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Artificial Intelligence Adoption in Sustainable Tourism in Sri Lanka: An Operator Perspective

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Abstract: This study investigates the adoption and utilization of Artificial Intelligence (AI) technologies in Sri Lanka's sustainable tourism sector, focusing on the operator perspective. Grounded in the Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT), the research identifies key factors influencing AI adoption, including perceived benefits, ease of use, user-friendliness, and top management support. Regression analysis of data collected from tourism operators highlights that perceived benefits (β=0.641) and ease of use (β=0.445) are significant drivers of AI adoption intentions and utilization for enhancing service quality, operational efficiency, and sustainability practices. Interestingly, network connectivity had minimal influence, suggesting the importance of other organizational enablers. The findings underscore the need for leadership engagement, user-centric AI tools, and supportive policies to foster AI integration in the ecotourism sector. The study provides actionable insights for policymakers and stakeholders to align technological innovation with sustainability objectives, promoting a resilient and competitive tourism industry in Sri Lanka.

Keywords: *Artificial Intelligence (AI), Sustainable Tourism, AI Adoption, Service Quality. Operational Efficiency. Tourism Operators.*

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I. INTRODUCTION

Tourism is critical to Sri Lanka's economic development, contributing significantly to employment generation and foreign exchange earnings. Traditionally, the tourism industry has primarily focused on mass-market tourism (S. Anandasayanan, 2020). However, there is a growing interest in nature-based tourism, particularly ecotourism, which emphasizes environmental sustainability and conservation (Erdem Baydeniza, 2024). Given Sri Lanka's rich biodiversity, the country possesses immense potential for ecotourism development, offering a range of activities that connect visitors with nature (Zoysa, 2022). Despite this potential, the sector remains underdeveloped due to challenges such as inadequate infrastructure, limited community engagement, and the slow adoption of modern technologies (Sudusingha Liyanage Jothirathna Fernando, 2013).

Sustainable tourism in Sri Lanka is vital for protecting the environment while preserving its rich cultural and natural attractions for current and future generations (Zoysa, 2022). Global tourism fosters cultural exchange and facilitates learning about diverse traditions, benefiting travelers and local communities (Tso, 2017). However, the tourism industry faces increasing challenges due to climate change and its environmental impacts, necessitating a global shift toward minimizing adverse effects across all sectors, including tourism (Qadar et al., 2023). Recognizing the importance of sustainable practices, Sri Lanka has adopted measures to preserve its natural and cultural resources, encourage eco-friendly travel practices, and support local communities (Nadeesha Hemachandra, 2021). These initiatives align with global efforts to reduce the carbon footprint of the tourism sector while enhancing environmental stewardship.

Sri Lanka boasts diverse ecotourism destinations that exemplify its commitment to sustainability, ranging from pristine rainforests and protected wildlife habitats to culturally significant sites (Zoysa, 2022). These locations highlight the intersection of conservation and tourism, underscoring the country’s dedication to preserving its unique attractions while contributing to global sustainability objectives (S. M. D. Fernando, 2016). Through these efforts, Sri Lanka demonstrates how tourism can evolve to address environmental challenges while continuing to offer enriching experiences. This approach emphasizes the potential of tourism as a driver of positive change, balancing economic growth, environmental preservation, and cultural heritage (Sugathapala, 2024).

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Artificial Intelligence (AI) is relevant in travel and tourism because it addresses evolving challenges and improves decision-making. Travelers often face complex decisions when planning trips, such as selecting destinations, transportation, accommodations, and activities. These choices directly influence their satisfaction with the overall travel experience. The vast range of options can make decision-making overwhelming, necessitating assistance through AI tools (Bulchand-Gidumal, 2020). Integrating AI into Sri Lanka's tourism industry requires collaboration among the government, private sector, and academia to build the necessary infrastructure, implement regulations, and develop a skilled workforce (Arachchi, 2022). The effective adoption of AI offers a unique opportunity to address the needs of modern travelers while promoting sustainable practices (Muwandeniya, 2022).

AI applications enhance efficiency, personalization, and sustainability across the tourism sector. For instance, AI-driven tools such as virtual assistants, predictive analytics, and augmented reality (AR) improve traveler experiences by providing real-time information, tailored recommendations, and immersive virtual tours (Fatima & Arsalan, 2024). Technologies like facial recognition and translation software streamline operations and eliminate language barriers, making travel more accessible for international tourists (Wijekoon, 2022). Additionally, AI-powered sustainability analytics help tourism operators track and mitigate their environmental impact, fostering responsible practices (Dilshan, 2024). Among these innovations, AI chatbots are particularly transformative for sustainable tourism development. They provide 24/7 support, personalize travel experiences, and promote conservation by recommending eco-friendly accommodations and educating tourists on responsible behaviors (Pillai & Sivathanu, 2020). Furthermore, chatbots optimize operations, reducing inefficiencies such as overbooking and resource misallocation, contributing to a sustainable tourism model that balances environmental preservation with visitor satisfaction (Dilshan, 2024).

Incorporating AI into Sri Lanka's tourism sector represents a forward-looking approach to overcoming challenges and embracing sustainable practices. By leveraging these technologies, the country can enhance the efficiency of its tourism operations, support environmental conservation, and cater to the evolving preferences of modern travelers, thereby achieving a harmonious balance between economic development and sustainability.

Operators who are directly involved in managing and delivering tourism services are central to the success of sustainable tourism in Sri Lanka (Sandaruwani, 2016). This includes eco-tourism providers, accommodation managers, tour guides, and travel agencies who align tourism activities with sustainability goals (Andreea Marin-Pantelescu, 2019). This sustainable goal can be achieved through improving service quality and operational efficiency. For this achievement, their role is crucial, as they oversee integrating sustainable practices into daily operations and balance environmental, cultural, and economic objectives. For instance, operators are pivotal in managing ecotourism destinations, ranging from protected wildlife habitats to culturally significant sites, ensuring these locations contribute to conservation and economic development (S. M. D. Fernando, 2016).

Adopting Artificial Intelligence (AI) in tourism presents a unique opportunity to address operators' challenges and enhance their capacity to deliver sustainable tourism experiences. AI-driven tools such as predictive analytics, virtual assistants, and sustainability analytics offer solutions to optimize operations, reduce costs, and minimize environmental impact (Rane, 2023; Fatima & Arsalan, 2024). For operators, AI applications such as chatbots can personalize tourist experiences, streamline logistical processes, and promote eco-friendly practices, ultimately enhancing service delivery while supporting sustainability goals (Dilshan, 2024; Pillai & Sivathanu, 2020).

Given its rich biodiversity and cultural heritage, Sri Lanka’s tourism sector holds significant ecotourism and sustainable tourism development potential. However, this potential remains largely untapped due to challenges such as inadequate infrastructure, limited community engagement, and the slow adoption of modern technologies (Zoysa, 2022). While global advancements in Artificial Intelligence (AI) have demonstrated the capacity to address sustainability challenges in tourism, there is a noticeable lack of research on integrating AI technologies within Sri Lanka’s sustainable tourism sector (Abu Bakkar Siddik, 2024). In particular, the role of tourism operators- accommodation providers, tour guides, and ecotourism managers in adopting AI to align their operations with sustainability goals has not been adequately explored (Yin Zhang, 2024). Moreover, critical factors such as operators’ attitudes and readiness, the influence of organizational size and infrastructure readiness, and the role of government support in facilitating AI adoption for sustainability remain under-researched (Ali, 2024). This study seeks to fill these gaps by examining how AI technologies can empower operators to overcome challenges, enhance operational efficiency, and support sustainability objectives in Sri Lanka's tourism industry. To achieve this, the study aims to investigate the following key questions:

- What factors influence the utilization of AI technologies to enhance service quality and operational efficiency?
- What factors influence the adoption of AI technologies among tourism operators in Sri Lanka's sustainable tourism sector?

The motivation for this research stems from the urgent need to address sustainability challenges in Sri Lanka’s tourism industry, particularly in the ecotourism sector, which remains underdeveloped despite the country's vast potential. As global tourism increasingly shifts towards eco-friendly and sustainable practices, Sri Lanka must adopt innovative approaches to meet evolving traveler preferences while minimizing environmental impacts (Sugathapala, 2024). Integrating Artificial Intelligence (AI) in tourism offers a transformative opportunity to enhance operational efficiency, promote sustainability, and improve tourist satisfaction

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(Tarsem Fatima, 2024). However, the slow adoption of AI technologies by tourism operators' critical stakeholders in delivering sustainable tourism experiences hinders progress. This research is driven by the urgent need to investigate how Artificial Intelligence (AI) can address critical challenges faced by tourism operators in Sri Lanka, such as effective resource management, enhancing customer engagement, and advancing environmental conservation efforts. By focusing on the perspective of operators, this study bridges the gap between cutting-edge technological innovation and sustainable tourism practices, paving the way for a resilient and eco-conscious tourism industry in Sri Lanka (Dilshan, 2024).

The significance of this research lies in its contribution to the sustainable development of Sri Lanka's tourism sector by tackling essential gaps in technology adoption and sustainability initiatives. By emphasizing the transformative role of AI in promoting sustainable tourism—particularly within the ecotourism sector the study provides actionable insights into achieving a delicate balance between economic growth and environmental stewardship. It underscores the pivotal role of tourism operators in adopting and implementing AI-driven solutions, offering a comprehensive understanding of their attitudes, challenges, and readiness. These insights are instrumental in fostering effective interventions that align with sustainability objectives (Tamara Gaji´c and, 2024).

The study also serves as a valuable resource for policymakers, offering guidance on designing supportive frameworks such as financial incentives, infrastructure improvements, and targeted training programs to accelerate AI adoption. By aligning the tourism sector with global sustainability goals, these measures can ensure the industry's long-term viability. Furthermore, the research delves into practical AI applications such as chatbots and sustainability tracking tools that address operational inefficiencies while enhancing tourist satisfaction. Through the promotion of AI adoption, the study indirectly supports job creation, encourages community engagement, and aids in preserving Sri Lanka's rich cultural and natural heritage, contributing to economic stability and improved quality of life. Beyond its practical implications, this study enriches academic discourse on the role of AI in sustainable tourism, particularly in the context of developing nations. It offers a robust framework for future research at the intersection of technology, sustainability, and tourism, with a focus on the operator's perspective. In doing so, it lays the groundwork for advancing both theoretical understanding and practical applications in this critical area of study.

II. THEORETICAL BACKGROUND AND HYPOTHESIS

The development of the hotel sector plays a vital role in driving economic growth (Buljat Maja, 2022). To remain competitive, hotels must focus on increasing their revenue while ensuring high levels of customer satisfaction (Jay Kandampully, 2008). In today's rapidly evolving technological landscape, every industry, including hospitality, must embrace advancements to enhance their products and services (Alaa M. Momani, 2022).

Artificial Intelligence (AI) has emerged as a transformative technology, simulating human intelligence through machines, particularly computer systems (Christopher Collins a, 2021). In the tourism and hospitality sector, AI offers numerous opportunities. For instance, AI can assist transport networks in reducing their carbon footprint by optimizing flight paths, enhancing fuel efficiency, and minimizing traffic congestion (Rusul Abduljabbar, 2019,). Moreover, AI can analyze visitor patterns and identify peak seasons, enabling better planning and resource allocation (Ma, 2024). It can also aid in distributing visitors more evenly by encouraging travel to less-visited areas, thereby reducing over-tourism. Additionally, AI is crucial in optimizing resource utilization and promoting sustainable choices among tourists (Tarsem Fatima, 2024). Alongside AI, blockchain technology supports sustainable practices by fostering a circular economy, enabling efficient and transparent management of local resources (Xiao, 2024). Together, these technologies can significantly contribute to a more sustainable and efficient hospitality sector (Tamara Gajić, 2024,).

The adoption of Artificial Intelligence (AI) in the tourism sector is influenced by various factors that can be categorized into key themes (Miguel-Ángel García-Madurga, 2023). The education levels of stakeholders and the number of employees in the organization play a foundational role in determining readiness for AI integration (David Hradecky, 2022). The type of tourism business also shapes the specific applications and needs for AI technologies (Minglong Li, 2021). The usage of AI, its adoption levels, and the types of technologies employed significantly impact the effectiveness of implementation. Additionally, attributes such as usability, user-friendliness, and the perceived benefits of AI directly affect its acceptance among users (Omar Ali, 2023).

Organizational support, including top management backing, and a conducive technological environment, are crucial for fostering AI adoption (Pawel Korzynski, 2024). Positive outcomes like improved efficiency, enhanced customer satisfaction, and better engagement underscore the advantages of leveraging AI (Singh, 2024). Furthermore, infrastructure factors such as network connectivity are essential for seamless operation (Seoungkwon Min, 2024). In the context of sustainability, environmentally sustainable practices and the future influence of AI highlight its potential to drive innovation responsibly. These variables collectively determine the likelihood of AI adoption and its long-term impact on the tourism industry (Verónica Bolón-Canedo, 2024)

A. A Theoretical Framework

A theoretical framework provides the foundation for a research study by outlining the theories or models that guide its design, analysis, and interpretation. In the context of this research on AI and sustainable tourism, the theoretical framework will depend on the key variables and relationships

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our aim to investigate. These are potential theoretical frameworks relevant to the study.

➢ *Technology Acceptance Model (TAM)*

The Technology Acceptance Model (TAM) (Marikyan D. P., 2024) explains the factors influencing users' acceptance and use of technology (Marikyan D. P., 2024). It focuses on two primary constructs: perceived usefulness (PU), which measures the extent to which a user believes the technology will enhance their performance, and perceived ease of use (PEOU), which assesses how effortless the technology is to use. In the context of AI chatbots in sustainable tourism, TAM can help evaluate how tourists and service providers perceive the benefits and usability of chatbots in enhancing travel experiences and operations. Understanding these factors can provide insights into their adoption intentions (Pillai, 2020).

➢ *Unified Theory of Acceptance and Use of Technology (UTAUT)*

The UTAUT expands upon TAM by incorporating additional variables, including social influence, effort expectancy, performance expectancy, and facilitating conditions. This theory provides a more comprehensive understanding of technology adoption by considering external influences and infrastructural readiness. For AI adoption in ecotourism, UTAUT can identify how cultural norms, peer recommendations, or available resources shape adoption behaviors among tourists and operators (Marikyan D. P., 2023).

B. Hypothesis

➢ *Technological Environment and AI Adoption*

The technological environment significantly influences AI adoption, particularly in industries like tourism and ecotourism. Key factors include infrastructure readiness, such as reliable internet connectivity and robust digital systems, which enable seamless deployment and scalability of AI tools like chatbots (Erlane K Ghani, 2022). The affordability and accessibility of AI platforms and user-friendly interfaces are crucial in encouraging adoption among smaller operators. Additionally, the availability of high-quality data supports AI functionality, while stringent data privacy and security measures build user trust (by Carlos J. Costa, 2024). Training programs to enhance stakeholders' technical skills and AI literacy are essential for effective implementation and management. Regulatory frameworks and compliance requirements also shape the adoption landscape, ensuring AI technologies meet sustainability and industry standards (Aline Cabral Costa Andrade, 2024). Demonstrable benefits, such as operational efficiency, enhanced customer experiences, and alignment with sustainability goals, further drive adoption. Together, these elements create an ecosystem that fosters AI integration, particularly in advancing sustainable tourism and ecotourism initiatives.

- H1a: A competitive technological environment positively influences the utilization of AI technologies to enhance service quality and operational efficiency.
- H1b: A more competitive technological environment positively influences the intention to adopt AI technologies.

➢ *Ease of Use and AI Adoption*

Ease of use is a critical factor influencing the adoption of AI technologies, including chatbots, across various sectors (Sachin Kuberkar, 2020). It refers to the simplicity and intuitiveness of an AI system, enabling users to interact with it effectively without requiring extensive technical knowledge or training. When AI solutions are designed to be user-friendly, they lower the cognitive and operational barriers for end-users and service providers (Åsne Stige, 2023).

In tourism, for example, an easy-to-use AI chatbot enhances tourists' experience by providing quick and accurate responses, personalized recommendations, and multi-language support through a straightforward interface (Chrysovelidis, 2020). For service providers, ease of use means less time and cost spent training staff and maintaining the system. A seamless user experience fosters trust in the technology and increases satisfaction and the likelihood of adoption. Therefore, emphasizing simplicity and accessibility in AI design is critical to encouraging widespread adoption in industries like tourism and ecotourism.

- H2a: The perceived ease of use of AI technologies positively affects the utilization of AI technologies to enhance service quality and operational efficiency.
- H2b: The perceived ease of use of AI technologies positively affects the likelihood of adoption.

➢ *User-Friendliness and AI Adoption*

User-friendliness is a pivotal factor in driving the adoption of AI technologies across industries. It refers to the design and functionality of AI systems that make them intuitive, accessible, and easy to interact with for users of varying technical expertise (Oluwayemisi Runsewe, 2024). A user-friendly AI solution minimizes complexity and enhances the user experience, increasing its appeal to end-users and service providers (Ikwueze, 2024). In the tourism sector, for instance, AI chatbots that are simple to navigate, offer clear instructions, and provide personalized, accurate responses encourage higher engagement (Siyao Ma, 2024). Features like natural language processing, multi-language capabilities, and mobile compatibility enhance accessibility and satisfaction, fostering trust in the technology. For service providers, user-friendly AI tools reduce the need for extensive training and technical support, making implementation more feasible and cost-effective (Shireen Fathi, 2024). AI technologies can achieve higher adoption rates by focusing on user-centric design, particularly in dynamic sectors like sustainable tourism and ecotourism (Bellos, 2023).

- H3a: The perceived user-friendliness of AI platforms significantly impacts the use of AI technologies to enhance service quality and operational efficiency.
- H3b The perceived user-friendliness of AI platforms has a significant positive impact on AI adoption intentions.

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➢ *Network Connectivity and AI Adoption*

Network connectivity is foundational in adopting AI technologies, particularly in sectors like tourism and ecotourism (Rane, 2023). Reliable and high-speed internet access is essential for the seamless operation of AI systems, including chatbots, as they rely on real-time data processing and cloud-based services. Poor connectivity can lead to delays, interruptions, and degraded user experiences, discouraging service providers and users from adopting these technologies (Ganesh Reddy Gunnam, 2024). In tourism, AI chatbots often require constant internet access to deliver personalized travel recommendations, instant customer support, and real-time updates. Limited connectivity poses significant challenges for operators in remote or rural ecotourism locations. However, technological advancements like satellite internet and 5G networks are bridging this gap. Improved network infrastructure enhances the reliability and scalability of AI systems, making them more accessible and efficient (K. Agius, 2020). Thus, robust network connectivity is a critical enabler of AI adoption and its long-term success in various industries.

- H4a: Reliable network connectivity (e.g., 4G/5G) positively influences the utilization of AI technologies to enhance service quality and operational efficiency.
- H4:b Reliable network connectivity (e.g., 4G/5G) positively influences the likelihood of adopting AI technologies.

➢ *Perceived Benefits*

Perceived benefits are a crucial determinant of AI adoption, influencing how users and organizations evaluate the value of implementing AI technologies (Sage Kelly, 2023). These benefits refer to the tangible and intangible advantages users expect to gain, such as increased efficiency, cost savings, enhanced customer experiences, and better decision-making capabilities. In tourism, for example, AI-powered chatbots provide 24/7 support, personalized recommendations, and streamlined booking processes, improving customer satisfaction and engagement (Dr. Tarun Kumar Vashishth, 2024). For service providers, adopting AI can automate repetitive tasks, reduce operational costs, and enable data-driven insights to optimize services (Khatri, 2023). Additionally, AI's ability to support sustainability initiatives, such as minimizing resource use and tracking environmental impact, aligns with broader organizational goals (Ignat Kulkov.Julia Kulkova, 2023). Adoption becomes more likely when the perceived benefits outweigh potential costs or risks, such as initial implementation expenses or technical challenges. Thus, effectively communicating and demonstrating these benefits is critical to fostering widespread acceptance of AI technologies.

- H5a: The perceived benefit of AI platforms significantly influences the utilization of AI technologies to enhance service quality and operational efficiency.
- H5b: The perceived benefit of AI platforms has a significant positive impact on AI adoption intentions.

➢ *Service Quality and Operational Efficiency*

AI adoption significantly enhances service quality and operational efficiency, particularly in sectors like tourism and ecotourism (Rane, 2023). AI technologies, such as chatbots and predictive analytics, improve service quality by offering personalized, real-time responses to customer inquiries, making interactions more seamless and efficient (Ignat Kulkov.Julia Kulkova, 2023). This increases customer satisfaction as tourists receive tailored recommendations, quick assistance, and more relevant information, enhancing their overall experience. On the operational side, AI optimizes resource management, automates routine tasks, and streamlines workflows, improving efficiency (Pookandy, 2024). For example, AI systems can handle repetitive tasks like booking confirmations, inquiries, and data entry, allowing staff to focus on more complex, value-added activities (Widemark, 2022). Additionally, AI's ability to analyze large volumes of data enables businesses to make informed decisions, anticipate customer needs, and forecast demand, which can reduce waste, cut costs, and improve sustainability efforts (Mallikarjuna Paramesha, 2024). Together, these improvements in service quality and operational efficiency make AI adoption a valuable tool for businesses aiming to enhance customer satisfaction, optimize operations, and remain competitive in a rapidly evolving market.

- H6: The perceived importance of AI in improving service quality and operational efficiency positively affects adoption intentions.

➢ *Customer Satisfaction and Engagement*

Customer satisfaction and engagement are central to the success of AI adoption, especially in industries like tourism and eco-tourism (R Semwal, 2024). AI technologies, such as chatbots, enhance both by providing personalized, responsive, and efficient services that meet customer needs and expectations (Chiara Valentina Misischiaa, 2022). For tourists, AI-powered solutions can offer instant support, answer queries, make personalized travel recommendations, and assist in navigating destinations (Ma S. Z., 2024). This level of convenience and accessibility leads to higher satisfaction, as tourists feel more supported and informed throughout their journey. Additionally, AI's ability to engage customers through personalized interactions creates a more meaningful experience, fostering a deeper connection with the service provider (Rane, 2023). For service providers, AI tools enable more effective customer relationship management. They enable operators to track preferences, tailor communications, and anticipate needs, boosting customer loyalty and encouraging repeat visits. Enhancing satisfaction and engagement makes AI adoption a valuable tool for building more robust, lasting customer relationships (V. Kumar a b, 2024).

- H7a: The perceived impact of AI technologies on customer satisfaction and engagement positively influences the utilization of AI technologies to enhance service quality and operational efficiency.

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- H7b: The perceived impact of AI technologies on customer satisfaction and engagement positively influences AI adoption intentions.

➢ *Environmental Sustainability Practices*

Environmental sustainability practices are increasingly integral to sectors like tourism, particularly ecotourism, where balancing human activities with nature conservation is crucial (Qadar Bakhsh Baloch 1, 2023). AI adoption can significantly support sustainability efforts by optimizing resource management, reducing waste, and promoting eco-friendly travel behaviors. AI-powered systems can help organizations monitor and manage environmental impacts like energy consumption, waste production, and carbon emissions (Verónica Bolón-Canedo L. M.-F.-B., 2024). For example, AI can optimize heating, cooling, and lighting in eco-friendly accommodations, reducing energy consumption (David B. Olawade, 2024). It can also provide data on resource usage, enabling operators to identify areas for improvement and implement conservation measures. AI can encourage sustainable behavior in tourism by providing real-time information on low-impact travel options, eco-friendly destinations, and responsible activities (Nangyalay Khan, 2024). Chatbots and other AI tools can offer travelers insights into sustainable practices, such as waste reduction and energy conservation, fostering environmentally conscious decisions (Majid, 2024). Integrating AI with environmental sustainability practices enhances operational efficiency and promotes eco-friendly tourism, aligning with the growing demand for sustainable travel experiences.

- H8a: Organizations that perceive AI as beneficial for implementing sustainable practices influence the utilization of AI technologies to enhance service quality and operational efficiency.
- H8b: Organizations that perceive AI as beneficial for implementing sustainable practices are more likely to adopt AI technologies

➢ *Top Management Support*

Top management support is critical in successfully adopting AI technologies within organizations. Leadership commitment ensures allocating necessary resources, including funding, technology infrastructure, and skilled personnel, to implement AI solutions effectively (Gal, 2024). When top management actively champions AI adoption, it signals organizational prioritization and fosters a culture of innovation and openness to technological advancements (Moonita Limiany Prasetyo, 2024). Management support also plays a vital role in addressing potential resistance to change by articulating the strategic benefits of AI, such as improved efficiency, enhanced customer experiences, and competitive advantages. Leaders who provide clear communication, training opportunities, and a well-defined vision for AI integration help build employee confidence and readiness to embrace new technologies. Additionally, top management can influence partnerships with technology providers, guide compliance with regulations, and ensure alignment of AI initiatives with organizational goals, such as sustainability or customer engagement. Strong leadership thus creates a foundation for successful AI adoption, ensuring operational and strategic objectives are met.

- H09a: Top management support positively influences the utilization of AI technologies to enhance service quality and operational efficiency.
- H09b: Top management support positively influences the adoption of AI technologies in the tourism sector.

C. Conceptual Framework

The conceptual framework of this study outlines the key factors influencing the adoption and utilization of Artificial Intelligence (AI) technologies in Sri Lanka's sustainable tourism sector, focusing on the operator perspective. It integrates constructs such as the technological environment, ease of use, user-friendliness, perceived benefits, customer satisfaction, environmental sustainability practices, and top management support. These factors collectively shape AI adoption intentions and utilization, aiming to enhance service quality, operational efficiency, and sustainability in tourism operations. Grounded in theoretical models like the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT), the framework hypothesizes relationships such as the positive influence of a competitive technological environment, perceived benefits, and leadership support on AI adoption. By exploring how AI can address operational challenges, improve customer engagement, and promote sustainability, this framework provides a comprehensive understanding of the drivers and barriers to integrating AI technologies in Sri Lanka’s tourism sector. It offers actionable insights for operators and policymakers to align technological innovation with sustainable tourism practices.

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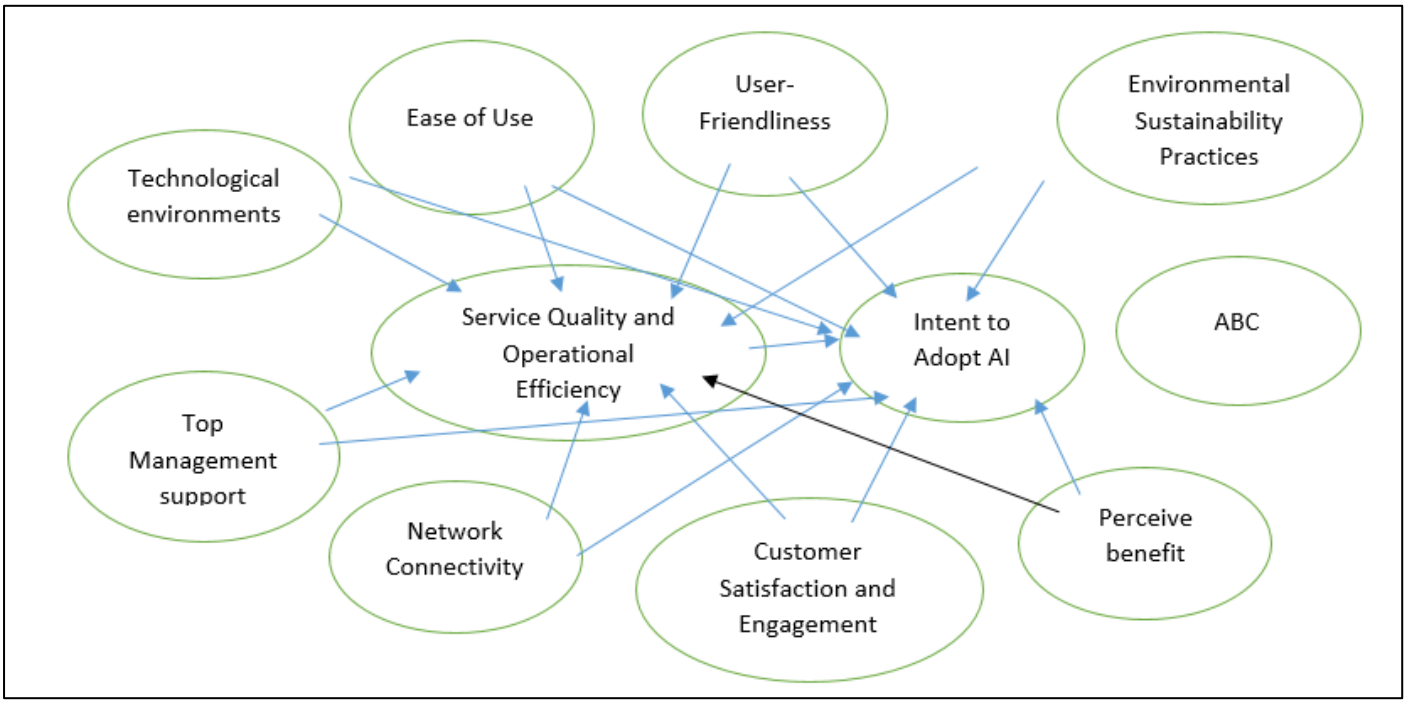

Fig 1: Conceptual Framework

III. METHODOLOGY

This study explores the adoption of Artificial Intelligence (AI) technologies in sustainable tourism from the perspective of tourism operators in Sri Lanka. The methodology is designed to comprehensively address the research questions and hypotheses, ensuring robust data collection and analysis.

A. Research Design

This study adopts a quantitative research approach, employing a cross-sectional survey design to collect data from tourism operators in Sri Lanka. This design facilitates identifying relationships between variables influencing AI adoption and its impact on sustainable tourism practices.

B. Population and Sampling

The target population includes tourism operators in Sri Lanka, such as eco-tourism providers, accommodation managers, tour guides, and travel agencies. A purposive sampling technique ensures the representation of stakeholders directly engaged in tourism operations and sustainability initiatives. The sample size is determined using a confidence level of 95% and a margin of error of 5%, ensuring statistical significance.

C. Data Collection Method

A structured questionnaire is utilized to collect primary data. The questionnaire is designed based on the literature review and theoretical frameworks, such as the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT). The instrument includes closed-ended questions and employs a five-point Likert scale to measure perceptions, attitudes, and behaviors. The questionnaire collects data on organizational demographics, current AI usage, sustainability practices, and factors influencing AI adoption, such as management support, government incentives, and infrastructure readiness. It also identifies barriers like cost and complexity, and it is distributed via email and online platforms for accessibility. It also gives guidelines for direct phone calls and personal meetings. Key variables include the dependent variable (intention to adopt AI), independent variables (e.g., perceived usefulness, ease of use, user-friendliness), moderating variables (e.g., government support), and control variables (e.g., tourism type). Data analysis employs descriptive statistics, correlation, regression, and moderation analysis to validate hypotheses and reliability testing using Cronbach's Alpha and factor analysis for construct validation.

This methodology provides a rigorous framework for investigating AI adoption in sustainable tourism, ensuring reliable and actionable insights for academia and industry practitioners.

IV. ANALYSIS

The survey collected data on various dimensions of AI adoption in the tourism sector. It begins by capturing organizational demographics, including the organization name, position of the respondent, education level, employee count, and the type of service offered. Questions explore the current level of AI adoption, the types of technologies used, and the importance of AI in improving service quality and operational efficiency. It also assesses organizational support for AI integration and the types of training programs provided to employees. Respondents provided insights into the impact of organizational size on AI integration and rated government support and potential incentives for adoption. The survey investigates into the competition within the technological environment, the ease of implementing AI tools, and the challenges faced, such as cost and lack of training. It

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examines the user-friendliness and benefits of current AI platforms and asks for examples of successful applications. Further, it evaluates the impact of AI on customer satisfaction, the likelihood of future adoption, and factors that would most influence decisions. Questions also focus on prospects, network connectivity, and necessary infrastructure improvements.

Finally, the survey emphasizes sustainability by assessing the extent of AI integration into sustainability practices, optimization of resources, and sustainable tourism practices. It seeks input on required policies, the role of taxes, and the effectiveness of standardized eco-certification programs in promoting AI-driven sustainable tourism. This comprehensive data set provides insights into the readiness, barriers, and perceptions surrounding AI adoption in the tourism sector. The structured questionnaire responses with liker scale were analyzed using SPSS software. The findings from the linear regression analysis are as follows:

A. Technological Environment and AI Adoption

- *Regression Analysis Results for H1a Hypothesis*

The analysis supports hypothesis H1a: "A competitive technological environment positively influences the utilization of AI technologies to enhance service quality and operational efficiency." The mean of AI technology enhances service quality and operational efficiency is 3.84, with a standard deviation of 0.987, indicating a generally positive perception among respondents with moderate variability. The regression coefficient ($\beta = 0.371$) signifies a positive relationship between the competitive technological environment and the utilization of AI technologies for service quality and operational efficiency. The p-value (0.019) confirms the statistical significance of this relationship at the 5% level. However, the R^2 value (0.123) shows that only 12.3% of the variance in AI utilization for service quality and operational efficiency is explained by the competitiveness of the technological environment. The confidence interval ([0.053, 0.573]) reinforces the reliability of the result. These findings suggest that while the technological environment has a significant favorable influence, other factors may also enhance service quality and operational efficiency through AI technologies.

- *Regression Analysis Results for the H1b Hypothesis*

The analysis does not provide sufficient evidence to support hypothesis H1b, which states that "A more competitive technological environment positively influences the intention to adopt AI technologies." While the mean score of 3.98 indicates a generally favorable intention to adopt AI technologies, the regression coefficient ($\beta = 0.113$) suggests a weak and negligible positive relationship. The p-value (0.466) is above the 0.05 threshold, indicating that the relationship is not statistically significant. Furthermore, the R^2 value (0.013) demonstrates that the competitive technological environment explains only 1.3% of the variance in the intention to adopt AI technologies. The confidence interval ([-0.13, 0.273]) includes zero, further indicating that the effect of the competitive technological environment on adoption intentions is not meaningful. These findings suggest that other factors beyond the competitive technological environment may play a more significant role in shaping the intention to adopt AI technologies.

B. Ease of Use and AI Adoption

- *Regression Analysis Results for H2a Hypothesis*

The analysis supports hypothesis H2a, which posits that "The perceived ease of use of AI technologies positively affects the utilization of AI technologies to enhance service quality and operational efficiency." The descriptive statistics show a mean score of 3.84 for utilization intention, with a standard deviation of 0.987, indicating a generally favorable perception among respondents. The regression analysis reveals a moderate positive relationship ($\beta = 0.321$) between ease of use and utilization, with a statistically significant p-value (0.036), confirming the reliability of this relationship. The R^2 value (0.103) suggests that the ease of use explains 10.3% of the variance in utilization, and the confidence interval ([0.026, 0.617]) excludes zero, further validating the findings. These results highlight the importance of ease of use as a significant driver of AI technology adoption to enhance service quality and operational efficiency. However, other factors may also contribute to this outcome.

- *Regression Analysis Results for H2b Hypothesis*

The analysis strongly supports hypothesis H2b, which states, "The perceived ease of use of AI technologies positively affects the likelihood of adoption." The mean score for the likelihood of adopting AI technologies is 3.98, with a standard deviation of 0.731, indicating a generally favorable perception among respondents with low variability. The regression coefficient ($\beta = 0.445$) demonstrates a moderate to strong positive relationship between ease of use and adoption likelihood. The p-value (0.002) is well below the 0.05 threshold, confirming the statistical significance of this relationship. Furthermore, the R^2 value (0.198) indicates that 19.8% of the variance in adoption likelihood is explained by perceived ease of use. The confidence interval ([0.123, 0.537]) excludes zero, affirming the reliability of the results. These findings highlight that ease of use is a significant and impactful factor in driving the adoption of AI technologies. This underscores the importance of designing user-friendly AI systems to enhance adoption rates.

C. User-Friendliness and AI Adoption

- *Regression Analysis Results for H3a Hypothesis*

The analysis supports hypothesis H3a, which states that "The perceived user-friendliness of AI platforms significantly impacts the use of AI technologies to enhance service quality and operational efficiency." The mean score for AI technology enhancing service quality and operational efficiency is 3.71, with a standard deviation of 1.060, indicating moderate agreement among respondents with some variability. The regression coefficient ($\beta = 0.437$) reflects a strong positive relationship between user-friendliness and AI utilization. The p-value (0.010) is below the 0.05 significance threshold, confirming that the relationship is statistically significant. Additionally, the R^2 value (0.191) indicates that 19.1% of the variance in the use

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of AI technologies for enhancing service quality and operational efficiency is explained by user-friendliness. The confidence interval ([0.138, 0.927]) excludes zero, further validating the reliability and strength of the relationship. These findings highlight that user-friendliness is a critical factor in driving the effective use of AI technologies to improve service quality and operational efficiency.

➢ *Regression Analysis Results for H3a Hypothesis*

The analysis supports hypothesis H3b, which states that "The perceived user-friendliness of AI platforms has a significant positive impact on AI adoption intentions." The mean score for the likelihood of adopting AI technology is 3.88, with a standard deviation of 0.769, indicating a generally favorable perception among respondents with relatively low variability. The regression coefficient (β = 0.413) demonstrates a moderate positive relationship between user-friendliness and AI adoption intentions. The p-value (0.015) is below the 0.05 threshold, confirming statistical significance. The R^2 value (0.176) indicates that 17.6% of the variance in adoption intentions is explained by user-friendliness. Furthermore, the confidence interval ([0.075, 0.655]) excludes zero, confirming the reliability of the results. These findings highlight that user-friendliness significantly influences intentions to adopt AI technologies, emphasizing the need for user-centric designs to promote adoption.

D. Network Connectivity and AI Adoption

➢ *Regression Analysis Results for H4a Hypothesis*

The analysis does not support hypothesis **H4a**, which posits that "Reliable network connectivity (e.g., 4G/5G) positively influences the utilization of AI technologies to enhance service quality and operational efficiency." The mean score of **3.84** and a standard deviation of **0.987** indicate moderate agreement among respondents regarding AI utilization. However, the regression coefficient (β = **-0.117**) suggests a weak negative relationship between reliable network connectivity and AI utilization. The p-value (**0.448**) exceeds the 0.05 significance threshold, indicating that the relationship is not statistically significant. Additionally, the R^2 value (**0.014**) shows that only 1.4% of the variance in AI utilization is explained by network connectivity, which is minimal. The confidence interval ([-0.475, 0.214]) includes zero, affirming the lack of a significant or reliable effect. These findings suggest that reliable network connectivity does not directly impact the utilization of AI technologies to enhance service quality and operational efficiency. Other factors may play a more critical role in influencing AI utilization.

➢ *Regression Analysis Results for H4b Hypothesis*

The analysis does not support hypothesis H4b, which posits that "Reliable network connectivity (e.g., 4G/5G) positively influences the likelihood of adopting AI technologies." While the mean score for AI adoption likelihood is 3.98, indicating a generally favorable perception, the regression coefficient (β = -0.171) suggests a weak negative relationship between network connectivity and adoption likelihood. The p-value (0.266) is above the 0.05 significance threshold, indicating that this relationship is not statistically significant. The R^2 value (0.029) shows that only 2.9% of the variance in adoption likelihood is explained by network connectivity, which is minimal. Furthermore, the confidence interval ([-0.395, 0.112]) includes zero, confirming the lack of a meaningful or reliable effect. These findings indicate that reliable network connectivity does not significantly positively influence the likelihood of adopting AI technologies. Other factors may be more critical in driving AI adoption.

E. Perceived Benefits

➢ *Regression Analysis Results for H5a Hypothesis*

The analysis strongly supports hypothesis H5a: "The perceived benefit of AI platforms significantly influences the utilization of AI technologies to enhance service quality and operational efficiency." The mean score of 3.84 and standard deviation of 0.987 indicate a generally favorable perception among respondents with moderate variability. The regression coefficient (β = 0.641) demonstrates a positive relationship between perceived benefits and AI utilization. The p-value (0.00) is below the 0.05 significance threshold, confirming statistical significance. The R^2 value (0.411) indicates that 41.1% of the variance in AI utilization is explained by the perceived benefits, which is substantial. The confidence interval ([0.397, 0.870]) excludes zero, further validating the reliability and strength of the relationship. These findings highlight that perceived benefits play a critical role in driving the utilization of AI technologies to enhance service quality and operational efficiency, emphasizing the importance of showcasing the tangible advantages of AI adoption.

➢ *Regression Analysis Results for H5b Hypothesis*

The analysis supports hypothesis H5b, which posits that "The perceived benefit of AI platforms has a significant positive impact on AI adoption intentions." The mean score of 3.98 and a standard deviation of 0.731 indicate a generally favorable intention to adopt AI technologies among respondents with low variability. The regression coefficient (β = 0.428) demonstrates a moderate positive relationship between perceived benefits and adoption intentions. The p-value (0.004) is below the 0.05 threshold, confirming statistical significance. The R^2 value (0.184) shows that perceived benefits explain 18.4% of the variance in adoption intentions. Furthermore, the confidence interval ([0.108, 0.519]) excludes zero, reinforcing the reliability and strength of the relationship. These findings emphasize that perceived benefits significantly influence adoption intentions, highlighting the importance of showcasing AI platforms' advantages to drive adoption. This underscores the need for organizations to communicate tangible benefits, such as efficiency and service quality improvements, to potential adopters.

F. Service Quality and Operational Efficiency

The findings for H6 provide compelling evidence supporting the hypothesis that the perceived importance of AI in improving service quality and operational efficiency positively affects adoption intentions. The analysis yielded a mean score of 3.98, indicating that participants generally agree on the importance of AI for enhancing service quality

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and operational efficiency. The standard deviation of 0.731 suggests moderate variability in responses. The regression analysis highlights a statistically significant and robust positive relationship between the perceived importance of AI and adoption intentions, as evidenced by a regression coefficient (β) of 0.576 and a p-value of 0.00 ($p < 0.01$). This indicates a high confidence level in the positive effect of perceived importance on adoption intentions. Additionally, the explained variance (R^2) of 0.315 demonstrates that approximately 31.5% of the variation in adoption intentions can be attributed to the perceived importance of AI in improving service quality and operational efficiency. The confidence interval (95%) for β, ranging from 0.237 to 0.615, further confirms the robustness of this relationship. In summary, these results underscore the critical role of AI's perceived value in driving adoption intentions, suggesting that promoting its benefits for service quality and operational efficiency could significantly enhance acceptance and integration within relevant industries.

G. Customer Satisfaction and Engagement

➢ *Regression Analysis Results for H7a Hypothesis*

The results for H7a strongly support the hypothesis that the **perceived impact of AI technologies on customer satisfaction and engagement positively influences the utilization of AI technologies to enhance service quality and operational efficiency**. The mean score of **3.84** reflects that respondents generally perceive AI as positively impacting customer satisfaction and engagement. The standard deviation of **0.987** indicates a moderate level of variability among responses. The regression coefficient (β) of **0.509** demonstrates a significant positive relationship between the perceived impact of AI on customer satisfaction and engagement and its utilization for improving service quality and operational efficiency. The p-value of **0.00** ($p < 0.01$) provides strong statistical evidence supporting this relationship. The explained variance (R^2) of **0.259** indicates that 25.9% of the variance in utilizing AI for service quality and operational efficiency is explained by its perceived impact on customer satisfaction and engagement. The confidence interval for β, ranging from **0.316 to 1.010**, further validates the reliability of these results. In summary, these findings highlight the importance of emphasizing AI technologies' benefits in enhancing customer satisfaction and engagement to drive their adoption for improving service quality and operational efficiency. This underscores the need for service providers to showcase AI's tangible benefits to stakeholders for greater utilization and impact.

➢ *Regression Analysis Results for H7a Hypothesis*

The findings for H7b confirm that the perceived impact of AI technologies on customer satisfaction and engagement positively influences AI adoption intentions. The mean score of 3.84 suggests that respondents generally recognize the positive impact of AI on customer satisfaction and engagement, while the standard deviation of 0.987 indicates moderate variability in their perceptions. The regression coefficient (β) 0.490 reflects a statistically significant positive relationship between the perceived impact on customer satisfaction and engagement and AI adoption intentions. With a p-value of 0.01 ($p \leq 0.05$), this relationship is confirmed to be significant at the 95% confidence level. The explained variance (R^2) of 0.240 shows that 24% of the variation in AI adoption intentions can be attributed to its perceived impact on customer satisfaction and engagement. The confidence interval for β, ranging from 0.212 to 0.739, further reinforces the robustness and reliability of this relationship. In conclusion, these results underscore the importance of highlighting AI's ability to enhance customer satisfaction and engagement as a key driver for its adoption. Service providers and stakeholders should prioritize showcasing these benefits to foster stronger adoption intentions among potential users.

H. Environmental Sustainability Practices

➢ *Regression Analysis Results for H8 a Hypothesis*

The results for H8a indicate that **organizations that perceive AI as beneficial for implementing sustainable practices positively influence the utilization of AI technologies to enhance service quality and operational efficiency**. The mean score of **3.84** suggests that respondents generally agree on the perceived benefits of AI for sustainability. The standard deviation of **0.987** reflects moderate variability in responses. The regression coefficient (β) of **0.128** demonstrates a positive relationship between the perception of AI's benefits for sustainability and its utilization for service quality and operational efficiency. The p-value of **0.017** ($p < 0.05$) indicates statistical significance, affirming the validity of the relationship. The explained variance (R^2) of **0.128** shows that 12.8% of the variation in AI utilization can be attributed to its perceived benefits for sustainability. The confidence interval for β, ranging from **0.065 to 0.628**, further confirms the reliability of these findings. In conclusion, these results highlight that promoting AI's role in achieving sustainable practices can encourage its adoption to enhance service quality and operational efficiency. This underscores the need for organizations to align AI initiatives with sustainability goals to maximize their adoption and impact.

➢ *Regression Analysis Results for H8 b Hypothesis*

The findings for H8b suggest that **organizations that perceive AI as beneficial for implementing sustainable practices may positively influence AI adoption, but the relationship is not statistically significant**. The mean score of **3.84** indicates that respondents generally recognize the benefits of AI for sustainability, while the standard deviation of **0.987** shows moderate variability in their perceptions. The regression coefficient (β) of **0.247** suggests a potential positive relationship between the perceived benefits of AI for sustainability and AI adoption. However, the p-value of **0.1063** ($p > 0.05$) indicates that this relationship is not statistically significant at the 95% confidence level. The explained variance (R^2) of **0.128** shows that perceptions of AI's sustainability benefits explain 12.8% of the variance in AI adoption intentions. However, the confidence interval for β, ranging from **-0.039 to 0.393**, includes zero, confirming the lack of statistical significance. In conclusion, while the data hints at a positive association between perceptions of AI's sustainability benefits and adoption intentions, the relationship is not strong enough to be conclusive. Further

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research with a larger sample size or additional variables may be needed to clarify this relationship.

I. Top Management Support

➢ *Regression analysis results for H9a hypothesis*

The results for H9a strongly support the hypothesis that **top management support positively influences the utilization of AI technologies to enhance service quality and operational efficiency**. The mean score of **3.84** suggests that respondents generally perceive top management support as important, while the standard deviation of **0.987** reflects moderate variability in responses. The regression coefficient (β) of **0.40** indicates a significant positive relationship between top management support and the utilization of AI technologies for service quality and operational efficiency. The p-value of **0.007** ($p < 0.01$) confirms that this relationship is statistically significant. The explained variance (R^2) of **0.160** shows that 16% of the variation in AI utilization is explained by top management support. Additionally, the confidence interval for β, ranging from **0.083 to 0.499**, further validates the robustness of this relationship. In conclusion, these findings highlight the critical role of top management support in driving the effective utilization of AI technologies. Organizations seeking to improve service quality and operational efficiency through AI should ensure strong support and commitment from their top management to foster adoption and implementation success.

➢ *Regression Analysis Results for H9b Hypothesis*

The findings for H9b strongly support the hypothesis that **top management support positively influences the adoption of AI technologies in the tourism sector**. The mean score of **3.98** suggests that respondents generally agree on the importance of top management support for AI adoption. At the same time, the standard deviation of **0.731** indicates relatively low variability in their responses. The regression coefficient (β) of **0.395** demonstrates a significant positive relationship between top management support and AI adoption in the tourism sector. The p-value of **0.008** ($p < 0.01$) confirms this relationship is statistically significant. The explained variance (R^2) of **0.156** indicates that 15.6% of the variation in AI adoption can be attributed to top management support. Furthermore, the confidence interval for β, ranging from **0.059 to 0.367**, provides additional evidence of the robustness of this relationship. In conclusion, these results emphasize the pivotal role of top management support in fostering the adoption of AI technologies within the tourism sector. To enhance AI adoption, organizations in the tourism industry should prioritize securing active involvement and advocacy from their top management teams.

J. Summary of the Result

The regression analysis of 44 responses highlights the critical factors influencing adopting and utilizing Artificial Intelligence (AI) technologies in Sri Lanka's tourism sector. Significant drivers include perceived benefits, ease of use, user-friendliness, and top management support, all demonstrating statistically significant positive relationships with both AI utilization and adoption intentions. Perceived benefits had the strongest impact on utilization ($\beta = 0.641$, $p < 0.001$, $R^2 = 0.411$), while ease of use significantly influenced adoption intentions ($\beta = 0.445$, $p = 0.002$, $R^2 = 0.198$). However, network connectivity showed weak and statistically insignificant effects, suggesting its limited role in shaping AI adoption behaviors. The findings underscore the importance of fostering organizational readiness, prioritizing user-friendly AI designs, and emphasizing tangible benefits to drive AI adoption and utilization. This study provides valuable insights for policymakers and stakeholders in promoting AI technologies, emphasizing the need for supportive frameworks, leadership engagement, and tailored solutions to align AI initiatives with sustainable tourism objectives. Figure 2 illustrates the model, highlighting the positive relationship between AI's role in enhancing service quality and operational efficiency, its alignment with sustainability goals, and the intention to adopt AI technology. A detailed summary of the results is presented in Tables 1 and 2, while the tested model is illustrated in Figure 2.

Table 1: Results of the Hypothesis Testing for Service Quality and Operational Efficiency

	H1a	**H2a**	**H3a**	**H4a**	**H5a**	**H7a**	**H8a**	**H9a**
Mean	3.84	3.84	3.88	3.84	3.84	3.84	3.84	3.98
Standard divination	0.987	0.987	0.769	0.987	0.987	0.987	0.987	0.731
Sample Size (N)	44	44	34	44	44	44	0.128	44
Regression Coefficient (β)	0.371	0.321	0.413	-0.117	0.641	0.509	0.128	0.395
p-value	0.019	0.036	0.015	0.448	0.00	0.00	0.017	0.008
R^2 (Explained Variance)	0.123	0.103	0.176	0.014	0.411	0.259	0.128	0.156
95% confidence interval	[0.053, 0.573]	[0.026, 0.617]	[0.075, 0.655]	[-0.475, 0.214]	[0.397, 0.870]	[0.316, 1.010]	[0.065, 0.628]	[0.059, 0.367]

Table 2: Results of the Hypothesis Testing for AI Adoption Intention

	H1b	**H2b**	**H3b**	**H4b**	**H5b**	**H6**	**H7b**	**H8b**	**H9b**
Mean	3.98	3.98	3.88	3.98	3.98	3.98	3.84	3.84	3.98
Standard divination	0.731	0.731	0.769	0.731	0.731	0.731	0.987	0.987	0.731
Sample Size (N)	44	44	34	44	44	44	44	44	44
Regression Coefficient (β)	0.113	0.445	0.413	-0.171	0.428	0.576	0.490	0.247	0.395
p-value	0.466	0.002	0.015	0.266	0.004	0.00	0.01	0.1063	0.008
R^2(Explained Variance)	0.013	0.198	0.176	0.029	0.184	0.315	0.240	0.128	0.156

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95% confidence interval	[-0.13, 0.273]	0.123, 0.537	0.075, 0.655	-0.395, 0.112	0.108, 0519	0.237, 0.615	0.212, 0.739	-0.039, 0.393	0.059, 0.367

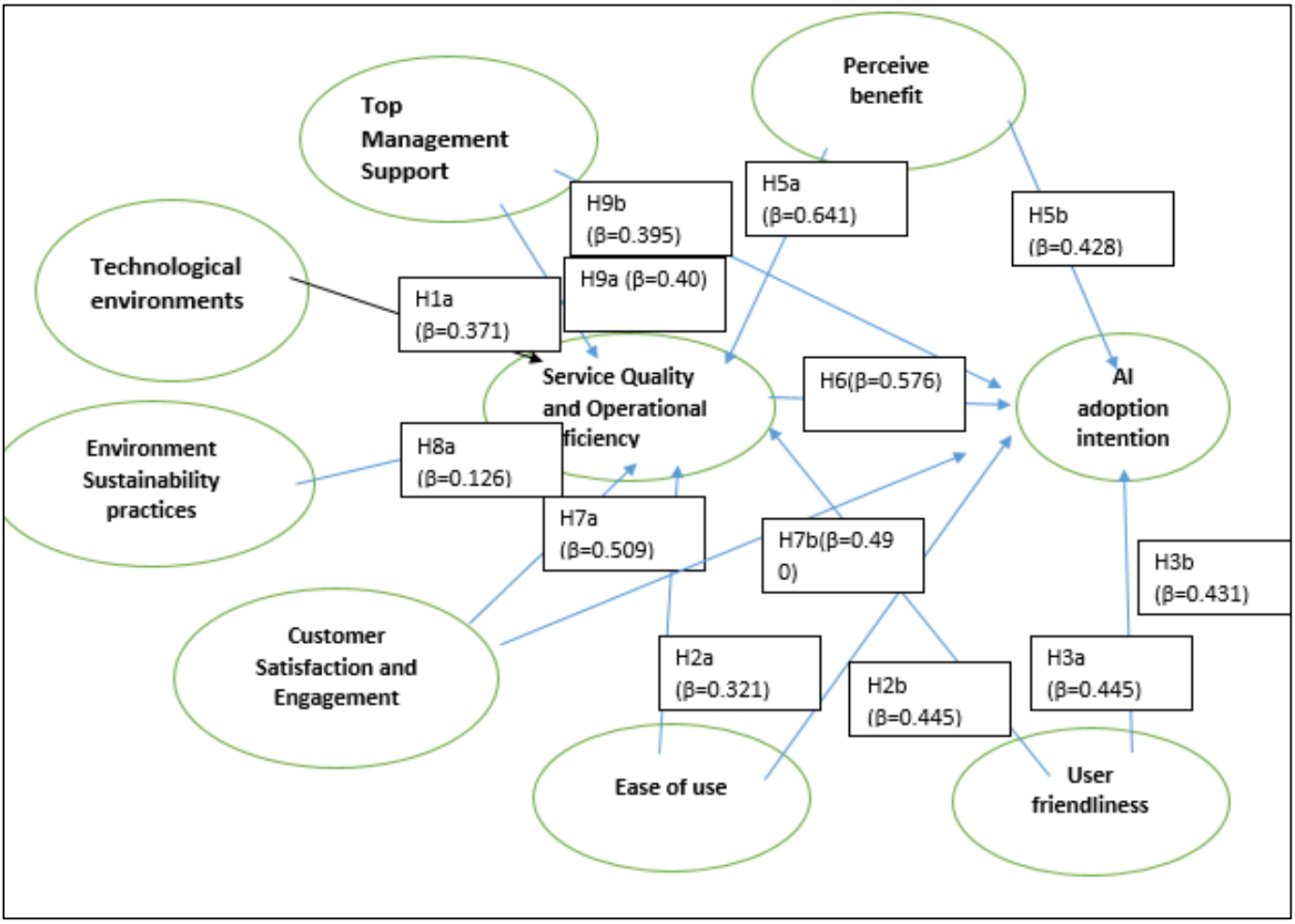

Fig 2: Model with Positive Relationships

V. CONCLUSION

This study explored the adoption and utilization of Artificial Intelligence (AI) technologies in Sri Lanka's sustainable tourism sector, focusing on the operator perspective. The findings demonstrate that perceived benefits, ease of use, user-friendliness, and top management support are critical drivers of AI adoption and utilization. These factors significantly influence the integration of AI technologies to enhance service quality, operational efficiency, and alignment with sustainability goals. Perceived benefits showed the strongest impact on AI utilization, while ease of use was pivotal in shaping adoption intentions. Conversely, network connectivity exhibited minimal influence, suggesting the need to explore other enablers of AI adoption. These insights highlight the importance of fostering organizational readiness, designing user-centric AI systems, and demonstrating tangible benefits to encourage adoption. By addressing these factors, tourism operators can leverage AI to overcome operational challenges, promote sustainability, and enhance customer engagement, thereby contributing to the long-term resilience and competitiveness of Sri Lanka's tourism industry.

VI. DISCUSSION

The findings of this study underscore the transformative potential of AI technologies in advancing sustainable tourism. Perceived benefits, ease of use, and user-friendliness emerged as significant enablers, aligning with the Technology Acceptance Model (TAM) and Unified Theory of Acceptance and Use of Technology (UTAUT). These results highlight the critical role of user-centric design and clear communication of AI's advantages in fostering adoption. Top management support also played a crucial role, emphasizing the need for leadership engagement in resource allocation and strategic prioritization of AI initiatives. Interestingly, network connectivity was not a significant factor, indicating that, while important, infrastructure readiness may not be the sole determinant of AI adoption.

These findings offer actionable insights for policymakers and stakeholders in the tourism industry. Initiatives to promote AI adoption should prioritize training programs, financial incentives, and infrastructure enhancements to address identified barriers. Developing AI tools tailored to the unique needs of ecotourism operators, such as sustainability tracking and customer personalization

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features, could further accelerate adoption. Additionally, fostering collaborations between the public and private sectors can support integrating AI technologies into tourism practices, ensuring alignment with sustainability objectives.

The study's limitations, including its reliance on a small sample size and cross-sectional design, suggest avenues for future research. Expanding the sample size and incorporating longitudinal data could provide a more comprehensive understanding of AI adoption trends. Furthermore, exploring cultural and organizational factors and the role of government policies could enrich the insights gained. Overall, this study contributes to the growing body of literature on AI and sustainable tourism, offering a robust foundation for future investigations at the intersection of technology, sustainability, and tourism.

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