Journal of Soft Computing Exploration
Homepage: htttps://shmpublisher.com/index.php/joscex
p-ISSN: 2746-7686
e-ISSN: 2746-0991

.

Tourism digital innovation geographic information system based web application for spatial information of tourism destinations

Amrul Rais Hidayat [1], Tutik Khotimah[2], Rizkysari Meimaharani[3]
[1,2,3]Department of Informatical Engineering, Universitas Muria Kudus, Indonesia

Article Info

Article history:

Received June 19, 2025
Revised June 29, 2025
Accepted July 10, 2025

Keywords:

Tourism web
Web based application
Geographic information system
Waterfall method
Karisidenan pati

ABSTRACT

This study aims to develop a web-based tourism application by utilizing Geographic Information System (GIS) to optimize the dissemination of tourism information in the Pati Karisidenan area. This application is designed to assist local communities and tourists in choosing tourist destinations by providing information such as location, description, route, facilities, and visitor reviews. In addition, the app is also equipped with search and filtering features to help users find tourist attractions based on category, distance, or available facilities. This application was developed using the PHP programming language and MySQL database. The development process adopts the Waterfall method, which consists of the requirements analysis stage, system design using ERD and DFD, implementation, testing, and maintenance. Application testing is carried out using the Black Box Testing method to ensure all functions run according to specifications. The test results from visitors showed satisfaction with the use of the application by 97% of 15 audiences. This application is expected to support the promotion, accessibility, and management of tourism potential digitally by local governments.

Corresponding Author:

Amrul Rais Hidayat,
Department of Informatical Engineering,
Universitas Muria Kudus,
Jl. Lkr. Utara, Kayuapu Kulon, Gondangmanis, Kec. Bae, Kabupaten Kudus, Jawa Tengah 59327.
Email: amruloke11@gmail.com
https://doi.org/10.52465/joscex.v6i2.587

1. INTRODUCTION

Karisidenan Pati, which includes Pati, Kudus, Jepara, Rembang, and Blora, has abundant tourism potential including natural, historical, cultural, and culinary tourism, but unstructured information dissemination hinders its optimal utilization [1]. Tourism information spread on the internet is often not integrated, making it difficult for tourists to plan visits, and limiting promotional efforts from local governments and tourism managers [2]. To overcome these obstacles, it is necessary to develop a Geographic Information System (GIS)-based web application that is able to present tourism data interactively through digital maps, provide complete information about destinations, facilities, and accessibility, as well as support more effective tourism promotion to increase tourist visits to the Pati Karisidenan [3].

Some previous research conducted by Bagau and Chernovita (2021) designed a web-based GIS to display tourist locations and public transportation routes in Salatiga using the Waterfall method. This system

aims to make it easier for tourists to access information and increase tourist visits [4]. Research conducted by Chairunnisa et al. (2020) developed a web-based geographic information system to map tourist locations in Samarinda City to overcome the limited information available to tourists. This system uses the Waterfall model and the Google Maps API to present interactive maps, support location search, route navigation, and data management by the admin [5]. Research by Alamsyah et al. (2021) developed a web-based GIS using modern technology to map tourist attractions in Bandung City, to make it easier for tourists to access information and support tourism promotion [6]. Further research was conducted by Permana and Rahmah (2021) developed a web-based GIS using the Waterfall method to accurately present information on tourist, culinary and hotel locations in DKI Jakarta through an interactive map [7]. Meanwhile, Febrian and Nasir (2021) utilized GIS and spatial analysis to support smart tourism in Gunung Nona, producing a spatial database and recommending the development of a web-based information system to support sustainable tourism management [8].

Based on previous research, the development of web-based geographic information systems (GIS) for the tourism sector has been widely carried out in various regions. However, most of these systems are still limited to small area coverage and have not integrated tourism data across districts in one centralized platform. Until now, the Karisidenan Pati region, which includes Pati, Kudus, Jepara, Rembang, and Blora Regencies, has not had an integrated system that is able to present tourism information in a complete, interactive, and easily accessible manner for tourists and destination managers. In addition, the utilization of GIS web application as a structured and effective tourism promotion media in this region is still very limited. Seeing these problems, this research aims to develop a web-based geographic information system that can map and present tourism information in an integrated manner. The system designed not only displays the location of tourist attractions, but also contains information about supporting facilities and travel routes that can help tourists in planning trips more efficiently.

This research proposes the design of a web-based geographic information system that supports the management and dissemination of tourism information in the Karisidenan Pati region more effectively and structurally. The system was developed using the PHP programming language that supports the creation of secure, efficient, and modern web applications. The development method used is the Waterfall model which consists of the stages of needs analysis, system design, implementation, testing, and maintenance. This system design is also supported by Data Flow Diagram (DFD) and Entity Relationship Diagram (ERD) modeling to clarify the flow of data and relationships between entities in the system. It is hoped that this system can be a solution to the limitations of delivering tourism information that has been done manually, and become the first step in encouraging the application of digital technology in the tourism sector in the Pati Karisidenan region.

2. METHOD

In this research, the author applies a descriptive method with a qualitative approach as the main basis. The descriptive method is used to describe and explain the actual situation systematically, objectively, and factually [9]. This approach aims to obtain a comprehensive and in-depth understanding of the problems in the dissemination and utilization of tourism information in the Pati Karisidenan region[[10]. The research stage is divided into two parts, namely the data collection stage involving literature studies, interviews, and observations, and the system development stage designed to provide easy, fast, and centralized access to tourism information for users.

Frame of mind

A framework is a systematic foundation that helps researchers organize ideas in a structured and logical manner. In this research, the framework is used to design a Geographic Information System (GIS)based web application to optimize the delivery of tourism information [11]. The framework is shown in the Figure 1.

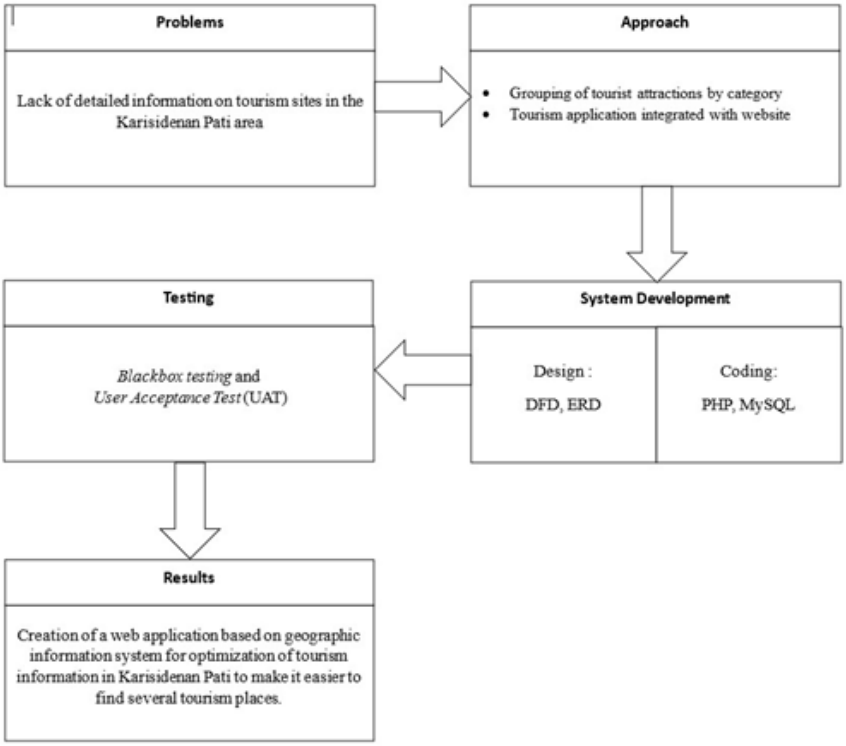

Figure 1. Frame of mind (Source: Chairunnisa et al. (2020))

Method of collecting data

This research applies a qualitative approach to explore user needs in accessing and understanding tourism-related information. Data collection was conducted through interviews, observations, and literature review on existing tourism web systems [12]. This approach is intended to provide a solution to the problem of limited public knowledge about the location, facilities, and potential of tourism spread across the Pati Karisidenan area. The data collection methods used include:

Observation

Direct observations were conducted at tourist objects in Kudus Regency to assess field conditions, ease of access to the location, completeness of available facilities, and the presence of information facilities such as signboards and promotional media around the tourist area.

Literature review

Conduct a literature review, both in the form of books, journals, kudus district tourism office, websites about tourism and research related to web application systems based on tourism geographic information systems to strengthen the theoretical basis.

Interview

Conducted with residents or friends who live in the Pati Karisidenan area to find out some tourism places.

Software Development Methods

The Waterfall method is applied in the development of GIS-based tourism web applications, where each phase is carried out in a linear sequence. The process begins with requirements analysis, followed by system design, implementation, testing, and maintenance [13]. Each phase must be fully completed before moving on to the next. The phases of the waterfall method can be seen in the Figure 2.

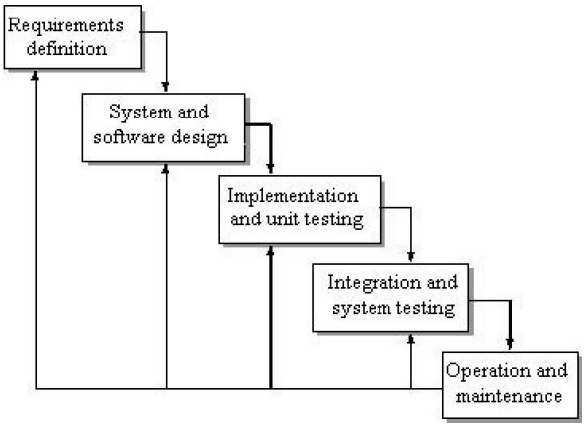

Figure 2. Waterfall method (Source: Mahardika and Abdillah (2024))

The development of GIS-based tourism web applications applies the Waterfall method which is divided into five structured stages, namely:

Requirement analysis

At this stage, the identification of system requirements both functional and non-functional is carried out based on literature reviews, observations, and interviews with stakeholders involved in the tourism sector. The outcome is a system requirements specification that serves as the main reference for the design phase. Problem identification involves analyzing the issues that justify the need for the research. This includes examining challenges within the case study, specifically related to tourism in the Karisidenan Pati area, such as identifying tourist site locations and assessing the conditions of these places [14].

System design

In the system design stage, a web-based tourism application is planned, including user interface (UI/UX) design and workflow. The requirements analysis is translated into ERD and DFD to illustrate the system's structure and flow for the Karisidenan Pati area [15].

Implementation

The Implementation involves converting the system design into an application using PHP and MySQL. This stage includes coding key features such as gallery, tourism spots, and categories [16].

Testing

The system testing stage aims to ensure that all features in the tourism application system function properly. Testing this tourism application uses the black box testing method [17].

Maintenance

System maintenance is done after all stages are completed. At this stage, the system is monitored regularly to ensure that no problems arise during use such as bugs or errors. If errors or technical problems occur, repairs will be made immediately [18].

3. RESULTS AND DISCUSSIONS

Requirement Analysis

In the development of a tourism web application based on the Pati Karisidenan geographical information system, identification of system requirements is carried out to ensure that the application is built in accordance with the process of user needs. Table 1 shows the website features.

Table 1. Website features

Role	Feature
Admin	View admin dashboard home Manage the dashboard menu page Manage profile menu Manage gallery menu (add, remove, update) Manage tourism menu (add, remove, update) Manage category menu (add, remove, update) Manage news menu (add, remove) Print PDF reports
Member	View the gallery and location of the Karisidenan Pati tour

The table above is an explanation of the features on the website that can be used by admins and gym members.

Design

Entity Relationship Diagram

Entity Relationship Diagram is a database design model that facilitates the visualization of data and the relationships between entities in it. Each entity represents an object, either real or abstract, related to the system being developed [19]. In figure 3 shows Entity Relationship Diagram.

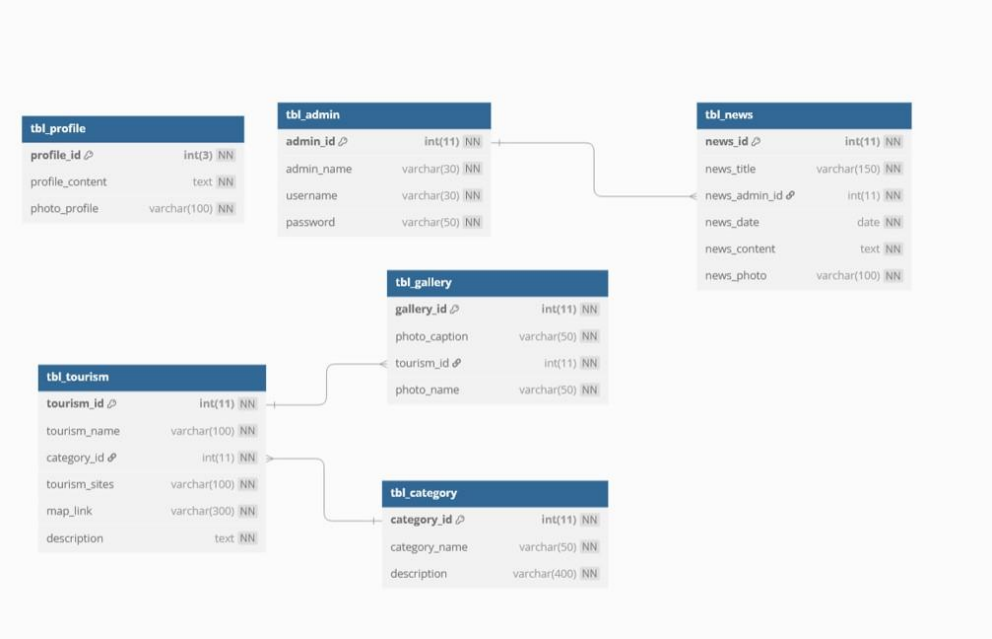

Figure 3. Use case diagram

Data flow diagram

DFD is a graphical representation that shows system components, data flow between components, as well as the source, destination, and storage of data. DFDs are organized in stages, starting from context diagrams, then DFD level 0, to DFD level 1 [20]. Each process can be further elaborated until it reaches the smallest detail that cannot be subdivided. At this level, the diagram is described in more detail, such as login process, data input process (profile, gallery, tours, categories, news). Figure 4 shows DFD.

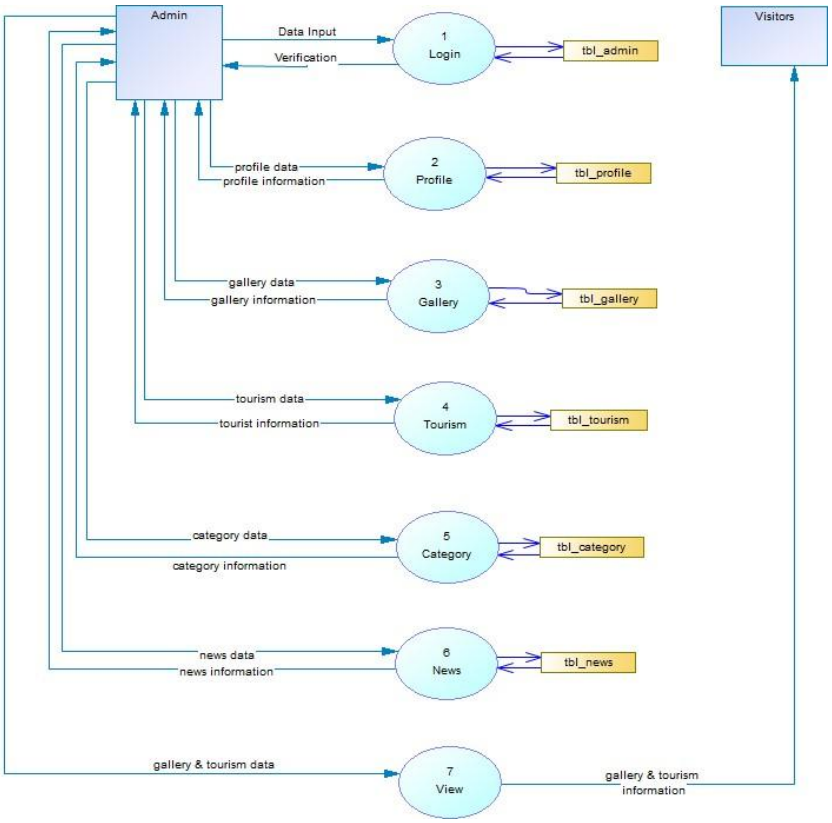

Figure 4. Data flow diagram

Implementation

Login

The login page functions as an initial gate for the admin to enter the tourism application, by entering the username and password that has been created. Figure 5 shows the login view for admin.

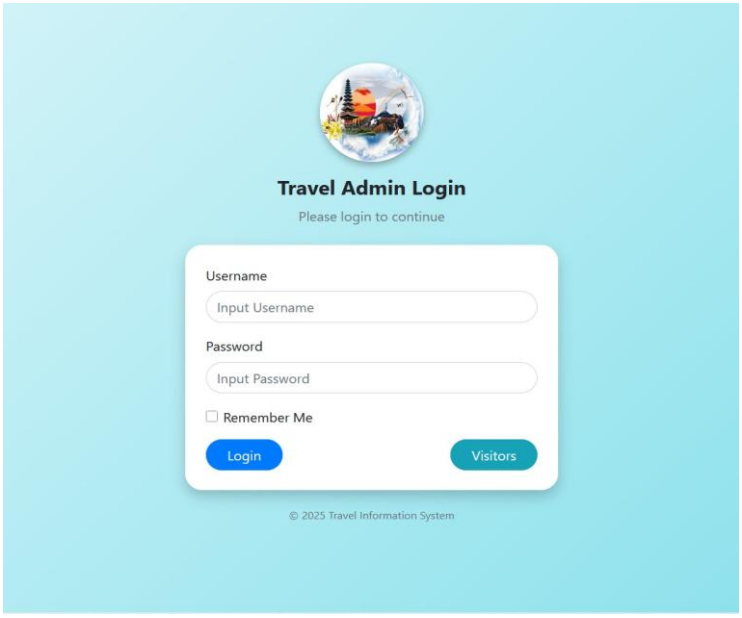

Figure 5. Login page

.

Home page

In the home menu section the admin can see what menus are in the tourism application and what data has been added such as the number of tours, galleries, categories and news. Figure 6 shows the dashboard view for admin.

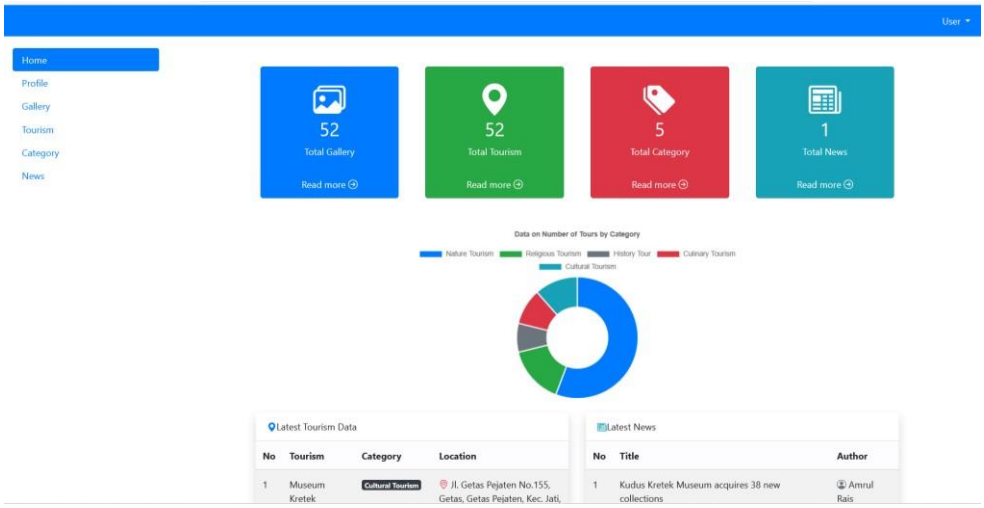

Figure 6. Homepage

Profile

The profile menu provides information about admin information that is using the tourism application. there is information about the place of birth, hobbies, address, etc. Figure 7 shows the profile admin.

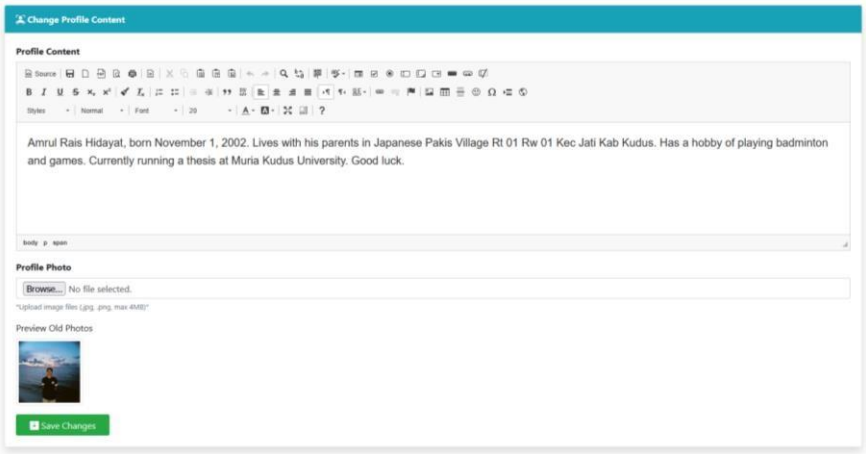

Figure 7. Profile page

Gallery

Gallery page contains photos about the tourist attractions that have been added. so that you can see the image of the tour that is being searched and can imagine it. Admin can also add, change, delete tourist gallery data. Figure 8 shows the Gallery page for admin.

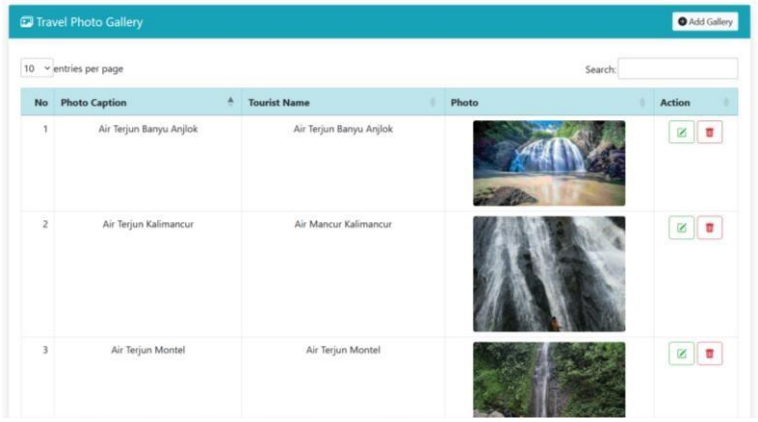

Figure 8. Gallery page

Tourism

Tourism page contains the name of tourism, categories, and also locations that have been managed by the admin. on this page can also display maps using Google Maps. Figure 9 shows the Tourism page for admin.

Figure 9. Data security

Category

Admin can add various categories and their descriptions on the category page. admin can also change or delete category data that has been added. Figure 10 shows the Category page for admin.

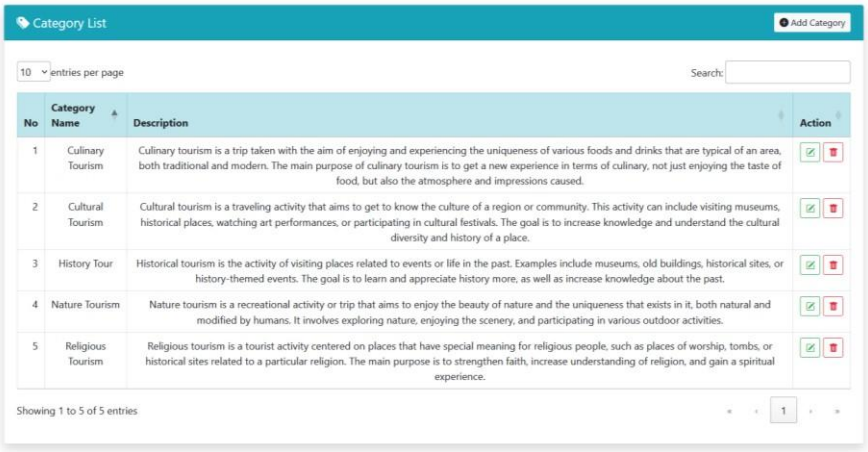

Figure 10. Category page

News

In the settings section, functioned for admins to be able to change or change from old usernames and passwords to new ones. so that security is better maintained and secure. Figure 12 shows the Setting for admin.

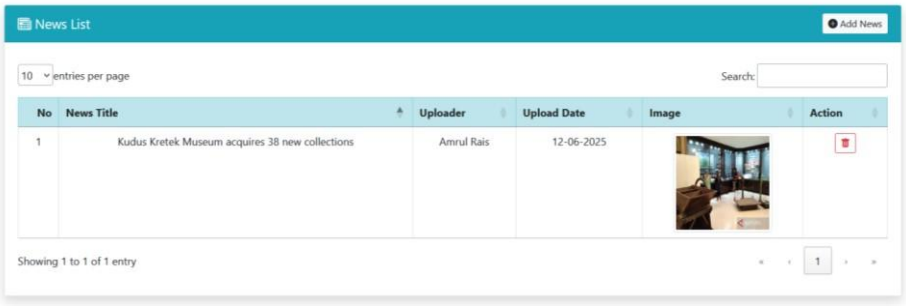

Figure 11. News page

Visitor

In the settings section, functioned for admins to be able to change or change from old usernames and passwords to new ones. so that security is better maintained and secure. Figure 12 shows the Setting for admin.

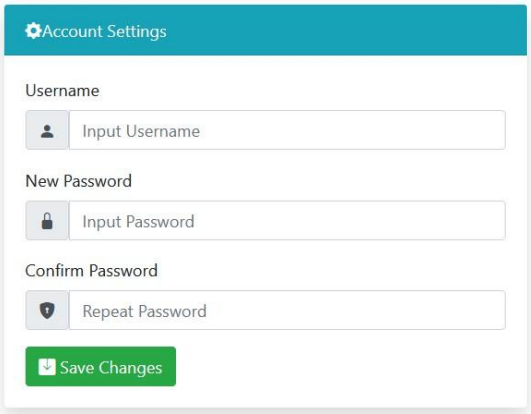

Figure 12. Setting page

Visitor

On the visitor page, tourists can see several tourist attractions that have been added by the admin and also see an overview of the tourist attractions. so that tourists can find references to travel where. Figure 13 shows the Visitor page for visitors.

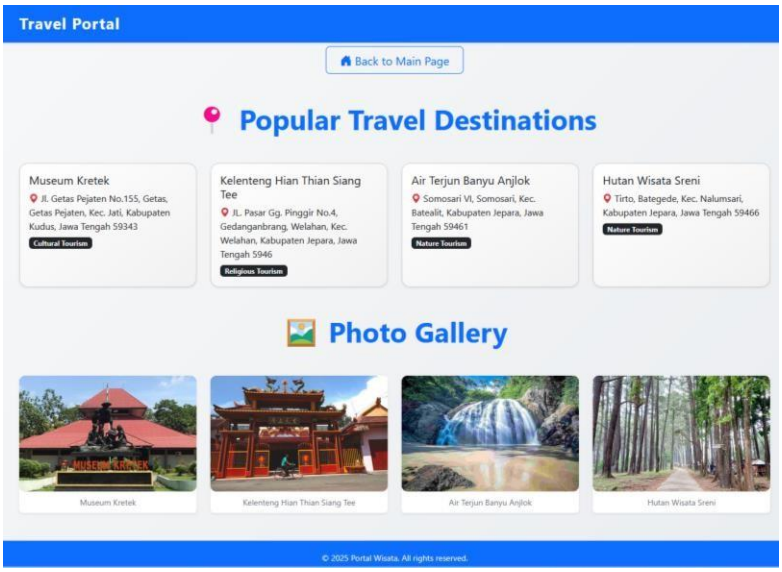

Figure 13. Visitor page

Testing

Testing of the Geographic Information System (GIS)-based tourism web application in the Pati Karisidenan region was conducted using a black box testing approach. This method was used to ensure that all main features-such as settings, user profiles, photo galleries, tourist destination information, place categories, latest news, and visitor data-can function optimally and in accordance with the input-output scenarios that have been designed. This test is an important step in ensuring the quality, reliability, and convenience of users in accessing digital tourism information. Blackbox testing is shown in Table 2. Table 2. Blackbox testing results.

Table 2. Blackbox testing results

No.	Testing	Information	Status
1	Login	The admin successfully logged into the system after entering username and password.	Succeed
2	Setting	The admin successfully changed the username and password.	Succeed
3	Profile	Admin successfully uploaded his own bio and profile picture	Succeed
4	Gallery	Admin successfully adds, edits, modifies, deletes and captions photos of tourism spots.	Succeed
5	Tourism	Admin successfully adds, edits, changes, deletes and gives maps of tourism places	Succeed
6	Category	Admin successfully adds, edits, changes, deletes category data	Succeed
7	News	Admin successfully adds, deletes renewable tourism place news data	Succeed
8	Visitor Page	Visitors can view data on tourism sites along with gallery photos.	Succeed

The next test is the User Acceptance Test (UAT) which aims to assess whether the Pati Karisidenan Geographic Information System (GIS)-based tourism web application has met the needs and expectations of users. The UAT was conducted by involving end-users directly to ensure that key features, such as searching for tourist destinations, functioned properly and as expected. The evaluation process was conducted using assessment weights determined based on Likert scale criteria, and calculated using the formula as listed in Equation (1).

$$Index\ \% = \frac{Total\ score}{Score\ max} x100 \dots\dots\dots\dots\dots\dots (1)$$

User Acceptance Testing (UAT) involved 15 respondents from visitors as part of the system evaluation process. In this test, the respondents were asked to fill out a questionnaire containing a number of questions that had been prepared previously. The final results of the UAT testing implementation are presented follows:

Table 3. UAT test results

No	Question	Score					Total	Percentage
		SA (5)	A (4)	N (3)	DA (2)	SD (1)		
1.	Is the app interface easy to understand and use?	15	0	0	0	0	75	100%
2	Does the tourist spot search feature work well and provide appropriate results?	11	4	0	0	0	71	94%
3	Is the information displayed in the app (such as tour descriptions, locations, and photos) complete and accurate?	14	1	0	0	0	74	98%
4	Can the gallery and tourist information features be accessed smoothly without technical problems?	12	3	0	0	0	72	96%
Average percentage								97%

4. CONCLUSION

Based on the results of research and implementation, the Pati Karisidenan Geographic Information System (GIS)-based tourism web application has successfully fulfilled the needs of digital tourism information. The main features such as search for tourist attractions, gallery display, and presentation of location data run well and according to user expectations. The use of the Waterfall development method provides a systematic workflow, resulting in a stable and easy-to-use system. The results of black box testing also show that all system functions have run according to the scenario and no significant errors were found.

As a recommendation for further development, the system can be improved by adding interactive features such as user reviews, integration of more responsive digital maps, and analysis of tourist data in the form of graphs. The development of a mobile version is also recommended to expand the range of services and increase user accessibility in obtaining tourist information anytime and anywhere.

REFERENCES

[1] H. Suhendi and F. U. Ali, "SISTEM INFORMASI GEOGRAFIS BERBASIS WEB UNTUK PEMETAAN JALAN DAN JEMBATAN DI KOTA CIREBON," *Naratif J. Nas. Riset, Apl. dan Tek. Inform.*, vol. 2, no. 1, pp. 6–15, Jul. 2020, doi: 10.53580/naratif.v2i1.77.

[2] R. P. Lestari, J. Juhadi, and H. Tjahjono, "Sistem Informasi Pariwisata Kabupaten Kudus Berbasis Webgis," *Geo-Image J.*, vol. 9, no. 1, pp. 43–48, 2020.

[3] S. Hidayatullah, H. S. Mangiri, and R. I. Sudomo, "Pembuatan Website Pariwisata Unggulan di Kota Jepara," *Joined J. (Journal Informatics Educ.*, vol. 2, no. 2, p. 19, 2020.

[4] M. Y. P. Bagau and H. P. Chernovita, "PERANCANGAN SISTEM INFORMASI GEOGRAFIS PARIWISATA DAN RUTE ANGKUTAN UMUM BERBASIS WEB PADA DINAS KEBUDAYAAN DAN PARIWISATA KOTA SALATIGA," *Sebatik*, vol. 25, no. 2, pp. 632–638, Dec. 2021, doi: 10.46984/sebatik.v25i2.1177.

[5] L. Chairunnisa, W. E. Sari, and D. Arifin, "Sistem Informasi Geografis Pemetaan Tempat Wisata Di Kota Samarinda Berbasis Web," *Bul. Poltanesa Vol*, vol. 21, no. 1, 2020.

[6] N. Alamsyah, W. Erpurini, and F. Setiawan, "Rancang Bangun Sistem Informasi Geografis Berbasis Website Untuk Pemetaan Objek Wisata Pada Dinas Kebudayaan Dan Pariwisata PadaKota Bandung," *J. Sains Sosio Hum.*, vol. 5, no. 1, pp. 544–552, 2021.

[7] D. R. A. Permana and G. M. Rahmah, "PERANCANGAN SISTEM INFORMASI GEOGRAFIS PARIWISATA DKI JAKARTA BERBASIS WEBSITE," *J. Teknol. dan Manaj.*, vol. 19, no. 1, pp. 7–16, Apr. 2021, doi: 10.52330/jtm.v19i1.15.

[8] D. Febrian and M. Nasir, "Sistem Informasi Geografis Pariwisata Kabupaten Bangka Barat Berbasis WEB," *J. Sisfokom (Sistem Inf. dan Komputer)*, vol. 10, no. 3, pp. 334–339, Nov. 2021, doi: 10.32736/sisfokom.v10i3.1262.

[9] A. Anita and R. Hardianto, "Sistem Informasi Pariwisata Untuk Merekomendasikan Destinasi Wisata Mengunakan Metode Simple Additive Weighting," *TeknoIS J. Ilm. Teknol. Inf. dan Sains*, vol. 15, no. 1, pp. 96–103, 2025.

[10] S. Suryayusra and W. Maula, "Penerapan Chatbot pada Website Pariwisata Palembang untuk Membantu Masyarakat dalam Mengakses Informasi Pariwisata Kota Palembang," *J. Pengabdi. Masy. Bangsa*, vol. 3, no. 4, pp. 1250–1257, 2025.

[11] A. P. Nugroho, S. A. Prabowo, and A. Rafi'Izzuddin, "Smart Tourism Berbasis Web Untuk Optimalisasi Pengelolaan Dan Promosi Pariwisata Di Kabupaten Nganjuk," in *Seminar Nasional Teknologi \& Sains*, 2025, pp. 464–470.

[12] Y. A. Astuti, "PENGEMBANGAN WEBSITE PROFIL DESTINASI WISATA BERBASIS CONTENT MANAGEMENT SYSTEM PADA DINAS KEBUDAYAAN DAN PARIWISATA ACEH TENGGARA," *War. Dharmawangsa*, vol. 19, no. 2, pp. 825–832, 2025.

[13] I. K. T. J. Putra, I. G. A. D. Saryanti, and L. Yuningsih, "Sistem Informasi Pariwisata Desa Pupuan Berbasis Website Menggunakan Framework Laravel," in *Seminar Hasil Penelitian Informatika dan Komputer (SPINTER)| Institut Teknologi dan Bisnis STIKOM Bali*, 2025, pp. 703–708.

[14] F. Mahardika and M. L. Abdillah, "Design of unified modeling language information system for motorcycle unit selling and buying transactions using the waterfall method," *Hanif J. Inf. Syst.*, vol. 1, no. 2, pp. 37–48, 2024.

[15] F. D. Zebua and A. P. Harianja, "Design and development of hair cutting service search and call application using android-based waterfall method," *ASEAN J. Sci. Eng. Educ.*, vol. 5, no. 1, pp. 39–46, 2025.

[16] M. B. A. Pratama, S. S. Hilabi, M. M. Ihsan, I. Ferdiansyah, and H. S. Nizar, "Application of the Waterfall Method in Creating Payroll Applications Based on Java Netbeans," *J. Multimed. dan Teknol. Inf.*, vol. 6, no. 01, pp. 35–45, 2024.
[17] S. Wijaya, A. Andhika, and M. Ilyas, "Development of Sales Information System for SME with the Waterfall Method: A Grocery Store BSR Case," *J. Tek. Inform.*, vol. 3, no. 4, pp. 1043–1049, 2022.
[18] F. Heriyanti and A. Ishak, "Design of logistics information system in the finished product warehouse with the waterfall method: review literature," in *IOP Conference Series: Materials Science and Engineering*, 2020, p. 12100.
[19] M. M. Syahidin, "Entity Relationship Diagram (ERD): Pengertian dan Komponennya," *J. Teknol. Inf. Dan Komput.*, vol. 2, no. 1, pp. 1–8, 2021.
[20] M. F. A. Saputro, B. A. Herlambang, and A. K. Anam, "Sistem Informasi Geografis Peta Interaktif Pariwisata Kabupaten Pati berbasis Sistem," *J. Ilm. Res. Student*, vol. 1, no. 3, pp. 767–776, 2024.

.