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Website-Based Running Sports Information System for Communities in North Sulawesi Using Extreme Programming Method

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Abstract: The community in North Sulawesi has shown a strong interest in running, as evidenced by the increasing number of running communities and events. However, the absence of an integrated platform that provides information about running routes, communities, and events has become a challenge for runners in accessing information efficiently. This study employs the Extreme Programming method and aims to develop a web-based information system that delivers comprehensive information related to running sports. The website features key components such as community profile pages, a running event calendar, and running route locations, complete with maps, route descriptions, track lengths, difficulty categories, photo galleries, and supporting facilities like toilets and resting spots. The displayed information is sourced from various local communities and is systematically organized to ensure easy access for the public. Additionally, the website includes a contact page that allows users to provide suggestions or feedback to the admin. It also features a function that enables event organizers to directly submit event data and running route locations into the system through the contact page. This system is expected to help the community access information more easily and increase participation in running activities throughout North Sulawesi.
Keywords: Running, Website, Route, Community, Extreme Programming

1. INTRODUCING

Public awareness of the importance of maintaining health through exercise is increasing from time to time [1]. One of the sports that is now in great demand is running. Running comes in different types, such as sprints, marathons, recovery runs, and intervals, which makes them flexible and adaptable to individual needs [2]. In addition, running is classified as an efficient, inexpensive sport, and can be done anywhere, both on tracks, highways, and other public spaces. In addition to maintaining physical health, running is also a recreational medium and social interaction that is favored by various circles of society [3].

The phenomenon of increasing interest in running sports is also evident in North Sulawesi (SULUT). The emergence of various running communities such as Manado Runners, Manado Running Club, and Mareno Runners marked the public's enthusiasm for this sport. In addition, running events such as the Manado Half Marathon, Karno Run 2024, and 5K Fun Run further strengthen the running sports culture in the area. However, the community still faces obstacles in accessing information on available running routes. The information is spread across various platforms without structured documentation, making it difficult for runners, both beginners and experienced, to plan their activities.

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As a solution to this problem, an information technology-based forum is needed that is able to provide running route data in an integrated manner. A website is a digital media consisting of pages that are interconnected in a single domain [4]. Websites are one of the most effective means of disseminating information quickly and widely [5]. To present interactive maps, the use of OpenStreetMap (OSM) technology is an ideal choice because it is free, open, and can be updated by users directly [6]. OSM has been widely used in geospatial information systems due to its flexibility and accuracy [7].

The development of a website-based running route information system requires an adaptive software development approach, considering that the information in it is dynamic and frequently updated. The Extreme Programming (XP) method is one of the effective agile development methods in handling the needs of the rapidly changing system [8]. Research from [9] shows that XP is able to increase the accessibility of public transportation route information in the city of Bandung through a web-based system.

Research related to the use of web-based information systems with digital maps has also been conducted extensively in the context of sports and route-based activities. For example, research conducted by [10] developed a 10 km running route digital map based on WebGIS to provide easily accessible route information for runners and sports tourists in the city of Surakarta, demonstrating the direct application of WebGIS in the context of running sports. Additionally, [11] proposed a Geographic Information System (GIS)-based routing approach for route planning in street-based sporting events, emphasizing the role of GIS in selecting and evaluating optimal routes for city-scale events. In the realm of other outdoor activities [12] developed a website-based information system that integrates mountain climbing route maps, logistical needs, and community forums to support climbing activities, illustrating how web systems with geographic data can facilitate outdoor physical activity communities. These studies demonstrate the need for integrated digital platforms that not only display maps, but also provide route information and community features that support user accessibility and engagement.

However, existing research still has limitations because it does not specifically accommodate the needs of runners, does not combine route, event, community, and user contribution information in one platform, and rarely uses the Extreme Programming approach for location-based sports systems. This situation indicates a research gap that needs to be filled through the development of a more structured, integrated, and flexible running route information system to meet the needs of the running community in certain areas such as North Sulawesi.

This study adapts a similar approach with the aim of building a Website-Based Running Sports Information System in North Sulawesi. This system will provide complete information about the running routes, including the name of the location, the length of the track, the level of difficulty (easy, medium, difficult), supporting facilities (toilets, rest areas, small stalls), and photo galleries. In addition, this system will contain a running event calendar, a running community profile that can be accessed through social media links, and suggestions and recommendations features that allow users to contribute to the development of website content.

With this system, it is hoped that the people of North Sulawesi, especially runners, can access information on routes, communities, and running events easily, quickly, and in a structured manner. This platform is not only a means of information, but also a vehicle to increase public participation in a healthy lifestyle through running sports.

2. METHOD

The development of a web-based running sports information system for communities in North Sulawesi uses the Extreme Programming (XP) method because it is flexible and able to adapt to user needs and support continuous feedback.

2.1 Data Collection Methods

This study uses primary data obtained through interviews, questionnaires, field surveys, and social media searches of the runner community in North Sulawesi. The data was focused on runners aged 18–45 years. Initial information was collected from social media, including community profiles, events, and running locations. Interviews were conducted with 20 runners to find out their interest in running and

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information needs. A questionnaire containing 15 questions was distributed to 100 respondents to identify the location of the run, interest in the running information website, and the level of agreement with the benefits of the website. A field survey was conducted to evaluate the feasibility of the recommended running location.

2.2. Development Method: Extreme Programming (XP)

This research uses the Extreme Programming (XP) method as shown in Figure 1 which consists of four stages: *Planning, Design, Coding*, and *Testing*. The Extreme Programming (XP) methodology was chosen because of its prominent advantages in the software development process, especially in terms of flexibility and its ability to adapt to changes [13]. XP encourages the creation of quick feedback from users through short iterations and phased out features, keeping the development process relevant to real needs [14]. In addition, this approach is able to minimize project risk by detecting errors early and accelerating their repair through continuous refactoring [15]. The active involvement of users at every stage of development also increases their satisfaction, while maintaining a stable and continuous work rhythm.

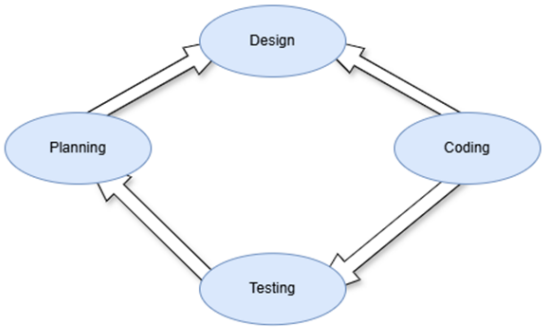

Figure 1. Extreme Programming (XP) Method

2.2.1 Planning

Interviews and questionnaires were conducted to find out the needs of runners in North Sulawesi related to information on routes, events, and running communities. As a result, three main features are determined: Running route maps and information, Running event calendar, Runner community profile. Complementary data was obtained from community social media and field surveys. User stories are structured to describe user needs.

2.2.2 Design

The system design is created using UML (Use Case and Activity) diagrams. The interface is designed with the principle *of a simple UI,* including home pages, routes, events, communities, contacts, and admins. The map feature uses OpenStreetMap-based polylines.

2.2.3 Coding

The website is developed with HTML, CSS, PHP, JavaScript, and MySQL. Key features include route information, events, communities, and contact forms. Additional features such as submit events and locations are provided for user and manager collaboration.

2.2.4 Testing

Testing is carried out using the Black Box Testing method to ensure the system functions as needed. The test results are used for system improvement and performance.

3. RESULT AND DISCUSSIONS

3.1. Planning

The planning stage aims to identify user needs as the basis for creating a website-based running sports information system. Data collection was carried out through interviews, questionnaire distribution, and observation in the North Sulawesi region. This process aims to explore the user's needs for running route information, events, and running communities. In addition, a field survey was

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conducted to verify the location of the recommended route. Additional information such as events is obtained from the social media of the runner community. As a form of user participation, a contact menu is provided that contains the event submission feature and submit route locations. This data is the basis for creating system features and information available in the system. The following is a list of questionnaire answers that have been shared:

Table 1. List of respondents questions and answers based on questionnaires

No	Question	Answer Options	Number of Respondents
1.	What is the average distance you run on average?	Less than 3 km	32
		3 – 5 km	40
		6 -1 0 km	23
		More than 10 km	5
2.	How important do you think information about the route or location of the run is?	Very important	56
		Important	31
		Quite Important	14
		Not Important	1
3.	Do you often face difficulties in finding safe and varied running routes?	Sometimes	52
		Yes	31
		No	19
4.	How often do you search for or use information about running routes on the internet?	Sometimes	54
		Yes	24
		No	24
5.	Do you think that this *website* that provides running information will be useful for runners in North Sulawesi?	Very Useful	57
		Useful	33
		Quite Useful	11
		Not Useful	1
6.	If available, are you interested in using this *website* to find recommendations for running routes in North Sulawesi?	Very Interested	45
		Interested	42

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		Quite interested	14
		Not Interested	1
7.	What features do you think are important to provide in this *website*? (Select all that apply)	Recommended Safe Running Routes	68
		Calendar Event	23
		Facility Information around Running Location	4
		Running Community Profile	3
		All Important	4

Based on the results of interviews, questionnaires (Table 1), observations, and social media searches, three main features were created in the system, namely community profiles, event calendars, and route locations, which became the main menu on the website. In addition, two additional features were added, namely submit events and submit route locations, to make it easier for organizers and users to share information. Although there have been no direct interviews with the venue manager, the location submit feature was still created as a first step to capture user participation, with a verification system by the admin to maintain the validity of the data.

3.2 Design

The design stage visualizes the structure and workflow of the system to be created using UML and creates an interface that supports ease of use [16].

3.2.1 Use Case Diagram

This Use Case Diagram (Figure 2) illustrates the interaction between Admins, Users, Event Organizers, and Route Managers based on the predetermined functional needs of the system.

Figure 2. Use Case Diagram

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Based on Figure 2, there are four main user roles: Admin is fully responsible for data management (*events*, route locations, communities), incoming messages, and confirmation of new submissions; Users focus on accessing information related to *events*, routes, communities, and can send messages; Event Organizers have the ability to submit new *event* data and communicate with admins; while Route Managers can submit new route location data and coordinate with admins, ensuring that all parties can interact effectively with the system according to their respective roles.

3.2.2 Activity Diagram

Activity Diagrams describe the flow of user and system activity in performing key functions [17]. This diagram helps visualize the process in the Website-Based Running Sports Information System in North Sulawesi. For example, can see the activity diagram when the admin logs in in Figure 3.

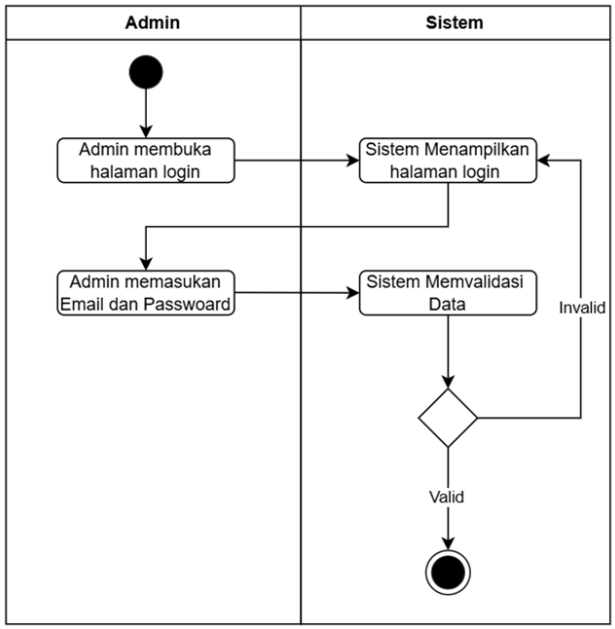

Figure 3. Activity Diagram Web Admin Login Process

Figure 3 shows the admin login flow. The process starts when the admin opens the login page and enters the email and password. The system validates the data entered. If it's invalid, the login page is displayed again. If valid, the admin successfully logs in to the system.

3.2.3 User Interface Design

The interface design of this website was made to support the promotion and management of information about running activities in a structured manner. Each page is made to be easy to use by a wide range of people, with a simple, responsive, and consistent layout. The following is the page on the website (Figure 4).

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Figure 4. Event Page Interface Design

The Events page interface design (Figure 4) displays a list of running activities in a table format complete with categories, locations, and organizers. When one of the events is clicked, full details such as name, date, and additional information will appear. The design is informative and still maintains consistency with the rest of the page.

3.3 Coding

3.3.1 Admin Page View

For example, on the route description page in the admin system (Figure 5) which displays an interactive map using openstreetmap and leaflets. The blue line indicates a predetermined running route, with the starting point marker in blue. There are facilities icons around the route. On the left side of the map, you'll find buttons to edit, delete, and zoom the map. The bottom custom route update button is used to save changes to routes that have been created.

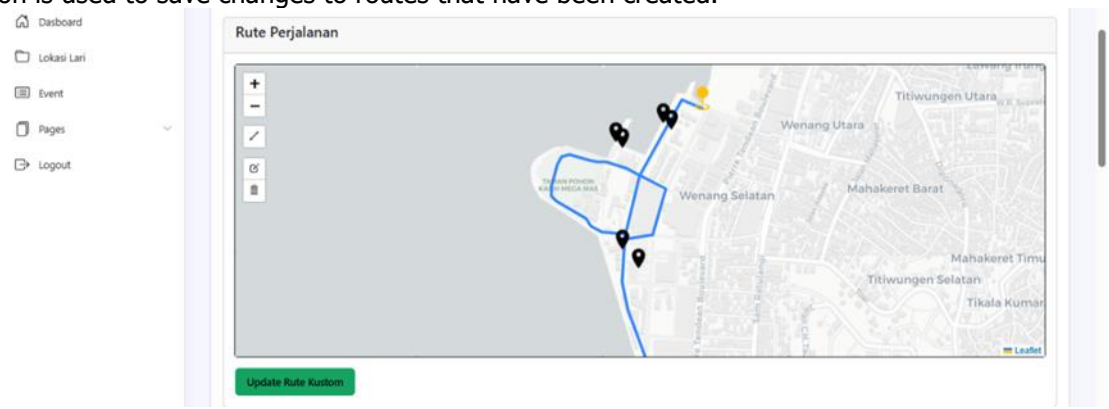

Figure 5. Route Page View

3.3.2 User Page View

For example, the event calendar page (Figure 6) displays a list of running events that will take place in North Sulawesi. On this page, users can find information about the event schedule, implementation locations, and available competition categories.

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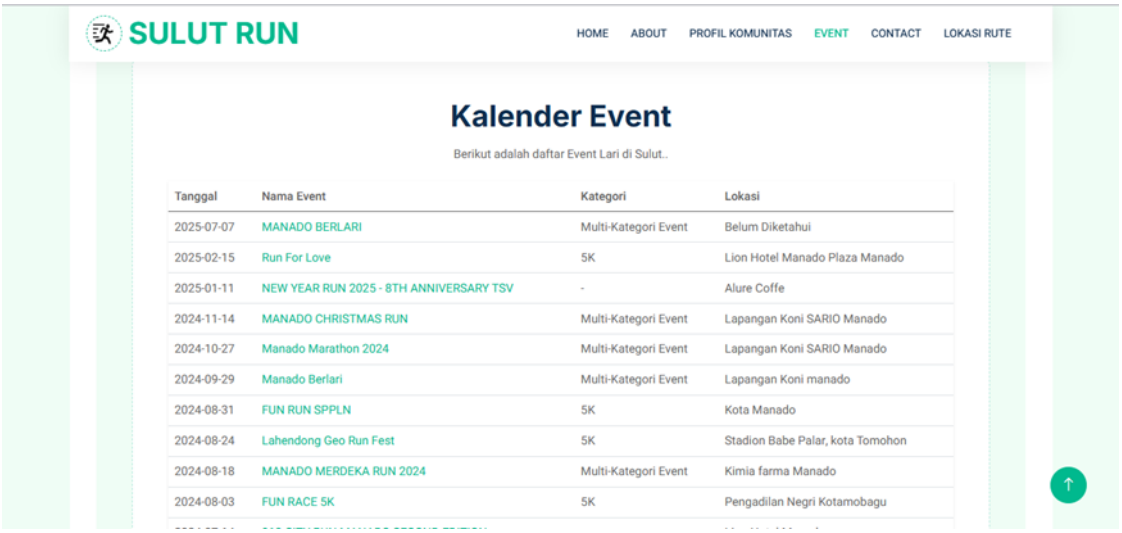

Figure 6. Event Calendar Page View

3.4 Testing

System testing is done to ensure that each feature performs according to its function. The test is carried out using the Black Box Testing method, which is testing the system function from the user side without looking at the internal code structure [18]. Testing was carried out on all major features, both from the general user and admin side. In addition to functional testing, user testing is also carried out to evaluate the level of satisfaction, ease of use, and clarity of information in the system that has been developed. This user test involved 50 respondents representing the target users of the system, using a questionnaire that covered aspects of interface appearance, navigation, feature functionality, and overall experience. The results of the test are as follows:

4.4.1 Testing for Pages *Admin*

Table 2. Login Testing

No	Features Tested	Scenario	Expected results	Tested Results	Successful/ Unsuccessful
1.	*Successful login* with valid data	Enter email and *password*	System redirects to the homepage/*dashboard*	The system successfully entered the home page	Succeed
2.	*Login* failed due to incorrect email or *password*	Not entering email or *passwoard* only inputs one of them	The system displays the phrase "*wrong password* " or "Email not found" and stays on the same page	The system manages to display the phrase "*wrong password* " or "Email not found" and stays on the same page	Succeed
3.	Email is filled but *password* is blank	Input emails and not *password input*	The system displays the phrase "*please fill out this field*" and stays on the same page	The system successfully displays the phrase "*please fill out this field*" and remains on the same page	Succeed
4.	*Password* filled in but email blank	Enter passwords and don't enter emails	The system displays the phrase "*please fill out this field*" and stays on the same page	The system successfully displays the phrase "*please fill out this field*" and	Succeed

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			remains on the same page		

Table 3. Running Location Page Testing

No	Features Tested	Scenario	Expected results	Tested Results	Successful/ Unsuccessful
1.	Added features Route location	Enter all the data on the *form (popup)* without missing a single one and click save	Data is stored and appears in a table within the Run locations page	The data is successfully saved and appears in the table within the Run locations page	Succeed
		The data entered in the *form (popup)* is incomplete and click save	The system displays the phrase "*please fill out his field*" and remains in the form	System Succeeds Displays the phrase "*please fill out his field*" and remains in the form	Succeed
2.	Route Drawing Features	Click the *drawing icon* then start Draw the line from the starting point to the end point, after that adjust and tidy up the line of the route points and save it by clicking on "Update Custom Route"	System Saves Routes drawn and displayed on the Route location page on the admin page and user page	System Saves Routes drawn and displayed on the Route location page on the admin page and user page	Succeed
3.	Facility Add-on Features	Enter the facility data on the *form* (popup) and click save	The data is saved and a facility sign icon will appear on the map	The data is saved and a facility sign icon will appear on the map	Succeed
4.	Photo Gallery Features	Enter a description and photo and click save	Photo data is stored and will appear on the Route location page on Admin and user	The data of the successful photo is saved and will appear on the Route location page on Admin and user	Succeed
5.	Edit and add route location data	Click the edit icon and replace the data you want to replace and then click save	New data is successfully saved	New data is successfully saved	Succeed
6.	Delete Feature	Click the delete icon to delete the data that needs to be deleted	Successfully delete data that needs to be deleted	Successfully delete data that needs to be deleted	Succeed

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Table 4. Event Page Testing

No	Features Tested	Scenario	Expected results	Tested Results	Successful/ Unsuccessful
1.	Event plus features	Enter all the data on the form (popup) without missing a single one and click save	Data is stored and appears in a table within *the event page*	The data is successfully saved and appears in the table within *the event page*	Succeed
		The data entered in the form (popup) is incomplete and click save	The system displays the phrase "*please fill out his field*" and remains in the *form*	System Succeeds Displays the phrase "*please fill out his field*" and remains in the *form*	Succeed
2.	Edit and add route location data	Click the edit icon and replace the data you want to replace and then click save	New data is successfully saved	New data is successfully saved	Succeed
3.	Delete Feature	Click the delete icon to delete the data that needs to be deleted	Successfully delete data that needs to be deleted	Successfully delete data that needs to be deleted	Succeed

Table 5. Testing Pages

No	Features Tested	Scenario	Expected results	Tested Results	Successful/ Unsuccessful
1.	Incoming Messages	Read incoming messages from users and reply to them	Replies sent to the user page	Reply sent successfully	Succeed
2.	Book New Routes	Verify the Run route submitted by the user (runner/bidder)	Verified route data is successfully saved and displayed on the Route Location page	Verified route data is successfully saved and displayed on the Route Location page	Succeed
3.	Book *a new* event	Verify new events submitted by users (runners/vendors)	Verified event *data* is successfully saved and displayed on *the event page*	Confirmed event *data* is successfully saved and displayed on the *event page*	Succeed
4.	Replace *passwoard* and email	Change your *password* and new email and click save	The system validates and successfully changes *the password* or new email	The system validates and successfully changes *the password* or new email	Succeed

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3.4.2 Testing for User Pages

Table 6. Home Page Testing

No	Features Tested	Scenario	Expected results	Tested Results	Successful/ Unsuccessful
1.	Button "Browse more Community"	Click the *"Browse more Community" button*	System displays the Event calendar page	The system successfully displays the Event calendar page	Succeed
		Click the *"Browse more Community"* button	The system displays the Route Location page	The system successfully displays the Route Location page	Succeed
		Click the *"Browse more Community" button*	System displays the Community Profile page	The system successfully displays the Community Profile page	Succeed
2.	"Explore Location" button	Clicking the "Explore Location" button	The system displays the Route Location page	The system successfully displays the Route Location page	Succeed
3.	Event Name	Click the *event* name on the *event calendar*	The system displays *the event description page*	The system successfully displays *the event description page*	Succeed
4.	Route Rental	Click on one of your Route location profiles	The system displays the Route Location profile	System successfully displays Profile of the Location of the Route	Succeed
5.	Community Profile	Click on one of the community profile profiles	The system opens social media profiles of the community	The system successfully opened the social media profile of the community	Succeed

Table 7. Community Profile Page Testing

No	Features Tested	Scenario	Expected results	Tested Results	Successful/ Unsuccessful
1.	"Social Media" Icon	Click on the "social media icon" present in the community profile	The system displays social media Runner community	The system successfully displays social media Runner community	Succeed

Table 8. Event Page Testing

No	Features Tested	Scenario	Expected results	Tested Results	Successful/ Unsuccessful
1.	Event Name	Click the *event* name on the *event calendar*	The system displays *the event description page*	The system successfully displays *the event description page*	Succeed

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Table 9. Contact Page Testing

No	Features Tested	Scenario	Expected results	Tested Results	Successful/ Unsuccessful
1.	Send a message	Enter your name, email, subject and message for the admin and click the "send messege" button to send the message	System sends a message to the admin	The system successfully sent a message to the admin	Succeed
2.	Submit *Event Features*	Enter all the required data on the form and then click save *event*	The system sends *event data* to the admin for verification before it is displayed on the *website*	The system successfully sends *event data* to the admin for verification before it is displayed on the *website*	Succeed
3.	Running Location Submit Feature	Enter all the necessary data on the form and then click save Run Location	The system sends the Route Location data to the admin for verification before it is displayed on the *website*	The system successfully sends the Route Location data to the admin for verification before displaying it on the *website*	Succeed

Table 10. Running Location Page Testing

No	Features Tested	Scenario	Expected results	Tested Results	Successful/ Unsuccessful
1.	Route Location Profile	Click on one of your Route location profiles	The system displays the Route Location profile	The system successfully displays the Route Location profile	succeed

Based on Tables 2 to 9, the functional evaluation of the system conducted using the Black Box Testing method shows optimal performance. Of the total 31 test scenarios covering the login feature, route location management, events, messages, and user interactions on the main and contact pages, all showed a Succeed status without any failures. Thus, overall, the test results achieved a 100% success rate, validating that all system functions ran validly in accordance with the expected design specifications.

3.4.3 User Test Results

Table 11. User test results

No	Question	Answer	Total
1.	What do you think about the initial appearance *(homepage)* of this website?	Very interesting	34
		Quite interesting	16
		Less attractive	0

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		Unattractive	0
2.	Do you find it easy to find the menu you are looking for on *this website* (*Home, About, Event*, Running Location, *contact*)?	It's easy	36
		Pretty easy	14
		Difficult	0
		Very difficult	0
3.	Do you think the information displayed on the *Home page* is clear enough to represent the content of all the other menus?	Yes, it's very clear	23
		Pretty obvious	27
		Less obvious	0
		Unclear	0
4.	How easy is it for you to understand the content of the *About page* which contains general information about running?	It's easy	40
		Pretty easy	10
		Somewhat Difficult	0
		Difficult	0
5.	Are the social media icons on the Community Profile page working properly and pointing to the community's social media correctly?	Yes	49
		Not	1
6.	Does the calendar on the events page make it easy for you to see the schedule and information *of running events*?	Very helpful	31
		Quite helpful	19
		Less Helpful	0
		Not Helpful	0
7.	How easy is it for you to use the send message feature on the contact page?	It's easy	35
		Pretty easy	15
		Somewhat Difficult	0
		Difficult	0
8.	Is the event and "*Submit* Running Location" features on the contact page clearly visible and easy to use for the organizer or manager?	It's Very Easy	28
		Pretty Easy	12
		A bit difficult	9
		Difficult	1
9.	Does the running location menu make it easier for you to get route information?	It's Very Easy	32
		Pretty Easy	16
		Somewhat Difficult	2
		Difficult	0
10.	Overall, did you find the experience of using this *website* pleasant and easy to understand?	Very fun	32
		Quite fun	17
		Ordinary	1
		Unpleasant	0

The percentage of user test results according to Table 10, which was conducted to evaluate the level of satisfaction, ease of use, and clarity of information in the system, is shown in Figure 7 below.

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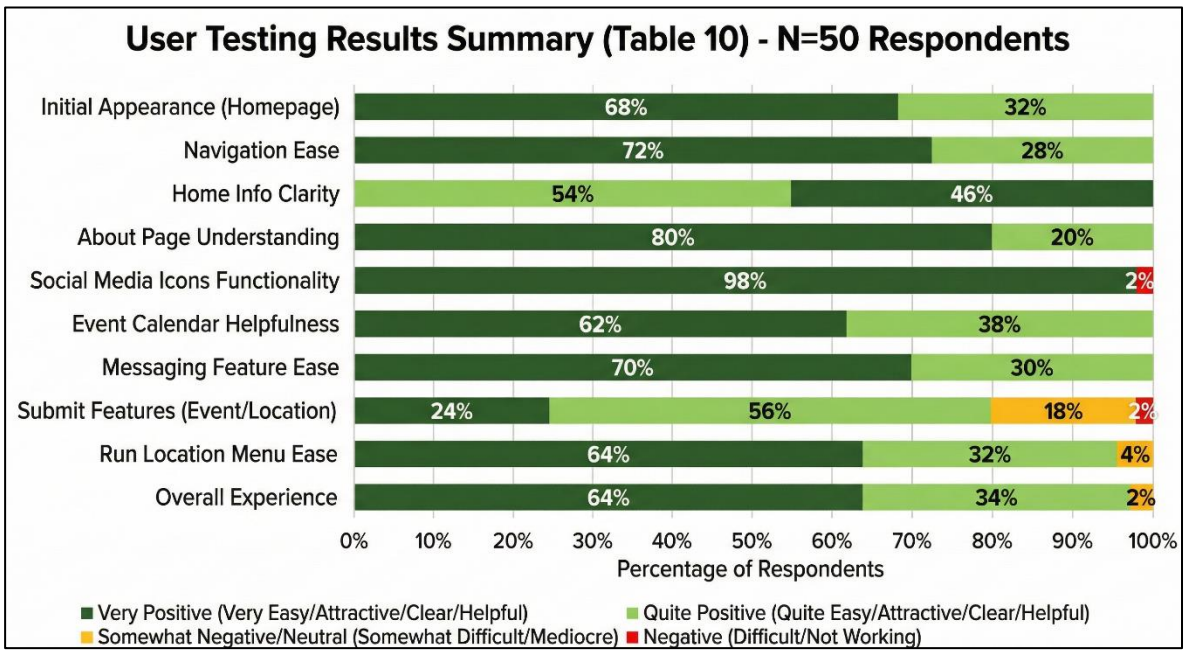

Figure 7. Persentage User Testing Results Summary

Based on Figure 7 results from user testing:

1. Most users give a positive rating to the initial appearance *of the website (homepages).* A total of 34 respondents (68%) rated it very attractive, and 16 respondents (32%) considered it quite attractive. No one rated the display as lacking or unattractive, which suggests that the initial interface design was quite attractive and in line with user expectations.
2. The results showed that 36 respondents (72%) found it very easy to find the menu they needed (*Home, About, Event*, Run Location, *contact*), while 14 respondents (28%) found it quite easy. None of the respondents found it difficult. This indicates that the navigation structure is good and intuitive.
3. The majority of respondents (54%) consider that the information presented on the *Home* page is quite clear, while 46% say it is very clear. This proves that *the Home* content has managed to represent the contents of the other menus well.
4. As many as 40 respondents (80%) found it very easy to understand the information on the About page , and the rest (20%) answered quite easily. This shows that general information about running sports is conveyed in a simple and easy-to-understand manner for users.
5. A total of 49 respondents (98%) stated that social media icons work well and lead to appropriate community accounts. This reflects the success of integrating social media elements in supporting connectivity with the running community.
6. A total of 31 respondents (62%) found the *event* calendar very helpful in viewing *the event schedule,* while 19 respondents (38%) found it quite helpful. This indicates that the calendar feature is quite effective in conveying *event information,* but it can still be improved in terms of visual or interactive.
7. A total of 35 respondents (70%) answered very easily, and 15 respondents (30%) answered quite easily in using the messaging feature. This shows that these communication features are easily accessible and used by common users.
8. The submit *event* and submit location features received mixed responses: 28 respondents (56%) rated it quite easy, 12 respondents (24%) found it very easy, 9 respondents (18%) found it somewhat difficult, and 1 respondent (2%) stated *that it was difficult*. This indicates that while the feature can be used, there is still a need for improved display or placement to make it more accessible to all organizers/managers.

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9. As many as 64% of respondents stated that the Lari location menu is very easy to use to get route information, and 32% found it quite easy. Only 4% answered somewhat difficult, and none of the respondents found it to be significantly difficult.

The majority of users (64%) stated that the experience of using *this website* was very pleasant, 34% found it quite enjoyable, and only 1 respondent (2%) stated that it was mediocre. This shows that the system has given a general positive impression to the user.

4. CONCLUSION

This website was created as a web-based information media that provides data related to the running community, event calendar, and location of running routes in the North Sulawesi region. This website was created based on data obtained through interviews, questionnaires, observations, and social media searches. The information collected is then processed and used as the basis for the creation of the main features of the website. This website consists of five main menus, namely Home, Community Profile, Event Calendar, Contact, and Running Location. Through these features, users can access complete running route information, including location descriptions, route difficulty, nearby facilities, and mileage. In addition, users can also get information related to the latest running events and registered running communities. Event organizers and route managers are also facilitated to submit new event and route information that will be published, after going through the identity confirmation process by the admin. As for the admin side, the system is equipped with a special menu consisting of Dashboard, Running Location, Events, Event Submenus, Messages, Routes, and Accounts. Through this menu, admins can perform various management functions, such as adding route locations, drawing route paths, input facility data and location photos, adding event information along with post links, verifying event data and routes sent, and responding to messages from users. All features and functions in the website have been tested using the Blackbox method and proven to work well according to their respective roles. In addition, tests are also carried out from the user side through questionnaires to assess aspects of comfort, ease of navigation, clarity of information, and overall satisfaction with the use of the website.

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