International Journal of Management Science and Information Technology
IJMSIT

E-ISSN: 2774-5694 P-ISSN: 2776-7388 OPEN ACCESS

Volume 4 (2), July-December 2024, 450-458
DOI: https://doi.org/10.35870/ijmsit.v4i2.3200

Implementation of Virtual Reality (VR) and Augmented Reality (AR) in Marketing and Service Development to Increase Customers in the Hospitality Sector

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Article history:
Received September 21, 2024
Revised September 24, 2024
Accepted September 25, 2024

Abstract

This study uses a quantitative approach to evaluate the effect of implementing Virtual Reality (VR) and Augmented Reality (AR) technology on customer satisfaction in the hospitality sector. VR allows customers to tour hotel facilities virtually, while AR adds digital interactive elements that enrich the customer experience. This study used a cross-sectional survey method, with data collected from 200 respondents in four and five-star hotels that have adopted VR and AR technology. A purposive sampling technique was used to select respondents who have used VR and AR-based services in the last three months. Data was collected through a 1-5 Likert scale questionnaire, where the data was analyzed using multiple regression after going through the classical assumption test. The results of the analysis showed that the implementation of VR and AR had a significant effect on increasing customer satisfaction. As many as 72% of respondents stated that virtual tours through VR helped increase booking confidence. In comparison, 64% reported that AR enriched the stay experience with interactive real-time information. This study confirms that VR and AR technologies significantly increase customer engagement and loyalty to hotel services. However, challenges in development costs and technology infrastructure are still obstacles to broader adoption.

Keywords:
Virtual Reality; Augmented Reality; Hotel marketing; Customer satisfaction; Digital technology.

1. INTRODUCTION

Virtual Reality (VR) technology offers the opportunity to create a virtual environment that allows users to experience a more immersive simulation of hotel facilities. By using VR, potential customers can explore the facilities offered by the hotel, such as rooms, restaurants, and recreational areas, without having to be physically present. This provides a more realistic experience for customers, helping reduce uncertainty and increase confidence in the decision-making process for booking. Wei (2019) stated that VR and Augmented Reality (AR) technology have great potential to transform the hospitality and tourism industry, especially in providing simulations that are very close to reality and are challenging to achieve with traditional methods. This is because VR can create a more immersive and interactive visual experience, allowing customers to gain a more comprehensive understanding of the services and facilities offered by the hotel. A study by Beck et al. (2019) supports this statement, stating that VR technology provides richer visualizations and allows for deeper user interaction. Through VR, customers can feel as if they are inside the hotel they will book, increasing confidence in their choice. This has a positive impact on increasing purchasing decisions, where customers tend to be more confident with their bookings after experiencing the virtual experience first. In addition, VR can provide added value in creating a more satisfying customer experience, ultimately increasing customer loyalty to the hotel brand in question. In addition to VR, AR (Augmented Reality) technology also plays a vital role in improving customer experience in the hospitality industry. AR adds

digital elements to the real world through smartphones or tablets. In the hospitality context, AR can provide additional information about hotel facilities or services directly to users, such as directions within the hotel, descriptions of restaurant menus, or even special offers available. Anggar et al. (2020) found that AR applications in the hospitality sector have high user satisfaction, mainly due to their ease of use and the interactive features they offer. This study confirms that AR can be an effective promotional tool, especially in attracting the attention of potential customers and facilitating more dynamic interactions with hotel services. Khaqiqi and Lizar (2022) also emphasized that the application of VR technology in the Indonesian tourism sector is still in its infancy but shows excellent potential for the future. They found that customer reception of the technology was generally positive, especially in increasing interest in hotels and destinations. VR and AR technologies have the potential to be a game-changer in the industry, creating more personalized and interactive experiences for customers, ultimately driving increased interest and satisfaction with the services offered.

Digital technologies, such as Virtual Reality (VR) and Augmented Reality (AR), have an increasingly significant role in the hospitality industry, not only limited to marketing but also in strengthening customer relationships and improving consumer interaction management. Pascucci et al. (2023) stated that applying digital technology, especially VR and AR, has improved market analysis capabilities and strengthened customer relationship management (CRM). Through this technology, hotels can better understand customer preferences and behaviour, which allows for the development of more targeted and personalized marketing strategies. In addition, this technology also helps create more interactive and engaging interactions between hotels and their customers, ultimately driving higher value in the relationship. The application of VR and AR is helpful as an attractive visual marketing tool and can build customer loyalty and retention through a more immersive and personalized experience. The immersive and interactive experience offered by VR allows customers to virtually 'visit' the hotel, allowing them to explore the facilities and services in more detail before booking. This reduces uncertainty in decision-making and creates a stronger emotional attachment to the hotel brand, which increases the likelihood of customers returning to the service in the future. In this way, VR and AR technologies strategically serve as an essential element in building long-term loyalty and increasing customer satisfaction. The challenges faced by the hospitality industry during the COVID-19 pandemic have also driven the need for faster and more effective technological adaptation. Raditya (2022) highlighted that the recovery strategy of the hospitality industry in Indonesia needs to consider the use of digital technologies, including VR and AR, to ensure operational continuity amid strict social restrictions. VR and AR, in this context, offer an innovative solution to create a safer and more engaging experience for customers, especially in the post-pandemic era where many travellers are more concerned about safety and health. With VR, customers can explore the hotel remotely without visiting physically, while AR can provide additional information about the hotel's health and hygiene protocols. Furthermore, Loureiro and Nascimento (2021) noted that digital technologies such as VR and AR have great potential to help shape a more sustainable future for tourism. With increasing consumer environmental awareness, this technology offers a more eco-friendly solution to promote hotel destinations and services without excessive physical travel. It also allows hotels to minimize their carbon footprint while offering customers an engaging experience. VR and AR can support sustainability initiatives in the hospitality industry by creating innovative solutions that reduce environmental impact while maintaining customer appeal and engagement.

The application of Virtual Reality (VR) technology in the hospitality industry has significant potential. Applying Virtual Reality (VR) technology in the hospitality industry offers excellent opportunities to improve customer experience and strengthen hotel competitiveness. With VR, prospective customers can virtually explore hotel facilities before booking, providing an in-depth and realistic picture of the facilities and services offered. This capability helps reduce uncertainty and increase customer confidence in choosing a hotel, ultimately contributing to increased customer satisfaction. Dewi (2023) emphasized that using VR in the context of promotion and learning creates an interactive experience that makes users feel like they are in a virtual environment in real life. This increases marketing effectiveness and provides a more personalized experience for customers. This finding is supported by Zaid (2023), who showed that hotel virtual tours can increase tourist satisfaction, especially in the context of the recovery of the post-pandemic hospitality industry. In the post-pandemic era, customers tend to be more careful when choosing a destination to stay, especially about cleanliness and safety factors. VR provides a solution that allows customers to make an initial "visit" to the hotel virtually to assess the standard of facilities without having to be physically present. Thus, VR is not only a marketing tool but also plays a strategic role in building a closer relationship between hotels and their customers by increasing personal and immersive interactions. In addition to improving customer experience, VR offers great service development potential through employee training. This technology can be used as an interactive learning tool that allows simulation of actual scenarios in the work environment, which can help improve employee competency. Mustikasari (2024) showed that the application of VR in education, such as teaching anatomy and physiology, has succeeded in improving students' practical skills and understanding. The same principle can be applied to employee training in the hospitality sector. For example, employees can be trained to handle complex customer service situations in a safe and controlled virtual environment. With VR-based training, employees can learn how to respond to real scenarios without dealing directly with customers in the real world, thereby minimizing the risk of errors. Research by

Aryaningtyas et al. (2020) also supports the idea that a work environment that supports employee skill development positively impacts performance and creativity. By utilizing VR technology to improve employee competency, hotels can provide better, faster, and more responsive services to customer needs. This improvement in service quality will directly impact customer satisfaction levels, which will ultimately strengthen customer loyalty and the hotel's competitiveness in the market. Investing in VR technology for employee training and development can be an effective strategy to create superior service and strengthen the hotel's position in the increasingly competitive hospitality industry.

The application of Virtual Reality (VR) in the hospitality industry has significant potential to strengthen the hotel's brand image. VR technology allows hotels to create immersive and different visual experiences from competitors, ultimately increasing the hotel's appeal in customers' eyes. Oryzativa and Ernungtyas (2020) emphasize that brand image and service quality are the main factors in customer satisfaction. By utilizing VR to provide a more authentic and engaging experience, hotels can create a deep impression in customers' minds, potentially increasing the perceived quality of service. Unique and interactive experiences through VR are a vital differentiation element in the highly competitive hospitality market. This technology allows customers to virtually explore hotel facilities before making a reservation, giving them a more precise and realistic picture of what they will get. Hidayat (2023) shows that authentic experiences provided through VR can increase customer interest and intention to visit the hotel in person. This helps increase booking conversions and creates a stronger emotional attachment between customers and the brand. Thus, VR is essential in marketing strategies, especially in building a solid and sustainable brand image in the hospitality industry. In addition to VR, augmented reality (AR) technology is also starting to play an essential role in improving the quality of customer experience and operational efficiency in the hospitality sector. AR works by adding digital elements to the natural environment, which can be used to provide additional information to customers. For example, through AR, hotels can display interactive information about facilities, services, or special offers that can be accessed directly through customers' mobile devices. This technology provides a more dynamic and informative experience, which increases overall customer engagement. Kristina and Darma (2021) noted that the application of AR in the accommodation and restaurant sector can create a more engaging and enjoyable experience for customers, ultimately increasing their satisfaction and loyalty. AR provides added value to hotels in terms of marketing and as a tool to improve customer interaction with hotel services as a whole. This is reinforced by research by Mahendra et al. (2021), which shows that AR in learning media can increase user understanding and engagement. In the hospitality context, AR can help customers better understand the facilities and services offered by the hotel, which ultimately contributes to improving the quality of service and customer experience. Applying VR and AR in the hospitality industry enriches the customer experience and plays a strategic role in building a solid brand image and improving operational efficiency. This technology can be an effective tool for creating added value that has a long-term impact on the hotel's success in a competitive market.

Augmented Reality (AR) technology in the hospitality sector has been shown to have great potential to improve service quality, communication efficiency, and customer experience. One example of a relevant AR application in the hospitality world is the integration of QR codes to provide additional information about hotel facilities and services quickly and efficiently. Permana et al. (2016) revealed that AR technology can monitor advertising points and provide customers with faster and more practical information. Through this approach, AR accelerates the flow of information and creates more dynamic and engaging interactions for customers, ultimately increasing their satisfaction with hotel services. AR's ability to enhance interactive communication between hotels and customers is critical in building closer and deeper relationships. In the post-COVID-19 pandemic era, AR technology also plays a vital role in recovering the hospitality sector. Raditya (2022) emphasized that technological innovation, including AR, is crucial to attracting customers back safely and innovatively. AR allows hotels to provide virtual experiences that remain attractive but minimize risk, such as providing information related to health protocols or promoting facilities without direct physical interaction. Such innovations are relevant in maintaining customer safety and increasing hotels' attractiveness amidst fierce competition. In marketing, AR is a strategic tool to create unique experiences that strengthen the hotel's brand image. Oryzativa and Ernungtyas (2020) highlight that a strong brand image and superior service quality are essential in increasing customer satisfaction. By utilizing AR, hotels can offer more engaging and interactive experiences, for example, by displaying virtual tours of facilities or showing various exclusive service packages. This approach enriches promotions and differentiates hotels from competitors, providing a competitive advantage in attracting new customers. Research by Widyantara et al. (2022) also supports this by showing that AR-based mobile applications can improve user understanding of promotional materials. In the hospitality context, customers can better understand the services and facilities offered through direct interaction provided by AR technology. In addition to supporting marketing and customer experience aspects, AR can improve employee training to improve service quality. Mustaqim (2017) noted that AR can be an effective interactive learning medium for developing practical skills. AR-based training allows hotel employees to experience real-time simulations of work situations without facing direct risks with customers. This technology allows for more effective training in improving employee competency, especially in dealing with complex service situations. By improving employee skills through AR technology, hotels can provide better, more efficient, responsive services to customer needs. Investing in

AR technology in the hospitality sector provides short-term marketing and customer experience benefits. It creates a long-term impact in improving service quality through employee training. This makes AR one of the technological innovations with great potential to drive digital transformation in the hospitality industry, providing hotels with a competitive advantage in meeting evolving customer expectations.

2. RESEARCH METHOD

This study uses a quantitative approach with a survey method to evaluate the effect of implementing Virtual Reality (VR) and Augmented Reality (AR) on customer satisfaction in the hospitality sector. The research design chosen is cross-sectional, where data is collected in one period to describe the relationship between the variables studied, namely the implementation of VR and AR as independent variables and customer satisfaction as the dependent variable. The quantitative approach was chosen because this study focuses on statistical measurements that can provide empirical evidence of the effect of VR and AR technology on customer satisfaction. The survey was conducted in four- and five-star hotels in Indonesia that have adopted VR and AR technology to improve customer service and interaction. This study involved a population consisting of all customers of four and five-star hotels in Indonesia who have used VR and AR-based services. The purposive sampling technique was used to select the sample, with 200 respondents who had used VR or AR services while staying at the hotel. The sample selection criteria were based on the use of the technology in the last three months and the respondent's ability to assess the quality of service received. The main instrument in data collection was a questionnaire distributed to respondents. This questionnaire uses a Likert scale of 1-5 that covers several essential components, such as respondent demographics, VR and AR usage experience during their stay, and customer satisfaction levels after using VR and AR-based services. A construct validity test was conducted to ensure the instrument's validity, while a reliability test used Cronbach's Alpha method to assess the consistency of the measurement results. A Cronbach's Alpha value above 0.7 indicates a high level of reliability of the measurement instrument. Data was collected by distributing questionnaires online and physically to customers who met the criteria at hotels that had implemented VR and AR technology. The data collection process lasted for four weeks and involved respondents from various regions in Indonesia. The collected data were analyzed using multiple regression methods to evaluate the effect of VR and AR implementation on customer satisfaction. Before the regression analysis, classical assumption tests such as normality tests, multicollinearity tests, heteroscedasticity tests, and autocorrelation tests were conducted to ensure the validity of the regression model. The research model used in this study is a multiple regression model that explains the relationship between independent variables and dependent variables. The independent variables analyzed include the implementation of Virtual Reality ($X1$) and the implementation of Augmented Reality ($X2$), while the dependent variable is customer satisfaction (Y). The regression equation used in this study is $Y = \alpha + \beta 1X1 + \beta 2X2 + e$, where Y represents customer satisfaction, $X1$ and $X2$ are the implementation of VR and AR, α is a constant, $\beta 1$ and β2 are regression coefficients, and e is the error term. This model is expected to provide clear insight into the extent to which VR and AR affect customer satisfaction in the hospitality sector.

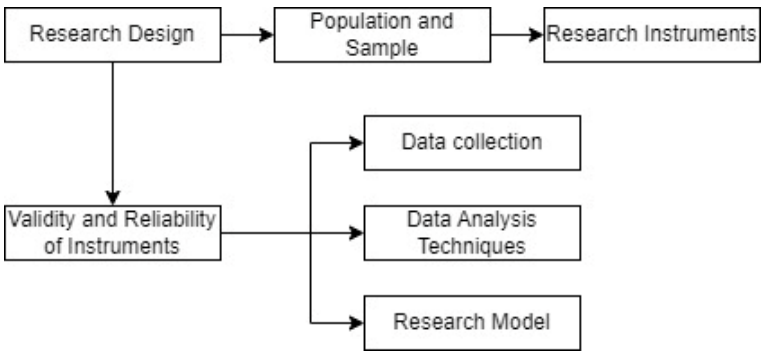

Figure 1. Research Design

The flowchart image above illustrates the stages of research carried out systematically using a quantitative approach. This research begins with Research Design, where a survey approach is chosen to analyze the effect of Virtual Reality (VR) and Augmented Reality (AR) on customer satisfaction in the hospitality sector. Furthermore, the Population and Sample stages are determined, with the population being customers of four and five-star hotels in Indonesia who have used VR and AR technology. The sample was taken using a purposive sampling technique with the criteria of customers who have used the technology in the last three months. The next stage is the preparation of the Research Instrument in the form of a questionnaire designed with a Likert scale of 1-5 to measure related variables. After that, Validity and Reliability Tests were carried out to ensure that the data collection instruments used were reliable and valid.

Data was collected by distributing questionnaires online and physically at hotels that had implemented VR and AR. The collected data were analyzed using multiple regression analysis techniques to evaluate the relationship between the implementation of VR and AR and customer satisfaction. Finally, a regression model was used to formulate the relationship between these variables, providing empirical insight into the impact of VR and AR technology on customer satisfaction.

3. RESULTS AND DISCUSSION

3.1. Results

Based on survey data collected from 200 respondents in various four and five-star hotels in Indonesia that have implemented Virtual Reality (VR) and Augmented Reality (AR) technologies, the study results show a significant influence of both technologies on increasing the number of customers. This study examines how VR and AR are applied in marketing strategies and service development in the hospitality sector and their impact on customer decisions in choosing hotel services. The results of the multiple regression analysis conducted showed that both VR and AR directly contributed to increasing customer decisions to use hotel services. VR technology, which allows potential customers to tour hotel facilities virtually, such as rooms, restaurants, and recreation areas, helps increase customer trust. With this virtual tour, potential customers can see the actual conditions of the hotel interactively, thereby reducing uncertainty and doubt before booking. As many as 72% of respondents stated that the ability to see hotel facilities through VR was an important factor influencing their decision to book a room. On the other hand, augmented Reality (AR) enriches customer interaction with hotel services by adding digital elements that facilitate access to information. AR features, such as real-time information about hotel facilities, local guides, or restaurant menus that can be accessed via the customer's mobile device, are considered very useful by customers. This provides convenience and a more personalized stay experience, increasing customer satisfaction and loyalty. As many as 64% of respondents stated that using AR during their stay strengthened their positive experience. From these results, the application of VR and AR in marketing and service development in the hospitality sector significantly impacts the increasing number of customers. These two technologies function not only as practical marketing tools but also as a means to enrich the customer experience during their stay at the hotel, ultimately increasing customer engagement and loyalty to the hotel.

3.1.1. Respondent Description

Most respondents in this study, namely 75%, are in the productive age range of 25-45 years. This demographic is very responsive to technological developments and tends to have high mobility in the use of digital-based services, including in the hospitality sector. This age profile is relevant because individuals in this group are often the main target of hotel marketing, especially in innovative promotional efforts that use technologies such as Virtual Reality (VR) and Augmented Reality (AR). This shows that the application of VR and AR technology directly reaches customer groups with a high potential to be influenced by digital innovation. The educational background of respondents also shows a similar pattern, with most having a secondary or higher education level, including a bachelor's degree. This higher level of education is closely related to the capacity and openness to adopt advanced technology in everyday life. Respondents with higher education usually have better access to technology and are more skilled in using it, which supports their acceptance of VR and AR in hospitality services. Regarding technological experience, this study shows that as many as 68% of respondents have used VR services provided by hotels, especially in marketing. The use of VR in booking rooms and exploring hotel facilities virtually is considered to help customers make more informed decisions, which can increase the level of trust in the services offered. On the other hand, as many as 57% of respondents also reported utilising AR services to obtain additional information presented interactively, such as hotel facility guides or maps of tourist destinations around the hotel. The descriptions of these respondents indicate that the customer group sampled in this study consists of highly educated individuals of productive age and very familiar with digital technology. This strengthens the validity of the findings related to the application of VR and AR in the hospitality sector as an effective tool to improve customer experience and influence their decisions in using hotel services.

3.1.2. The Influence of Virtual Reality (VR)

The regression analysis results show that implementing virtual reality (VR) in hotel marketing strategies significantly impacts customer decisions when choosing and booking hotel services. The regression coefficient for the VR variable is $\beta 1 = 0.65$, with a significance level of $p < 0.001$. These results confirm that VR plays a crucial role in increasing customer trust and interest in hotel services, primarily through features that allow customers to explore the various facilities the hotel offers visually. VR technology allows customers to "visit" the hotel virtually before making a reservation. Through VR, customers can explore hotel rooms, restaurants, swimming pools, spas, fitness centres, and other public facilities in real time, even though they are not physically at the location. This feature is beneficial in reducing the uncertainty that often arises when prospective customers try to choose a hotel based only on descriptions and static photos on the

website. With VR, customers can evaluate the quality and aesthetics of hotel facilities more thoroughly and interactively. This technology ultimately helps customers feel more confident in making reservation decisions. As many as 72% of respondents stated that using VR in the hotel booking process greatly influenced their final decision. This is especially true for customers seeking a premium experience, where the quality of a hotel's facilities is a significant factor in their choice. Luxury hotels, which often compete on the strength of their facilities, can leverage VR to provide realistic virtual tours to potential customers, creating a more engaging and memorable experience. With virtual tours accessible via personal digital devices such as laptops, tablets or smartphones, customers can see the condition of the room and the facilities available before they check-in. From a marketing perspective, the implementation of VR provides significant added value for hotels, especially in the high-end market segment where experience and exclusivity are paramount. With VR's ability to provide real-time visual simulations, hotels can showcase their facilities more accurately and engagingly than traditional marketing methods that only use images and descriptions. The technology also allows customers to interact directly with the visual elements of the hotel's facilities, providing them with a more immersive and informative experience. This increases the hotel's attractiveness to potential customers and contributes to increased reservation rates. Another advantage is that VR helps hotels stay competitive in a hospitality industry increasingly dominated by technological innovation. The application of VR strengthens the hotel's marketing strategy by providing a unique and different experience that is difficult to imitate by hotels that have not yet adopted this technology. Hotels that offer virtual tours through VR can create a solid first impression in the minds of potential customers, which ultimately encourages them to choose the hotel over its competitors. The application of VR in hotel marketing and service development has proven effective in influencing customer decisions. This technology increases customer trust in the quality of hotel services and provides a more personalized and interactive experience, thereby increasing the reservation rate and customer loyalty to the hotel.

3.1.3. The Influence of Augmented Reality (AR)

Augmented Reality (AR) significantly contributes to increasing customer satisfaction and strengthening the appeal of hotel services. The analysis results show that the AR variable's regression coefficient is $\beta 2 = 0.54$ with a significance level of $p < 0.05$, which means that the application of AR technology has a direct positive impact on customer satisfaction. This technology, which can display additional information about hotel facilities or local tourist attractions through mobile devices, improves the quality of interaction between customers and the services offered by the hotel. The application of AR facilitates a more interactive and personalized experience for customers. With the AR feature, customers can scan physical locations within the hotel and get additional relevant information in real time. As many as 64% of respondents in this study reported that using AR helped them make faster and more confident decisions about utilizing hotel facilities. For example, customers can use AR to scan the restaurant menu available at the hotel and get a detailed description of each dish, including chef recommendations or food suggestions that suit their dietary preferences. This technology allows customers to experience more targeted and informative services, ultimately increasing their satisfaction with hotel services. In addition, AR also functions as a tool to increase the appeal of hotel services in customers' eyes. AR's ability to provide local travel guides via mobile devices helps customers navigate popular locations around the hotel. Not only does this feature enhance customer convenience, it also adds value that makes their stay more enjoyable. Hotels integrating AR into their services create unique experiences that set them apart from their competitors. Using AR to provide additional information visually and interactively allows customers to feel more connected to the hotel's surroundings and services. From a marketing perspective, implementing AR also helps to enhance the hotel's image as a modern and innovative service provider. Hotels that use AR in their marketing and services are perceived as more sophisticated, attracting a younger, more tech-savvy customer segment. This is important in the competitive hospitality industry, where technological innovation is often a key differentiator. AR technology can provide a positive first impression to new customers while strengthening the loyalty of existing customers by providing more prosperous and accessible services. By utilizing AR, hotels can provide a more personalized service, as the information provided by this technology can be tailored to each customer's preferences. For example, customers can use AR to access information about special offers available just for them or to find the most relevant amenities to their needs. This personalization makes customers feel more valued and cared for, ultimately increasing their satisfaction with the stay experience. The application of AR in the hospitality sector offers several significant benefits. It increases customer engagement with hotel services and provides a more personalized and interactive experience, ultimately increasing customer satisfaction and strengthening the hotel's appeal. Hotels that adopt AR as part of their service and marketing strategies will be better able to compete in an increasingly competitive industry and attract more customers who value innovative and informative experiences.

3.1.4. Classical Assumption Test Analysis

This study uses classical assumption test analysis to ensure that the applied regression model meets all the necessary statistical requirements so that the model parameter estimates are reliable and valid. This test is

essential to assess whether the data used in the study meet several basic assumptions underlying multiple regression analysis, including normality, multicollinearity, heteroscedasticity, and autocorrelation.

a. Normality Test, the normality test ensures that the residuals (the difference between the observed values and those predicted by the regression model) are typically distributed. In this analysis, the regression model residuals are tested using the Kolmogorov-Smirnov test and the Shapiro-Wilk test, and the expected probability plot (P-P Plot) is examined. The results of both tests show that the p-value is more significant than the accepted significance level ($\alpha = 0.05$), indicating that the residuals are normally distributed. In addition, the P-P Plot shows that the residual points are spread close to the diagonal line, indicating a normal distribution. The normality of the residuals is essential because it ensures that the significance test performed on the regression coefficients is valid and unbiased. If the normality assumption is not met, parameter estimation can be inefficient, and the results of hypothesis testing may be inaccurate.
b. Multicollinearity Test, a multicollinearity test checks for a high linear correlation between independent variables in the regression model. High multicollinearity can cause the regression coefficient to become unstable, affecting the accuracy of prediction and interpretation. Variance Inflation Factor (VIF) and Tolerance are used to test for multicollinearity. The VIF values for the Virtual Reality (VR) and Augmented Reality (AR) variables are below the general threshold of 10, with an average VIF value of around 2.5. The tolerance for both variables is also greater than 0.1, indicating no multicollinearity problem between the independent variables. This is important because low multicollinearity ensures that each independent variable uniquely contributes to the dependent variable, namely customer satisfaction.
c. Heteroscedasticity Test, the heteroscedasticity test aims to check whether the residual variance remains constant across the values of the independent variables. Heteroscedasticity indicates that the residual variance varies, which can lead to inefficient estimation and biased interpretation. The Glejser Test and Scatter Plot between the residual and prediction are used to test for heteroscedasticity. The results of the Glejser Test show no significant correlation between the absolute residual value and the model's predicted value, with a p-value greater than 0.05. In addition, the Scatter Plot of the residual against the predicted value shows a random distribution without a particular pattern, indicating that the residual variance is constant (homoscedasticity) across the prediction range. Thus, the assumption of homoscedasticity is met, ensuring that the regression results are unbiased and can be interpreted validly.
d. Autocorrelation Test, an autocorrelation test is conducted to check whether the residuals in one observation are correlated with the residuals from other observations. Autocorrelation can interfere with regression estimation because it can cause bias in the regression coefficient values and standard errors. Autocorrelation is tested using the Durbin-Watson Test. The Durbin-Watson value ranges from 1.5 to 2.5, close to the ideal value of 2. This result indicates no significant autocorrelation in the residual data, so the regression model estimation can be considered independent of one observation from another. The absence of autocorrelation also confirms that the error terms are uncorrelated, so the assumption of residual independence is met.

By fulfilling these assumptions, the multiple regression model used can accurately measure the effect of implementing Virtual Reality (VR) and Augmented Reality (AR) on customer satisfaction in the hospitality sector so that the results obtained are valid for use as a basis for decision making.

3.2. Discussion

This study shows that applying Virtual Reality (VR) and Augmented Reality (AR) technologies significantly contributes to increasing customer satisfaction in the hospitality sector. Based on multiple regression analyses, both VR and AR have an essential role in influencing customer decision-making, increasing engagement, and strengthening customer loyalty to hotel services. Each technology has a unique function that, when combined, creates synergy and enriches the customer experience. The application of VR in hotel marketing strategies has been shown to impact customer decisions significantly. VR allows prospective customers to virtual tour hotel facilities such as rooms, restaurants, recreation areas, and other public facilities. This feature reduces the uncertainty that is often an obstacle in decision-making when choosing accommodation. Customers no longer rely on static images or descriptions that may not be representative. They can see the actual condition of hotel facilities in a more interactive and detailed manner, increasing confidence in making reservations. As many as 72% of respondents in this study stated that virtual tours via VR were essential in their decision to book a hotel room. This finding supports previous research by Beck et al. (2019), which showed that VR can create an immersive visual experience, increase emotional attachment between customers and hotels, and strengthen booking intentions. AR, on the other hand, provides further benefits in enhancing customer engagement during their stay. AR adds digital elements to the real world, allowing customers to access additional information in real-time via their mobile devices. AR features like interactive menus, hotel facility maps, and local guides provide a more personalized and informative experience. As many as 64% of respondents reported that using AR enriched their experience during their stay, especially in providing easy access to information. AR technology also increases service efficiency, where customers can quickly find the information, they need without directly interacting with

hotel staff. This aligns with research by Anggar and Iryanti (2020), which shows that AR can increase user engagement through dynamic digital interactions. Although the results of this study show the great potential of VR and AR in improving the quality of hotel services, several challenges need to be overcome. The cost of developing VR and AR technology is still relatively high, especially when creating high-quality content that can provide an adequate interactive experience. In addition, the necessary technological infrastructure, such as hardware compatible with VR and AR, has yet to be fully available in many hotels, especially in areas with limited access to advanced technology. Another factor to consider is the need for a workforce with specialized skills in managing and developing VR and AR content. The lack of trained human resources can slow down the adoption of these technologies in the hospitality sector. From a marketing strategy perspective, these findings emphasize the importance of hotels investing in VR and AR technologies to stay competitive in an increasingly digital marketplace. VR can be a powerful tool to increase booking conversions, while AR plays a vital role in enriching the customer experience during their stay. These technologies enable hotels to offer more personalized, efficient, and informative services, ultimately increasing customer loyalty. Implementing VR and AR can also enhance the image of hotels as innovative and modern service providers, which is an essential factor in attracting the tech-savvy customer segment. The implementation of VR and AR in the hospitality sector positively impacts the customer experience. It contributes to the long-term success of hotels in the face of increasing competition. These technologies are essential in building stronger customer relationships and creating significant added value in hotel services.

4. CONCLUSION

This study comprehensively shows that applying Virtual Reality (VR) and Augmented Reality (AR) technology in the hospitality sector significantly increases customer satisfaction, booking decision-making, and customer loyalty. VR allows potential customers to explore hotel facilities virtually, reducing uncertainty and increasing confidence in booking decisions. This technology allows customers to experience a near-real experience without being physically present at the location, which is a competitive advantage in hotel marketing strategies, especially in markets that increasingly prioritize customer experience. From the study results, as many as 72% of respondents stated that VR's ability to provide virtual tours was a determining factor in their decision to book a room. The interactive features VR offers, such as detailed visualization of hotel facilities, allow hotels to differentiate themselves from competitors who still use traditional marketing methods. VR not only increases initial customer engagement but also has the potential to strengthen the hotel's brand image as an innovative and luxurious service provider. AR technology, conversely, enriches customer interactions during their stay by providing relevant real-time information, such as restaurant menus, hotel facility maps, and local guides that can be accessed via mobile devices. As many as 64% of respondents admitted that using AR improves the quality of their experience, making hotel services more personalized, informative, and efficient. AR increases customer satisfaction by making accessing information easier and strengthening customers' emotional attachment to hotel services, ultimately driving long-term loyalty. The study also identified several challenges in implementing VR and AR technologies in the hotel industry. High development costs and limited technological infrastructure are significant obstacles to the widespread adoption of these technologies. In addition, the need for a workforce with specific skills in developing and managing VR and AR content hinders the optimization of these technologies in many hotels. Therefore, long-term investment in human resource training and improving technological infrastructure is crucial to ensure the success of VR and AR implementation. The findings of this study emphasize the importance of adopting VR and AR technologies as part of a hotel's digital strategy to increase competitiveness in an increasingly competitive market. These technologies are promotional tools and strategic instruments for improving service quality, strengthening customer engagement, and building loyalty. Hotels that successfully integrate VR and AR into their marketing and service development strategies will better meet the expectations of modern customers who prioritize interactive and personalized digital experiences. Thus, implementing VR and AR can be a determining factor for long-term success in the hospitality sector, especially in creating superior and unforgettable customer experiences.

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