Design of a Road Damage Complaint Application for the National Road Implementation Center I Aceh Based on Android

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Article Info	ABSTRACT
	The proliferation of public complaints regarding road damage has created a predicament within the community, as it has led to an increase in accidents among road users due to the prevalence of several damaged roads. The existing road damage complaint services have been suboptimal, resulting in unfulfilled complaints due to inadequate responsiveness to community submissions. In order to address this issue, it is necessary to develop an application that can effectively disseminate information about damaged roads to relevant stakeholders. This would enable prompt follow-up actions to be taken for road repairs, hence enhancing the convenience of road users. Complaints regarding national road damage are often addressed by one of the public facilities and services, specifically the Aceh National Road Implementation Center I. The concerns regarding road damage have not been effectively communicated, leading to misunderstanding regarding the appropriate recipient of the complaints. In this project, we want to develop an Android application specifically designed for submitting road damage complaints. The program will streamline the process of submitting complaints, particularly at the Aceh National Road Implementation Center I. The road damage complaint application can be designed to allow road users to submit evidence of complaints by uploading images using the android application. Users can capture photos directly from the camera or select them from the smartphone's gallery for reporting purposes.
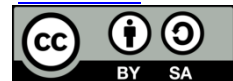
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1. Introduction

The rapid population growth has created demands for comfort and inner satisfaction in daily life, which constitutes happiness in life. One of them is the right to express opinions and receive attention from others. Public complaints are an important element in a regional institution because they aim to assess the success of the work that has been done, address

shortcomings, and receive feedback on tasks that have been carried out. Complaints about road damage in the Aceh region sent to the National Road Implementation Center I Aceh have not been conveyed properly, causing confusion among the public about whom to address their complaints to.

The complaints from the public are about road damage with potholes and even waterlogged areas, causing many road users to complain and their vehicles to get damaged. This has led the public to demand that the damaged roads be repaired immediately. Meanwhile, the existing complaint service only uses email and the agency's phone number, which makes it difficult to follow up on the numerous complaints from the public. To achieve optimal service for public complaints regarding road damage, the National Road Implementation Center I Aceh requires adequate facilities and the dissemination of information to the public. The facility consists of a complaint system that is easy for the public to use, namely through an Android-based application, as almost all road users use this communication technology.

In the current era of information technology, many mobile phone technologies have evolved into smartphones, which have become a daily necessity for society, making it impossible for people to be without this technology. This is clearly proven that smartphones are no longer consumed by certain groups, but almost everyone now has access to this technology without any class restrictions. that is why smartphones are an important part of the advancement of information technology [1].

The existence of an Android-based road damage complaint application allows information to be received more quickly and enables the sending of road damage locations in the form of photos uploaded to the system that will be developed later. With the development of an Android-based public complaint system for road damage, the relevant agencies can directly follow up on reports from the public so that public services on national roads in the Aceh region can be resolved and also provide more optimal reports.

This research aims to produce an Android-based road damage reporting application, so that the public can easily convey information related to road damage and the application can be effectively and easily implemented for road users. The method used to support the results of this research is the waterfall method, designed as an Android application implemented with the Android Studio programming language. The results of the testing on the road damage complaint application indicate that this application can operate according to needs and can be easily used by users.

2. Theoretical Basis

In recent years, the use of mobile technology has experienced rapid development, especially in providing faster and more efficient public services. Santoso [2] explains that Android-based applications offer ease of access and widespread use, making them very suitable for implementation in public complaint systems. Mobile-based applications allow the public to directly participate in reporting infrastructure issues, such as road damage. Santoso also emphasized that with the increasing adoption of mobile technology,

applications designed to report road damage can help the government respond to reports more quickly and efficiently.

In addition, geographic information systems (GIS) play an important role in improving the accuracy of road damage reporting. According to Wahyudi [3], GIS allows for more accurate reporting, as the location of damage can be automatically determined through geolocation features. The use of GIS is very helpful in visualizing the spread of road damage in certain areas, making it easier for the National Road Implementation Agency (BPJN) to prioritize repairs. The integration of GIS also accelerates the verification of received reports, as officers can immediately see the specific locations of damage through digital maps, making decision-making more efficient.

In terms of technology-based public complaints, Rahman [4] stated that mobile-based complaint systems not only expedite the reporting process but also enhance transparency. The notification feature in the application allows the public to monitor the progress of their reports, which in turn enhances government accountability in handling complaints. Applications like this help create a more open relationship between the public and the government, as users receive real-time feedback on the status of their reports, from receipt to resolution. However, aspects of security and ease of use are also important concerns in the development of complaint applications. Mulyadi [5] emphasizes that public complaint applications must be designed with user data security in mind, especially regarding personal information and location. User authentication systems need to be implemented to ensure that the submitted reports are valid and legitimate. Additionally, a simple and user-friendly interface is crucial to ensure widespread adoption, especially among communities that are less familiar with technology.

Lastly, the integration of mobile technology in road infrastructure management shows great potential in improving the overall efficiency of infrastructure management. According to Nurdin [6], the automatic verification system implemented in public complaint applications can reduce the time required for the government to follow up on reports. In addition, with real-time data collected from users, the government can conduct better long-term analysis in planning road maintenance and repairs. Overall, previous studies have shown that Android-based applications integrating GIS technology and mobile-based public complaint systems can have a positive impact on improving the effectiveness of road damage management. In addition, factors such as security, ease of use, and transparency are also important elements in ensuring the successful implementation of this application in the community.

3. Research Methodology

Previous Research

To support the research titled "Design of a Road Damage Reporting Application at the National Road Implementation Center I Aceh Based on Android," here are some relevant previous studies:

a. "Development of an Android-Based Public Complaint Service Application". This research discusses the development of an Android-based application used to report various public issues, including road damage. Android-based applications in public complaint services can enhance public participation in infrastructure maintenance through easily accessible technology [7].

b. "Implementation of a Web-Based Road Damage Complaint Information System at the Public Works Department". This study develops a web-based complaint system that allows the public to report road damage online. The web-based complaint system allows for greater transparency and accountability in the management of road damage reports [8].

c. "Design of a GIS-Based Road Damage Reporting Application". This research integrates Geographic Information System (GIS) technology with a road damage reporting application, allowing users to report damage locations more accurately using digital maps. The integration of GIS in the road damage reporting application provides an advantage in terms of the accuracy of location data reported by the community [9].

d. "Case Study on the Application of Mobile Technology in the Urban Infrastructure Damage Reporting System". This research examines the effectiveness of using mobile applications to report infrastructure damage, including roads, in urban environments. The focus of the research is on the ease of use of the application and the responsiveness of the relevant agencies in following up on the reports received. The use of mobile technology in the infrastructure complaint system can enhance the efficiency of managing damage reports in urban areas [10].

e. "Analysis of the Road Damage Reporting System with Mobile Technology at the Public Works Department". This research evaluates the implementation of a mobile application for reporting road damage at the Public Works Department, with an in-depth analysis of the advantages and challenges faced in the implementation of this system. This research also highlights aspects of data security and interoperability with existing systems. The implementation of a mobile application at the Public Works Department has increased public engagement in reporting road damage [11].

The method used in this research employs the Waterfall Method with stages including: Analysis and Requirements, System Design, Implementation, Verification, and System Maintenance [12].
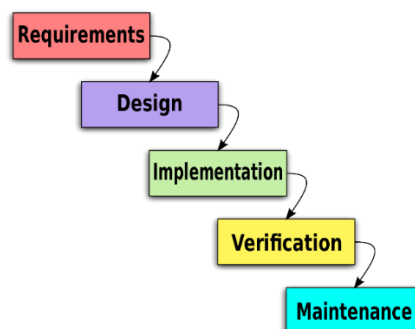

Figure 1. Waterfall Method

Analysis and Needs

The needs analysis begins with the identification of the main users of the application, namely the general public and the National Road Implementation Agency (BPJN) I Aceh. The community needs an easy and quick way to report road damage, which includes features for submitting reports, describing the problem, uploading photos of the damage, and tracking the status of the report. Meanwhile, BPJN needs a system that can verify reports, follow up with the appropriate priority, and monitor the entire repair process. The application must also provide notification features to inform users about the status updates of their reports. Functional requirements include the application's ability to collect accurate complaint data through GPS, allow users to attach photos, and manage complaint status through the internal BPJN dashboard. Additionally, integration with the BPJN information system will be necessary to ensure that reports can be processed efficiently by the relevant agencies.

In terms of non-functional requirements, this application must have an intuitive, user-friendly, and responsive interface. The application needs to be compatible with various versions of Android, at least from Android 6.0 (Marshmallow) and above, and support use in areas with limited internet access. Security features must be taken into account, especially to protect users' personal data and prevent false reports. The performance of the application is also important, so it must run smoothly on devices with low to mid-range specifications.

From a technical standpoint, the application will be developed using the Kotlin or Java programming language for the Android platform. The system's backend will be built using REST API with a server based on PHP or Node.js. The database used can be MySQL or Firebase to store complaint reports, user data, and report statuses. The application will also use the Google Maps API to facilitate the accurate marking of road damage locations. In the development of this application, resources such as software developers with expertise in Android application development and backend servers, as well as server infrastructure capable of handling complaints from many users simultaneously, are needed. BPJN must also prepare a team to monitor reports and follow up on road repairs based on the received reports.

Analysis of the Running System

The road damage complaint system currently in place at the National Road Implementation Agency (BPJN) I Aceh still uses conventional methods, where the public reports road damage via phone, letter, or by coming directly to the BPJN office. Complaints are also sometimes made through social media or government websites, but there is currently no integrated system specifically for handling road damage reports. After receiving the report, officers at BPJN manually record the report, either in a logbook or in a simple digital file. The recorded information includes the reporter's name, contact details, damage description, and location, which are usually described in general terms without accurate details such as GPS coordinates. The reports received are then submitted to the technical department for verification through field surveys. Officers must conduct a direct check at the reported

location, which takes quite a long time, especially if the location description is unclear. This often causes delays in the verification and handling process. Additionally, report management is done manually, without a centralized system that can integrate complaint data from various sources, making it difficult to monitor report status in real-time and manage repair priorities.

The current system also does not provide feedback to the public regarding the status of their complaints. After reporting road damage, the public does not have access to know whether their report has been received, is being processed, or has been addressed. This lack of transparency often leads to dissatisfaction among the reporters. Additionally, the manual recording process is prone to human errors, both in recording and archiving reports, which can result in complaint data being lost or not monitored properly. The limitations of this system become more apparent when many complaints come in, as there is no automatic mechanism to sort, prioritize, and distribute reports efficiently. Without the integration of technologies such as GPS or Geographic Information Systems (GIS), verifying the location of road damage also becomes a challenge, which slows down the problem resolution process. Overall, the current system in place requires fundamental improvements to enhance the speed, efficiency, transparency, and accuracy in handling road damage complaints.
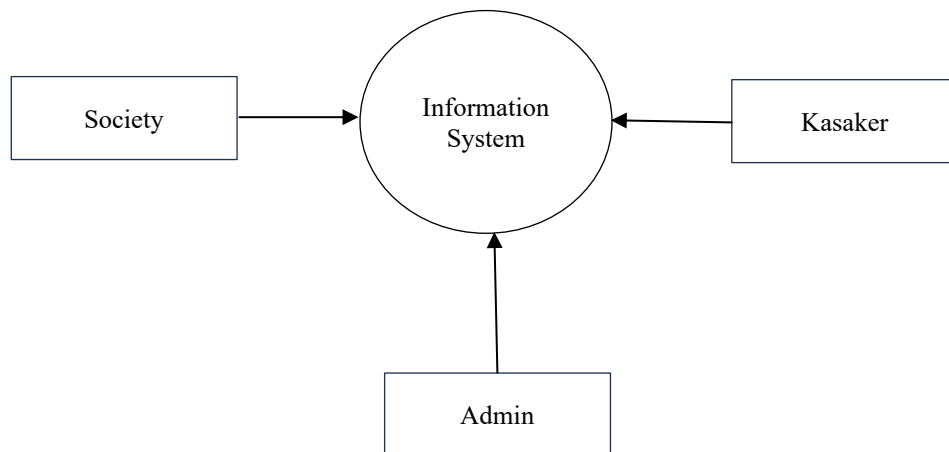

Figure 2. Context Diagram

4. Results and Discussion

The road damage complaint system at the National Road Implementation Agency (BPJN) I Aceh is currently facing several significant obstacles, such as manual recording processes, slow field verification, and a lack of transparency in providing feedback to the public. The existing system tends to be inefficient due to the lengthy complaint process and the need for many manual steps, from recording to verifying damage in the field. Additionally, reporters do not receive certainty regarding the status of their reports, which results in a lack of trust and satisfaction from the public towards the provided public services. The use of an Android application will enable the public to report road damage more easily and quickly. Features such as uploading photos or videos of road damage, as well as accurately determining the location of the damage through GPS technology, will greatly help reduce

location determination errors that often occur in manual systems. This technology also allows the BPJN technical team to directly obtain complete and accurate information regarding road damage conditions before conducting field surveys, thereby speeding up the verification process.

One of the important elements of this new system is real-time data integration, which allows reports received by officers to be directly distributed to the relevant technical departments. In the manual system, reports often experience delays because they have to be processed manually and submitted gradually. This Android-based system eliminates those delays by automating report management, allowing reports to be handled immediately upon receipt. In addition, BPJN management can monitor all incoming reports through the provided dashboard, allowing for more structured and efficient handling.
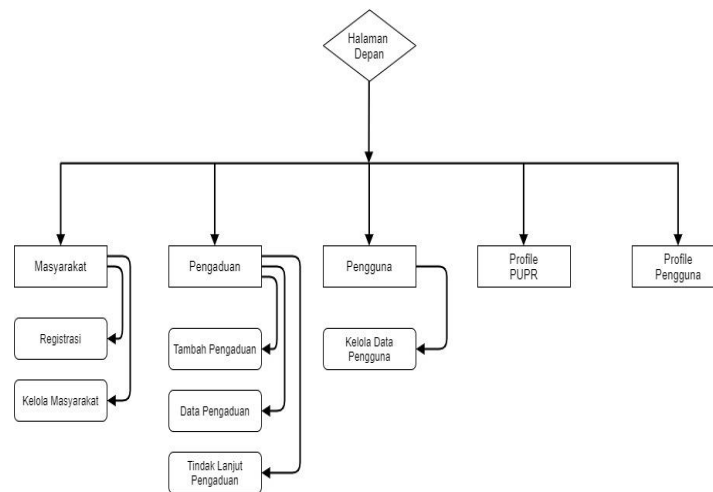

Figure 3. Application Design Display

a. Menu Login

Figure 4. Login Screen

This display consists of NIK or Email and a password used to log in to access the main menu of the program. If the entered data is correct, it will proceed to the main menu

display. In this password form, the data that will be entered must match the data stored in the database, namely the NIK or Email and password.
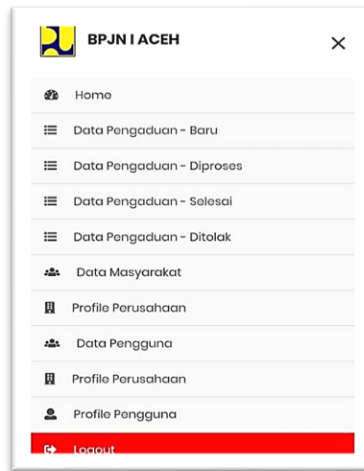
b. Main Menu

Figure 5. Main Menu Display

The image above shows the main admin menu of the community complaint information system application at the National Road Implementation Center I Aceh, which is first displayed when the Name, NIK or Email, and password are entered correctly. The Home screen serves as the starting point for opening the application, which contains all the submenus: Home, new complaint data, processed complaint data, completed complaint data, rejected complaint data, community data, user data, profile, and Logout. In the Home menu, it serves as the main interface of this complaint system. The complaint data menu is for new incoming complaints. The processed complaint data menu is for printing complaints and responses that will be developed and followed up on. The completed complaint data menu will soon send out a report of the completed repairs and the resolution of the complaint. In the rejected data menu, incoming data will first go through a user identity survey. The community data menu is for the registration process of all community members who have successfully registered and can delete community accounts. The user data menu functions to manage the admin application or local office according to the location. The BPJN profile menu functions for the PUPR identity vision & mission. The Profile menu functions to add or change the admin's Name, NIK, Email, and password. The logout option is for exiting the Home interface.

c. Complaint Data

Below is the view of incoming complaints, where all complaints entering this system will be automatically stored in the system and undergo a selection process by the admin.

Figure 6. Community Complaint Interface

d. Complaint Data Processed

The display below is data currently being processed, which has already been followed up by the SATKER admin to be forwarded to the PPK section where the location has been determined.
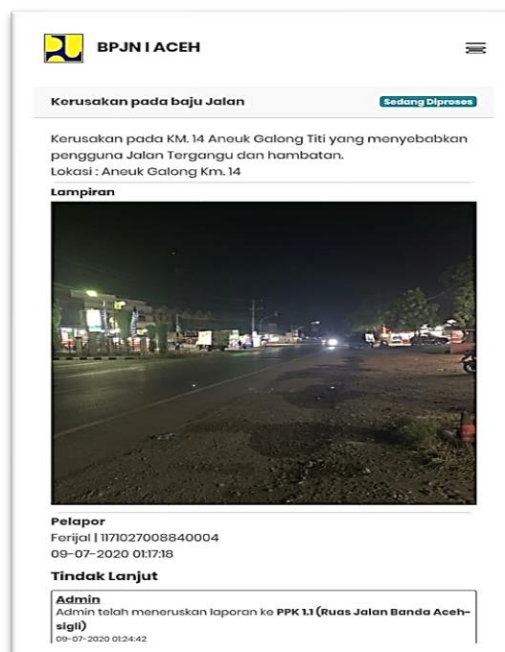

Figure 7. Processed Complaint Data

e. Completed Complaint Data

The display below is the view that has entered the relevant PPK section for review and further action to carry out the repair process and is attached with the new file that has been repaired.
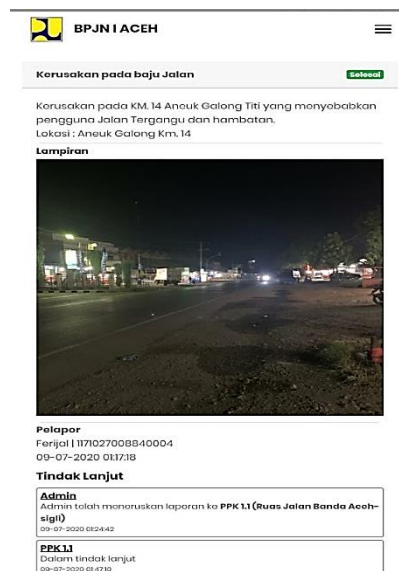

Figure 8. Completed Complaint Data

f. Rejected Complaint Data

The display below shows the file rejected by the admin because the reporting process does not match the attached data in the specified section and no file was uploaded.

Figure 9. Rejected Complaint Data

5. Conclusion

This research successfully designed an effective and efficient Android-based system to facilitate road damage complaints by the community in Aceh. This application offers ease in reporting road damage with technological support such as GPS to ensure location accuracy and features for uploading photos or videos to visually validate the condition of the damage. The implementation of this new system can significantly improve the efficiency of the complaint management process at the National Road Implementation Hall (BPJN) I Aceh. All reports will be processed automatically and integrated with a dashboard that allows the technical team to promptly verify and address them. In addition, this application also enhances transparency by providing real-time complaint status

information to the reporters, thereby increasing public trust in public services. With this system in place, it is expected that road damage handling will become faster, more accurate, and more organized, ultimately contributing to the improvement of road infrastructure quality in the Aceh region. Constraints in the previous manual system can be minimized, and this technology is expected to serve as a model for other government agencies in handling public complaints efficiently.

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