A GDS-Based Green Airline Ticketing Decision System Model to Support Sustainable Tourism in Bali

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Abstract. The growing demand for sustainable tourism highlights the need to integrate environmental considerations into airline ticketing systems. This study examines the role of a Green Airline Ticketing Decision System (GATDS) based on Global Distribution System (GDS) technology in promoting sustainable travel behaviour among tourists in Bali. The proposed model incorporates Digital Ticketing Competency (DTC), Airline Ticketing System Quality (ATSQ), Green Tourism Awareness (GTA), Green Travel Intention (GTI), and Green Travel Decision (GTD). A quantitative survey was conducted with 300 airline ticket purchasers using travel agency services in Bali. Data were analysed using Structural Equation Modelling–Partial Least Squares (SEM-PLS). The results indicate that DTC, ATSQ, and GTA have significant positive effects on GTI. Green Travel Intention was found to be the strongest predictor of Green Travel Decision, while DTC, ATSQ, and GTA also exerted significant direct effects on travel decisions. The model explained 68.4% of the variance in GTI and 74.1% of the variance in GTD. The findings suggest that integrating sustainability-related information into airline ticketing platforms can encourage environmentally responsible travel choices and support the development of sustainable tourism destinations.

Keywords: Digital Ticketing Competency, Global Distribution System, Green Airline Ticketing System, Green Tourism Awareness, Green Travel Decision, Sustainable Tourism

1 Introduction

One of the most important components of the global tourism system is air transportation, which enables fast and efficient travel between countries and regions (Gössling & Mei, 2025); (Guzman & Navarro-Pineda, 2025). The development of the aviation industry also poses new challenges related to the environmental impact of air transportation activities, such as global carbon emissions that impact climate change and environmental degradation (Guzman & Navarro-Pineda, 2025); (Sharma et al., 2024). Therefore, in recent years, there has been increasing attention to the concepts of green tourism and sustainable tourism, which emphasize the importance of more environmentally friendly travel practices and sustainable management of tourist destinations (García-García et al., 2023); (Hussain et al., 2023). The significant increase in the number of tourists to Bali can put pressure on the environment, including

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increased energy consumption, carbon emissions, and pressure on natural resources (Higham et al., 2018). Therefore, an innovative approach is needed that can integrate sustainability principles into the tourism system.

Online airline ticketing systems and various digital travel platforms allow travelers to search for flight information easily, compare ticket prices, and make travel reservations quickly and efficiently (Avirutha & Sittisook, 2025); (Sigala, 2018). The quality of digital systems, such as usability, information quality, and system reliability, significantly influences travelers' decisions to use online travel booking services (Mafrudoh et al., 2025). Studies on tourist behavior show that travelers with high levels of environmental awareness tend to prefer environmentally friendly tourism products and support sustainable tourism practices (Zungur et al., 2025); (Han et al., 2020). This environmental awareness can influence various travel decisions (Banerjee et al., 2025; (Gössling et al., 2023). Smart tourism utilizes information and communication technology to enhance the tourist experience while supporting more efficient and sustainable destination management (Elizabeth et al., 2025); (Peeters et al., 2018). In this context, digital systems such as airline ticketing systems function not only as travel reservation tools but also as information platforms that can influence travelers' behavior in choosing more sustainable travel. Research on green tourism generally focuses on tourist behavior and environmental awareness without considering the role of digital technology in the travel decision-making process (García-García et al., 2023.); Han et al., 2021; (Bramwell & Lane, 2012).

On the other hand, research on online travel booking systems focuses more on aspects of system quality, ease of use, and user purchasing decisions without linking these to environmental sustainability dimensions (Avirutha & Sittisook, 2025),; (Higham et al., 2018). Research on smart tourism technologies shows that digital technology has great potential to support sustainable tourism development by providing more transparent and efficient travel information (Peeters et al., 2018); (Buhalis, 2020). However, empirical research examining the integration of digital ticketing system user competency, ticketing system quality, green tourism awareness, and tourist travel decisions is still relatively limited. In the development of airline ticket distribution systems, Global Distribution Systems (GDS) such as Amadeus IT Group, Sabre Corporation, and Travelport have become the main infrastructure that connects airlines, travel agencies, and tourists in one integrated digital system (Leal Filho et al., 2023); (Leal Filho et al., 2023; Sigala, 2018). GDS provides real-time information regarding schedules, prices, and ticket availability that influence tourists' travel decisions (Avirutha & Sittisook, 2025). However, existing systems are still oriented towards commercial aspects and have not optimally integrated environmental information such as carbon emissions (Li & Terason, 2023). In fact, the integration of digital technology with green tourism principles has the potential to encourage more sustainable travel decisions (Peeters et al., 2018). Therefore, it is necessary to develop a GDS-based Green Airline Ticketing Decision System model to support more environmentally friendly tourist decision-making (Higham et al., 2018).

A research gap that warrants further study is an integrative model explaining how digital airline ticketing systems can encourage more environmentally friendly travel decisions among tourists. Therefore, this study seeks to develop a GDS-based Green Airline Ticketing Decision System model that integrates digital technology, ticketing system quality, and green tourism awareness to explain tourist travel decisions. This

research aligns with the research direction within the Bali State Polytechnic's Research and Development Program (RIPPkM), which emphasizes the importance of developing innovation-based applied research in the sustainable tourism sector. By integrating the concepts of digital technology and green tourism, this research is expected to provide both academic and practical contributions in supporting the transformation towards more sustainable tourism in Bali.

Digital Ticketing Competency refers to an individual's capability to search, compare, evaluate, and purchase airline tickets using digital reservation technologies. Competent users can efficiently interpret fare rules, booking classes, ancillary services, refund policies, and environmental information provided within airline reservation platforms. Higher competency reduces transaction uncertainty while increasing travelers' confidence in selecting sustainable travel options. Recent studies indicate that digital competence significantly influences technology acceptance, online purchasing behavior, and service satisfaction within tourism contexts. Travelers' ability to use digital ticketing systems can increase ease of access to travel information, thereby encouraging tourists to choose more environmentally friendly travel alternatives (Leal Filho et al., 2023); (García-García et al., n.d.); (Mafrudoh et al., 2025).

H1: Digital Ticketing Competency has a positive effect on Green Travel Intention.

H5: Digital Ticketing Competency has a positive effect on Green Travel Decision.

System quality represents users' perceptions regarding the functionality, usability, reliability, responsiveness, security, and information quality of digital airline reservation systems. High-quality ticketing systems facilitate faster booking, transparent pricing, secure payment processes, and effective travel information delivery. In sustainable tourism, system quality also includes the ability to display carbon footprint information, eco-labels, sustainable airline ratings, and green travel recommendations that support environmentally informed decision-making. A ticketing system with good information quality can increase user trust and encourage intention to use the system when choosing a travel itinerary (Omido et al., 2025); (Barua & Kaiser, 2024); (Higham et al., 2018).

H3: Airline Ticketing System Quality has a positive effect on Green Travel Intention.

H7: Airline Ticketing System Quality has a positive effect on Green Travel Decision

Green Tourism Awareness reflects tourists' knowledge and concern regarding environmental sustainability, climate change, and responsible travel behavior. Tourists with stronger environmental awareness are more likely to consider ecological consequences when selecting transportation modes and travel services.

Previous studies consistently demonstrate that environmental awareness positively influences green purchasing behavior, sustainable consumption, and eco-friendly travel intentions. Travelers who are highly aware of sustainability issues tend to be more interested in traveling that supports sustainable tourism principles (Avirutha & Sittisook, 2025); (Zungur et al., 2025); (Gössling & Mei, 2025).

H2: Green Tourism Awareness has a positive effect on Green Travel Intention.

H6: Green Tourism Awareness has a positive effect on Green Travel Decision.

Green Travel Intention represents an individual's willingness to choose environmentally responsible travel alternatives. According to behavioral theories, intention serves as the strongest predictor of actual behavior. Travelers with stronger

intentions are more likely to select flights offering lower carbon emissions, carbon offset programs, or environmentally certified airlines. Tourists' intention to undertake environmentally friendly travel is an important factor influencing travel decisions made by tourists (Banerjee et al., 2025); (Elizabeth et al., 2025).

H4: Green Travel Intention has a positive effect on Green Travel Decisions.

Green Travel Decision refers to the final purchasing behavior in selecting airline services that support environmental sustainability. Such decisions are influenced by individual competency, technological support, environmental awareness, and behavioral intention. Integrating these dimensions within digital ticketing platforms is expected to enhance sustainable travel choices (Zungur et al., 2025); (Gössling & Dolnicar, 2022).

2 Methodology

2.1 Research Design

This study employed a quantitative explanatory research design to investigate the determinants of environmentally responsible airline ticket purchasing behavior among tourists in Bali. The research aimed to examine the causal relationships between Digital Ticketing Competency (DTC), Airline Ticketing System Quality (ATSQ), Green Tourism Awareness (GTA), Green Travel Intention (GTI), and Green Travel Decision (GTD). Structural Equation Modeling based on Partial Least Squares (SEM-PLS) was selected because it is suitable for predictive research, theory development, and complex models involving multiple latent variables.

2.2 Population and Sample

The population comprised domestic and international tourists who had purchased airline tickets through travel agencies utilizing Global Distribution Systems (GDS) such as Amadeus, Sabre, or Travelport while traveling to or from Bali. A purposive sampling technique was adopted using the following criteria: respondents aged over 18 years; had purchased airline tickets through GDS-based travel agencies within the previous 12 months; possessed prior experience with online or offline airline ticket booking; voluntarily participated in the survey. A total of 300 valid questionnaire responses were obtained and analysed. This sample size exceeded the minimum requirement recommended for SEM-PLS analysis and ensured adequate statistical power.

2.3 Instrument Development

Data were collected using a structured questionnaire measured on a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The questionnaire consisted of five latent variables: Digital Ticketing Competency (DTC)= 6 indicators, Airline Ticketing System Quality (ATSQ)= 6 indicators, Green Tourism Awareness(GTA)= 5 indicators, Green Travel Intention (GTI)= 5 indicators, Green Travel Decision (GTD)= 5 indicators

The measurement items were adapted from previous studies on technology adoption, information systems quality, sustainable tourism, and green consumer behavior, with modifications to reflect airline ticket purchasing through Global Distribution Systems.

2.4 Data Collection Procedure

The survey was conducted between April and June 2026 in several tourism areas in Bali, including Denpasar, Badung, Gianyar, and Ngurah Rai International Airport. Respondents completed the questionnaire electronically using QR Code access provided by cooperating travel agencies and university researchers. Prior to distribution, the instrument underwent expert validation and pilot testing involving 30 respondents to ensure content validity and clarity.

2.5 Data Analysis

The collected data were analyzed using SmartPLS 4.0. The analytical procedure consisted of two sequential stages:
Measurement Model Assessment. The reflective measurement model was evaluated using: Indicator Loading (>0.70), Cronbach's Alpha (>0.70), Composite Reliability (>0.70), Average Variance Extracted (AVE >0.50), Heterotrait-Monotrait Ratio (HTMT <0.90), Variance Inflation Factor (VIF <5)
Structural Model Assessment. The structural model was evaluated using: Path Coefficients, Bootstrapping (5,000 subsamples), Coefficient of Determination (R^2), Effect Size (f^2), Predictive Relevance (Q^2), Standardized Root Mean Square Residual (SRMR). Hypotheses were accepted when the p-value was less than 0.05.

3 Result and Discussion

3.1 Result

Respondent Characteristics. Among the 300 respondents, 53.7% were male and 46.3% were female. The largest age group was between 26–35 years (41.3%), followed by 36–45 years (27.7%), 18–25 years (18.0%), and above 45 years (13.0%).Regarding education level, 61.0% held undergraduate degrees, 24.7% possessed postgraduate qualifications, while the remainder had diploma or senior high school education. Approximately 72% reported purchasing airline tickets online more than three times annually, indicating considerable familiarity with digital airline reservation systems.

Measurement Model Evaluation. The measurement model demonstrated satisfactory psychometric properties. DTC = 0.914 (Cronbach;s Alpha), 0.932 (Composite Reliability), 0.695 (AVE); ATSQ = 0.927 (Cronbach;s Alpha), 0.942 (Composite Reliability), 0.731 (AVE); GTA=0.901 (Cronbach;s Alpha), 0.926 (Composite Reliability), 0.714 (AVE); GTI=0.918 (Cronbach;s Alpha), 0.938 (Composite

Reliability), 0.751 (AVE); GTD=0.925 (Cronbach;s Alpha), 0.944 (Composite Reliability), 0.772 (AVE)

All constructs exceeded recommended thresholds, indicating excellent internal consistency and convergent validity.

Outer Loading = DTC1 (0.842), DTC2 (0.865), DTC3 (0.811), DTC4 (0.856), DTC5 (0.874), DTC6 (0.833), ATSQ1–ATSQ6 (0.812–0.903), GTA1–GTA5 (0.818–0.892), GTI1–GTI5 (0.846–0.914), GTD1–GTD5 (0.857–0.921). All indicator loadings exceeded 0.70, confirming indicator reliability.

Discriminant Validity (HTMT) = DTC–ATSQ (0.623), DTC–GTA (0.547), ATSQ–GTA (0.601), GTI–GTD (0.783). All HTMT values were below 0.90, indicating adequate discriminant validity.

Structural Model. Collinearity Assessment (VIF) = DTC(2.11), ATSQ(2.38), GTA(1.94), GTI(2.26)

All VIF values were below five, suggesting that multicollinearity was not a concern.

The Coefficient of Determination indicates that the model explains **68.4%** of Green Travel Intention and **74.1%** of Green Travel Decision, indicating substantial explanatory power (Figure 1).

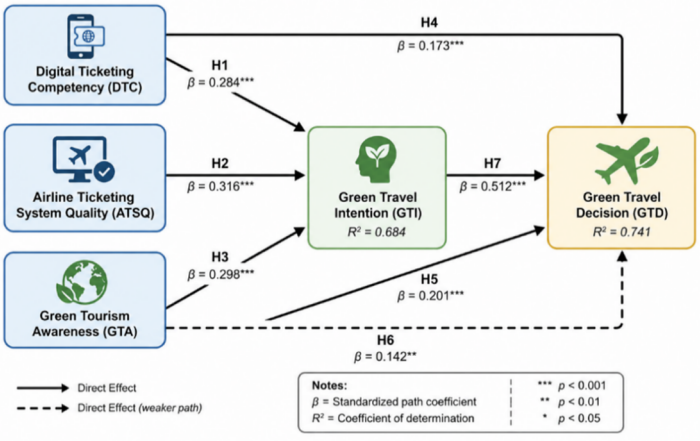


Figure 1. Structural model of the Green Airline Ticketing Decision System (GATDS). The values shown are standardized path coefficients estimated using PLS-SEM (n = 300).

Hypothesis Testing. Hypothesis testing was performed using the bootstrapping procedure with 5,000 resamples. The significance level was set at 5%, with hypotheses accepted when t-statistics exceeded 1.96 and p-values were below 0.05. Hypothesis Testing Results : H1(Hypothesis), DTC → GTI(Path), 0.284(β), 5.412 (t-value), <0.001(p-value), Supported(Decision); H2(Hypothesis), ATSQ → GTI (Path), 0.316(β), 6.183 (t-value), <0.001(p-value), Supported(Decision); H3(Hypothesis), GTA → GTI (Path), 0.298 (β), 5.847 (t-value), <0.001(p-value), Supported(Decision); H4(Hypothesis), DTC → GTD (Path), 0.173 (β), 3.271 (t-value), 0.001(p-value),

Supported(Decision); H5(Hypothesis), ATSQ → GTD (Path), 0.201(β), 3.965 (t-value), <0.001(p-value), Supported(Decision); H6(Hypothesis), GTA → GTD (Path), 0.142 (β), 2.854 (t-value), 0.004(p-value), Supported(Decision); H7(Hypothesis), GTI → GTD (Path), 0.512(β), 10.847 (t-value), <0.001(p-value), Supported(Decision). The results indicate that all seven hypotheses were statistically supported. Green Travel Intention exhibited the strongest direct influence on Green Travel Decision (β = 0.512), confirming its mediating role in translating technological capability and environmental awareness into actual purchasing behaviour.

Effect Size (f^2). Effect size analysis was conducted to evaluate the relative contribution of each predictor to the endogenous constructs. DTC → GTI=0.124 (f^2) small, ATSQ → GTI=0.167 (f^2) medium, GTA → GTI=0.151 (f^2) medium, DTC → GTD=0.069 (f^2) small, ATSQ → GTD=0.081 (f^2) small, GTA → GTD=0.052 (f^2) small, GTI → GTD=0.081 (f^2) large. Green Travel Intention demonstrated the largest effect on Green Travel Decision, highlighting the importance of behavioural intention in sustainable airline ticket purchasing.

Predictive Relevance. Predictive relevance was evaluated using the blindfolding procedure. GTI=0.471(Q^2), GTD=0.593 (Q^2). Both Q^2 values exceeded zero, confirming that the proposed model possesses strong predictive capability.

Model Fit. SRMR=0.058 Recommended (<0.080); NFI=0.917Recommended (>0.900).The model demonstrated an acceptable goodness-of-fit and can therefore be considered suitable for explaining sustainable airline ticket purchasing behaviour.

3.2 Discussion

The findings demonstrate that Digital Ticketing Competency (DTC) significantly influences Green Travel Intention (GTI). This result indicates that tourists with higher levels of digital competency are better able to search, compare, and evaluate airline services via Global Distribution Systems before making travel decisions. Individuals with better digital literacy are also more likely to understand sustainability-related information presented during the booking process, thereby increasing their intention to choose environmentally responsible travel alternatives. These findings are consistent with previous studies reporting that digital competence enhances technology acceptance, online purchasing behaviour, and decision quality within tourism ecosystems (Sharma et al., 2024); (Sigala, 2018)). Furthermore, intelligent digital platforms facilitate sustainable consumer behaviour by providing transparent and personalised travel information (Buhalis, 2020); (Gretzel et al., 2015).

The results further reveal that Airline Ticketing System Quality (ATSQ) positively influences Green Travel Intention. Reliable reservation systems, transparent fare information, secure payment facilities, and user-friendly interfaces increase travellers' confidence in using digital booking platforms. More importantly, the inclusion of environmental information, such as estimated carbon emissions and eco-labels,

encourages tourists to consider sustainability when selecting flights. This finding supports previous studies demonstrating that information quality and system reliability significantly affect customer satisfaction and behavioural intention in online travel booking (Barua & Kaiser, 2024). These results also reinforce the role of smart tourism technologies in promoting sustainable travel decision-making (Sigala, 2018).

Green Tourism Awareness was also found to significantly influence both Green Travel Intention and Green Travel Decision. Tourists who possess greater awareness of climate change, aviation emissions, and environmental conservation are more likely to select environmentally friendly travel alternatives. This finding is consistent with previous research indicating that environmental awareness remains one of the strongest predictors of sustainable tourism behaviour and green purchasing decisions (Dolnicar, 2020); (Zameer & Yasmeen, 2022); (Ogiemwonyi et al., 2023); (Patwary et al., 2022). It further confirms that strengthening tourists' environmental knowledge contributes directly to more responsible travel choices.

Among all structural relationships, Green Travel Intention exhibited the strongest direct effect on Green Travel Decision ($\beta = 0.512$). This finding supports the Theory of Planned Behavior, which argues that behavioural intention represents the most immediate determinant of actual behaviour. Similar findings have been reported in studies investigating sustainable airline choice and environmentally responsible tourism behaviour (Higham et al., 2018.); (Han, 2021);Therefore, behavioural intention serves as a critical mediating mechanism through which digital competency, system quality, and environmental awareness ultimately influence sustainable airline ticket purchasing.

Overall, the proposed Green Airline Ticketing Decision System (GATDS) successfully integrates technological capability and sustainability considerations into a unified behavioural framework. Unlike previous studies that separately examined digital booking systems or environmental awareness, this model demonstrates how both dimensions jointly explain environmentally responsible airline ticket purchasing behaviour. The findings therefore extend previous smart tourism research by illustrating that digital reservation platforms can evolve from purely transactional systems into intelligent decision-support systems capable of promoting sustainable tourism development (Buhalis, 2020; (Gretzel et al., 2021); (Sigala, 2023); (Gössling & Mei, 2025).

Theoretical Implications. This study extends the literature on smart tourism and sustainable aviation by integrating information systems quality, digital competency, and environmental awareness into a single behavioural framework. Unlike previous studies that examined these variables independently, the proposed GATDS model demonstrates their combined influence on green travel decisions through behavioural intention. The research also contributes to the application of behavioural intention theory within airline ticketing systems by incorporating sustainability attributes into digital reservation platforms. This integrated approach provides new theoretical insights into how technological innovation can facilitate sustainable consumer behaviour in tourism.

Practical Implications. The findings provide several practical implications for tourism stakeholders. Airlines should incorporate carbon emission indicators, fuel efficiency information, and environmental certification into digital booking interfaces. Global Distribution System providers should integrate sustainability modules capable of recommending lower-emission flight alternatives. Travel agencies should educate customers regarding environmentally responsible travel options while improving digital ticketing competencies among front-line employees. Tourism policymakers should encourage the adoption of green digital ticketing standards as part of broader sustainable tourism strategies, particularly in destinations highly dependent on air transportation such as Bali.

4 Conclusion

This study developed and empirically validated a Green Airline Ticketing Decision System based on Global Distribution System technology to explain sustainable airline ticket purchasing behaviour among tourists in Bali. The findings demonstrate that Digital Ticketing Competency, Airline Ticketing System Quality, and Green Tourism Awareness significantly influence Green Travel Intention. Green Travel Intention subsequently becomes the strongest determinant of Green Travel Decision. The proposed model explains substantial proportions of behavioural variance, confirming its robustness for predicting environmentally responsible travel decisions. Integrating sustainability information into airline ticketing platforms has considerable potential to encourage greener travel choices while supporting sustainable tourism development. Future research should investigate cross-country comparisons, incorporate real-time carbon footprint data generated by airlines, and explore artificial intelligence-based recommendation systems capable of personalizing sustainable travel alternatives..

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