TAPAKNUSA: A CONCEPTUAL DESIGN OF A SMART TOURISM APPLICATION BASED ON SPATIAL MAPPING AND INCLUSIVITY IN INDONESIA

Inez Andriana Regita Cahyani*[1], Mutiara Astia Rizky[2]
Independent Author[1 2]
Email: inezandrianaa@gmail.com, mutiaraastiaa@gmail.com

Abstract

Indonesia possesses vast and diverse tourism potential; however, tourists continue to face challenges related to spatial accessibility, inclusive mobility, and cultural understanding. Existing navigation platforms primarily emphasize efficiency-based routing and have not adequately accommodated the needs of diverse users, such as persons with disabilities, elderly travelers, pregnant women, and individuals with limited mobility. This study introduces TapakNusa, an innovative conceptual model of a smart tourism application that integrates spatial mapping, inclusive adaptive routing, green tourism principles, and cultural contextualization within a single digital ecosystem. Using a Design Thinking approach, this research synthesizes insights from literature review, comparative analysis of existing tourism applications, and secondary Geographic Information System (GIS) data. The primary outcome of this study is the development of a conceptual framework for TapakNusa that offers adaptive route options like express, scenic, culinary, and accessible, supported by accessibility indicators such as ramps, tactile paths, public transportation availability, and estimated travel time. The findings demonstrate that integrating accessibility and contextual information into spatial mapping can enhance tourism inclusivity and user-centered experiences. The core value of TapakNusa lies in its application of spatial empathy, transforming digital maps from purely navigational tools into inclusive and culturally aware tourism companions. The platform promotes green tourism through paperless information systems, walkable route recommendations, and low-emission transportation options, while embedding cultural guidance such as local etiquette, destination difficulty levels, and halal/non-halal culinary labeling to support respectful tourism and local MSMEs. By integrating Inclusive Tourism Theory, the 3A Framework (Attractions, Accessibility, Amenities), and Smart Tourism, TapakNusa contributes an innovative, ethical, and sustainable model for digital tourism development in Indonesia.

Keywords: **Smart Tourism, Design Thinking, Spatial Mapping, Inclusive and Green Tourism, Accessibility**

A. INTRODUCTION

Indonesia possesses vast and diverse tourism potential, ranging from natural beauty to cultural and culinary diversity. The tourism sector plays a strategic role in supporting the national economy through employment creation and regional generation. However, despite the increasing popularity of Indonesian destinations, both domestic and international tourists still encounter challenges in exploring them due to limited spatial information, accessibility, and understanding of local culture. According to the Badan Pusat Statistik (BPS), the number of international tourist arrivals in April 2024 reached 1.07 million, an increase of 23.23 percent compared with April

* *Corresponding author*

2023 (Badan Pusat Statistik, 2024). These data demonstrate strong tourism growth and highlight the importance of digital innovation to improve accessibility, information accuracy, and inclusivity in tourism services.

The rapid growth of Indonesia's tourism industry creates both opportunities and challenges. In practice, many destinations still lack comprehensive and adaptive digital mapping systems. General mapping applications such as Google Maps are limited to efficiency based routing and have not yet accommodated the specific requirements of users such as persons with disabilities, pregnant women, the elderly, or travelers with limited mobility, These limitations hinder equal participation in tourism and reduce the potential benefits of inclusive tourism development. As tourism demand rises, the need for an integrated, user centered, and culturally responsive digital platform becomes increasingly urgent.

To address these challenges, this study introduces TapakNusa, a smart tourism concept that integrates spatial mapping, inclusive design principles, and features promoting environmental and cultural awareness. The system incorporates the green tourism principle by promoting low emission transportation and walkable routes, as well as cultural sensitivity through information about local etiquette and halal/non-halal culinary labelling. This approach reflects Indonesia's effort to transition toward a more intelligent, inclusive, and environmentally responsible tourism ecosystem.

Tourism development has long been guided by the 3A framework, which emphasizes the interconnection between Attractions, Accessibility, and Amenities as the foundation for destination competitiveness (González-Rodríguez et al., 2023) As global tourism evolves, these elements are complemented by digital and inclusive approaches. The concept of inclusive tourism stresses that accessibility is a right rather than an additional feature, ensuring equal participation for all visitors regardless of ability or condition (Lu et al., 2025). Recent studies further show that smart tourism destinations are increasingly associated with sustainable development, integrating green technologies, stakeholder collaboration, and inclusive governance to enhance visitor experience and minimize environmental impact (El Archi et al., 2023) . Meanwhile, global bibliometric research indicates a paradigm shift from technology-centered approaches toward more human-centered, participatory, and ethically sustainable models of tourism innovation (Yan et al., 2025).

Despite extensive research on smart and inclusive tourism, studies that contextualize these frameworks in Indonesia remain limited. Most local digital platforms emphasize navigation and attraction listing but lack adaptive features addressing accessibility. There is still a lack of research exploring how spatial technology and empathetic design can be combined to create digital ecosystems that support inclusivity and sustainability in Indonesia's tourism sector This gap underscores the need for conceptual framework and practical models linking digital innovation with inclusive tourism principles.

Therefore, this study aims to fill that gap by developing a conceptual model of TapakNusa, a smart tourism application that integrates spatial mapping, accessibility features, and cultural and sustainability content. TapakNusa serves as an interactive platform connecting tourists, local communities, and government within a unified digital ecosystem. Through this integration, TapakNusa demonstrates how spatial data and empathetic design can enhance tourism accessibility and inclusivity in Indonesia.

By understanding the challenges and opportunities of digital transformation in Indonesia's tourism sector, this study is expected to contribute both theoretically and practically.

Theoretically, it enriches tourism literature by linking the 3A framework, inclusive tourism theory, and smart tourism within a single model that emphasizes empathy and sustainability. Practically, it provides insights for policymakers, developers, and stakeholders to design digital systems that improve accessibility, reduce environmental impact, and strengthen cultural awareness.

B. RESEARCH METHOD

This research applies a qualitative descriptive approach using the design thinking methodology as the core framework to conceptualize the TapakNusa smart tourism application. This approach focuses on understanding user needs and translating them into inclusive and innovative digital solutions through iterative problem-solving. The study was conducted through literature review, analysis of existing tourism applications such as Google Maps, Citymapper, and Traveloka, and examination of secondary data obtained from the Geographic Information System (GIS) and official tourism statistics. The research procedure followed the five phases of Design Thinking: *Empathize, Define, Ideate, Prototype,* and *Test.* In the *Empathize* phase, user challenges related to spatial accessibility, inclusivity, and cultural understanding were identified through documentation and prior studies. The *Define* phase synthesized these issues into key problem statements focusing on the lack of accessible route mapping, cultural context, and adaptive tourism information. During the *Ideate* stage, conceptual solutions were generated, including multi-layered route options, accessibility indicators, and contextual information features. The *Prototype* phase involved the creation of a low-fidelity conceptual model illustrating TapakNusa's key functions such as adaptive routing, facility mapping, and user interface components. Finally, in the *Test* phase, the conceptual design was validated through comparative analysis with existing applications and evaluation against inclusive tourism and smart tourism criteria. Data collection relied primarily on secondary sources, including academic literature, policy documents, and open-source spatial data. Qualitative data were analyzed thematically according to the Design Thinking framework to identify user-centered insights and ensure methodological consistency. GIS data supported spatial representation and verification of accessibility features. The findings of each phase were synthesized to construct the conceptual model of TapakNusa, which can serve as a replicable framework for future prototype development and policy innovation in Indonesia's smart and inclusive tourism sector.

C. FINDINGS AND DISCUSSION

The findings derived from the literature review and Design Thinking process, reveal that Indonesia's digital tourism ecosystem remains fragmented in terms of inclusivity, spatial integration, and sustainability. Although several digital platforms, such as Google Maps, Traveloka, and Citymapper who provide navigation and travel assistance, they primarily focus on efficiency and accuracy without addressing the experiential and accessibility dimensions crucial to diverse travelers. This gap highlights the absence of user-centered approaches that integrate cultural, environmental, and inclusive considerations into the digital tourism experience. Previous studies on Smart Tourism emphasize that technology and data-driven solutions can enhance visitor experiences, destination management, and sustainability (Yap et al., 2025) However, their implementation in Indonesia remains limited to service-oriented applications rather than spatially empathetic systems. At the same time, research on Accessible Tourism (Lu et al., 2025)

underscores the importance of universal accessibility, advocating that tourism must be designed for all individuals regardless of ability. Yet, accessibility in Indonesia's tourism infrastructure continues to face challenges, not only in physical environments but also in digital representation and information delivery.

Moreover, studies on GIS-based tourism planning (Dao et al., 2025) show that spatial technologies can significantly improve mobility, route optimization, and environmental awareness. Nevertheless, few models integrate accessibility indicators, route difficulty levels, or cultural information into such systems. The synthesis of these findings supports the need for an integrated framework that unites inclusivity, spatial mapping, and smart technology within a single platform. Through the Design Thinking approach (Brown, 2008) , this research identified user empathy and iterative design as essential components in developing an innovative tourism application. The findings suggest that applying empathetic design principles to spatial technologies can bridge existing gaps in Indonesia's tourism landscape, leading to the conceptualization of TapakNusa, a smart, inclusive, and sustainable tourism solution tailored to Indonesia's diverse cultural and geographical context.

The conceptual design of TapakNusa represents the culmination of the Design Thinking process, synthesizing theoretical insights, user-centered perspectives, and spatial data analysis into an integrated framework for inclusive and sustainable tourism. The model serves as a conceptual prototype for a smart tourism application specifically developed to address the accessibility, cultural, and environmental gaps present in Indonesia's digital tourism landscape. By operationalizing the principles of Design Thinking, Smart Tourism, Inclusive Tourism, and the 3A Theory (Attraction, Accessibility, Amenities), TapakNusa transforms the idea of digital mapping from a purely navigational tool into an empathetic tourism ecosystem that accommodates diverse travelers.

The design process followed the five iterative stages of Design Thinking, such as *Empathize, Define, Ideate, Prototype,* and *Test.* During the *Empathize* stage, secondary data analysis and literature review identified a series of user challenges, including inadequate accessibility information, lack of adaptive route options, and limited cultural contextualization in current navigation platforms. Tourists with physical disabilities, pregnant women, elderly visitors, and families with small children often encounter barriers when accessing tourist destinations. Moreover, existing platforms such as Google Maps or Citymapper prioritize route efficiency rather than inclusivity, resulting in an incomplete user experience. These findings guided the *Define* stage, which formulated the main design problem: the absence of an integrated spatial tourism platform that considers inclusivity, environmental awareness, and cultural ethics.

In the *Ideate* stage, the research conceptualized TapakNusa as a multi-functional platform combining adaptive routing, contextual information, and sustainability-oriented features. The ideation process drew from existing literature on Smart Tourism (Yan et al., 2025; Yap et al., 2025) and Accessible Tourism (Lu et al., 2025 ; UNWTO, 2016) resulting in several innovative design components. The Adaptive Routing System allows users to choose among four route categories, such as *fast*, *scenic*, *culinary*, and *accessible*. This feature adapts navigation to different user preferences and physical abilities, promoting an inclusive digital experience. For instance, the *accessible route* option displays pathways equipped with ramps, tactile paving, and pedestrian-friendly facilities. The *scenic route* emphasizes visually rich paths with landmarks or viewpoints, while the *culinary route* integrates popular dining spots and local cuisine. Each route

is supported by real-time Geographic Information System (GIS) data that provides information on transport availability, crowd density, and environmental conditions.

A distinguishing feature of TapakNusa lies in its contextual information layers, which embed cultural, environmental, and ethical data into the digital interface. Each tourist destination includes short notes about local customs, "do's and don'ts," and etiquette rules in sacred or traditional areas. This feature encourages respectful interaction between tourists and local communities, aligning with the principles of cultural sustainability. The application also highlights green tourism practices by recommending low-emission transport options, walkable routes, and environmentally responsible destinations. This paperless approach contributes to sustainable tourism by minimizing the need for printed brochures, banners, or physical maps, thus reducing waste and promoting eco-conscious travel behavior.

The Prototype phase involved translating these conceptual elements into a low-fidelity interface model. The prototype visualizes the main components of the TapakNusa system:

1. an interactive map displaying multiple route options;
2. icons representing accessibility indicators (ramps, tactile paving, slope grade, public transport access);
3. integrated data layers for public facilities such as ATMs, rest areas, fuel stations, and e-money top-up points;
4. culinary and accommodation information labeled according to halal/non-halal status and price categories to support local micro, small, and medium enterprises (MSMEs).

The interface is designed for clarity, minimalism, and ease of navigation, enabling users of varying digital literacy levels to access tourism information seamlessly.

Another key innovation of the TapakNusa model is the application of spatial empathy, a concept that aligns geospatial accuracy with human-centered understanding. This principle ensures that technological precision serves human experience, not the other way around. Unlike traditional digital maps that simply calculate distance and time, TapakNusa interprets space through social and cultural lenses. It "feels" the journey by integrating empathetic design elements, showing which routes are not just faster, but safer, more comfortable, and culturally respectful. This approach humanizes technology and positions TapakNusa as a socially intelligent tourism companion rather than a mere navigation app.

The 3A Theory (Attraction, Accessibility, Amenities) is also embedded in the TapakNusa framework. Attractions are visualized through spatial tagging and linked multimedia content, while Accessibility is addressed through adaptive routing and inclusive features. Amenities are classified based on traveler needs, ranging from budget to luxury accommodations and from local eateries to international restaurants, thus ensuring the availability of supporting infrastructure for all visitor categories. This integration creates a holistic tourism environment where digital and physical accessibility reinforce each other. Furthermore, the model's sustainability dimension corresponds to the Smart Tourism paradigm, which advocates for technology-driven efficiency and environmental responsibility. By centralizing data within one digital platform, TapakNusa optimizes tourism management for both users and policymakers. Local governments can use aggregated data (e.g., visitor density, route popularity) to manage crowds and infrastructure maintenance more effectively. On the user side, digitalized information empowers travelers to make environmentally and socially responsible decisions, such as choosing public transportation over private vehicles or supporting local community-based tourism.

In its final conceptual form, TapakNusa represents not only a technological solution but also a value-driven framework that integrates inclusivity, sustainability, and cultural integrity. The model demonstrates how empathetic design and spatial technology can coalesce into a powerful tool for social good, aligning Indonesia's tourism sector with global standards such as the United Nations Sustainable Development Goals (SDGs) and Tourism for All initiatives. The application's features collectively answer the research objectives established in the introduction, enhancing accessibility, promoting cultural understanding, and encouraging environmentally responsible behavior through a smart, paperless digital ecosystem. As a conceptual outcome, TapakNusa provides a replicable model for future research and prototype development. The framework may serve as a blueprint for digital tourism innovation in other regions, offering guidelines for integrating human-centered design, spatial intelligence, and inclusive accessibility in one comprehensive system. In doing so, TapakNusa redefines the landscape of Indonesian tourism from fragmented digital platforms into a cohesive, smart, and empathetic ecosystem, one that not only guides travelers to their destinations but also connects them meaningfully to the people, culture, and environment that define them.

As a conceptual outcome, TapakNusa provides a replicable model for future research and prototype development. The framework may serve as a blueprint for digital tourism innovation in other regions, offering guidelines for integrating human-centered design, spatial intelligence, and inclusive accessibility in one comprehensive system. In doing so, TapakNusa redefines the landscape of Indonesian tourism, from fragmented digital platforms into a cohesive, smart, and empathetic ecosystem that not only guides travelers to their destinations but also connects them meaningfully to the people, culture, and environment that define them.

Regarding the first objective, the conceptual model of TapakNusa addresses the need for inclusive accessibility by integrating adaptive routing, accessibility indicators (ramps, tactile paths, slope data), and contextual information about user mobility requirements. Prior literature emphasizes the importance of universal accessibility in tourism. For instance, Accessible Tourism: Concepts and Issues underscores that tourism must be designed to accommodate persons with disabilities, elderly travelers, and individuals with mobility constraints (Lu et al., 2025) . The findings of this study confirm that existing mainstream mapping and tourism applications often neglect such accessibility dimensions, thereby validating the gap identified in previous research and justifying the inclusive features embedded in TapakNusa.

For the second objective, the research applied the Design Thinking methodology: *Empathize, Define, Ideate, Prototype,* and *Test*, to structure the conceptual design. The findings demonstrate how each stage contributed to the development of TapakNusa's features: *Empathize* identified user mobility needs; *Define* framed the core problems; *Ideate* generated the route categories and feature ideas; *Prototype* structured the interface and data flow; and *Test* offered conceptual validation through literature and heuristic comparison. This process aligns with the broader view of service design and user-centered innovation (Brown, 2008; (Hou, 2024) which has been successfully applied in tourism innovation contexts. By mapping how each stage informed specific design features, the study demonstrates methodological rigor and replicability.

Concerning the third objective, the TapakNusa model strongly reflects sustainability and cultural tourism principles. The research findings indicate that TapakNusa integrates green tourism, through paperless information, promotion of walkable and low-emission routes, and sustainable destination guidance, with cultural and social dimensions. Contextual layers provide information on local etiquette, halal/non-halal labeling, and heritage sensitivity, thereby

embedding cultural respect into digital travel experiences. This combination echoes the concept of Smart Tourism, which defines smart destinations as systems that merge ICT, data, personalization, and mobility to enhance visitor experience (Yap et al., 2025). TapakNusa extends this paradigm by embedding inclusivity and cultural awareness into the smart tourism framework, demonstrating that digital innovation can serve both efficiency and empathy.

In interpreting why these results emerged, the study highlights the interplay between spatial intelligence and inclusive design. The adaptive routing system is not only a technological innovation but a direct response to empirical evidence showing that travelers have diverse mobility constraints and informational needs. Similarly, the contextual information layers address a key gap noted in prior research: the underrepresentation of cultural and environmental contexts in tourism technologies. By linking these elements, TapakNusa embodies the theoretical synergy between Smart Tourism, Inclusive Tourism, and Destination Accessibility frameworks, creating a model that humanizes spatial data through empathetic design. When comparing these findings with earlier investigations, the results show consistency and advancement. They reaffirm that technology alone is insufficient for inclusive tourism; social, cultural, and user-centered dimensions are equally critical. Past studies on accessible tourism emphasized that physical accessibility must be matched with appropriate information systems and policy frameworks (Lu et al., 2025; UNWTO, 2016) . TapakNusa builds upon these principles by proposing a comprehensive digital ecosystem rather than isolated accessibility tools or single-destination solutions. Its integration of adaptive routing, inclusive data layers, and cultural information expands the scope of previous research, offering an original contribution to the smart tourism discourse.

In summary, the findings effectively meet all three research objectives. First, TapakNusa conceptualizes an inclusive digital tourism platform by embedding accessibility indicators and adaptive routing systems. Second, it demonstrates the practical application of Design Thinking as an empathetic, iterative method for developing user-centered innovation. Third, it contributes to sustainable tourism by integrating paperless systems, green mobility, and cultural sensitivity. The model's consistency with, yet advancement beyond, prior studies positions TapakNusa as a replicable conceptual framework for the next generation of smart, inclusive, and sustainable tourism development in Indonesia.

D. CONCLUSION

This study developed TapakNusa, a conceptual model for a smart tourism application that integrates spatial mapping, inclusivity, and sustainability within the Indonesian context. Grounded in the Design Thinking methodology, the research synthesized insights from literature review, analysis of existing applications, and secondary GIS data to address major gaps in Indonesia's digital tourism ecosystem, namely the lack of accessibility, contextual information, and cultural representation. The results demonstrate that TapakNusa transforms conventional digital mapping into an empathetic, user-centered tourism platform. By embedding adaptive routing, accessibility indicators, and contextual cultural layers, TapakNusa promotes equal participation in tourism for travelers of all abilities. Its integration of green tourism principles, such as paperless operation, promotion of walkable routes, and low-emission transportation, further supports Indonesia's transition toward sustainable and environmentally responsible tourism practices. The study contributes to theory by linking Smart Tourism, Inclusive Tourism, 3A Theory, and Design Thinking into one cohesive framework. This integration extends the

conventional understanding of smart destinations by incorporating human-centered empathy and cultural intelligence into digital innovation. Practically, TapakNusa offers a replicable model for policymakers, developers, and tourism stakeholders seeking to design inclusive and sustainable digital platforms.

While this research presents a conceptual model, future studies should advance TapakNusa into prototype development and pilot testing using real GIS datasets and user evaluation. Such empirical validation would help assess usability, accessibility performance, and policy applicability across diverse destinations. Furthermore, collaboration with the Ministry of Tourism and local governments could enhance data integration and ensure inclusive infrastructure mapping at the national level. In conclusion, TapakNusa exemplifies how empathetic design and spatial intelligence can jointly redefine Indonesia's tourism landscape, bridging technology with humanity to create a smarter, more inclusive, and sustainable future for all travelers.

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