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Website Development Using SDLC Prototyping Model: A Case Study on Hospitality Service Website

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ABSTRACT

The rapid development of digital technology has encouraged the hospitality industry to utilize websites for information and promotion. However, Villa XYZ currently relies on social media, which limits the accessibility and completeness of information for potential customers. This study aims to develop a website based on user requirements and evaluate its functionality using a Research and Development (R&D) approach with the SDLC prototyping model. Functional testing was conducted using black box testing. The results showed that the website's functional requirements were fully met, passing all 21 functional test cases with a 100% effectiveness score, a result further corroborated by stakeholders' own validation during the iterative development process. This study contributes to villa-based website development through the SDLC prototyping model and black box testing as a systematic functional testing method.

Keywords: *Website development, SDLC prototyping, Black box testing, Hospitality*

I. INTRODUCTION

The development of digital technology has created new opportunities for the hospitality industry to innovate and enhance consumer experience (Wynn and Lam, 2023). The application of technology in accommodation services enables consumer access to online booking systems, expands market reach, and supports business competitiveness (BPS-Statistic Indonesia, 2024). Websites serve as a primary source of information for consumers who are unable to directly access a property (Cheng, Tsai, and Chang, 2023) and have become integral to marketing activities in the hospitality industry (Van Huy and Thai Thinh, 2024).

Before making a reservation, consumers tend to search for and compare accommodation information online. Booking through a property website plays an important role in shaping the pre-consumption experience (Ongsakul et al. 2021). Based on a preliminary survey with 10 respondents, all stated that they had accessed a hotel's website before making a reservation. Since hospitality products are intangible, information presented on websites is the primary representation of the product, and website quality significantly shapes consumer trust and booking intentions (Amin et al. 2021).

Villa XYZ is a villa rental accommodation provider in Bogor Regency, West Java, which currently relies on Instagram and TikTok as its main information channels. The content is limited to short facility photos and guest documentation videos, without a centralized information platform. This creates a gap between consumer behavior, which increasingly involves searching for accommodation information through websites, and the accessibility of Villa XYZ's information. Developing an official website is therefore necessary to enhance information accessibility, support consumers' pre-consumption needs, and pre-booking information process.

This study focuses on developing the Villa XYZ website using the SDLC Prototyping model and validating its functionality through black box testing. The DeLone & McLean IS Success Model (2003) was used as a conceptual lens to scope the development priorities of this study, directing the requirement-gathering and testing process toward two dimensions, which are information quality and system quality, without claiming to empirically measure these constructs through validated instruments.

II. LITERATURE REVIEW

Information System Success Model

The DeLone & McLean IS Success Model is a conceptual framework for explaining and measuring the success of an information system (DeLone and McLean, 2003). The updated model consists of six dimensions which are information quality, system quality, service quality, use, user satisfaction, and net benefits. In this study, development focuses on information quality including accuracy, relevance, consistency, and completeness of information and system quality, which refers to ease of use, response time, and the ability of the system to function according to user needs. These two dimensions direct the development scope and serve as the basis for functional testing.

Website as Information Media in Hospitality Industry

The need for information arises from a gap between the knowledge people possess and the knowledge they require (Suwanto, 1997). According to Minazzi (2015), consumers in the tourism sector go through three stages which

are pre-trip (anticipatory), during-trip (experiential), and post-trip (reflective). In the pre-trip stage, consumers search for information about products or services to meet their needs. Because hospitality products are intangible and geographically fixed, consumers cannot experience them in advance, creating high dependence on accurate and complete online information (Van Huy and Thai Thinh, 2024).

The internet is an important distribution medium in the hospitality industry, and websites are a key factor in business success (Jeong, Oh, and Gregoire, 2003). In the hospitality industry, websites support consumer access to information and expand market reach (BPS-Statistic Indonesia, 2024). When planning reservations, consumers tend to visit hotel or villa websites, through which they can obtain the latest product and service information (Ongsakul et al. 2021). A consumer's first impression of a property is frequently shaped by searching its website (Punnasuparom and Choibamroong, 2020), and the availability of comprehensive facility and service information on a website tends to increase consumer satisfaction (Albayrak et al. 2023).

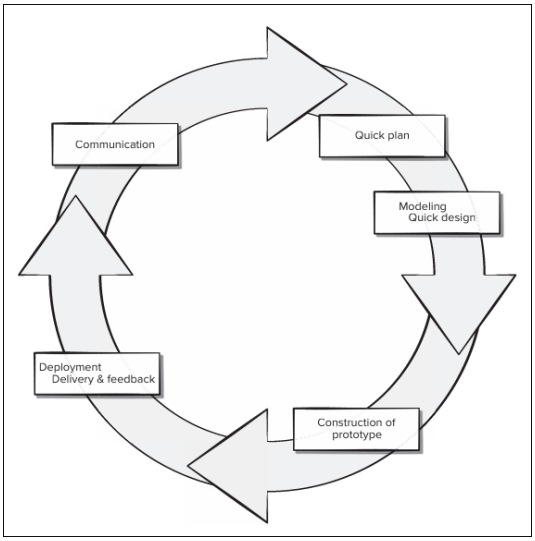
Previous studies confirm the role of websites as effective information media across sectors. Andriyan et al. (2020) and Yusrinda et al. (2025) developed websites as information media for educational organizations. Mukhlis (2023), Nurlailah & Nova Wardani (2023), and Wiyanto et al. (2022) developed websites to disseminate tourist information and promote tourism destinations. These studies demonstrate the consistent function of websites in centralizing and delivering organizational information to broader audiences.

Software Development Life Cycle Prototyping Model

The Software Development Life Cycle (SDLC) is a series of stages and activities used as a reference in developing software (Prabowo, Gaol, and Hidayanto, 2022). Various SDLC models exist, including Waterfall, Agile, Iterative, and Prototyping, each with distinct characteristics and levels of flexibility. The Waterfall model follows a linear sequential flow with low flexibility, while the Agile model emphasizes team collaboration and iterative development with high flexibility. The Prototyping model uses initial prototypes to be tested by users in order to refine requirements before final development, offering high flexibility and moderate complexity (Sanmocte and Costales, 2025).

Prototyping is a repetitive cycle of gathering user requirements through the creation of initial prototype models, allowing users to evaluate and provide feedback for further development (Saravanan et al. 2020). This model is particularly effective in identifying user needs that are not yet clearly defined at the outset, as requirements are clarified progressively through prototype reviews (Nifratama, Suratno, and Arsa, 2024). According to Pressman & Maxim (2020), the prototyping model has five development stages (see Figure 1) which contains (1) Communication, the identification and definition of system objectives and requirements through stakeholder interviews. (2) Quick Plan,

system planning based on the identified requirements, (3) Modelling Quick Design, the creation of a preliminary design as a visual representation, (4) Construction of Prototype, the implementation of the preliminary design into a working prototype with limited functionality, and (5) Deployment, Delivery & Feedback, the demonstration of the prototype to stakeholders to obtain feedback for iterative refinement until user needs are met.



Source: Pressman & Maxim, 2020

Figure 1. Stages of SDLC prototyping model

Previous studies demonstrate the effectiveness of the SDLC prototyping model in website and system development. Nifratama et al. (2024) used the prototyping method to develop a clinical information system through two iterative testing stages. Cornelia & Suryasari (2023) developed a web-based incentive calculation system using the SDLC prototyping method. Firmansyah et al. (2021) and Situmorang & Zul (2024) implemented the prototyping SDLC model in developing web-based information and management systems. Mabruri & Sanjaya (2025) applied the prototyping method to Android-based application development.

Black Box Testing

Testing is an essential stage in software development to ensure that the system runs correctly and in accordance with user needs, while also assessing software quality and identifying errors (AbuSalim, Ibrahim, and Wahab, 2021; Saravanan et al., 2020). Black box testing is a type of system testing that emphasizes checking software functions based on their specifications without examining the internal structure, so that testers do not require programming skills (AbuSalim et al. 2021; Dewi, Narayana, and Rahardian, 2023). This method

tests how inputs and outputs are executed in the software to ensure all specified functions are working properly.

Use case testing is a specific approach under black box testing in which functionality is verified from the user's point of view based on use case scenarios. A use case is a scenario that identifies the interaction of each actor with the system (Sommerville, 2011) and explains system functionality from the actor's perspective (Copeland, 2004). Several previous studies have applied black box testing to validate system functionality, Abdillah et al. (2023) used black box and usability testing on an educational website, Astiti (2023) applied black box testing in website development using the extreme programming method, Dewi et al. 2023) implemented black box testing in an information system with the waterfall SDLC model, Fikri & Voutama (2023) and Muslimin et al. (2020) applied equivalence partitioning as a black box technique in application and information system testing.

III. METHOD

This study is a Research and Development (R&D) study at Technology Readiness Level (TRL) 7, representing a system prototype tested in an operational environment (Engel et al. 2012). The qualitative approach was selected for the website development process because it enables in-depth exploration of stakeholder needs through interviews, which are inherently contextual and situational in nature (Sugiyono, 2023). This is particularly appropriate for identifying functional and non-functional requirements of a website intended for a specific business context with initially undefined specifications.

The research object is Villa XYZ, a villa rental accommodation provider in Bogor Regency, West Java. Three informants were selected using snowball sampling which are the villa owner, the villa caretaker, and a consumer of the villa, representing the business decision maker, operational staff, and service user, respectively. These three informants were chosen to fulfill source triangulation, ensuring that the data obtained reflected multiple perspectives on the website's requirements. Technique triangulation was also applied by recording and transcribing all interviews, which were subsequently verified by the informants.

Website development was carried out using the SDLC Prototyping model (Pressman and Maxim, 2020), which was selected because it is specifically designed to handle situations where user requirements are not fully defined at the outset. Through iterative prototype creation and stakeholder evaluation, the model allows requirements to emerge and be refined gradually, making it suitable for this study where the stakeholder had a general vision but lacked the technical ability to specify detailed requirements. The development followed five stages.

1. Communication: semi structured interviews to identify stakeholder needs.
2. Quick Plan: system structure planning using UML diagrams (use case and activity diagrams) created with Draw.io.
3. Modelling Quick Design: creation of wireframes as low-fidelity prototypes and mockups as high-fidelity prototypes using Figma.
4. Construction of Prototype: development of an interactive clickable prototype using Figma.
5. Deployment, Delivery & Feedback: prototype demonstration to informants, collection of feedback, and iterative revision. Two iterations were conducted before the prototype was approved and subsequently developed into a website using WordPress, published via Hostinger hosting at the domain villaXYZ.com.

The qualitative data collected throughout this process were analyzed using the qualitative data analysis model by Miles and Huberman in Sugiyono (2023). This analysis began with data reduction, where data from observations, including villa XYZ social media activity, consumer reviews, and competitor website comparisons, along with transcribed interviews were summarized, selected, and grouped based on user requirements and prototype evaluations relevant to the research objectives. The process then moved to data display, which was carried out through narrative descriptions and summaries of system requirements to serve as the foundation for the system design, including UML diagrams, wireframes, mockups, and prototypes. Subsequently, conclusion drawing and verification were performed by interpreting the processed data and verifying them through system testing to ensure that the developed website successfully met user needs and functioned as intended.

Functional testing was conducted using the black box testing method with a use case approach (AbuSalim et al., 2021; Copeland, 2004). This method was selected because it evaluates software functionality based solely on inputs and outputs, without requiring knowledge of the system's internal structure, making it accessible to non-technical testers such as the informants. Test cases were developed based on the use case diagrams, covering four main pages of the website which are Beranda, Tentang Kami, Fasilitas, and Reservasi, with a total of 21 test cases. While black box testing validates functional execution, the test cases in this study are explicitly designed to target the information quality and system quality dimensions emphasized by the DeLone & McLean model. Specifically, test cases verifying navigation, linking, and feature access are structured to evaluate system quality, while test cases confirming the completeness of displayed content focus on information quality. Table 1 presents this mapping using the Beranda page test cases as an illustrative example and the same mapping logic applies to the remaining three pages.

Table 1 Mapping of Beranda page test cases

No.	Test Case ID	Test Step	Indicated Dimension
1.	BP01	Access the website through the domain villa XYZ.com	System Quality (page response) & Information Quality (completeness of displayed content)
2.	BP02	Choose/click one of navigation menu on Beranda header	System Quality (navigation function)
3.	BP03	Click "Selengkapnya" button on preview of villa information section	System Quality (inter-page linking)
4.	BP04	Clicks "Lihat Lainnya" button on preview of villa facilities	System Quality (inter-page linking)
5.	BP05	Explore/choose one of action on Beranda footer	System Quality (navigation/feature access)

To assess the overall functional performance of the website, an effectiveness score was calculated. The formula adapted from Samdono, Sari, and Aditiawan (2024), as shown in Equation 1.

$$Application\ Effectiveness\ Score = \left(\frac{Table\ A\ Score + Table\ B\ Score + \cdots + Table\ n\ Score}{\sum Total\ Tested\ Table}\right) (1)$$

The website is considered to have met its functional requirements if the effectiveness score reaches 100%, meaning all test scenarios produce valid results that match the expected outcomes defined in each test case.

IV. RESULTS AND DISCUSSION

SDLC Prototyping Model

Communication

Interviews were conducted with three informants to identify website requirements. The findings revealed that Villa XYZ's promotion through Instagram and TikTok was scattered, limited in content, and insufficient for potential customers. Key requirements included a centralized platform integrating all villa related information such as complete facility information, booking and payment details, WhatsApp integration for direct reservation contact, Google Maps integration for location access, and authentic visual documentation of the villa's actual condition. Functional and non-functional requirements derived from the interviews are presented in Table 2.

Table 2. Functional and Non-Functional Requirements

Functional Requirements	Non-Functional Requirements
1. Complete and detailed information about facilities and additional services	1. User-friendly, easy to navigate, and easy to understand information
2. Actual visual content of villa's condition	2. Reflect villa's concept
3. Testimonials from previous consumer	3. Professional and trustworthy appearance
4. WhatsApp integration for reservation	4. High quality and real condition visual content (images/videos)
5. Social media integration	5. Easy to manage and maintain
6. Information related to booking and payment	6. Scalable for future development
7. Google Maps integration for location information	

Quick Plan

Based on the identified requirements, UML diagrams were developed. Use case diagrams described four main user interactions which are viewing the Beranda, Tentang Kami, Fasilitas, and Reservasi pages, each with include (automatically executed) and extend (conditionally triggered) interactions. As an illustrative example, the use case diagram for the Beranda page displays the fundamental interactions available to the user upon entering the website (see Figure 2).

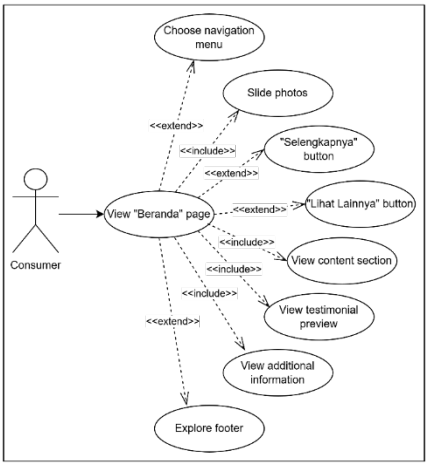


Figure 2. Use case of Beranda page

Activity diagrams illustrated the sequential flow of user activities from initial website access through navigation to specific features, including social media links, Google Maps, facility gallery, and WhatsApp CTA. To demonstrate this workflow, the activity diagram for the Beranda page is presented to map out

the detailed step by step process of user activity and system responses in Beranda page (see Figure 3).

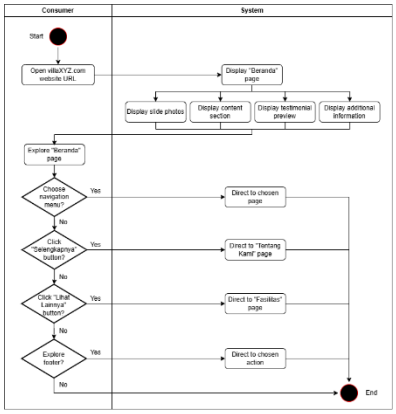


Figure 3. Activity diagram of Beranda page

Modelling Quick Design

Wireframes were developed to represent the page structure, navigation layout, and information organization of each page. Here is the Beranda page wireframe, one of the wireframes that were created (see Figure 4).

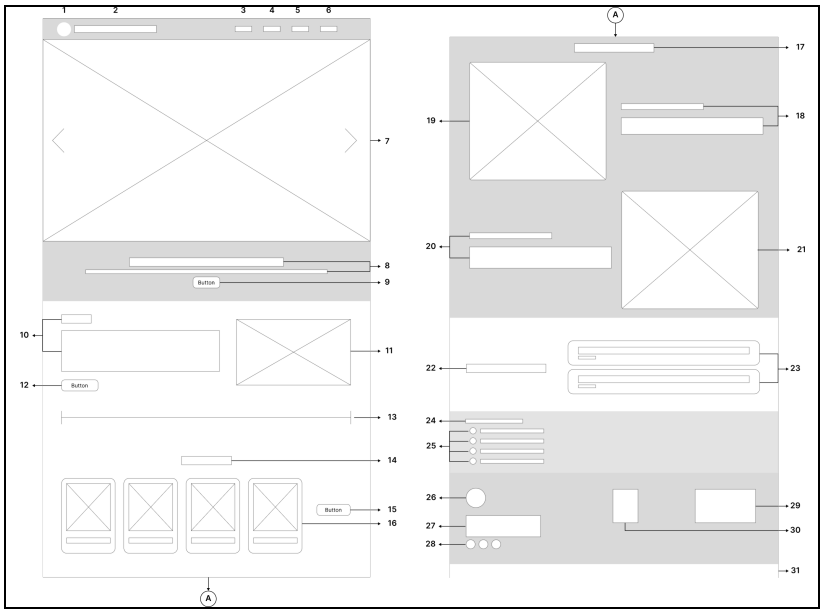


Figure 4. Beranda page wireframe

Mockups then visualized the complete interface design, incorporating a green color scheme consistent with the Villa XYZ brand identity and the villa's concept of a family destination and camping ground reflecting the values of "aman, asri, akrab". Here is the Beranda page mockup, one of the mockups that were created (see Figure 5).

Figure 5. Beranda page mockup

Construction of Prototype

An interactive clickable prototype was built using Figma, enabling informants to navigate between pages and interact with buttons to evaluate the design and functionality. The prototype flow connects the Beranda page as the main entry point to the Tentang Kami, Fasilitas, and Reservasi pages through the navigation menu and inter-page buttons.

Deployment, Delivery & Feedback

Two iterations of prototype review were conducted via Zoom meeting. In the first iteration, informants provided feedback on copywriting, navigation order, interface elements, image border radius, and the addition of facility photos. Revisions were implemented across all pages. In the second iteration, all informants confirmed that the revised prototype fully met their expectations.

The approved prototype was then developed into a WordPress website hosted on Hostinger and published at villaXYZ.com. Plugins used include Blocksy Companion (theme), Stackable (block editor), Trustindex.io (Google Maps review integration), and Popup Maker (promotional popups). The final website comprises four pages which are Beranda (villa overview, facility preview, testimonials, and additional information), Tentang Kami (detailed villa profile, values, social media integration, and Google Maps), Fasilitas (complete facility information with categorized gallery), and Reservasi (reservation and payment information with WhatsApp CTA). Here is a display of the developed website on the Fasilitas page (see Figure 6).

Figure 6. Fasilitas website page

Black Box Testing

Black box testing was conducted based on 21 test cases across four main pages, carried out by all informants via Zoom meeting. The detailed scenario results of Beranda page as example of the black box testing scenario are presented in Table 3.

Table 3. Black box testing scenario of Beranda page

No.	Test Case ID	Test Step	Expected Outcomes	Test Results	Status
1.	BP01	Access the website through the domain villa XYZ.com	The system opens and displays Beranda page along with all information, image, and button	As expected	Pass
2.	BP02	Choose/click one of navigation menu on Beranda header	The system directs to chosen page with all content and feature	As expected	Pass
3.	BP03	Click “Selengkapnya” button on preview of villa information section	The system directs to Tentang Kami page with all content and feature	As expected	Pass
4.	BP04	Clicks “Lihat Lainnya” button on preview of villa facilities	The system directs to Fasilitas page	As expected	Pass

No.	Test Case ID	Test Step	Expected Outcomes	Test Results	Status
			with all content and feature		
5.	BP05	Explore/choose one of action on Beranda footer	The system directs to chosen action	As expected	Pass

The summary of all the test case results is presented in Table 4, where each tested page was represented as an individual table to facilitate the effectiveness score calculation. As a result, the Beranda, Tentang Kami, Fasilitas, and Reservasi pages were treated as separate tables in the calculation process.

Table 4. Black box testing summary result

No.	Table	Total Test Case	Valid Results	Invalid Results	Status
1.	Beranda	5	5	0	Pass
2.	Tentang Kami	6	6	0	Pass
3.	Fasilitas	6	6	0	Pass
4.	Reservasi	4	4	0	Pass
	Total	**21**	**21**	**0**	**21**

All 21 test cases produced valid results with a “Pass” status, yielding an overall effectiveness score of 100% using Equation 1. Therefore, it can be concluded that the functionality of the Villa XYZ website is considered good and has met the expected requirements.

In terms of novelty, prior studies on the SDLC Prototyping model, such as Cornelia & Suryasari (2023), Firmansyah et al. (2021), Situmorang & Zul (2024), and Nifratama et al. (2024), applied it to internal organizational systems in non-hospitality sectors, where requirements were typically defined by organizationally-structured stakeholders with relatively clear technical specifications from the outset. Meanwhile, studies on hospitality website development, such as Andriyan et al. (2020), Nurlailah & Nova Wardani (2023), Mukhlis (2023), and Wiyanto et al. (2022), did not employ a systematic development model nor structured functional testing. This study contributes to the existing literature in two ways. Methodologically and practically, it integrates the SDLC Prototyping model, use case-based black box testing, and WordPress-

based development for a villa accommodation website, offering a replicable framework for small scale hospitality practitioners who, unlike organizationally structured stakeholders in prior Prototyping studies, possess a general vision but lack the technical literacy to specify detailed requirements upfront. Conceptually, this study illustrates how the Prototyping model's iterative requirement elicitation capability is particularly suited to addressing this specific constraint, distinguishing the present context from the organizationally-defined requirement settings typical of prior Prototyping applications. This combination of practical replicability and conceptual fit between method and stakeholder context, rather than the combination of techniques alone, constitutes the primary contribution of this study.

Regarding the justification of findings, the 100% effectiveness score confirms that the iterative approach successfully translated stakeholder requirements into a fully functional website. Beyond functional correctness, this outcome was also corroborated by stakeholders themselves during the iterative Deployment, Delivery & Feedback stage, where the owner, caretaker, and consumer evaluated the prototype against their own expectations, which are centralized and complete villa information, ease of access, and authentic visual representation, and confirmed in the second iteration that these expectations were fully met. This stakeholder confirmation complements the black box testing results by providing qualitative evidence that the functional outcomes also align with what stakeholders themselves consider indicative of a successful website.

These results are also discussed in relation to the DeLone & McLean IS Success Model (2003), which identifies system quality and information quality as key determinants of information system success. The black box testing results provide indicative, though not exhaustive, evidence relevant to both dimensions. As mapped in Table 1, test cases verifying navigation and inter-page functionality (e.g., BP02–BP05) align with the system quality dimension, while test cases confirming the completeness of displayed content (e.g., BP01) align with the information quality dimension. This mapping shows that the prototyping and testing process did engage with these dimensions during development, although a fully validated empirical measurement of information quality and system quality as latent constructs remains outside the scope of this study, representing a measurable, though not formally instrumented, improvement over the fragmented information previously available on Villa XYZ's social media.

In comparison with related studies, Firmansyah et al. (2021) applied the SDLC Prototyping model in web-based system development but omitted systematic functional testing, a gap this study addresses by embedding black box testing within the prototyping cycle. Astiti (2023) also applied black box testing in website development but within the Extreme Programming framework, which prioritizes technical agility over stakeholder-centered requirement alignment, a distinction that matters when clients have limited technical literacy and

undefined initial requirements. Situmorang & Zul (2024) used the prototyping model but validated through usability testing, focusing on user experience rather than functional correctness. This study's use of black box testing thus offers a more direct measure of whether the system meets its specified functional requirements.

V. CONCLUSION AND RECOMMENDATION

This study successfully developed the Villa XYZ website using the SDLC Prototyping model through five stages with two prototype construction iterations answering the research question of how the model is implemented in hospitality website development. Two iterations of prototype evaluation enabled stakeholder requirements to be systematically captured and refined and confirmed by stakeholders as meeting their expectations, while black box testing confirmed that all 21 functional test scenarios passed with a 100% effectiveness score, together indicating that the website fully meets its functional requirements, though further evaluation would be needed to establish broader usability or business impact. For practitioners, particularly small-scale villa or hospitality businesses, this study provides a replicable framework for developing user-aligned websites using WordPress without requiring advanced programming skills, emphasizing the importance of iterative stakeholder involvement throughout the development process. For further research, it is recommended to extend the study by incorporating usability evaluation to assess user experience beyond functional correctness, which are addressing the gap between functional validation and broader claims of website success, exploring the integration of an online booking and payment system, and examining the website's actual impact on consumer booking intention within the villa accommodation context.

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