposes, such as brief vacations or business-related visits. This analysis provides valuable information for hotel management to tailor services and packages according to guest type, ensuring that different categories of visitors are offered appropriate amenities and experiences aligned with their length of stay.



	August	April	August	December	February	January	July	June	March	May	November	October	September
Business traveler		2		3			4	4	2	3	1	2	2
Couple	3	22	45	24	14	16	19	19	15	22	17	21	15
Family with teens	1	6	18	15	2	4	7	11	3	6	5	3	3
Family with young children		5	9	17	1	4	11	13	3	3	4	2	2
Group		4	10	7	1	1	8	8	3	7	13	8	1
Solo traveler	1	4	8	6	5	6	4	8	10	7	4	15	7

Figure 10. Length of Stay based on Guest Type Classification (589 Accounts)

Figure 10 displays the distribution of hotel guest stays classified by guest type across 589 accounts, providing a detailed comparison of how different visitor groups are distributed in terms of length of stay. The figure indicates that couples consistently exhibit the most extended stays, particularly in the 3-4 night range, surpassing other visitor types such as families with young children and solo travelers. This trend suggests that couples may prioritize extended leisure experiences, taking more time to explore the destination and enjoy hotel amenities. Families with young children also show a significant presence in the 3-4 night category, likely reflecting a desire for more extended stays to accommodate the needs of younger family members, such as

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additional relaxation time or more structured activities. Meanwhile, solo travelers and guests in groups favor shorter stays, often between 1-2 nights, indicating that these guest types may visit for more transient purposes, such as short vacations or business-related trips. This distribution provides valuable insights for hotel management to design tailored services and promotional packages that cater to each guest type, ensuring a more personalized experience based on their expected length of stay.

Guest satisfaction can be interpreted as a reflection of how well a hotel's services and facilities meet or exceed the expectations of its visitors. High satisfaction levels are often associated with positive guest experiences, where factors such as room quality, service professionalism, and location convenience play significant roles. Feedback highlighting exceptional service or luxurious amenities suggests the hotel successfully fulfills its value proposition, enhancing guest loyalty and repeat business. However, areas of dissatisfaction, such as limited breakfast options or noise disturbances, signal opportunities for improvement. By addressing these concerns, the hotel can not only elevate the overall guest experience but also align its offerings more closely with the diverse needs of its clientele. Analyzing patterns in satisfaction levels across various guest demographics allows management to enhance service delivery strategically, ensuring that both strengths are maintained and areas needing improvement are addressed. This interpretation underscores the importance of continuous evaluation in maintaining high standards of guest satisfaction and long-term success in the competitive hospitality industry.

3.2 Hotel Guest Satisfaction : Bintang Flores Labuan Bajo

Hotel guest satisfaction at Bintang Flores Labuan Bajo is a crucial indicator of the effectiveness of the hotel's services and its ability to meet guest expectations. Guests frequently praise the hotel for its stunning location, friendly staff, and well-maintained facilities, all of which contribute to a positive overall experience. High ratings in these areas suggest that the hotel excels in providing a comfortable and welcoming environment, essential for leisure and business travelers. However, some feedback points to areas for potential improvement, such as the variety of breakfast options and noise levels during busy periods. While not widespread, these concerns highlight opportunities for the hotel to refine its offerings further and enhance guest satisfaction. By continuously addressing such feedback and implementing targeted improvements, Bintang Flores can maintain its high service standards and further solidify its reputation as a premier destination in Labuan Bajo. This proactive approach to guest feedback ensures the hotel's long-term success in delivering exceptional experiences.

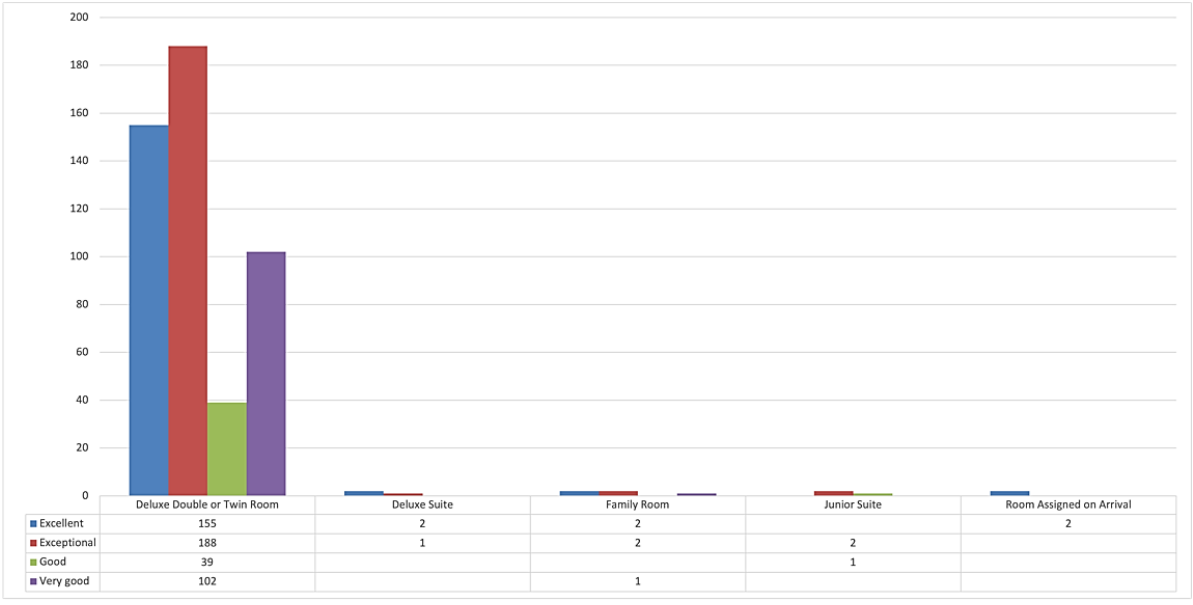

Figure 11. Rating based on Visitor Type (497 Account)

Figure 11 presents the distribution of guest ratings based on visitor type across 497 accounts, revealing key trends in how different categories of guests perceive their stay at Bintang Flores Hotel. Most guests, particularly those staying in the Deluxe Double or Twin Room, rated their experience as "Excellent" or "Very Good," reflecting high satisfaction levels among couples, families, and group travelers. These ratings suggest that the hotel's core services, such as room quality, service efficiency, and amenities, align well with the expectations of most visitor types. However, fewer guests rated their experience as "Good" or "Fair," indicating areas for potential improvement, especially in other room types like suites, which received fewer but varied ratings. The consistency of high ratings in the Deluxe Double or Twin Room category highlights the room's popularity and ability to meet the needs of a wide range of guest profiles. This data emphasizes the importance

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of maintaining service excellence in popular room categories while addressing feedback from guests who rated their stay lower to ensure a balanced and comprehensive improvement strategy across all visitor types.

Based on customer reviews, the analysis of hotel guest dissatisfaction at Bintang Flores Labuan Bajo reveals several critical factors contributing to their negative experiences. Among the recurring issues are complaints regarding service quality, specifically slow and inefficient responses from staff, which hindered the overall guest experience. Another common concern is the cleanliness and condition of the beach, with several guests highlighting the presence of rubbish and the lack of maintenance in these areas, leading to dissatisfaction with what could otherwise be a key selling point for the hotel. Additionally, the limited variety of breakfast options and inconsistent Wi-Fi connectivity are frustrating for guests who expect higher standards, given the hotel's four-star rating. These factors collectively contribute to a perception of the hotel as not meeting the expectations of its guests, thereby impacting its reputation and customer satisfaction. Analyzing these reviews offers valuable insights for service improvement strategies that could elevate the hotel's standards and align guest expectations with the services provided.

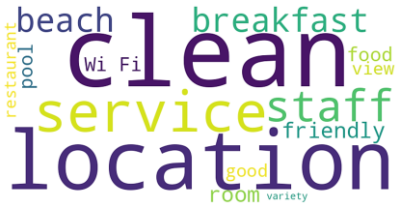

Figure 12. Top 15 Word based on Reviews Data

Figure 12 highlights the top 15 most frequently mentioned words from guest reviews of Bintang Flores Hotel, providing insights into critical factors that shape guest satisfaction. The word "clean" emerges as the most prominent, with a frequency of 1.00, underscoring the importance guests place on cleanliness as a critical aspect of their experience. Similarly, "location" (0.82) and "service" (0.71) are highly rated, reflecting the significance of the hotel's strategic placement and the quality of service provided by staff. Words like "breakfast" and "beach," with frequencies of 0.59, point to amenities that guests frequently discuss, though they may also indicate areas for improvement based on mixed reviews. The presence of terms such as "Wi-Fi" and "variety" at lower frequencies suggests potential weaknesses, where guest expectations regarding internet connectivity and the variety of food offerings might not always be fully met. The prominence of these terms illustrates the hotel's strengths in maintaining a clean environment and delivering satisfactory service, pointing out specific areas where targeted improvements could enhance overall guest satisfaction.

Hotel guest satisfaction at Bintang Flores Labuan Bajo is a crucial measure of the hotel's service quality and ability to meet diverse guest expectations. The hotel receives consistent praise for its strategic location, friendly staff, and well-maintained facilities, all contributing to a welcoming environment ideal for leisure and business travelers. However, areas such as breakfast variety and occasional noise disruptions during busy periods are highlighted as areas needing improvement. While these concerns are not widespread, they reflect opportunities for the hotel to refine its offerings and enhance overall guest satisfaction. Figure 11 further illustrates guest ratings based on visitor type, revealing that most Deluxe Double or Twin Room guests rated their experience as "Excellent" or "Very Good," particularly couples, families, and group travelers. This suggests that the hotel's core services align well with the expectations of its key demographics. Also, Figure 12 shows that words like "clean," "location," and "service" dominate guest reviews, emphasizing the importance of maintaining cleanliness and service quality. Addressing less frequent concerns like Wi-Fi connectivity and food variety presents further opportunities to elevate the guest experience. These insights underscore the need for continuous service refinement to maintain the hotel's high standards and reputation.

3.3 Discussion: Hotel Customer Satisfaction

The discussion on hotel customer satisfaction is pivotal in understanding how service quality, amenities, and guest experiences interact to shape overall satisfaction levels. High ratings often reflect a successful alignment of services with guest expectations, particularly in location, staff friendliness, and cleanliness, frequently cited as key drivers of positive experiences [29]. However, the analysis also reveals certain factors, such as limited breakfast options and inconsistent Wi-Fi connectivity, which detract from an otherwise satisfactory stay. These issues, while not dominant, point to areas where improvements could significantly enhance the guest experience. Hotels can maintain their competitive edge and foster stronger customer loyalty by addressing such concerns and continuously refining service offerings. In this regard, customer feedback is an essential tool for gauging satisfaction and identifying actionable areas for improvement, ultimately contributing to the sustained success and reputation of the hotel within a highly competitive market.

The application of Knowledge Discovery in Databases (KDD) in identifying hotel customer satisfaction through feedback analysis offers a robust framework for extracting meaningful insights from large datasets. By leveraging KDD methodologies, such as data mining and sentiment analysis, guest feedback can be

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systematically processed to uncover hidden patterns, correlations, and trends that directly influence customer satisfaction. This process allows for a more nuanced understanding of guest experiences, revealing both the positive aspects of location and cleanliness and areas needing improvement, such as Wi-Fi reliability and breakfast variety. The advantage of KDD lies in its ability to handle vast amounts of structured and unstructured data, enabling a comprehensive analysis that traditional methods may overlook [30]. Such insights are crucial for hotels aiming to enhance their service quality and customer experience. Through continuous feedback analysis, KDD empowers hotels to make data-driven decisions, aligning their services more closely with guest expectations and fostering long-term customer loyalty. This approach positions KDD as an indispensable tool for the hospitality industry, particularly in a data-driven market environment.

Improving hotel guest satisfaction requires a strategic approach to enhance critical aspects of service delivery and amenities. One recommended strategy is prioritizing personalized service, ensuring guests feel valued through tailored interactions that meet their preferences. This can be achieved by training staff to anticipate guest needs and respond promptly to feedback, particularly addressing recurring concerns such as Wi-Fi reliability and food variety. Additionally, offering flexible and diverse dining options, including expanding breakfast choices, would significantly improve the guest experience, especially for those staying longer. Investing in modernizing facilities, such as improving internet connectivity and maintaining public spaces like the beach, can further enhance the perception of the hotel's quality. Continuous monitoring of guest feedback through data analytics is essential, allowing the hotel to adapt swiftly to emerging trends and maintain a competitive edge. By implementing these strategies, hotels can cultivate stronger guest loyalty, elevate overall satisfaction, and position themselves as preferred destinations for leisure and business travelers.

The challenge of maintaining high levels of guest satisfaction at Bintang Flores Hotel in Labuan Bajo is multifaceted, involving both operational and service-related factors. One significant issue arises during high-demand seasons when the influx of guests can lead to delays in service and a decline in personalized attention. This is compounded by guest feedback highlighting concerns such as inconsistent Wi-Fi connectivity and a limited variety of breakfast options, which, while not significant, can affect overall satisfaction, particularly for longer-stay guests. Furthermore, the hotel's proximity to natural attractions makes it appealing, but this also necessitates consistent upkeep of surrounding areas, including cleanliness and accessibility of the beach, which some guests have noted as lacking. Addressing these challenges requires a holistic approach involving investment in staff training to manage increased demand effectively, infrastructure improvements, and a more flexible food and beverage offering. By confronting these issues head-on, the hotel can enhance the guest experience, ensuring that service quality remains consistent and that guest expectations are met or exceeded across all touchpoints.

4. CONCLUSION

The conclusion of this research underscores the importance of using Knowledge Discovery in Databases (KDD) to analyze guest feedback and improve service quality and overall guest satisfaction at Bintang Flores Hotel in Labuan Bajo. By applying KDD methodologies, this study processed 589 guest reviews, allowing for the identification of critical factors influencing satisfaction, such as the hotel's cleanliness, location, and staff service, which were frequently mentioned with high satisfaction levels (1.00 for "clean," 0.82 for "location," and 0.71 for "service"). However, issues such as limited breakfast variety (0.59) and Wi-Fi connectivity (0.41) were highlighted as recurring concerns, particularly for long-term guests and business travelers. The data also reveals that most guests staying in the Deluxe Double or Twin Room rated their experience as "Excellent" or "Very Good," especially among couples and families, reinforcing the importance of maintaining quality in this room category. Conversely, suite categories received fewer reviews and more varied ratings, indicating the need for targeted improvements in these areas. The KDD approach enabled a comprehensive analysis by mining structured data (numerical ratings) and unstructured data (written feedback), helping the hotel pinpoint specific areas requiring operational enhancements. The data highlights critical challenges related to service consistency during peak periods, infrastructure (e.g., Wi-Fi and beach maintenance), and the need for greater food variety, which, if addressed, could significantly elevate guest satisfaction. Implementing targeted strategies based on this data will enable Bintang Flores Hotel to refine its services, ensuring sustained guest satisfaction and competitiveness in the hospitality market.

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