ISSN: 2581-1274

Development of a Web-Based Tourism and Culinary Promotion Information System Using the Waterfall Method: A Case Study of Aceh

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ARTICLE INFO

Article history:
Published
April 3, 2026

Keywords:
Information System
Tourism Promotion
Culinary
Web-Based System
Waterfall Method

ABSTRACT

The rapid advancement of information technology has significantly influenced various sectors, including tourism and culinary industries, which are key drivers of regional economic growth. However, the promotion of Aceh's tourism and culinary potential remains less effective due to the limited use of integrated digital platforms. This study aims to design and develop a web-based information system for promoting Aceh's tourism and culinary sectors as part of a digital investment strategy for the Aceh Investment and One-Stop Service Office (DPMPTSP). The system was developed using the Waterfall model through five stages: requirements analysis, system design, implementation, testing, and maintenance. The system was implemented using React.js for the front end and MySQL as the database. The platform provides integrated information about tourist destinations, culinary products, and regional events. Functional testing using the black-box method showed that all system features operated according to specifications. Usability evaluation involving 20 respondents produced an average score of 4.20, indicating that the system is easy to use and visually appealing. These results demonstrate that a web-based information system can effectively support digital promotion and improve the visibility of Aceh's tourism and culinary potential.

I. Introduction

Information technology has emerged as a major catalyst for digital transformation across various sectors, particularly within tourism and culinary industries. The adoption of web-based platforms enables information to be disseminated efficiently, widely, and without temporal constraints, positioning websites as effective media for digital promotion and public information delivery [1]. Within the context of regional development, the tourism and culinary sectors play a strategic role in stimulating economic growth, enhancing regional competitiveness, and preserving local cultural identity [2].

Aceh Province is endowed with a wide variety of tourism destinations and distinctive culinary products that reflect its rich cultural heritage and economic potential. Culinary tourism, in particular, has become an integral component of sustainable tourism development, as it integrates local traditions with visitor experiences and contributes to regional value creation [1]. Despite these advantages, the promotion of Aceh's tourism and culinary potential has not yet been supported by a fully integrated and well-structured digital platform. Promotional information is often dispersed across multiple channels, resulting in limited accessibility, inconsistent presentation, and reduced promotional effectiveness [3].

Previous studies have highlighted the importance of web-based information systems in enhancing tourism promotion and information accessibility. Research conducted in similar contexts demonstrates that integrated web platforms are capable of improving promotional efficiency, increasing user engagement, and facilitating public access to tourism-related information. For

example, Ichsan, Ramadhani, and Shabryana [12] developed a web-based tourism package application to support promotional activities in Nusa Village, demonstrating that centralized web systems can significantly enhance information delivery. Likewise, Andini and Putra [13] emphasized the role of visually appealing website design in culinary tourism promotion by applying the Waterfall methodology in system development, an approach aligned with the method adopted in this study. Additional studies further confirm that comprehensive web platforms contribute positively to public engagement and tourism marketing effectiveness [4].

In a broader digital application context, Novita et al. [15] demonstrated that systematically developed web-based platforms can effectively support information dissemination and user interaction through their study on Google Sites as digital learning media. Although conducted within the education sector, their findings reinforce the importance of structured development processes and user-oriented design principles, which are equally applicable to tourism and culinary promotion systems. Moreover, the integration of information and communication technologies (ICT) into tourism activities has been shown to enhance destination visibility and strengthen digital promotion strategies, particularly in developing regions [5].

Recent studies have also explored the application of advanced information technologies in institutional information systems to improve data management and operational efficiency. Khairuman, Ginting, and Mukhroji [16], for instance, investigated the use of blockchain technology for student data management, highlighting the role of structured digital systems in enhancing data security and system reliability. These findings further support the relevance of systematic system development approaches in building reliable and efficient web-based information platforms.

Statistical data from the Central Bureau of Statistics of Aceh indicate fluctuations in international tourist arrivals during early 2025, underscoring the need for more innovative, centralized, and sustainable digital promotion strategies [6]. Strengthening digital promotion through a unified web-based information system is therefore essential to improve the visibility and attractiveness of Aceh's tourism and culinary assets for both tourists and potential investors.

The Aceh Investment and One-Stop Integrated Service Office (DPMPTSP Aceh) plays a crucial role in facilitating regional investment and supporting economic development. However, existing government-managed websites primarily focus on administrative and licensing services, while tourism and culinary promotional content is often treated as supplementary information [7]. This condition limits the potential of official digital platforms to function as strategic promotional media.

Although previous studies have demonstrated the effectiveness of web-based platforms in tourism promotion, most existing systems primarily focus on providing tourism information without integrating tourism promotion with broader regional investment strategies. In addition, many systems present tourism destinations and culinary information separately, resulting in fragmented promotional platforms. These limitations indicate the need for an integrated information system that combines tourism destinations, culinary information, and regional events within a single digital platform to support more effective digital promotion.

This study provides several academic contributions. First, this study proposes a semi-dynamic web-based information system model that balances flexibility in content management and system simplicity for institutional use. Second, the research integrates tourism and culinary promotion with regional investment strategies within a single digital platform, which is rarely explored in previous tourism information system studies. Third, this study presents usability evaluation results within the context of a government institution, providing insights into user perceptions and system effectiveness in supporting digital promotion initiatives.

Based on these considerations, this study aims to design and develop a web-based information system for tourism and culinary promotion in Aceh. The system is developed using a structured software engineering approach to ensure systematic implementation, consistency, and reliability [8]. In addition, usability principles are incorporated to ensure that the system aligns with user needs and delivers a positive user experience [9]. By providing integrated, accessible, and visually engaging promotional information, the proposed system is expected to support Aceh's digital investment strategy and enhance the competitiveness of its tourism and culinary sectors in the digital era [10].

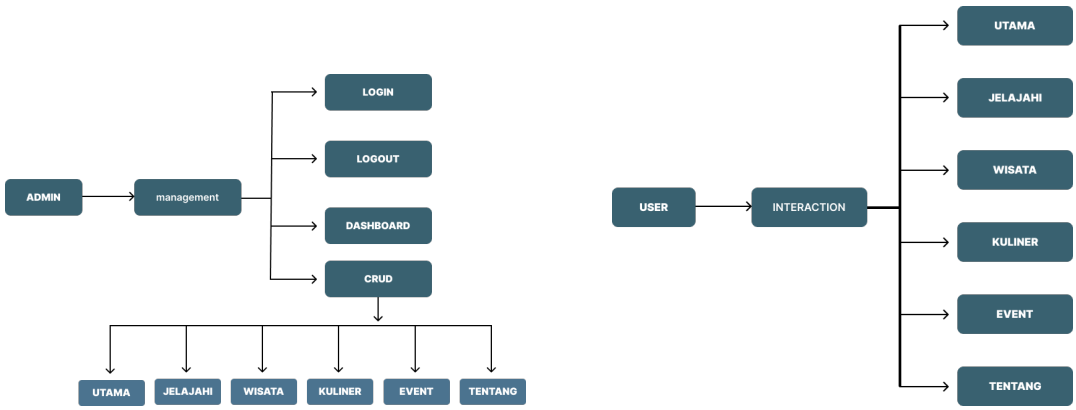
II. The Proposed Method/Algorithm

A. Proposed System Overview

The proposed system is designed as a web-based information platform that integrates tourism destinations, culinary information, and regional event data into a single digital medium. The system aims to support promotional activities conducted by the Aceh Investment and One-Stop Integrated Service Office (DPMPTSP Aceh) by providing accessible and structured information for the public, potential tourists, and investors. The platform emphasizes usability, clarity of information, and visual consistency to enhance user experience and promotional effectiveness.

B. Use Case Diagram

The use case diagrams of the proposed system are presented in Figure 1 and Figure 2. These diagrams illustrate the functional interactions between the system and two primary actors, namely the administrator and the public user. The use case diagrams are used to define system functionality, actor responsibilities, and system boundaries within the proposed web-based tourism and culinary promotion information system.



(a) Admin Use Case Diagram (b) User Use Case Diagram

Fig. 1. Use Case Diagram: (a) Admin Use Case Diagram, (b) User Use Case Diagram

Fig. 1(a) illustrates the administrator use case diagram. The administrator is responsible for managing system content, including adding, updating, and deleting data related to tourism destinations, culinary information, and regional events. These administrative functions ensure that all published information remains accurate, consistent, and aligned with institutional promotional objectives.

Fig. 1(b) presents the user use case diagram, which describes the interaction between public users and the system. Users can access the system without authentication and interact with available features such as viewing tourism destinations, exploring culinary information, and accessing event-related details. This use case diagram emphasizes ease of access and reflects the system's focus on providing open and user-friendly promotional information.

C. Activity Diagram

The activity diagrams shown in Fig. 3 and Fig. 4 represent the operational workflows of the proposed web-based information system from both administrative and user perspectives. These diagrams illustrate how system functions are executed sequentially, starting from initial user or administrator actions through system responses, and how interactions between users, administrators, and the system occur during normal system operation.

Furthermore, the activity diagrams assist in clarifying process logic and system boundaries by visualizing the flow of activities and decision points within the system. This representation helps ensure that all functional requirements are accurately translated into system workflows, reduces ambiguity during implementation, and supports consistency between the system design and the developed application.

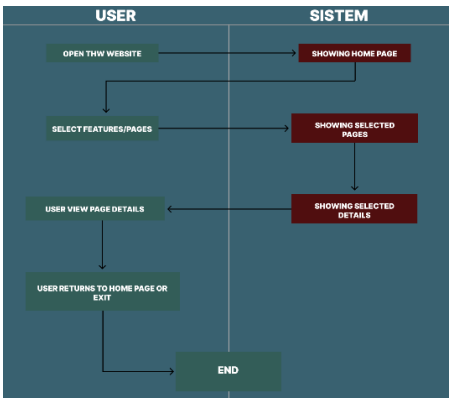


Fig. 2. User Activity Diagram

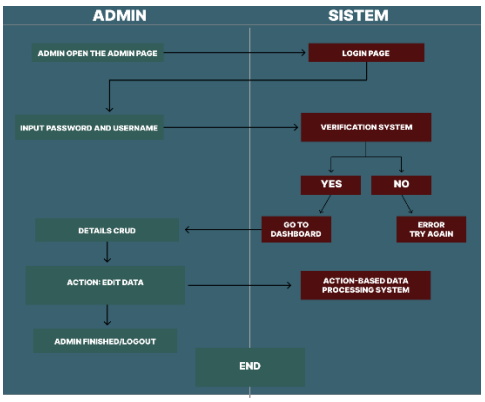


Fig. 3. Administrator Activity Diagram

Fig. 2 presents the user activity flow, which describes how public users interact with the system to access promotional information. Users begin by accessing the website through a web browser and navigating the available menus. The system responds by displaying lists of tourism destinations, culinary products, and event information, followed by detailed views based on user selection. This activity flow reflects the system's emphasis on accessibility, simplicity, and efficient information delivery for digital promotion purposes.

Fig. 3 illustrates the sequence of administrative activities within the system. The process begins when the administrator accesses the system and performs authentication to obtain authorized access. Once logged in, the administrator manages promotional content by performing data input, modification, and deletion related to tourism destinations, culinary information, and regional events. After the data are validated, the system stores the information in the database and updates the public interface accordingly, ensuring that all published content remains accurate and up to date.

III. Method

This study employed a systematic methodology to design and develop a web-based information system aimed at promoting tourism and culinary attractions in Aceh. A User-Centered Design (UCD) approach was adopted to ensure that usability and user experience were prioritized throughout the design and implementation process [6]. This approach emphasizes a deep understanding of user needs and translating them into both functional and interface design requirements.

The system development process followed the Waterfall model due to its structured and sequential nature, which is particularly suitable for projects with clearly defined requirements [7], [8]. Furthermore, previous web-based system development studies reported in *Inotera Journal* demonstrate the effectiveness of structured development processes in delivering functional web applications. For example, Ichsan, Susilawati, and Haykal [14] developed a web-based village information system to improve public service delivery, illustrating that web systems developed through a systematic approach can efficiently meet both user needs and functional requirements.

The development workflow consisted of four primary stages: requirement analysis, system design, implementation, and testing**.** Each phase was completed systematically before moving to the next to ensure consistency, reliability, and adherence to project specifications.

During the requirement analysis phase, both functional and non-functional requirements were identified. Functional requirements focused on administrative content management and public information access, while non-functional requirements emphasized usability, performance, and

system reliability. User needs were identified through document analysis and direct observation of existing promotional platforms managed by DPMPTSP Aceh.

The system design phase was conducted based on the identified requirements and was represented through use case diagrams and activity diagrams to illustrate system functionality and interaction flows. Interface design prioritized simplicity, consistency, and ease of navigation to enhance the overall user experience in accordance with UCD principles. In implementing the User-Centered Design (UCD) approach, potential users were involved during the evaluation stage of the system. Participants were asked to explore several system features such as browsing tourism destinations, accessing culinary information, and viewing event details. User feedback was collected through a structured usability questionnaire to evaluate the clarity of navigation, ease of use, completeness of information, and visual appearance of the system. This process ensured that the system interface and functionality were aligned with user expectations and usability principles.

Finally, the system evaluation phase focused on both functional testing and usability assessment. Functional testing verified that all implemented features operated according to the specified requirements. Usability evaluation employed heuristic principles proposed by Nielsen [11], including visibility of system status, interface consistency, and ease of use, to assess the overall quality of the user interface. These principles complemented the UCD approach and ensured that the developed system met user expectations and provided a satisfactory user experience [10]. The usability evaluation involved 20 respondents who interacted with the platform and provided feedback through a structured questionnaire. This number of participants is considered sufficient for identifying usability issues in small-scale system evaluations.

IV. Results and Discussion

A. System Interface Implementation

The developed system provides a web-based interface that integrates tourism destinations, culinary information, and regional events into a single platform. Fig. 4 presents the main page interface of the system, which displays featured tourism and culinary content along with navigation menus for easy access.

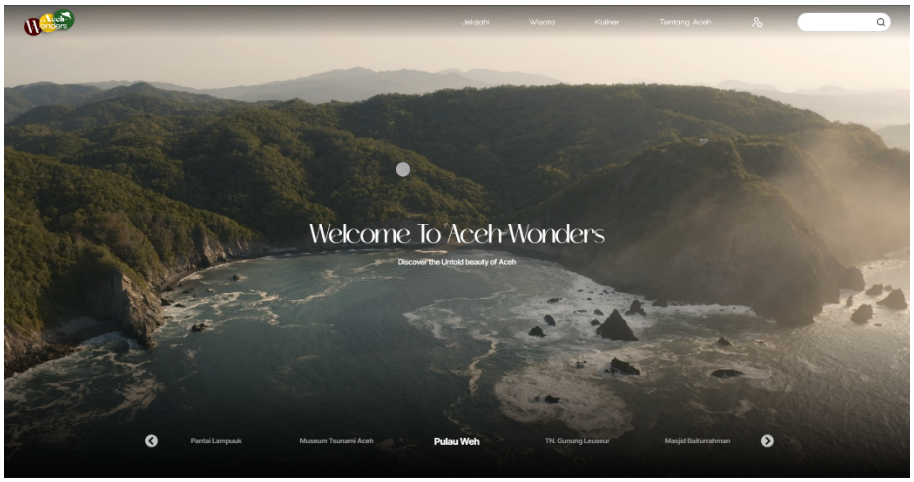


Fig. 4. Main Page Interface of the Tourism and Culinary Information System

The interface design emphasizes clarity of information and ease of navigation. Users can access detailed information by selecting the desired category, and the system displays the selected content in an organized and visually consistent layout.

Figure 5. Administrator Dashboard Interface, which allows administrators to manage promotional content efficiently. Through this interface, administrators can add, update, and delete tourism, culinary, and event data without directly accessing the system code.

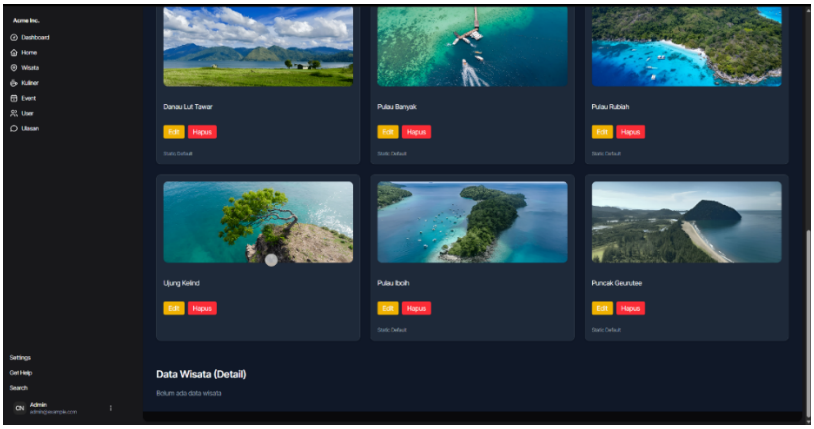


Fig. 5. Administrator Dashboard Interface

B. *Functional Testing Results*

Functional testing was conducted to verify that all system features operated according to the defined requirements. Testing focused on both administrative and user functionalities, including data management, navigation, and content display.

Table 1. Functional Testing Results

No.	Tested Functionality	Expected Result	Test Result
1	Admin Login	Admin successfully logs into the system	Passed
2	Add tourism data	Data is saved and displayed correctly	Passed
3	Update culinary information	Updated data appears on user interface	Passed
4	Delete event data	Data is removed from the system	Passed
5	User views tourism information	Information displayed correctly	Passed
6	User navigates system menus	Pages load and function properly	Passed

C. *Usability Evaluation Results*

Usability evaluation was conducted to measure user perceptions of the developed web-based tourism and culinary promotion information system. The evaluation aimed to assess whether the system meets user expectations in terms of ease of use, clarity of navigation, completeness of information, and visual appearance. This evaluation supports the usability claims presented in the abstract and method sections.

Data were collected using a questionnaire based on a five-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree). The questionnaire was distributed to 20 respondents, consisting of general users who accessed and explored the system features, including tourism information, culinary content, and event listings. The usability indicators evaluated in this study include ease of use, navigation clarity, information completeness, and visual appearance. The results of the usability evaluation are summarized in Table 2.

Table 2. Usability Evaluation Results

No.	Usability Indicator	Mean Score	Category
1	Ease of Use	4.32	Very Good
2	Navigation Clarity	4.25	Very Good

No.	Usability Indicator	Mean Score	Category
3	Information Completeness	4.18	Good
4	Visual Appearance	4.40	Very Good
	Overall Average	4.20	

Based on the results presented in Table II, all usability indicators obtained mean scores above 4.0, indicating positive user responses toward the developed system. The highest score was obtained for the visual appearance indicator, suggesting that users perceived the interface design as attractive and visually consistent.

The ease-of-use indicator also achieved a high mean score, demonstrating that users were able to interact with the system efficiently without significant difficulty. Similarly, navigation clarity received a very good score, indicating that the menu structure and navigation flow were easy to understand and supported efficient access to information.

Although the information completeness indicator received a slightly lower score compared to other indicators, it still falls within the good category. This result suggests that while the system already provides sufficient tourism and culinary information, future development may further enhance content depth and data coverage.

Overall, the usability evaluation results confirm that the application of User-Centered Design (UCD**)** principles and usability heuristics contributed positively to the system's usability and user satisfaction. These findings support the conclusion that the developed system is suitable for use as a digital promotion platform for tourism and culinary sectors in Aceh.

These findings are consistent with previous studies on web-based tourism promotion systems, which reported that well-designed digital platforms improve information accessibility and user engagement in tourism promotion. Research conducted by Ichsan et al. [12] and Andini and Putra [13] also reported that well-designed web platforms significantly improve information accessibility and user engagement in tourism promotion. The usability scores obtained in this study further confirm that integrating structured system development methods, such as the Waterfall model, with User-Centered Design (UCD) principles can produce systems that are both functional and user-friendly. This indicates that usability-focused system design plays an important role in enhancing the effectiveness of digital tourism promotion platforms.

V. Conclusion

This study developed a web-based tourism and culinary promotion information system for Aceh using the Waterfall development method. The system integrates information on tourism destinations, culinary products, and regional events into a single platform to support digital promotion initiatives by the Aceh Investment and One-Stop Integrated Service Office (DPMPTSP Aceh). Functional testing confirmed that all system features operated according to the specified requirements, while usability evaluation produced an average score of 4.20, categorized as "Very Good," indicating positive user perceptions of the system's usability and interface.

However, this study has several limitations. The system currently implements a semi-dynamic content structure and the usability evaluation involved a limited number of respondents. Future research may focus on developing a fully dynamic system, integrating advanced features such as interactive maps or analytics, and involving a larger user population to obtain more comprehensive usability insights.

Acknowledgment

The authors would like to express their sincere appreciation to Universitas Bina Bangsa Getsempena for the academic support provided during this research. The authors also thank the Aceh Investment and One-Stop Integrated Service Office (DPMPTSP Aceh) for granting permission and providing valuable information for system development and evaluation.

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