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Design and Build of Road Damage Information System in Madiun Regency Using Web Development Life Cycle Methods

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Abstract

Government infrastructure development is growing rapidly, starting from the central and provincial levels. One of the infrastructures currently being pushed by the government is road infrastructure. Both toll roads, regional roads, and district/city roads. Road infrastructure that has been built requires maintenance and repair. Road damage maintenance and repair in urban districts, especially Madiun Regency, Existing Road damage data is still recorded manually using paper, where the government needs help knowing data on road damage that has been recorded, which road conditions have not been repaired, and which have been fixed immediately. Because manual data is prone to wear and loss, tucked in with other manual files. So, the road improvement priority in Madiun Regency still needs to be put on target. For this reason, an information system is required to record the damage to road infrastructure in Madiun Regency. This information system was built using the web development life cycle (WDLC) method. We chose this method because it can be used in all web application development processes and can be modified or added to prototyping and looping to maximize results. The information system for road damage in Madiun Regency was developed using the PHP & MySQL programming languages. The result of this study is a road damage information system that contains updated data on road damage conditions in the Madiun district. Apart from being paperless, digitized data has the advantage of minimal damage and expected data loss and can help decision-makers prioritize repairs by looking at the data in the road damage information system.

Keywords: Web Development Life Cycle (WDLC), Information System, Infrastructure, Road Damage. Website

1. INTRODUCTION

Government development in road infrastructure is growing fast, starting from the central level with the Trans Java toll road development project to the construction of provincial and city-district roads. As a result, it can accelerate the economy at the regional and central levels. However, the rapid development of road infrastructure will only reduce its benefits if there is road maintenance and repair, whether periodic maintenance or repairs at certain times. Slightly different from toll road infrastructure, where the government and its partners have arranged the

maintenance and repairs, or provincial roads, which are handled under the local government, for district roads, repairs are carried out by the district government. Meanwhile, data damage in the district, especially Madiun district, is still being processed manually.

Because the process is still manual in the form of written reports to the government using paper, the data is prone to damage and data loss. Moreover, the regency government finds it difficult to see data on existing road damage, so the priority for repairing road damage becomes ineffective and inefficient. In addition, the level of satisfaction of road users will be low. The results of research conducted by Pradityo et al. showed that the comfort of road users and services from the local government determines road users' satisfaction level [1]. With the development of current technology, existing road damage data in Madiun Regency, which is still recorded manually, can be converted into digitized data and accessed by policymakers to prioritize road repairs in Madiun Regency. Therefore, research on the design and construction of a road damage information system in the Madiun district was made to provide convenience in accessing road damage data and make it easier for policymakers to decide priorities for road repair in the Madiun district.

The information system for road damage in Madiun Regency was built using the web development life cycle (WDLC) method. This method develops a complete life cycle model for a web-based system. This method is a basic SDLC development model that provides the basic structure for web-based system development. It includes various complete guidelines from planning to the final system product that can meet user needs. All types of web application development processes, like the waterfall model, prototyping, spiral, etc., can adopt this method.[2] In the WDLC method, there are five primary stages.

It was achieving the first phase of web feasibility, or the eligibility of a system requires careful planning. It is crucial in building a whole web-based information system. The next stage in the web development life cycle will go wrong if the planning goes wrong. In the planning stage, there are several planning steps. The first is to determine the purpose of the system used, and the next is to find out the user profile and the website development technology to be used along with the infrastructure to be used, such as web browser version, internet connection, high-resolution monitor, etc. After determining the goals, user profiles, and technology to be implemented, the next stage is to pay attention to the owners and users involved in developing this web-based information system. Their participation plays an essential role in each phase of the WDLC. The last step that needs to be done is to pay attention to the type of content that will be displayed [2].

Website analysis is a series of analysts' activities in collecting user information needs and analyzing them systematically. The following are the steps in the WDLC

analysis stage. The first is to identify functions based on user requirements. The next step is to focus on running functions and processes that form the basis for supporting the development of information systems [2]. At this stage, the details of the web-based information system are prepared. Includes diagrammatic representations, logical and physical artifacts to be developed, data models, process models, etc., and the documented system design [2]. the testing phase is the most critical in a web-based information system. In this phase, we compare the functionality that has been built with the expected functionality. If appropriate, we assume that the product follows the user's wishes. This stage is the stage where the system begins to be implemented. At this stage, a system first interacts with the user, and the user starts to take advantage of the system [2]. This method is used because it has benefits, including flexibility in its application.

Several studies related to the web development life cycle (WDLC) method and Information system were carried out by Febriani Nur A.K. et all., in his research using the WDLC method to design electronic official document management applications based on organizational needs so that they succeed in fulfilling security solutions including guaranteeing the confidentiality, authentication, and integrity.[3] D.trianti et al. have succeeded in building a web-based application for student savings data processing using the web development life cycle method. This application is used to help display transaction information in detail to students and parents of students. The application that was built also succeeded in minimizing recording errors and loss of student savings books.[4] R.kaban et al. in his research by applying the WDLC method for the design of a responsive web-based library information system that can be appropriately displayed by all browsers and hardware, such as PCs or mobile devices, so that it can make it easier for members and officers to carry out search, borrowing, and returning activities book [5].

Dermawan et al., In their research, succeeded in developing the IKRA-ITH National Semester web using the WDLC method. The IKRA-ITH National Semester Web development has fulfilled the user acceptance test and can be used to promote Universitas Persada Indonesia Y.A. In their research, I [6] Hisham M.R et al. have succeeded in developing a web marketplace for household needs using the WDLC method. Users can order the requirements in this web marketplace using the cash-on-delivery payment method and online bank payment points. Virtual or cashless payments are needed in the current era of the Covid 19 pandemic.[7] Meanwhile, Karim Luthfi et al., in their research using the web development life cycle (WDSL) method, succeeded in developing a guest scheduling information system at the ASN employee training center, the Ministry of Village Development, Disadvantaged Regions and Transmigration. This application can make it easier for the admin or user to fill in data and schedule [8]. Susanto, in his research entitled Implementation of an e-document information system at the Semarang City Public Works Service, has proven that a combination of technology and the activities of people using technology can support operations

and management. In this case, the researcher managed to change the recording of letters in the manual form to digitalized recording of notes under the name e-document [9].

Research on road damage with various methods and their applications. Many have been implemented, including the following. Lauryn S.M. et al., in their research on web-based road damage, have succeeded in designing a road damage information system by utilizing the GIS application so that it can help or be helpful for the government of Serang Regency, especially the public works department.[10] P. Pamungkas et al. Their research was motivated by the absence of a road damage complaint application directly managed by the PUPR service. In this research, an android mobile-based information system for road damage complaints was built using Android Studio. This application was created to make it easier for the public to report road damage complaints. Moreover, related parties can respond adequately [11]. N. Rofi'ah et al., in their research in Probolinggo, succeeded in creating a geographic information system about road damage, making it easier for PUPR to prioritize or handle road repairs [12].

2. METHODS

The method used in this study adopts the WDLC (web Development Life Cycle) method. This method provides a basic structure that includes various guidelines for meeting the requirements of a web. All types of web application development processes can adopt WDLC. In addition, it can also be modified by including prototyping and iterative structure to improve quality. The following figure shows several stages in the Web Development Life Cycle method.

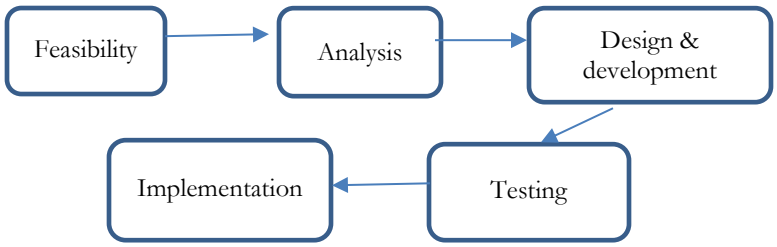

Figure 1. Diagram Web Development life cycle

The first stage of the Web development life cycle is feasibility. Feasibility is obtained with proper planning. Planning has a critical role because if the planning stage is wrong, the next stage will go wrong. At this stage, interviews with users are carried out with the aim of

a) Identify goals. That is what goals you want to achieve by building a road damage information system.

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b) Understand the user. Which serves to identify system users. And map the obstacles faced by users of this system
c) Understand the technology to be used and its constraints
d) Identification of system owners and system users.
e) Deciding the use of information generated by the system will be helpful to what extent.

The next stage is the analysis stage. At this stage, the analyst uses information that has been obtained to be processed systematically into the primary function of the information system, such as the need for data input, output, and user performance. This study's programming language and database design use the PHP and MySQL programming languages. The next stage is the design and development stage. At this stage, the road damage information system has designed a blueprint using the Unified Modeling Language (UML), as shown in Figure 2.

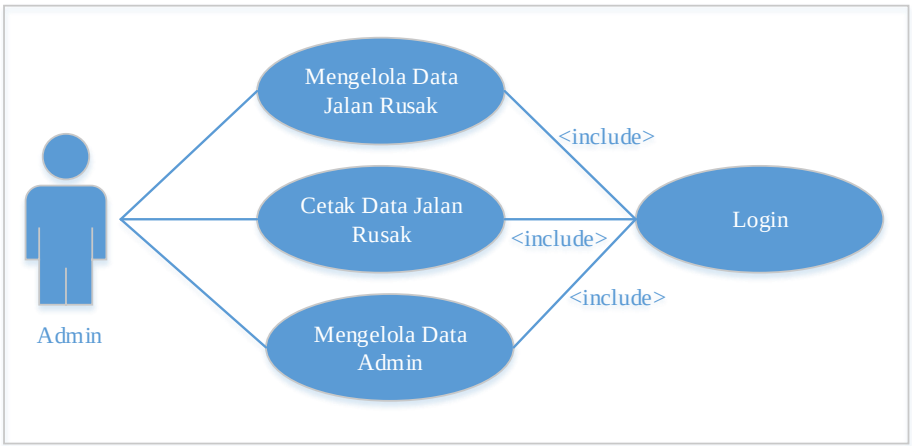

Figure 2. *Use Case Diagram*

From the picture above, it can be concluded that the admin can manage broken road data, print damaged road data, and collect admin data. Moreover, it is required to log in first before working data; after successfully logging into the system, the admin can carry out three activities, namely, activities to manage damaged road data. This management includes inputting, editing, and deleting damaged data. In this case, damaged road data that has received treatment or repair can be deleted from the system. The next activity is that the admin can print road damage data based on the superior's request. The last activity is the admin data management activity, where the admin is authorized to manage system user data. The ERD or Entity-relationship Diagram System design can be described as shown in Figure 3.

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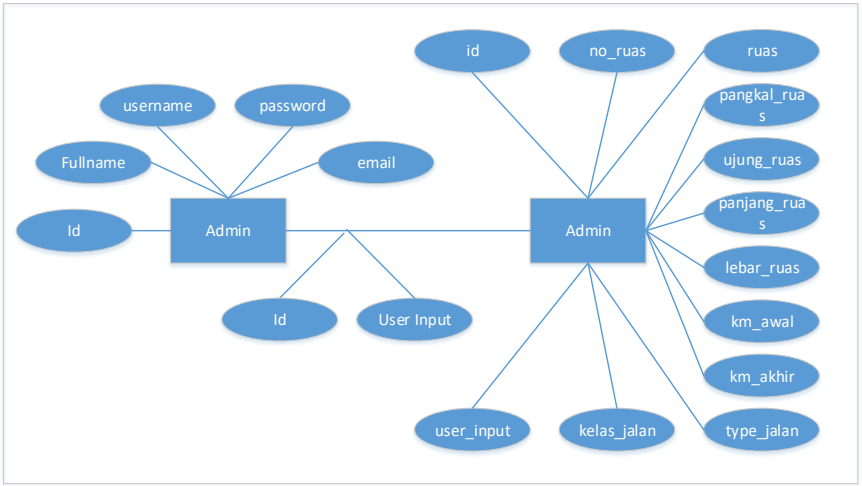

Figure 3. ERD (*Entity Relationship Diagram*)

Based on the ERD design on Figure 3, the Madiun Regency Road Damage Information System Consists of 2 entities, each with different functions and attributes. The first entity has a role in verifying or validating admin data to gain access to the system. The entity has the attributes Id, Fullname, username, password, and email. While the second entity has a function to store road damage data where the second entity has the attributes Id, No_section, Section, Pangkal_ruas, Ujung_ruas, Width_ruas, Km_beginning, Km_end, Type_road, Class_road, User_input, and log_delete. Table design can be seen in Table 1 and Table 2.

Table 1. Tabel Admin

No	Field Name	Data Type
1	Id	Int (11) Primary Key
2	Fullname	Varchar (50)
3	Username	Varchar (50)
4	Password	Varchar (50) MD5
5	Email	Varchar (50)

The function of the admin table is to store admin data used to verify user data to gain access to the system. Admin table structure contains field id as a unique data parameter that cannot be the same and is auto incremental. The field "full name" is for storing complete name data, and the field "username" is used for storing username data as a user parameter for the login process. The password field is used for storing passwords user encrypted with MD5 mode and e-mail to keep the user's e-mail.

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The Road Section table is used to store damaged road data, and this table is related to the admin table with the id parameter in the admin table and user_input in the road sections table.

Table 2. Table Road Segment

No	Field Name	Data Type
1	Id	Int (11) Primary Key
2	No_ruas	Int
3	Ruas	Varchar (50)
4	Pangkal_ruas	Varchar (50)
5	Ujung_ruas	Varchar (50)
6	Lebar_ruas	Varchar (50)
7	Km_awal	Varchar (50)
8	Km_akhir	Varchar (50)
9	Type_jalan	Varchar (50)
10	Kelas_jalan	Varchar (50)
11	User_input	Varchar (50)
12	Log_delete	Enum

The road segment table consists of the following fields, id, no_section, segment, base_section, end_section, length_section, width_section, km_beginning, km_end, type_path, class_path, user_input, log_delete.

The next stage is the testing stage. In this stage, the method used for the testing stage is Blackbox Testing. Blackbox testing is software testing in terms of functional specifications without testing the design and program code to determine whether the software's functions, input, and output comply with the required specifications [13]. Blackbox Testing is easy because it only requires the lower and upper limits of the expected data. Estimating the amount of test data can be calculated through the number of data entry fields to be tested, the entry rules it must meet, and the upper and lower limit cases it must try.

The last stage in the Web Development life cycle method is the implementation stage which includes system installation on the hosting/server and domain registration.

3. RESULTS AND DISCUSSION

The system interface design on the Madiun Regency Road Damage Information System is as follows. First, it is the interface design for logging into the system is shown in Figure 4.

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Figure 4. Login Page

In figure 4. It can be seen that for the login process, the user is required to enter the user's username and password data and click the login button to enter the system. The design of the Road Damage SIM dashboard is as follows.

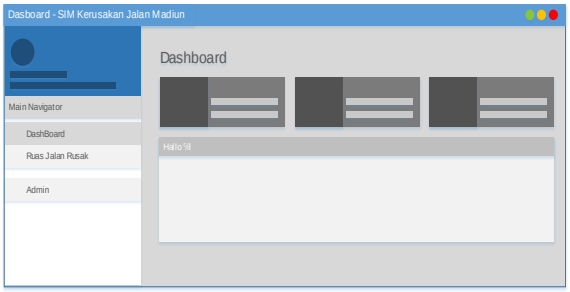

Figure 5. Dashboard Page

In figure 5. illustrated after the user has successfully logged in will display the dashboard page. The dashboard has a valuable description menu, navigation menu, and road damage statistics. The system interface design for road damage data is as follows:

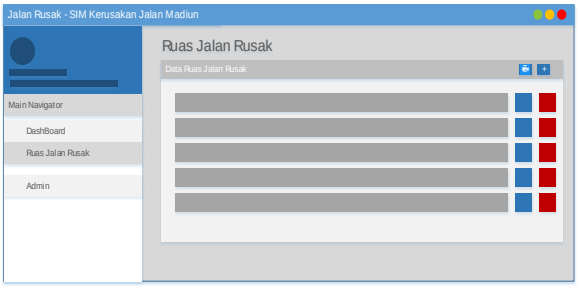

Figure 6. Road Damage Data Page

In the road damage data display, tables and actions are displayed on the right side of the table. The interface design of the Road Damage added data is as follows.

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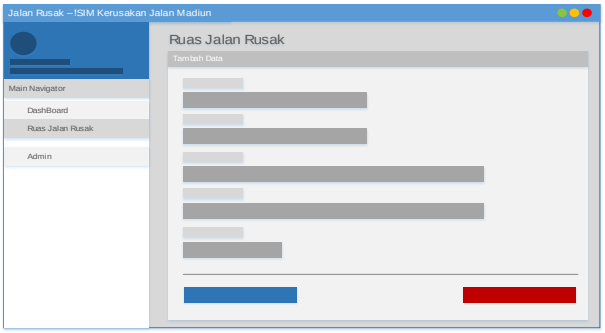

Figure 7. Add Road Damage Data Page

On the added road damage data menu is an input of road damage data. The design of the Road Damage SIM data editing interface is as follows.

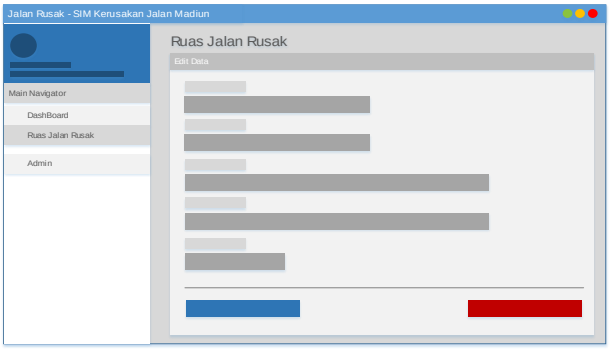

Figure 8. Edit Road Damage Data Page

The user can change the road damage data on the edit road damage data and then save it. The interface design of Wipe SIM Data Road Damage is as follows.

Figure 9. Erase Road Damage Data Page

When the user selects the delete table data menu, data deletion confirmation will appear. The interface design of Wipe Data Road Damage is as follows.

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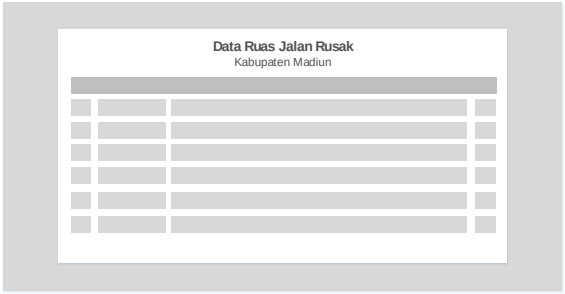

Figure 10. Print Road Damage Data Page

On the data printing menu, all data that has been stored will be displayed, and then the user can print the page. The login page displays the login form for the admin as verification of admin access rights into the system. The login display can be seen in Figure 11.

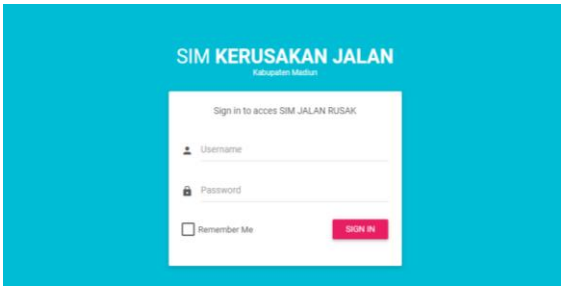

Figure 11. Login Admin Page

The dashboard page displays statistical data on the Road Damage Management Information System and a navigation menu for users.

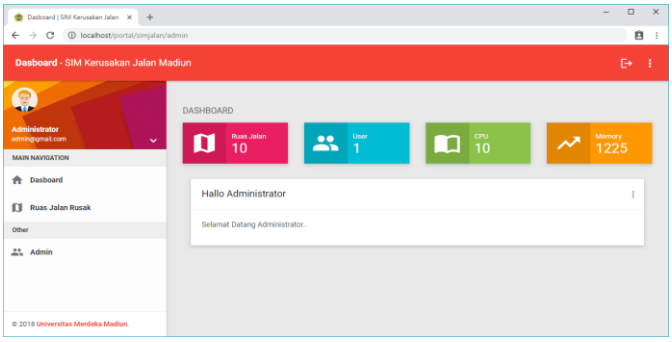

Figure 12. Dashboard Page

The Road Damage Data page displays a road damage data table, and users can add data, edit data, and delete data.

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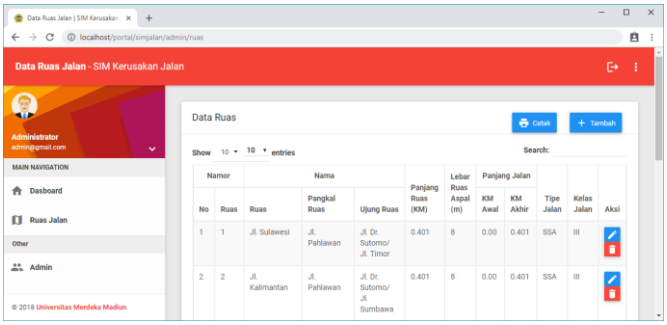

Figure 13. Road Damage Data Page

The Road Damage Data Edit page displays data in the input then the user can make changes to the data, which will then be stored in the database

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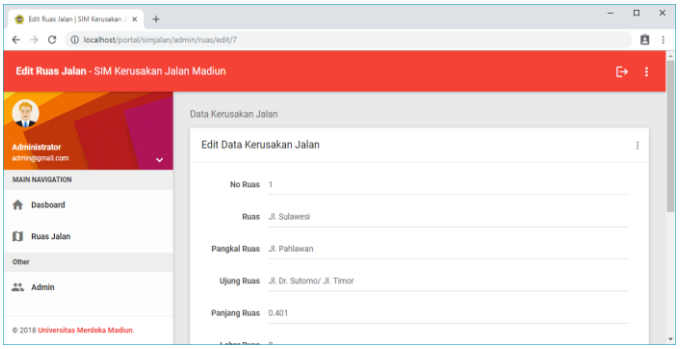

Figure 14. Road Damage Data Edit Page

The Print user data page can print road damage data stored in the database.

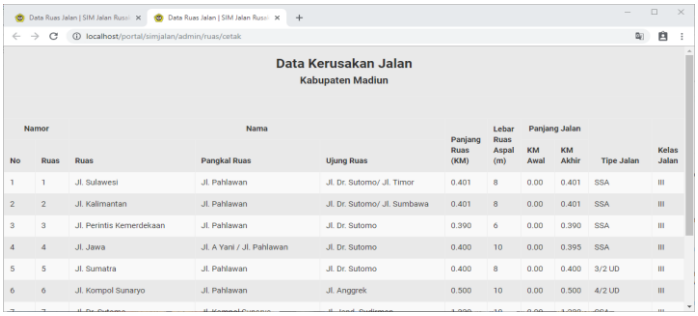

Figure 15. Road Damage Data Print Page

If the decision maker needs road damage data as a reference for implementing road repair and maintenance, it can be done in two ways. The decision maker logs into the system and gets the data, or the admin can print the required road damage

data and give it to the decision maker. For the system testing phase using BlackBox testing with the following results

Table 3. System Function Test Results

No.	Expected output	Accepted		Score (%)
		Yes	No	
1.	The Username and Password have been successfully inputted and validated by the system	✓		100
2.	The dashboard page can display statistical data that has been entered.	✓		100
3.	The Road Section page can appear properly	✓		100
4.	Road segment data that has been input can appear properly on the road section page	✓		100
5.	Users can add road damage data via the add data button	✓		100
6.	Users can reduce/delete data via the trash can button on the right side	✓		100
7.	Users can edit data via the pencil button on the right	✓		100
8.	Users can print road damage data stored in the database via the print button on the right.	✓		100

Based on the table above, the test results with the eight main parameters state that the function of the eight parameters can run and is appropriately validated.

4. CONCLUSION

From the explanation above, we can conclude that the road damage information system in the Madiun district has been successfully built using the web development life cycle (WDLC) method. The test results also show that all functions in the system can run properly. Data already stored in the system can be printed or viewed and used to assist decision-makers in prioritizing the construction and repair of damaged roads. In the future, the road damage information system in Madiun Regency can add new features according to the needs of the Madiun Regency government without changing the initial design.

REFERENCES

[1] P. Utomo, L. Fatmawati, R. Rochidajah, and D. N. Amadi, "Assessment of Toll User Satisfaction in East Java Using Simple Additive Weighting (SAW)," *J. Inf. Syst. Informatics*, vol. 4, no. 2, pp. 361–384, 2022, doi: 10.51519/journalisi.v4i2.259.

[2] M. Tremaine and A. Sarkar, "Overview of Web Development Life cycle in Software Engineering," *Int. J. Sci. Res. Comput. Sci. Eng. Inf. Technol. © 2018 IJSRCSEIT* |, vol. 3, no. 6, pp. 2456–3307, 2018.

[3] N. A. K. Febriyani and R. B. Hadiprakoso, "Rancang Bangun Aplikasi Naskah Dinas Elektronik Berbasis Web Menggunakan WDLC," *Ultim. InfoSys J. Ilmu Sist. Inf.*, vol. 12, no. 1, pp. 43–51, 2021, doi: 10.31937/si.v12i1.1747.

[4] D. Triyanti and T. Dermawan, "Membangun Sistem Informasi Pengolahan Data Tabungan Siswa Berbasis Web," *J. Inf. dan Komput.*, vol. 7, no. 2, pp. 109–120, 2019, doi: 10.35959/jik.v7i2.159.

[5] R. Kaban and F. Fajrillah, "Pengembangan Sistem Informasi Perpustakaan Dengan Framework Css Bootstrap Dan Web Development Life Cycle," *J. Ilm. Inform.*, vol. 2, no. 1, pp. 83–89, 2017, doi: 10.35316/jimi.v2i1.454.

[6] I. Dermawan, S. W. P, S. Budilaksono, and M. A. Suwarno, "Pengembangan Web Semnas Ikra-Ith Dengan Metode WDLC (Web Development Life Cycle)," *J. IKRA-ITH Inform.*, vol. 3, no. 7, pp. 39–48, 2019.

[7] R. Hisham and H. W. Aripradono, "Perancangan Dan Pengembangan Web Marketplace Kebutuhan Rumah Tangga Menggunakan Model Wdlc Dengan Metode Scrum," *J. Ilm. Betrik*, vol. 13, no. 1, pp. 75–86, 2022, doi: 10.36050/betrik.v13i1.424.

[8] L. Karim and N. Purwandari, "Sistem Informasi Penjadwalan Tamu Pada Pusat Pelatihan Pegawai Aparatur Sipil Negara Kementerian Desa Pembangunan Daerah Tertinggal Dan Transmigrasi," *J. Sist. Inf. Bisnis*, vol. 2, no. 2, pp. 90–96, 2021, doi: 10.55122/junsibi.v2i2.320.

[9] D. P. Susanto, "Implementasi Sistem Informasi e-Document Pada Dinas Pekerjaan Umum Kota Semarang," *J. Inf. Syst. Informatics*, vol. 3, no. 2, pp. 234–242, 2021, doi: 10.33557/journalisi.v3i2.118.

[10] M. S. Lauryn *et al.*, "Sistem Informasi Geografis Kerusakan Ruas Jalan Berbasis Web," vol. 6, no. 1, pp. 20–31, 2019, [Online]. Available: https://e-jurnal.lppmunsera.org/index.php/jsii/article/view/1022

[11] P. Pamungkas, H. Nugroho, and ..., "Sistem Informasi Kerusakan Jalan Berbasis Android (studi Kasus Pemerintahan Kab. Bandung)," *eProceedings …*, vol. 4, no. 3, pp. 1880–1891, 2018, [Online]. Available: https://openlibrarypublications.telkomuniversity.ac.id/index.php/appliedscience/article/view/7531

[12] N. H. Rofi'ah, "Sistem Informasi Geografis Pemetaan Kerusakan Jalan Berbasis Web Dan Android," *JATISI (Jurnal Tek. Inform. dan Sist. Informasi)*,

vol. 8, no. 4, pp. 1868–1879, 2021, doi: 10.35957/jatisi.v8i4.1227.

[13] W. N. Cholifah, Y. Yulianingsih, and S. M. Sagita, "Pengujian Black Box Testing pada Aplikasi Action & Strategy Berbasis Android dengan Teknologi Phonegap," *STRING (Satuan Tulisan Ris. dan Inov. Teknol.*, vol. 3, no. 2, p. 206, 2018, doi: 10.30998/string.v3i2.3048.