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Research Article

AI-Driven Visual Communication Strategies for Enhancing Engagement in Smart Hospitality Platforms

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Abstract: The rapid evolution of Smart Hospitality has reshaped how tourists interact with service providers. Visual communication plays a pivotal role in influencing engagement, yet most digital content remains generic, limiting brand resonance. This study investigates AI-driven visual communication strategies to enhance engagement by bridging computer science and design communication. A mixed-method approach was employed, starting with the analysis of 120 hospitality visuals using K-means clustering and sentiment analysis to identify aesthetic patterns. Two stimuli sets were developed: Set A (Generic) and Set B (AI-Personalized with ≥70% preference similarity). A survey experiment (n = 156) involving Generation Y and Z users was conducted. Quantitative analysis revealed that AI-personalized visuals significantly outperformed generic content, with engagement scores increasing from M = 3.42 to M = 4.15 and trust levels rising by 21% ($p<0.001$). Qualitative feedback from NVivo thematic coding confirmed that users perceived AI-tailored visuals as more authentic and relevant. This study offers an interdisciplinary novelty by integrating computational machine learning with visual storytelling. The findings demonstrate how AI personalization within the IoT-linked Smart Hospitality ecosystem can bridge technical innovation with user-centered design to advance digital tourist experiences.

Keywords: Artificial Intelligence, Visual Communication, Smart Hospitality, User Engagement, Personalization

Introduction

The hospitality and tourism industry has undergone profound digital transformation, with online platforms and mobile applications increasingly serving as the primary interfaces for customer interaction. This shift toward smart hospitality is not merely a technological trend but a strategic necessity to improve operational efficiency and the guest experience, allowing providers to personalize the guest journey while simultaneously streamlining interactions (Anwar et al., 2024). The global online travel booking service market is projected to reach USD 1.13 trillion by 2030, expanding at a compound annual growth rate of 9.0% between 2022 and 2030 (Research, 2023). In Southeast Asia, the rise of mobile-first adoption has further accelerated reliance on digital platforms for hotel reservations, destination exploration, and travel reviews (Hien et al., 2024; Yu, and Meng, 2026). These developments underscore the critical role of digital engagement in shaping competitiveness within the tourism ecosystem.

Within these platforms, visual communication functions as a crucial determinant of user perceptions and decision-making. Elements such as imagery, typography, color schemes, and interface design directly influence how tourists perceive trust, quality, and desirability. Visual storytelling in particular has been shown to strengthen destination image and foster emotional connections with potential travelers (Deng et al., 2021; Gretzel and Collier de Mendonça, 2019; Sharafuddin et al., 2024). Despite this, much of the content deployed on hospitality platforms remains static and generic, failing to adapt to the cultural, aesthetic, or personal preferences of individual users. This lack of personalization limits user engagement, reduces brand resonance, and constrains loyalty.

Artificial Intelligence (AI) presents a transformative opportunity to address these limitations by enabling

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dynamic personalization and adaptive content delivery. The integration of AI-driven personalization is central to modern consumer engagement strategies; as established by Hollebeek et al. (2024), artificially intelligent technologies facilitate a multidimensional engagement process that influences cognitive, emotional, and behavioral responses. Advances in computer vision and generative modeling allow AI systems to analyze user data and generate contextually relevant visuals in real time. The integration of these AI-personalized visuals within smart hospitality platforms aligns with broader advancements in secure and efficient data processing within the Internet of Things (IoT) ecosystem.

Furthermore, the development of these platforms is intrinsically linked to the evolution of smart cities, where big data and artificial intelligence are leveraged to enhance urban services and citizen engagement (Chakir et al., 2024). For instance, the use of a Hybrid Autoencoder and Gated Recurrent Unit (GRU) model, especially when optimized by meta-heuristic algorithms like the Honey Badger Algorithm, has demonstrated significant potential in optimizing data features and ensuring system robustness (Addula et al., 2025). Such frameworks are essential for maintaining the integrity and reliability of real-time user preference mapping in smart hospitality environments. Liu and Kim (2025) demonstrated that hybrid models combining Conditional Generative Adversarial Networks (CGANs) with Transformer architectures can produce high-quality, customized visual communication, underscoring AI's potential in design innovation (Liu and Kim, 2025). Similarly, Yu and Meng (2026) found that image generative AI in tourism significantly improved personalization and consumer engagement compared to conventional marketing methods.

Industry forecasts reinforce these academic findings. The Hospitality in 2025 Report by Oracle and Skift emphasizes that personalization, automation, and AI-driven design are no longer optional but expected by guests (Oracle and Skift, 2025). The Hospitality Financial and Technology Professionals (HFTP) report further warns that hotels failing to adopt data-driven personalization risk losing competitiveness, as customers increasingly demand tailored experiences across both digital and physical touchpoints (Financial and Professionals, 2025). At a policy level, the OECD (2024) highlights AI-enabled personalization and immersive technologies such as AR/VR as critical innovations for smart tourism across advanced economies (OECD, 2024).

While technological adoption is accelerating globally, tourism transformation must also remain sensitive to local cultural and environmental contexts. In Indonesia, for example, the case of Kampung Naga Tasikmalaya demonstrates that tourism requires a holistic balance between cultural conservation and environmental sustainability (Dewantara et al., 2024). Similarly, the discourse on the high-touch, high-tech paradigm stresses that technology should complement rather than replace human and cultural interaction, particularly in rural destinations where authenticity and tradition form key aspects of the tourist experience (Supina et al., 2024). These insights highlight that while AI-driven personalization enhances engagement, its implementation must also align with broader principles of cultural sensitivity and sustainable tourism.

Emerging technologies such as Augmented Reality (AR) further demonstrate the potential of visual innovation for user engagement. A study on the XYZ Perfume Brand revealed that AR-based promotional experiences designed through user-centered design significantly improved consumer interaction and brand recall (Erlyana et al., 2023). Translating these findings into hospitality suggests that AI-driven personalization, when combined with immersive and interactive visual communication, could create richer and more persuasive digital tourism experiences.

Despite these promising directions, empirical research on AI-driven visual communication in hospitality remains limited. Most studies have concentrated on AI applications in recommendation engines, pricing optimization, and automated customer service, with far less focus on visual communication strategies. This represents a crucial research gap, as visuals are often the first and most powerful touchpoint in smart hospitality. Addressing this gap requires an interdisciplinary approach that bridges computer science methodologies (AI personalization, image analysis, clustering, sentiment analysis) with communication design principles (visual storytelling, semiotics, and cultural adaptation).

The objective of this study is to examine the role of AI-driven visual communication strategies in enhancing tourist engagement in smart hospitality platforms. By combining computational methods with design communication perspectives, this research contributes to both theory and practice, offering new insights into how AI-enabled visual storytelling can advance smart hospitality experiences while remaining culturally and contextually relevant. Based on this objective, the study tests the following hypotheses:

- H_1: AI-personalized visuals significantly increase user engagement compared to generic visuals on smart hospitality platforms
- H_2: AI-personalized visuals generate a higher level of user trust than conventional, static visual content
- H_3: Higher levels of AI-driven engagement and trust lead to more confident and efficient travel decision-making among users

Materials

The materials employed in this study included both software and survey instruments. For AI-based content analysis, Python 3.10 with libraries such as TensorFlow, Keras, and scikit-learn was utilized to perform image clustering and sentiment analysis. NVivo 12 was used for qualitative coding of open-ended responses. For survey distribution and data management, Google Forms and SPSS 27 were employed. The visual stimuli consisted of 120 digital images sourced from hospitality booking platforms and promotional campaigns. These were categorized into two sets: Set A (generic visuals) and Set B (AI-personalized visuals)**.**

Methods

This study applied a mixed-method approach integrating quantitative and qualitative analysis. The research framework, as illustrated in Figure 1, integrates data collection, AI-based analysis, stimuli development, survey experiment, and data analysis into a unified workflow. This framework demonstrates how computational techniques, specifically K-means clustering and sentiment analysis, are systematically combined with experimental design to evaluate the impact of AI-personalized visuals on user behavior.
The research design followed three phases:

1. Data Collection of Visuals: A total of 120 images were extracted from leading hospitality platforms. These visuals were analyzed using AI clustering to identify recurring design patterns, including color dominance, layout composition, and object recognition. Sentiment analysis was further applied to assess potential user responses to different visual features
2. Stimuli Development: Based on AI analysis, two visual sets were developed:
    - Set A**:** Generic hospitality visuals commonly used on booking sites
    - Set B**:** AI-personalized visuals reflecting preferred design attributes identified through clustering and sentiment analysis
3. Survey Experiment: A total of 156 participants were recruited through purposive sampling, divided into Generation Y (ages 30–44) and Generation Z (ages 18–29). Inclusion criteria required participants to have prior experience using hospitality platforms within the last year. Respondents were randomly exposed to both sets of visuals and then completed a questionnaire measuring engagement, trust, and decision-making on a 5-point Likert scale

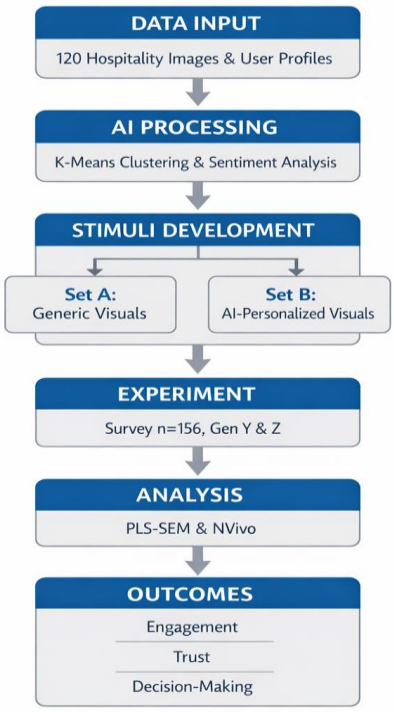

Fig. 1: Research Framework

Data Collection

A dataset of visual materials was collected from major hospitality platforms, including hotel booking applications, travel service websites, and digital promotional campaigns. The selection criteria emphasized diversity in design features such as imagery, color schemes, typography, and layouts. This dataset represented both commonly used generic visuals and AI-personalized variants for comparative analysis.

AI-Based Content Analysis

The collected visuals were examined using AI-based techniques to identify common patterns in visual communication. Image clustering and sentiment analysis were performed with Python libraries (TensorFlow, Keras, and scikit-learn). The outcomes of this analysis informed the development of two experimental sets of stimuli: Set A (Conventional generic visuals) and Set B (AI-personalized visuals, tailored to reflect user-preferred design attributes derived from clustering and sentiment analysis).

To ensure methodological transparency, the AI-driven personalization for Set B followed a rigorous three-stage workflow:

1. Attribute Segmentation: First, we segmented visual attributes from the 120 images using k-means clustering to categorize technical and aesthetic features (e.g., saturation, composition, color temperature, and object categories). Simultaneously, sentiment analysis was applied to simulated social

media interactions to assess emotional responses to these visual features, identifying which elements evoked feelings of authenticity and adventure

2. Preference Mapping: Second, these clustered attributes were mapped to user preferences extracted from digital profiles. These digital profiles were constructed using aggregated, anonymized behavioral data from hospitality platforms. By integrating the sentiment analysis results, we were able to weight the visual features that aligned most strongly with the target demographics' affective preferences
3. Similarity Scoring and Selection: Finally, visuals for Set B were selected based on a strict quantitative threshold. We calculated the mathematical distance between the clustered image feature vectors and the target user preference vectors using cosine similarity. Only visuals achieving a ≥70% similarity score to the identified preference clusters were included in Set B. As illustrated in Figure 2, this computational selection ensured that Set B incorporated dynamic compositions, warmer color temperatures, and lifestyle-oriented imagery tailored statistically to the 'adventurous' and 'authentic' traits of Generation Y and Z, rather than relying on subjective aesthetic choices

Survey Experiment

A total of 156 participants were recruited through purposive sampling. Eligible respondents were required to be active users of hospitality applications within the past 12 months. Participants were exposed to both visual sets (A and B) in randomized order and subsequently completed a structured questionnaire measuring engagement, trust, and decision-making on a 5-point Likert scale.

Instruments

The questionnaire comprised 18 items adapted from validated constructs in digital engagement and hospitality research. The items covered three domains:

1. Engagement (visual appeal, attention, interactivity)
2. Trust (credibility, authenticity, relevance)
3. Decision-making (intention to book, perceived usefulness)

Open-ended items were included to capture qualitative impressions. Reliability was confirmed through pilot testing, with Cronbach's alpha values exceeding 0.70.

Data Analysis

Quantitative data were analyzed using SPSS 27 for descriptive statistics and paired-sample t-tests, while SmartPLS 3.0 was applied to model relationships among engagement, trust, and decision-making. Qualitative responses were thematically coded in NVivo 12, enabling triangulation of findings between quantitative and qualitative strands.

a. generic visual b. AI-personalized visual

Fig. 2: Comparison of visual stimuli used in the experiment: (a) set A (Generic) Features static, high-exposure imagery with centered compositions; (b) Set B AI-personalized result to optimize color temperature tones, and lifestyle-oriented tailored to user engagement pattern identified in the target demographic

Results

Respondent Characteristics

A total of 156 participants completed the survey, consisting of 79 Generation Z respondents (18–29 years old) and 77 Generation Y respondents (30–44 years old). Gender distribution was balanced (51% female, 49% male). The majority of respondents reported using hospitality platforms at least once in the past six months, confirming their familiarity with digital booking systems.

Comparison of Generic vs. AI-Personalized Visuals

Paired-sample *t*-tests indicated significant differences between Set A (generic visuals) and Set B (AI-personalized visuals). Engagement scores were substantially higher for AI-personalized visuals ($M = 4.21$, $SD = 0.58$) compared to generic visuals ($M = 3.47$, $SD = 0.72$), $t(155) = 10.84$, $p<0.001$. Trust levels also increased when participants were exposed to personalized visuals ($M = 4.15$, $SD = 0.63$) relative to generic content ($M = 3.52$, $SD = 0.69$), $t(155) = 9.91$, $p<0.001$. Decision-making intention, as measured by likelihood of booking, was similarly enhanced ($M = 4.09$ vs. $M = 3.44$, $t(155) = 8.73$, $p<0.001$). These results confirm that AI-personalized content significantly improves user perceptions across all three constructs compared to traditional generic visuals.

Measurement Model Results

Outer Loadings and Construct Reliability

All indicators loaded significantly on their respective constructs, with loadings ranging from 0.77 to 0.87, surpassing the 0.70 threshold. Cronbach's alpha values (0.83–0.85) and composite reliability values (0.89–0.90) further demonstrated internal consistency. AVE values

(0.68–0.74) exceeded the 0.50 criterion, supporting convergent validity (Table 2).

Discriminant Validity

In addition to convergent validity, discriminant validity was established using the Heterotrait-Monotrait (HTMT) ratio. As shown in Table 3, all HTMT values between the constructs of Engagement, Trust, and Decision-making were below the conservative threshold of 0.85. This confirms that the three constructs are empirically distinct and measure unique aspects of the user experience within the structural model.

Table 1: Comparison of Mean Scores between Generic and AI-Personalized Visuals (n = 156)

Construct	Generic Visuals (M ± SD)	AI-Personalized (M ± SD)	*t* (155)	*p* Value
Engagement	3.47±0.72	4.21±0.58	0.48	< 0.001
Trust	3.52±0.69	4.15±0.63	0.44	< 0.001
Decision-making	3.44±0.71	4.09±0.66	0.38	< 0.001

Table 2: Outer Loadings and Construct Reliability

Construct	Indicator	Loading	Cronbach's Alpha	Composite Reliability (CR)	AVE
Engagement	ENG1	0.82	0.84	0.89	0.71
	ENG2	0.85			
	ENG3	0.79			
	ENG4	0.84			
	ENG5	0.77			
	ENG6	0.81			
Trust	TRU1	0.86	0.83	0.90	0.72
	TRU2	0.82			
	TRU3	0.83			
	TRU4	0.78			
	TRU5	0.80			
	TRU6	0.84			
Decision-making	DEC1	0.78	0.85	0.89	0.74
	DEC2	0.87			
	DEC3	0.80			
	DEC4	0.82			
	DEC5	0.79			
	DEC6	0.83			

Table 3: Discriminant Validity (HTMT Ratio)

Construct	Decision-making	Engagement	Trust
Decision-making			
Engagement	0.675		
Trust	0.306	0.507	

Table 4: Path Coefficients and Significance (PLS-SEM)

Hypothesis	Path	β	*t*-value	*p*-value
H1	Engagement → Trust	0.62	12.45	<0.001
H2	Engagement → Decision-making	0.34	3.12	<0.01
H3	Trust → Decision-making	0.41	6.78	<0.001

Structural Model Results

Path Coefficients

To assess the significance of the path coefficients, a bootstrapping procedure with 5,000 subsamples was performed using SmartPLS 3.0. The structural model confirmed significant relationships among the constructs. Engagement exerted a strong and significant influence on trust (β = 0.62, p<0.001), confirming that higher user engagement with AI-personalized visuals enhances their trust toward hospitality platforms. In addition, engagement directly influenced decision-making (β = 0.34, p<0.01), suggesting that the attractiveness and interactivity of personalized visuals increase users' likelihood to book. Trust also positively predicted decision-making (β = 0.41, p<0.001), indicating that when users perceive the content as credible and authentic, they are more confident in making booking decisions. Together, these findings demonstrate that all three hypothesized relationships (H1, H2, and H3) were supported (Table 4).

Model Fit Indices

Model fit statistics showed strong overall adequacy, confirming the structural integrity of the proposed

framework. The detailed summary of these fit indices, including their respective thresholds and interpretations, is presented in Table 5. The SRMR value of 0.04 was well below the recommended threshold of 0.08, indicating a good fit between the model and the empirical data. Furthermore, the NFI reached 0.91, surpassing the 0.90 benchmark for acceptable fit. The explained variance was substantial: the model accounted for 38% of the variance in trust ($R^2 = 0.38$) and 52% of the variance in decision-making ($R^2 = 0.52$). Additionally, the model's predictive relevance was assessed using the blindfolding procedure in SmartPLS. The $Q2$ values for the endogenous constructs of Trust ($Q2 = 0.339$) and Decision-making ($Q2 = 0.513$) were both well above zero, further confirming the predictive accuracy of the model.

This moderate-to-strong explanatory power suggests that engagement and trust are not merely aesthetic factors but robust predictors of user behavior within the IoT-linked Smart Hospitality ecosystem. The high R^2 for decision-making (0.52) underscores that over half of a user's booking intention can be directly influenced by AI-driven visual personalization, representing a significant practical impact for digital tourism platforms.

Qualitative Insight

The qualitative findings provided nuanced perspectives that complemented the quantitative results. Participants consistently emphasized that AI-personalized visuals conveyed a stronger sense of relevance compared to generic content. Respondents explained that these visuals "felt tailored" to their preferences, which created a more engaging and immersive user experience. Beyond aesthetic appeal, personalization was often associated with professionalism and authenticity. Several participants noted that AI-generated visuals appeared "trustworthy" and "credible," in contrast to the generic visuals that were sometimes described as repetitive or uninspiring.

Table 5: Model Fit Statistics

Index	Value	Threshold	Interpretation
SRMR	0.04	< 0.08	Good fit
NFI	0.91	> 0.90	Acceptable fit
R^2 (Trust)	0.38	≥ 0.25 (weak), ≥ 0.50 (moderate)	Moderate explanatory power
R^2 (Decision-making)	0.52	≥ 0.25 (weak), ≥ 0.50 (moderate)	Moderate explanatory power
Q^2 (Trust)	0.339	> 0	Predictive relevance established
Q^2 (Decision-making)	0.513	> 0	Predictive relevance established

This enhanced perception of credibility translated into greater confidence when making booking decisions. Participants highlighted that the alignment between visuals and their expectations reduced uncertainty and increased their willingness to proceed with transactions. As one respondent observed, personalized visuals made the platform "look reliable, which makes me more comfortable booking." Collectively, these qualitative insights suggest that AI-personalized content influences both emotional and cognitive dimensions of user experience, reinforcing engagement while simultaneously building trust that underpins decision-making.

Discussion

The findings of this study confirmed all three hypotheses proposed in the Introduction, underscoring the potential of AI-driven visual communication in enhancing tourist engagement and decision-making within hospitality platforms. First, engagement significantly predicted trust ($\beta = 0.62$, $p<0.001$), indicating that more appealing and interactive visuals enhance users' perception of credibility. This result aligns with prior studies emphasizing the role of design aesthetics and interactivity in fostering user trust (Gretzel and Collier de Mendonça, 2019). The strong path coefficient further suggests that in smart hospitality contexts, visual engagement functions not only as an affective driver but also as a prerequisite for building cognitive evaluations of authenticity and reliability.

Second, engagement exerted a direct influence on decision-making ($\beta = 0.34$, $p<0.01$). This finding highlights that the attractiveness of AI-personalized visuals translates into behavioral intentions such as willingness to book. Previous literature on augmented reality in consumer engagement has demonstrated similar outcomes, where immersive and personalized promotional tools increased consumer interaction and purchase intent (Erlyana et al., 2023). The parallels indicate that personalization of visuals whether in luxury goods or hospitality can trigger both emotional resonance and transactional behavior.

Third, trust itself emerged as a significant predictor of decision-making ($\beta = 0.41$, $p<0.001$). This supports the notion that credibility and perceived authenticity are indispensable to consumer decisions in online environments. The result resonates with the *high-touch*, high-tech discourse, which argues that technological innovations should reinforce rather than replace human trust and cultural authenticity (Supina et al., 2024). In hospitality, where uncertainty often accompanies booking decisions, trust acts as the mediating bridge between technological appeal and behavioral commitment.

The comparative analysis between Set A (generic visuals) and Set B (AI-personalized visuals) further

validated these relationships. Paired-sample *t*-tests showed significant improvements across engagement, trust, and decision-making when users interacted with AI-personalized content (Table 1). These findings provide empirical evidence that personalization significantly outperforms generic design strategies in hospitality contexts. Moreover, the qualitative insights reinforced this conclusion, as participants consistently associated AI-personalized visuals with relevance, professionalism, and decision confidence.

Beyond its theoretical contributions, the statistical improvement in engagement (from M = 3.47 to M = 4.21) and trust (from M = 3.52 to M = 4.15) carries significant weight for the hospitality industry. In a highly competitive digital marketplace, a nearly 20% increase in user engagement scores suggests that AI-driven visuals can substantially reduce bounce rates on booking platforms and enhance conversion rates. The rise in decision-making intention (M = 4.09) indicates that personalized visuals do not merely improve aesthetic appeal but actively nudge users toward completing a booking. By moving trust scores above the 4.0 threshold on a 5-point scale, AI personalization helps platforms overcome the "generic" feel that often leads to consumer skepticism, thereby fostering brand credibility.

Furthermore, the application of automated AI clustering to generate these visuals allows marketing teams to deliver high-quality, tailored content at scale without the prohibitive costs of manual design for every demographic. The long-term impact of these technologies extends beyond user interface aesthetics; as noted by (Siddik et al., 2025), artificial intelligence acts as a catalyst for sustainable tourism growth by optimizing economic cycles and resource allocation within the digital ecosystem. By integrating AI-driven visual communication, hospitality providers not only enhance immediate engagement but also contribute to a more resilient and sustainable digital tourism economy. This shift from "acceptable" to "excellent" levels of engagement represents a critical competitive advantage in retaining the attention of digitally native Generation Y and Z travelers. The importance of tailoring digital strategies to specific cohorts is further supported by Erlyana et al. (2025a), whose research on computational models highlights that brand equity and consumer loyalty are significantly influenced by generational differences in digital interaction. By leveraging similar computational approaches to analyze visual preferences, this study confirms that AI-driven personalization is essential for maintaining brand resonance across diverse age groups.

The effectiveness of the AI-driven personalization observed in this study echoes the findings of (Chaudhary et al., 2025), who highlighted how mathematical models and machine learning can transform raw consumer data into actionable marketing insights. By applying similar logic to visual communication, this research confirms that computational analysis is superior to conventional, static marketing methods in digital ecosystems. Furthermore, the effectiveness of using sentiment analysis to decode traveler preferences is supported by George and Ramos (2024), who emphasizes that analyzing emotional undertones in tourism data provides critical insights for enhancing destination branding and service quality. This aligns with our findings that AI-driven visuals, grounded in sentiment-based preferences, significantly improve user trust and engagement. The integration of sentiment analysis to assess user preferences further aligns with contemporary findings in the Indonesian digital landscape; for instance, Madyatmadja et al. (2025) demonstrated that sentiment analysis using machine learning models can effectively capture user satisfaction markers and emotional responses toward platform features. By adopting similar principles, this study ensures that AI-driven visuals are not only aesthetically optimized but also grounded in the emotional expectations of the target demographic.

Placing the study within a broader context, the results extend ongoing discussions in tourism and communication research. Yu and Meng (2026). demonstrated that multimodal features combining text, visuals, and social interaction on travel agency Instagram posts significantly predicted user engagement, highlighting the value of design strategies that go beyond static content. Similarly, Ilieva et al. (2024) discussed how generative AI tools are reshaping tourism by producing adaptive and tailored content, yet little is known about their direct effect on trust and booking decisions an empirical gap that the present study addresses. Yu and Meng (2026) also argued that image generative AI transforms consumer experiences in tourism marketing, supporting our findings that personalization substantially increases engagement.

The study also echoes sustainability perspectives. Research on Kampung Naga in Indonesia emphasized that tourism development must balance cultural preservation and environmental sustainability (Dewantara et al., 2024). Likewise, Gouda and Halim (2025) found that sustainable and authentic social media content enhances loyalty in hospitality, reinforcing the notion that personalization strategies should remain ethically grounded. OECD (2024) policy guidelines similarly highlight the need for AI-enabled personalization to be implemented in a culturally sensitive and sustainable manner. This necessity for structured design integration is further emphasized by Erlyana et al. (2025b) who proposed a conceptual framework for integrating visual communication design into information systems for cultural and maritime heritage. Their work underscores that visual design is not merely an aesthetic layer but a critical functional component that enhances the delivery of complex information within digital ecosystems. By

applying a similar logic to smart hospitality platforms, this study reinforces that the systematic integration of AI-driven visuals is essential for creating cohesive and informative digital tourism experiences. Together, these studies suggest that while AI-driven personalization is effective, its success depends on integration with broader cultural and sustainability frameworks.

Despite these contributions, several limitations must be acknowledged. First, the study relied on self-reported survey data, which may be subject to response biases such as social desirability. Second, the experimental design employed static visual stimuli, which, while controlled, do not fully replicate the dynamic multimedia experiences of real-world hospitality platforms. Furthermore, while the stimuli in this study were strictly validated through an objective computational threshold (≥70% algorithmic similarity), a formal human manipulation check (pre-test) of the visuals was not conducted prior to the main study. Future research could complement algorithmic validation with traditional human pre-testing to further verify perceptual alignment. Third, the sample was limited to 156 respondents across two generational cohorts, potentially constraining the generalizability of findings to other demographic or cultural groups.

Future research could address these limitations by expanding the dataset to include larger and more diverse populations, incorporating real-time interaction with smart hospitality applications, and integrating multimodal content (e.g., video, augmented reality, mixed reality). (Minor et al., 2025) demonstrated that hotels in non-urban areas benefited from emotional visual communication during crisis contexts, suggesting that future work could explore how personalization functions across different geographies and conditions. Additionally, while this study focused on engagement, trust, and decision-making, future investigations could explore other constructs such as hedonic value, satisfaction, or long-term loyalty. Finally, comparative cross-cultural studies would provide deeper insight into how AI-personalized visuals operate in balancing global technological standards with local cultural values.

In summary, this study contributes to both computer science and design communication by empirically demonstrating how AI-personalized visuals enhance engagement, trust, and decision-making in hospitality platforms. By situating these findings within technological, cultural, and sustainability frameworks, the study offers practical implications for developers and designers while also highlighting pathways for more ethical and context-aware applications of AI in tourism.

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Author's Contributions

Yudhiet Fajar Dewantara: Data collection; Formal analysis; Writing original draft preparation.

Yana Erlyana: Conceptualization; Methodology; Theoretical framework.

Lim Jing Yi: Supervision, writing, review and edited.

Ethics

This study was conducted in accordance with the ethical standards of the institutional research committee at Bunda Mulia University. All participants were informed about the purpose of the study, the voluntary nature of their participation, and the anonymity of their data. Digital informed consent was obtained from all respondents prior to their participation in the survey. No personally identifiable information was collected, ensuring full confidentiality and compliance with data protection guidelines.

Ethical Considerations

All participants provided informed consent prior to participation. Anonymity and confidentiality were guaranteed, and respondents retained the right to withdraw at any stage. The study adhered to standard ethical guidelines for research involving human participants.

Conflict of Interest

The authors declare that there are no conflicts of interest.

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