

# Design and Development of a CMS-Based School Website Integrated with a 360° Virtual Tour Using the Waterfall Method at SDN Gadungan 02

Balya Ahmad Waffa<sup>1</sup>, Saiful Nur Budiman<sup>2</sup>, Wahyu Dwi Puspitasari<sup>3</sup>  
Informatics Engineering Study Program, Faculty of Engineering and Informatics, Universitas Islam Balitar

The utilization of information technology in education plays a crucial role in supporting the openness and equal distribution of information. SDN Gadungan 02, located in Blitar Regency, does not yet have an official digital platform, resulting in manual and limited methods of information delivery and school promotion. This study aims to design and develop a school website based on a Content Management System (CMS) integrated with a 360° Virtual Tour feature as an informative and interactive digital solution. The methodology used is the Waterfall model, comprising analysis, design, implementation, and testing phases. The technologies employed include React JS for the interface, Express JS and PostgreSQL for the backend, and React-Pannellum for displaying 360° panoramas. The website supports two user roles: admin and general users. Its main feature, the 360° Virtual Tour, allows visitors to explore the school environment online. Blackbox testing using the All-Pair technique showed a success rate of 94.87%, while Whitebox testing with the basis path technique resulted in a Cyclomatic Complexity score of 15, indicating moderate complexity. Closed Beta Testing by IT experts and internal users recorded satisfaction rates of 91.25% and 85%, respectively, while Open Beta Testing with 50 respondents yielded 84.75% satisfaction. The website is considered feasible, functional, accessible, and capable of delivering a strong digital experience. Its presence is expected to support information transformation and enhance the school's image and competitiveness in the digital era.

**Keywords:** Virtual Tour 360°, React JS, Express JS, *Waterfall*, React-Pannellum.

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## Corresponding Author:

Balya Ahmad Waffa

Informatics Engineering Study Program, Faculty of Engineering and Informatics, Universitas Islam Balitar

balyaahmad133@gmail.com

## 1. Introduction

The utilization of information technology has become a fundamental necessity in the current era of digitalization, including within the education sector. As educational institutions, schools play a strategic role in providing accurate, relevant, and easily accessible information to students, parents, and the wider community. One of the most effective media to bridge information dissemination and promotional needs is through a school website. The presence of a school website can support the delivery of information more accurately and efficiently. With such a platform, schools no longer need to spend excessive time disseminating information, as it can be accessed directly through the website. Moreover, the website can serve as a promotional medium to enhance the school's visibility to the public [1]. In line with this, a school website not only functions as an information center but also as a promotional tool to increase the attractiveness of the school to prospective students and parents [2].

However, based on interviews with Mr. Malik Sugiarto, the principal, and Ms. Della Purwaningsih, the school operator, UPT SD Negeri Gadungan 02 in Blitar Regency does not yet have an official website to support information dissemination and school promotion. Information regarding school activities, facilities, and achievements is currently conveyed through circular letters, bulletin boards, parent meetings, and WhatsApp groups. As a result, the dissemination of information is limited and does not effectively reach the broader community, particularly prospective students from outside the school's immediate area [3].

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The absence of a website also impacts the effectiveness of school promotion. In line with this issue, [4] state that schools without digital media tend to struggle in competing with institutions that actively utilize technology to promote their strengths. Furthermore, research by [5] indicates that the presence of a school website can increase the effectiveness of information dissemination by up to 96.67%, making it a strategic tool for communication and promotion.

Innovation in website development can further enhance its appeal through the integration of modern features, such as a 360-degree Virtual Tour. This technology allows visitors and prospective stakeholders to explore the school environment interactively without physically visiting the location. [6] argue that Virtual Tour features provide an engaging and informative experience, particularly for prospective students and parents located far from the school. Similarly, [7] highlight that the 360-degree Virtual Tour facilitates access to detailed and accurate information regarding school facilities while offering a modern exploration experience. Unlike conventional media such as text, photos, or videos, this technology enables users to experience a realistic simulation through panoramic 360-degree visuals [8]. This approach is particularly relevant given the limited availability of parents to visit the school directly due to occupational constraints such as farming, livestock work, overseas employment, or sand mining activities.

In addition to innovative features, a website requires supporting technology for efficient content management, such as a Content Management System (CMS). CMS enables schools to update content independently without requiring advanced technical expertise. This aligns with [9], who state that CMS functions as a system that facilitates content management and ensures up-to-date information delivery. By utilizing CMS, website maintenance becomes more structured and organized, ensuring the availability of current information. [10] further emphasize that CMS offers flexibility, robust security systems, and ease of integration with various digital media. This is particularly relevant for SDN Gadungan 02, which faces limitations in IT expertise, making CMS an appropriate solution for managing web-based information efficiently without complex programming. Furthermore, the development of an attractive and responsive user interface is essential to provide an optimal user experience. React JS technology can serve as an effective solution for building a simple yet dynamic interface, enabling the creation of reusable components that enhance efficiency in development [11].

In website development, a structured approach or method is required to ensure systematic design and implementation [12]. One suitable method is the Waterfall model, which provides a sequential process consisting of analysis, design, coding, testing, and support stages [13]. This approach minimizes potential errors by ensuring that each phase is completed in the correct order. According to [14], the Waterfall method is particularly suitable for projects with clearly defined and stable requirements, such as school website development. Since the objectives and scope are generally established from the outset, this method helps prevent significant changes during development. Although it has limited flexibility, the Waterfall model is effective for projects with well-defined requirements and relatively low risk, as well as shorter development timelines [15].

Based on the background described above, this study is titled "Design and Development of a CMS-Based School Website Integrated with a 360-Degree Virtual Tour Using the Waterfall Method at SDN Gadungan 02," which aims to support digital transformation in the education sector and facilitate more effective and widespread information dissemination by the school.

## 2. Literature Review

School websites have become an essential component of digital transformation in education because they facilitate information dissemination, communication, and institutional promotion [16]. Research shows that

website implementation improves the accessibility and effectiveness of school information while strengthening the institution's public image [17]. Furthermore, the use of a Content Management System (CMS) enables schools to manage website content efficiently without requiring advanced technical expertise, making information updates more structured and sustainable [18]. To ensure systematic development, the Waterfall method is widely applied in educational information systems due to its sequential and organized development stages [19].

In addition, 360° Virtual Tour technology has been recognized as an effective medium for providing interactive and immersive experiences in introducing institutional environments [20]. Previous studies have highlighted its effectiveness in enhancing user engagement and supporting promotional activities through panoramic [21]. However, limited research has examined the integration of CMS-based school websites with 360° Virtual Tour features at the elementary school level [22]. Therefore, this study addresses the gap by developing an integrated platform for SDN Gadungan 02. Based on this gap, the research problem is formulated as follows: (1) How can a CMS-based school website integrated with a 360° Virtual Tour be developed using the Waterfall method? and (2) How effective is the developed system in supporting information dissemination, school promotion, and user satisfaction?.

### 3. Methods

This study employs a Research and Development (R&D) approach with the Waterfall system development model to produce a CMS-based school website integrated with a 360° Virtual Tour. The development process is carried out systematically through the stages of requirements analysis, design, implementation, and testing. Data collection was conducted through direct communication with the school using interviews, observations, questionnaires, literature review, and documentation to understand needs and existing problems. The data used consist of primary data (such as 360° panoramic photos captured directly by the researcher) and secondary data (including school profile, teacher data, activities, and student achievements). Data collection instruments include observation guidelines, semi-structured interview guides, and documentation. The findings indicate that the school previously relied on conventional promotional media, resulting in suboptimal information dissemination and poorly documented school activities and achievements.

### 4. Result and Discussion

#### Implementation Results

The third stage in system development using the Waterfall method is the implementation phase. In this stage, the system was developed using the React JS library for the frontend, which is a JavaScript-based library, while the server-side (backend) was developed using the Node.js framework, specifically Express JS. The system was then built based on the previously designed structure and system architecture.

### 360° Panorama Photo Creation



Figure 1. Use of Insta360 Camera Connected to a Smartphone



Figure 2. Insta360 Studio Interface When Importing DNG Images



Figure 3. 360° Panorama Export Process



Figure 4. Result of Insta360 X3 Camera Capture

### Server-Side (Backend) Integration



Figure 5. API Endpoint Integration Using Postman

## User Interface (Frontend) Integration

### 1. Login Screen Page



Figure 6. Login screen when first accessing the website

### 2. Home Page



Figure 7. User Home page display

### 3. 360° Virtual Tour Page



Figure 8. User Virtual Tour 360 page display

### 4. School Profil Page



Figure 9. User School Profile page display

5. History Page



Figure 10. User History page display

6. Vision, Mission, and Goals Page



Figure 11. Vision, Mission, and Goals page

7. Teacher and Staff Page



Figure 12. Teachers and Staff page display of SDN Gadungan 02

8. News and School Information Page



Figure 13. User News and Information page display

9. News and Information Detail Page



Figure 14. Detailed News and Information page display

10. Login Page



Figure 15. Login page display

11. Admin Dashboard Page

Figure 16. Dashboard Page

12. Edit Vision, Mission, and Goals Page



Figure 17. Super Admin edit page for vision, mission, and goals

13. Edit History Page



Figure 18. Super Admin edit history page

14. Add Post Page (Admin)



Figure 19. Super Admin News and Information management page

15. Add News and Information Modal



Figure 20. Modal for adding news and school information

16. Edit User Modal



Figure 21. Modal for editing news and information

17. 360° Virtual Tour Management Page



Figure 22. Virtual Tour management page

18. Add Virtual Tour Modal



Figure 23. Modal for adding Virtual Tour

19. Add Hotspot Modal



Figure 24. Modal for adding hotspot

20. Edit Hostpot Modal



Figure 25. Modal for editing hotspot

21. Account Management Page



Figure 26. Account management page

## Testing Results

### Black Box Testing Using the All-Pair Testing Technique

All-Pair Testing is a method within Black Box Testing used to identify system defects through combinations of different inputs while minimizing the number of test cases. In the SDN Gadungan 02 School Website, Design and Development of a CMS-Based School Website Integrated with a 360° Virtual Tour Using the Waterfall Method at SDN Gadungan 02. Balya Ahmad Waffa et.al

All-Pair Testing was applied to main pages such as Home, Vision and Mission, School Profile, 360° Virtual Tour, and News & Information. Each feature was tested based on combinations of user interactions with user interface (UI) elements, such as navigation buttons, content display, and system responses to input.

**Table 1.** Black Box Testing Results – Home Page

ID	Test Case	Testing Steps	Expected Result	Actual Result	Status
HO1	Access Home page	User opens the SDN Gadungan 02 website URL	Home page displays header, heroAs section, vision & mission, and news	As expected	Valid
HO2	Check hero section display	User views the top section (hero)	“Welcome to SDN Gadungan 02” text appears with action buttons (Profile, Contact)	As expected	Valid
HO3	Navigate “School Profile” button	User clicks Profile menu	Redirected to school profile page	As expected	Valid
HO4	Navigate “Contact Us” button	User clicks “Contact Us” button in hero section	Redirected to school contact link page	As expected	Valid
HO5	Display Vision, Mission & Goals	User scrolls to section	Vision, Mission, and Goals displayed clearly	As expected	Valid
HO6	Navigate to Posts	User clicks Posts menu	Posts page displays list of articles/news	As expected	Valid
HO7	View post detail	User clicks a post	Post detail page displays complete information	As expected	Valid
HO8	Search posts	User inputs keyword in search field	Relevant posts appear in search results	As expected	Valid
HO9	Mobile responsiveness	User accesses website via mobile	Layout adapts and functions properly	As expected	Valid
HO10	Loading screen	User refreshes page	Loading screen appears	As expected	Valid

The table above presents the results of system testing on the Home page. Testing was conducted based on predefined scenarios for each main feature. Each test case that produced expected output was declared valid. Overall, Black Box testing using the All-Pair Testing technique achieved a validity rate of 94.87%, indicating that the system functions effectively across various input combinations, although minor improvements are still needed.

**White Box Testing Using the Basis Path Technique**

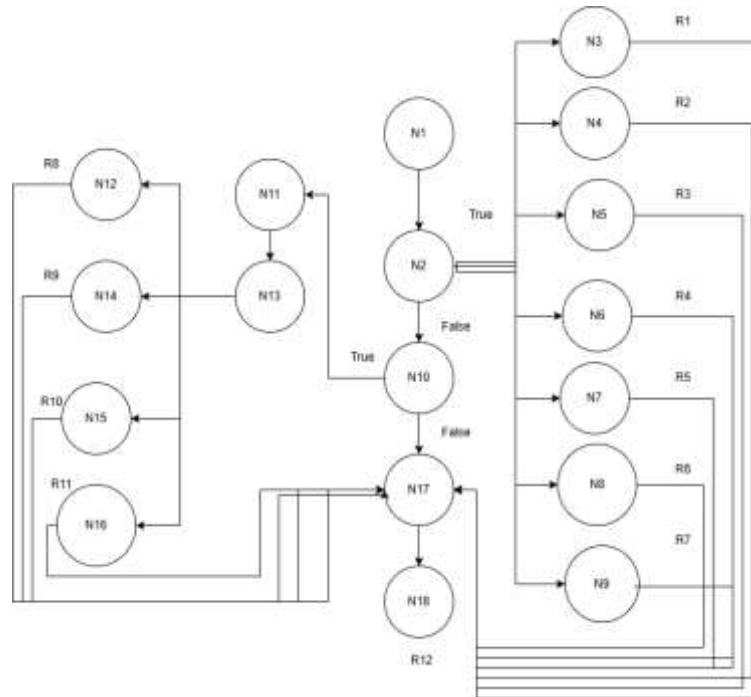
The second testing method applied is White Box Testing using the Basis Path technique. This testing aims to verify the internal logical control structure of the application, including branching and user navigation flows. This method is particularly suitable for testing routing components, as navigation and authentication depend on logical conditions.

**Table 2.** Node Identification in Program Code

Program Code	Routing Description	Node
function App() { if (loading) { return <SplashScreen... onComplete={() => setLoading(false)}	Displays splash screen during loading	N1

Program Code	Routing Description	Node
<Routes> <Route path="/" element={<Layout />} > <Route index element={<HomePage />} />	Displays Home Page	N2
<Route path="postingan" element={<FeedPage />} />	Displays posts page	N3
<Route path="postingan/id" element={<DetailFeedPage />} />	Displays post detail	N4
<Route path="sejarah-sekolah" element={<HistoryPage />} />	Displays school history	N5
<Route path="virtual-tour" element={<VirtualTourPage />} />	Displays virtual tour	N6
<Route path="visi-misi" element={<VisiMisiPage />} />	Displays vision & mission	N7
<Route path="sambutan-kepala-sekolah" element={<HeadSpeechPage />} />	Displays principal's speech	N8
<Route path="daftar-guru" element={<TeacherPage />} />	Displays teacher list	N9
<Route path="login" element={<LoginPage />} />	Displays login page	N10
<Route path="/admin" element={<LayoutAdmin />} > path="kelola-postingan"	Wraps admin routes	N11
path="dashboard"	Manage posts	N12
path="kelola-pengguna"	Admin dashboard	N13
path="kelola-guru"	Manage users	N14
path="kelola-virtual-tour"	Manage teachers	N15
<Route path="*" element={<NotFoundPage />} />	Manage virtual tour	N16
<Route path="*" element={<NotFoundPage />} />	Displays 404 page	N17
} root.render(...<App />...)	Application executed in browser	N18

The table above shows node identification used to construct the flow graph. The flow graph diagram represents the logical control flow of the routing structure in the SDN Gadungan 02 website. Each node represents an important logical point, while edges represent execution paths between nodes. This analysis confirms that the system has a structured navigation flow and can be systematically evaluated to ensure reliability and correctness.



**Figure 27.** Flow Graph Diagram for White Box Testing (Main Code)

The figure above represents a flow graph consisting of 18 nodes. Among these nodes, there are 3 predicate nodes (P), namely N2, N10, and N17. The edges represent the execution flow of the program, totaling 31 edges. These nodes have more than one outgoing path, indicating the presence of logical branching within the program flow. Additionally, the number of routes (R), or paths connecting nodes in the flow graph, is recorded as 12.

The next step is calculating Cyclomatic Complexity. Cyclomatic Complexity is a metric used to measure the logical complexity of a program. This metric is calculated based on the number of predicate nodes, nodes, and edges in the flow graph. The formulas used are:

$$V(G) = P + 1 = 3 + 1 = 4$$

$$V(G) = E - N + 2 = 31 - 18 + 2 = 15 \quad V(G) = R = 15$$

**Table 3.** Graph Matrix for White Box Testing (Main Code)

	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13	N14	N15	N16	N17	N18	Total
N1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
N2	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	9
N3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
N4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
N5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
N6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
N7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
N8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
N9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
N10	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	2
N11	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
N12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
N13	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	4
N14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
N15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
N16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1
N17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
N18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	11	2	31

Based on the Cyclomatic Complexity calculation and the graph matrix, the number of independent paths for the routing system is identified as 12. The independent paths are as follows:

**Table 4.** Independent Paths for White Box Testing (Main Code)

Path Code	Path Description
R1	N1 - N2 - N3 - N17 - N18
R2	N1 - N2 - N4 - N17 - N18
R3	N1 - N2 - N5 - N17 - N18
R4	N1 - N2 - N6 - N17 - N18
R5	N1 - N2 - N7 - N17 - N18
R6	N1 - N2 - N8 - N17 - N18
R7	N1 - N2 - N9 - N17 - N18
R8	N1 - N2 - N10 -N11 - N13 - N12- N17 - N18
R9	N1 - N2 - N10 -N11 - N13 - N14- N17 - N18
R10	N1 - N2 - N10 -N11 - N13 - N15- N17 - N18
R11	N1 - N2 - N10 -N11 - N13 - N16- N17 - N18
R12	N1 - N2 - N10 - N17 - N18

Based on the calculation results, the highest Cyclomatic Complexity (CC) value obtained is 15. Referring to the classification table, this indicates that the routing logic structure of the SDN Gadungan 02 website is moderately complex and has a medium risk level. This means the system contains a moderate level of logical conditions and branching, requiring deeper understanding during debugging and maintenance. After determining the independent paths, the next step is creating test cases and executing testing.

**Table 5.** White Box Testing Results (Main Code)

No	Path Code	Test Case	Expected Result	Status
1	R1	User accesses root '/' and clicks "Posts" menu	FeedPage (N3) is displayed	Valid
2	R2	User opens "Post Detail" via URL /postingan/:id	DetailFeedPage (N4) is displayed	Valid
3	R3	User opens "School History"	HistoryPage (N5) is displayed	Valid
4	R4	User opens "Virtual Tour"	VirtualTourPage (N6) is displayed	Valid
5	R5	User opens "Vision and Mission"	VisiMisiPage (N7) is displayed	Valid
6	R6	User opens "Principal's Speech"	HeadSpeechPage (N8) is displayed	Valid
7	R7	User opens "Teacher List"	TeacherPage (N9) is displayed	Valid
8	R8	User opens "Login" and accesses "Admin > Manage Posts"	LoginPage (N10) is displayed	Valid
9	R9	Access "Admin > Manage Users"	ManageUserPage (N14) is displayed	Valid
10	R10	Access "Admin > Manage Teachers"	ManageTeacherPage (N15) is displayed	Valid
11	R11	Access "Admin > Manage Virtual Tour"	ManageVirtualTourPage (N16) is displayed	Valid
12	R12	User only opens "Login" menu	LoginPage (N10) is displayed	Valid

Based on the testing results of the routing system, a total of 12 independent paths (R1–R12) were tested. All paths were successfully executed and declared valid (pass), with no failures identified. Out of these, 5 paths involve error handling scenarios using fallback mechanisms, where users are automatically redirected to the NotFound page (N17). Additionally, 5 paths represent login processes and access to admin pages.

### Closed Beta Testing Results

Closed Beta Testing was conducted to evaluate system functionality and user experience before public release. This phase involved two main groups: IT experts and school representatives.

**Table 6.** Questionnaire Results from IT Expert Testing

No.	Close Beta Questionnaire Statement	Scoring				Total Score
		S	S	N	T	
1.	The website can be accessed easily without technical issues such as slow loading or error pages.	0	2	0	0	8
2.	The system displays confirmation before deleting content to prevent errors.	2	0	0	0	10
3.	The panorama image upload feature works properly when the admin adds new content.	1	1	0	0	9
4.	CMS features (add/edit/delete) function properly with minimal errors (vision, mission, goals, history, teachers, and staff).	1	1	0	0	9
5.	Navigation controls in the 360° Virtual Tour (zoom, movement, location switching) are easy to use.	1	1	0	0	9
6.	The login system functions properly and provides access according to user roles.	2	0	0	0	10
7.	The combination of colors, fonts, and icons is visually comfortable and not distracting.	1	0	1	0	8
8.	The website is compatible with popular browsers (Chrome, Firefox, etc.).	2	0	0	0	10
Total Nilai						73

The results of the Closed Beta testing by IT experts show a satisfaction level of 91.25%, indicating that the system falls into the very satisfied category. This demonstrates that most features and functionalities of the website operate as expected and meet usability, performance, and reliability standards from a technical perspective.

**Table 7.** End-User Questionnaire Results

No.	Close Beta Questionnaire Statement	Scoring				Total
		S	S	N	T	
1.	The website interface is attractive and reflects the school's identity.	2	0	0	0	10
2.	The information presented is easy to find and read.	1	1	0	0	9
3.	The content management process (news, images, teacher profiles, Virtual Tour 360) is easy to perform.	0	1	1	0	7
4.	Navigation controls in the 360° Virtual Tour are easy to use.	0	1	1	0	7
5.	The website menu makes it easy for users to find information.	1	1	0	0	9
6.	The website is feasible for official use after testing.	1	1	0	0	9
<b>Total</b>						<b>51</b>

The Closed Beta testing results from end users show a satisfaction level of 85%, categorized as satisfied. This indicates that most features and functionalities meet expectations and adequately fulfill usability, user experience, and reliability aspects from the general user perspective.

### Open Beta Testing Results

Open Beta Testing was conducted by involving 50 respondents, consisting of students, parents, teachers, and the general public. The questionnaire included 10 statements measured using a Likert scale with a maximum score of 5 points.

**Table 8.** Open Beta Testing Results

No.	Open Beta Statement	Scoring				
		SS	S	NTS	ST	Total
1.	The website can be accessed easily without technical issues.	19	29	1	0	216
2.	The website appearance is attractive and professional.	16	28	4	2	208
3.	The information is presented clearly and meets user needs.	20	26	3	1	215
4.	The 360° Virtual Tour feature runs smoothly without technical issues.	14	29	6	1	204
5.	The website and Virtual Tour can be accessed well on various devices.	18	29	1	2	213
6.	The combination of colors, fonts, and design elements is comfortable to view.	17	25	6	2	207
7.	The post search feature works according to input keywords.	12	28	8	2	200
8.	The website layout remains neat and consistent across devices.	15	29	5	1	208
9.	The website gives the impression that SDN Gadungan 02 is a modern and informative school.	28	17	2	3	226
10.	The website makes it easier to access school information online.	24	22	3	1	222
<b>Total</b>					<b>2119</b>	

The Open Beta testing results show a satisfaction level of 84.76%, which falls into the very satisfactory category. This indicates that the website is well accepted by users and effectively supports access to school information in a modern and interactive manner. The findings of this study are consistent with previous research that emphasizes the importance of school websites as effective media for information dissemination and institutional promotion. The high satisfaction levels obtained from Closed Beta Testing and Open Beta Testing support the findings of [23], which indicate that web-based platforms improve accessibility and communication effectiveness in educational institutions. Furthermore, the successful implementation of CMS features aligns with the studies of [24], demonstrating that CMS technology simplifies content management while maintaining information quality and consistency. Similarly, the integration of the 360° Virtual Tour feature supports the findings of [25], who reported that virtual tour technology enhances user engagement and provides a more interactive experience in introducing educational environments. However, unlike previous studies that focused on either website development or virtual tour implementation separately, this research combines both technologies into a single integrated platform, thereby offering a broader contribution to digital transformation in elementary education [26].

The observed results are generally in accordance with the theoretical framework underlying website usability, digital communication, and user experience [27]. The high success rate in Black Box Testing and the positive user responses indicate that the developed system fulfills its intended functions and meets user expectations. The positive acceptance of the Virtual Tour feature can be attributed to its ability to provide realistic visualization of school facilities, reducing the limitations of physical visits and increasing public access to information. Minor limitations identified during testing may be associated with variations in user devices, internet connectivity, and differences in digital literacy among respondents. Overall, the findings suggest that integrating CMS and 360° Virtual Tour technologies can effectively support information management, institutional promotion, and user engagement. These results provide preliminary evidence that such an integrated platform can serve as a practical solution for schools seeking to strengthen their digital presence and improve communication with stakeholders [28].

## 5. Conclusion

Based on the results and discussion of the study on the design and development of a CMS-based school website integrated with a 360° Virtual Tour using the Waterfall method at SDN Gadungan 02, the following conclusions can be drawn:

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1. The process of designing and developing the CMS-based school website integrated with a 360° Virtual Tour at SDN Gadungan 02 was successfully carried out systematically using the Waterfall method, through the stages of requirements analysis, design, implementation, and testing. The website provides digital and interactive school information, equipped with a 360° Virtual Tour feature utilizing React JS, Express JS, PostgreSQL, and React-Pannellum technologies. The system supports two user roles, namely super admin and general users.
2. The results of Black Box testing using the All-Pair Testing technique showed a success rate of 94.87%, while White Box testing on the main navigation routes produced a Cyclomatic Complexity value of 15, which falls into the moderate complexity category. In the Closed Beta testing phase, the satisfaction level reached 91.25% from IT experts and 85% from internal users (principal and admin), while the Open Beta testing involving 50 respondents achieved a satisfaction rate of 84.75%. These findings indicate that the developed website is feasible for use, functional, easily accessible, and capable of providing an effective interactive experience as a medium for school information dissemination.

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