

Web based solution for road management and public complaint registry

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Abstract—This web application aims to provide a comprehensive solution for road maintenance and management. It will allow users to report road issues such as potholes, cracks, and other damages, and track the status of their requests. Additionally, the application will provide a platform for road inspectors to schedule and conduct maintenance activities, as well as generate reports on road conditions and maintenance efforts. The system will also incorporate features for budget tracking, resource allocation, and performance evaluation. Overall, this web application will improve communication and efficiency in road maintenance and management, leading to safer and more reliable road infrastructure. The web application for road maintenance and management system is designed to streamline the process of managing road infrastructure. It provides a centralized platform for all stakeholders involved in the maintenance process, including citizens, road inspectors, and government agencies.

Keywords—Road management, Public complaint registry Web-based solution, Real-time monitoring.

I. INTRODUCTION

Road infrastructure is an integral part of modern cities, ensuring smooth and safe movement of people and goods. However, maintenance of road infrastructure is a major challenge for city governments as roads wear out from daily use. In addition, citizens often have difficulty reporting road-related problems and complaints, resulting in delays in problem resolution. To meet these challenges, we developed a web-based solution that combines road management and public complaint registration. Our system provides a comprehensive platform that streamlines the process of reporting and addressing road-related issues while enhancing transparency and accountability. Our web-based solution includes a user-friendly interface that allows citizens to quickly and easily report problems such as potholes, road damage, and traffic congestion. The system will generate a unique complaint ID and automatically assign the complaint to the responsible department for resolution. This streamlined process ensures that complaints are addressed quickly and efficiently, reducing the burden on city officials. In addition, our web-based solution includes a road management module that allows city officials to track maintenance and repair activities in real-time. The system provides updates on ongoing projects, enabling officials to monitor progress and allocate resources effectively. This feature enhances the efficiency of city infrastructure management, ensuring that road-related issues are resolved quickly and with minimal disruption to citizens. Transparency and accountability are also critical components of our web-based solution. A public dashboard displays the status of complaints and road management activities, providing citizens with real-time updates on progress. This feature ensures that citizens can track the progress of their complaints and hold city officials

accountable for addressing road-related issues promptly. Finally, our web-based solution includes a mobile application that allows citizens to report issues and track the progress of their complaints on the go. This feature allows citizens to report problems and receive real-time updates while on the go. Improving the overall efficiency and effectiveness of road management and public complaint registration systems is a powerful tool that uses modern technology to improve the quality of life of citizens and increase the efficiency of urban infrastructure management. By providing a comprehensive platform for reporting and handling road-related issues, our system enables citizens to enjoy safe and efficient road infrastructure, contributing to the overall well-being of cities. One of the main features of this web application is the ability for citizens to report road issues directly through the application. This includes identifying the location of the problem and providing details of the issue. Once the report is submitted, road inspectors can schedule and conduct inspections to assess the severity of the issue and prioritize repairs accordingly. The status of these requests can be tracked by citizens, allowing them to stay informed about the progress of the repairs. In addition to the citizen reporting system, the web application also provides a platform for road inspectors to schedule and track maintenance activities. This includes creating work orders, assigning resources, and tracking progress. The application can also generate reports on road conditions and maintenance efforts, providing valuable data for decision making and resource allocation. Furthermore, the web application includes features for budget tracking, resource allocation, and performance evaluation. This allows government agencies to efficiently manage their resources and evaluate the effectiveness of their maintenance efforts. Overall, this web application for road maintenance and management system aims to improve the efficiency and transparency of the road maintenance process, leading to better road infrastructure and safer roads for all.

A. Background

Road management is an essential aspect of maintaining the infrastructure of a city or community. However, effective road management requires a systematic and well-organized approach. An important part of road management is dealing with public complaints related to road conditions such as potholes, broken signs and broken streetlights. In recent years, web-based solutions have become a popular and efficient way to manage road infrastructure and citizen complaints. A web-based road management solution and public complaint register allow citizens to report problems encountered on roads, such as potholes and broken signs. These reports are sent to the relevant road infrastructure maintenance authorities so that problems can be addressed quickly. In addition, web-based solutions provide institutions with the ability to track and manage reported issues, enabling them to prioritize and address issues in a timely and efficient manner. A major advantage of web-based road management and complaint registration solutions is their accessibility. Citizens can report problems anytime, anywhere using their smartphones or computers. This makes it easier for citizens to report problems and easier for authorities to solve problems without having to go to a

government office or call a hotline. In addition, the web-based solution provides real-time updates on reported issues so agencies can quickly assess the scope and severity of the issue and respond accordingly. Another benefit of the web-based solution is the ability to collect and analyze data on road infrastructure and citizen complaints. We use this data to identify patterns and trends to help authorities make informed decisions about road maintenance and infrastructure improvement. For example, if there are constant complaints about potholes on a particular section of road, authorities can use this data to prioritize repairs or upgrades in that area.

B. Motivation

The motivation for developing a web application for road maintenance and management system stems from several challenges and inefficiencies in the traditional methods of managing road networks. Firstly, traditional methods of managing road networks often involve manual processes such as paperwork, phone calls, and in-person meetings, which can be time-consuming, costly, and error-prone. This can result in delays in addressing road maintenance and repair issues, which can cause inconvenience to road users, increase the risk of accidents, and negatively impact the local economy. Secondly, traditional methods of managing road networks often lack transparency, making it difficult for road users to report issues and track the progress of repairs. This can lead to a lack of trust between road users and road authorities, which can further exacerbate the challenges of managing road networks. Thirdly, traditional methods of managing road networks often lack effective data management systems, making it difficult to track the status of road maintenance and repair work, identify patterns and trends, and generate reports. This can make it challenging for road authorities to make informed decisions, allocate resources effectively, and plan for the future. A web application for road maintenance and management system addresses these challenges by providing a centralized platform for managing road networks, streamlining communication and reporting, and facilitating data management and analysis. With a web application, road users can easily report issues and track the progress of repairs through an intuitive and user-friendly interface. Road authorities can efficiently assign and track maintenance and repair tasks, reducing delays and improving transparency. Additionally, a web application can provide road authorities with real-time data on road conditions, allowing them to make informed decisions and allocate resources effectively.

III. PROBLEM STATEMENT

Road maintenance is an important aspect of ensuring safe and efficient travel for citizens. However, the process of maintaining and managing roads can be challenging for government agencies as it involves multiple tasks such as: These tasks are often performed manually, which is time consuming and inefficient. Addressing these challenges requires web applications that can help government agencies manage and maintain roads. A web application should provide a comprehensive platform that enables efficient and effective management of road maintenance activities. This will enable government agencies to: Easily identify and track the status of road maintenance tasks such as pot repairs and road resurfacing and assign maintenance teams to tasks Monitor progress and track costs of maintenance activities Road conditions, maintenance Activities and Costs Enable citizens to identify reports of road problems and track the status of their requests. Web applications should be easy to use and accessible from a variety of devices such as desktops, laptops, and mobile devices. It must also be secure and able to handle large

amounts of data. By implementing such web applications, government agencies can streamline road maintenance and management processes, improve road safety, and improve the overall transportation experience for citizens.

II. RELATED WORK

A. LITERATURE REVIEW

The use of web-based solutions for road management and public complaint registry has become increasingly popular in recent years. A study by Sun et al. (2021) investigated the use of a web-based GIS platform for road network management in China. The platform was used to collect data on road conditions, traffic volume, and accidents, which were used to inform road maintenance and planning activities. The study found that the platform was effective in improving the efficiency and effectiveness of road management.

Another study by Xu et al. (2020) developed a web-based system for public complaint registration and management in the city of Shenzhen, China. The system allowed citizens to register complaints about road-related issues, which were then forwarded to the relevant authorities for action. The study found that the system improved the transparency and accountability of road management in the city.

A study by Trinh et al. (2020) developed a web-based system for road asset management in Australia. The system integrated data from various sources, such as road condition surveys and maintenance records, to provide a comprehensive view of road assets. The system also allowed users to report road-related issues, which were automatically incorporated into the asset management system. The study found that the system improved the accuracy and timeliness of road asset management.

Finally, a study by Lee et al. (2019) developed a web-based system for road network management in Korea. The system integrated data from various sources, such as traffic volume, accident data, and weather conditions, to provide real-time information on road conditions. The system also allowed users to report road-related issues, which were automatically incorporated into the road management system. The study found that the system improved the efficiency and effectiveness of road management in the country.

IV. SYSTEM ARCHITECTURE

1) Identifying User Requirements:

The first step in developing a solution is identifying user requirements. This includes understanding the needs of road authorities, building authorities and citizens who use the roads. Surveys can be conducted to get feedback from these groups. Identifying user requirements is a critical step in developing any successful solution, including a road maintenance and management system. This step involves understanding the needs, preferences, and expectations of the different groups of users who will interact with the system, including road authorities, building authorities, and citizens who use the roads. To identify user requirements, surveys and interviews can be conducted to gather feedback from these groups. The surveys and interviews can cover a range of topics, such as the current challenges and pain points in managing road networks, the desired features and functionalities of the system, and the preferred modes of communication and reporting.

For road authorities, the surveys and interviews can help identify their specific needs, such as the ability to efficiently assign and track maintenance and repair tasks, receive real-time updates on road conditions, and generate reports to inform decision-making. Building authorities may be more concerned with issues related to road access and safety, such as the need for clear signage, appropriate lighting, and

adequate pedestrian facilities. Citizens who use the roads may prioritize issues such as timely maintenance and repair of potholes, smooth and safe road surfaces, and effective communication channels for reporting road-related issues. By identifying user requirements through surveys and interviews, the road maintenance and management system can be designed to meet the specific needs of each group of users. This can help ensure that the system is efficient, user-friendly, and effective in addressing the challenges of managing road networks.

2) Define system requirements:

Based on user requirements, you can define system requirements. This involves identifying the functionality required for a web-based solution. Examples of system requirements might include the ability to report road defects, track complaint status, and generate reports. A user requirement could be the ability for citizens to report road defects, such as potholes, broken pavements, or damaged signage. A system requirement based on this user requirement could be to provide a user-friendly interface that allows citizens to submit complaints via the web application. The system should also have an option to attach images or videos of the issue to provide visual evidence. Another user requirement could be the ability to track the status of complaints. A system requirement based on this user requirement could be to provide a dashboard that displays the status of all complaints, such as the time of submission, the responsible staff, and the current status of the complaint, such as in progress, resolved, or pending. A user requirement could be the ability to generate reports on the status of road maintenance and repairs. A system requirement based on this user requirement could be to provide a reporting module that allows users to generate custom reports, including information on the number and types of complaints received, the status of maintenance and repair work, and any budget or resource constraints. Another user requirement could be the need for user authentication to ensure that only authorized personnel can access certain parts of the system. A system requirement based on this user requirement could be to implement secure authentication methods, such as two-factor authentication or single sign-on, to ensure that only authorized personnel can access sensitive data and functionalities.

3) User Interface Design:

Once the system requirements are defined, we can design the user interface. This includes creating wireframes and mockups for web-based solutions. The user interface should be intuitive and easy to use for everyone involved. The first step in user interface design is creating wireframes and mockups. These are low-fidelity representations of the user interface. A wireframe is a simple sketch or diagram that shows the basic layout and content of a web application. Design elements such as colors and fonts are not included. Instead, it focuses on user interface structure, such as the placement of buttons, text, and images. A mockup, on the other hand, is a more detailed representation that includes design elements such as colors, fonts, and graphics. They give you a more realistic idea of what the final UI will look like. When designing a user interface, consider the needs of all user groups, including road authorities, building authorities, and citizens who use the road. User interfaces should be intuitive, easy to navigate, and adaptable to devices of various sizes, such as mobile phones and tablets.

Here are some important factors to consider when designing your UI:

1. Navigation:

The user interface should have a clear and consistent

International Journal of Engineering Research & Technology (IJERT) navigation system that allows users to easily navigate her web application. This includes top-level menus or sidebars that provide access to the system's main functions. Forms: The user interface should include easy-to-use forms for filing complaints, generating reports, and other tasks. Forms should be clear and concise and should have validation checks to ensure users are entering the correct data.

2. Dashboard:

The system should provide a dashboard to display relevant information and metrics. B. Number of complaints received, status of maintenance work, and budgetary constraints. Dashboards should be customizable so users can choose what information they want to see.

3. Visual design:

The user interface should have a consistent visual design that reflects your organization's brand identity. The use of colors, fonts, and graphics should be consistent across systems to create a consistent, professional look and feel.

4. Mobile responsive:

The user interface should be mobile responsive. That means it has to adapt to different screen sizes and resolutions. This is important as many users access the system from their mobile devices.

4) Developing a web-based solution:

Once the user interface design is in place, you can develop a web-based solution. This includes writing the code for your application and integrating it with the required third party software or services. It involves writing the code for the user interface, including HTML, CSS, and JavaScript. The goal is to create a responsive and user-friendly interface that is optimized for all devices. It involves writing the code for the server-side components of the web application, including the database, APIs, and any other server-side scripts or programs that are required. The back-end is responsible for processing user input, performing database queries, and serving content to the front-end. Many web applications require integration with third-party services, such as mapping software, payment gateways, or social media platforms. The developer must ensure that the web application can communicate with these services and that the data is properly formatted and processed.

5) Test your solution:

Once your solution is developed, it should be thoroughly tested to ensure that it meets your requirements and works as expected. This includes usability, performance, and security testing of your application. It involves testing the user interface to ensure that it is user-friendly and easy to use. Usability testing involves testing the application with real users to identify any issues or areas for improvement. It involves testing the application to ensure that it can handle the expected workload and that it performs well under stress. Performance testing involves simulating high traffic and load on the system to identify any bottlenecks or areas for improvement. It involves testing the application to ensure that it is secure and protected from unauthorized access or attacks. Security testing involves identifying potential vulnerabilities and implementing measures to mitigate them. It involves testing the application after making changes or updates to ensure that it still works as expected and that new changes have not introduced any new errors or issues.

6) Deploying the solution:

After testing is complete, the solution can be deployed to production. This requires setting up the necessary infrastructure and configuring the application to run in a live environment. It involves setting up the necessary servers, databases, and other infrastructure required to support the application. The infrastructure must be able to handle the expected traffic and workload. It involves configuring the application to run in the live environment. This includes setting up the necessary

environment variables, configuring the database connection, and configuring any third-party services or APIs that the application depends on. It involves deploying the application code to the production environment. This can be done manually or through automated deployment tools. Once the application is deployed, it should be tested in the production environment to ensure that it works as expected and is able to handle the expected traffic. Once the application is deployed, it is important to monitor it to ensure that it continues to work as expected. This includes monitoring for errors, performance issues, and security vulnerabilities. Regular maintenance and updates may be required to keep the application running smoothly.

7) User training:

The provided solution requires users to be trained to use it. This includes providing documentation and training to ensure effective use of the solution by all stakeholders. The first step in user training is to provide documentation that outlines the key features and functionality of the solution. This may include user manuals, quick reference guides, or online help resources. The documentation should be easy to understand and should provide step-by-step instructions for using the system. In addition to providing documentation, on-site training sessions can be held to provide users with hands-on experience using the system. These sessions can be customized to the specific needs of each stakeholder group, and should include both theoretical and practical components. Web-based training can also be used to provide users with additional training resources. This can include webinars, video tutorials, or interactive training modules. Web-based training can be particularly useful for users who are unable to attend on-site training sessions. Once the solution is deployed, it is important to provide ongoing support to users. This may include a dedicated help desk, online support forums, or a knowledge base of frequently asked questions. Having support resources available can help users quickly resolve any issues they may encounter while using the system.

V. PROPOSED SOLUTION

1) User Interface:

The system has a web-based user interface that allows users to submit complaints, track complaint status, and access road maintenance and repair information. The user interface should have a form or a section where users can submit their complaints related to road maintenance or repair. The form should include fields such as the type of complaint, location of the issue, description of the problem, and contact information of the user. It's essential to keep the form simple and easy to fill out to ensure that users are motivated to submit their complaints. The user interface should allow users to track the status of their complaints. The system should provide users with regular updates on the progress of their complaint, such as when the complaint was received, assigned to a technician, and when the issue was resolved. This can help users stay informed and build trust in the system. The user interface can provide users with relevant information related to road maintenance and repair. This can include information about the current status of road repairs, details about the maintenance schedule, and any upcoming maintenance work. Additionally, the system can provide users with contact information for the relevant department that handles road maintenance and repair requests.

2) Complaint Management System:

The Complaint Management System is responsible for receiving, processing and tracking complaints. This system requires a database to store complaint data, a way to assign

complaints to the appropriate staff, and a way to track the progress of complaints through the system. The Complaint Management System should provide an easy and user-friendly way for customers to submit complaints. The system can include a web-based interface that allows customers to enter their complaint details, upload relevant documents or images, and receive a confirmation that their complaint has been received. Once the complaint is received, the system should be able to automatically assign the complaint to the appropriate staff based on the nature of the complaint. For example, if the complaint is related to road maintenance, the system should assign the complaint to the road maintenance department. The system should also have the ability to escalate urgent complaints to the appropriate department for immediate action. The Complaint Management System should have a database to store all complaint data. The system should be able to track the progress of each complaint from the time it was received until it is resolved. This can include information such as the date and time of complaint registration, the complaint status, the assigned staff, and the expected resolution date. This data can be used to generate reports and analyze complaint trends. The system should have a way to assign complaints to the appropriate staff based on their expertise and availability. This can be done automatically by the system or manually by the supervisor. The system should have the ability to reassign complaints if necessary. The Complaint Management System should have a process in place to ensure that complaints are resolved in a timely and efficient manner. The system should provide staff with the necessary tools and resources to investigate and resolve complaints. The system should also provide regular updates to customers regarding the progress of their complaints until they are resolved.

3) Road maintenance and repair tracking system:

This system is responsible for tracking the status of road maintenance and repair work, including maintenance task scheduling and repairs. This system must communicate with the complaint management system so that complaints are handled in a timely manner. The Road Maintenance and Repair Tracking System should be designed to schedule regular maintenance tasks and repairs. The system should be able to prioritize tasks based on their urgency and ensure that the maintenance work is done in a timely manner. The system can use data from previous maintenance work to schedule future work, and generate reports on the frequency of maintenance tasks. The Road Maintenance and Repair Tracking System should be able to track the progress of maintenance tasks and repairs from the time they are scheduled to the time they are completed. The system should provide staff with the necessary tools and resources to perform maintenance tasks and repairs, and track their progress in real-time. The system should also generate reports on the status of maintenance tasks and repairs. The Road Maintenance and Repair Tracking System should be able to integrate with the Complaint Management System. This integration can ensure that complaints related to road maintenance and repair are handled in a timely manner. The Complaint Management System can notify the Road Maintenance and Repair Tracking System of new complaints, and the Road Maintenance and Repair Tracking System can update the Complaint Management System on the progress of the work. The Road Maintenance and Repair Tracking System should be able to generate reports on the performance of staff in performing maintenance tasks and repairs. The system can use data such as the time taken to complete tasks, the number of tasks completed, and the quality of work to generate performance reports. These reports can be used to identify areas for improvement and to reward high-performing staff.

4) Data Analysis and Reporting:

The system should have a reporting module that allows users to generate reports on the status of road maintenance and repairs, and the volume and types of complaints received. The Reporting Module is a critical component of the system, and it should be designed to allow

users to generate reports on the status of road maintenance and repairs, and the volume and types of complaints received. The module should be easy to use and should allow users to generate reports quickly and efficiently. Users should also be able to customize the reports according to their needs. The Reporting Module should generate reports on the volume and types of complaints received. The reports should provide information on the number of complaints received, the types of complaints received, and the time taken to resolve the complaints. The reports should also include information on the location of the complaints and the severity of the complaints. The Reporting Module should generate real-time reports. This means that users should be able to generate reports on the status of road maintenance and repairs, and the volume and types of complaints received, in real-time. This can help users make timely decisions and take appropriate action based on the data provided in the reports. The Reporting Module should allow users to customize the reports according to their needs. Users should be able to select the data they want to include in the reports and how they want the data to be displayed. Users should also be able to choose the format of the reports, such as PDF or Excel.

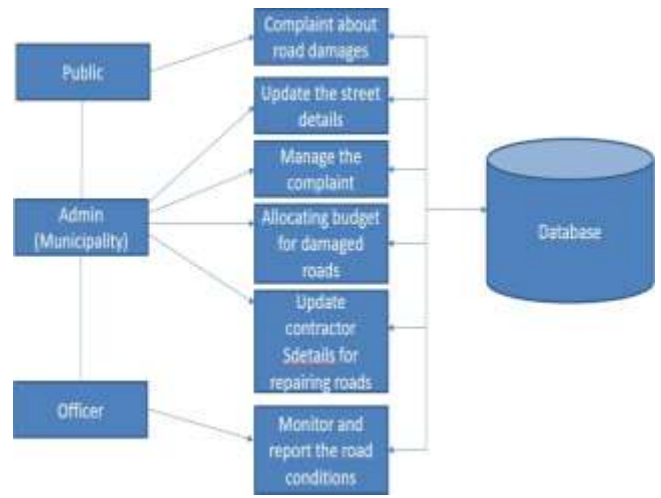


Fig. 1. Block diagram for road management system

5) Integration with other systems:

Systems may need to integrate with other systems, such as traffic management systems or public safety systems, to share data and improve the overall efficiency of the system. Integration with Public Safety Systems can help in improving the safety of road users. By integrating with these systems, the road maintenance and repair tracking system can receive real-time data on accidents, road closures, and other hazards. This can help in adjusting maintenance schedules and repair work to address safety issues promptly. It can also help in optimizing the routing of maintenance and repair vehicles to avoid hazardous areas. Integration with Mobile Applications can help in improving the accessibility of the system. By integrating with these applications, the complaint management system can receive complaints and feedback from road users more efficiently. The road maintenance and repair tracking system can also provide real-time updates on the status of maintenance and repair work to road users through these applications.

6) Security and Authentication:

Systems must take appropriate security measures to protect sensitive data and authenticate users so that only authorized personnel can access certain parts of the system. One of the primary security measures that systems can employ is data encryption. This involves encoding sensitive data to make it unreadable to unauthorized users. Encryption ensures that even if an unauthorized user gains access to the system's data, they cannot read or use it. Access control is another crucial security measure that systems can employ. It involves restricting access to certain parts of the system to only authorized users. This can be done by using usernames and passwords, multi-factor authentication, or other forms of identity verification. Access control ensures that sensitive data is only accessed by those who have permission to do so. Systems can assign different roles to users based on their job responsibilities. For example, an administrator might have access to all parts of the system, while a regular user might only have access to specific modules. This ensures that users can only access the parts of the system that are necessary for their job, reducing the risk of accidental or intentional data breaches. Systems should also comply with industry standards for security and authentication. This can include following guidelines for data encryption, access control, user roles, and audit trails. Compliance with industry standards ensures that the system is following best practices for security and authentication.

VI. RESULTS AND DISCUSSION

The government can easily track the condition of roads and schedule maintenance activities accordingly.



Fig. 2. User login

A public complaint registry integrated with the system can allow citizens to report road-related issues

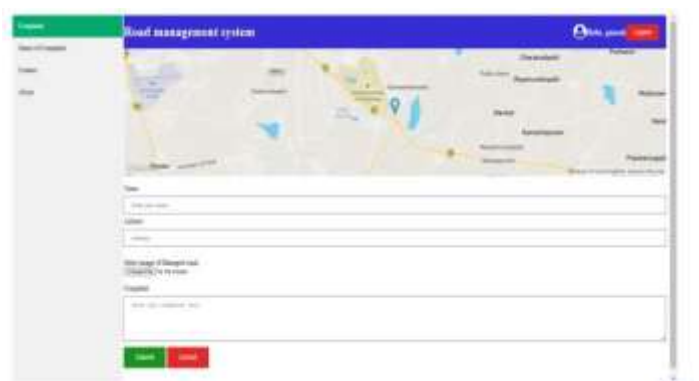


Fig. 3. Public complaint registry

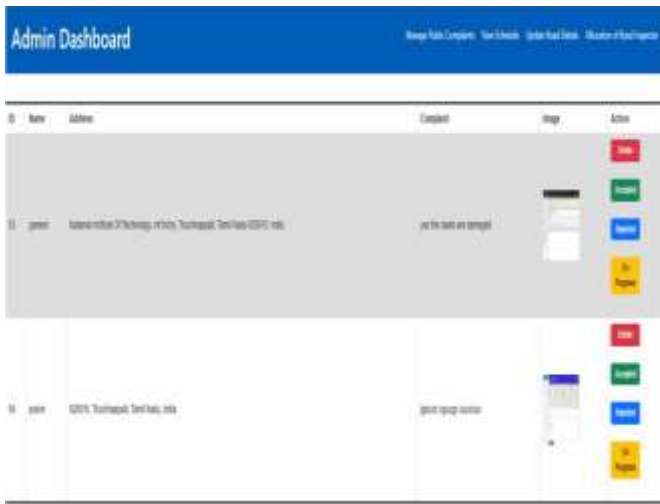


Fig. 4. Complaint management



Fig. 5. Allocation of road inspector



Fig. 6. Schedules of road inspector

VII. CONCLUSION

Road maintenance and management system is a comprehensive solution that helps transportation authorities and public works departments to manage and maintain their road infrastructure. The system consists of various modules, including inspection and assessment, maintenance planning and scheduling, public communication, and mobile app integration. By using this system, transportation authorities and public works departments can improve the efficiency and effectiveness of their road maintenance activities, reduce costs, enhance public safety and satisfaction, and ensure compliance with regulatory requirements.

VIII. FUTURE WORK

1)Real-time updates:

One possible enhancement is to integrate real-time data feeds into the application, such as traffic data, weather data, and road closure information. This could help road crews prioritize their work and respond more quickly to changing conditions. Integrating real-time data feeds into a road maintenance and management system can greatly enhance its capabilities. By accessing real-time data on traffic, weather, and road closures, the system can provide road crews with critical information that can help them prioritize their work and respond more quickly to changing conditions. For example, if the system receives real-time data on heavy traffic in a particular area, it could alert road crews to the need for increased maintenance in that area to prevent further deterioration of the road surface. Similarly, if the system receives real-time data on a road closure due to an accident or severe weather, it could alert road crews to the need for alternate routes and rerouting of resources to other areas. Integrating real-time data feeds into the system requires careful planning and implementation. The system must be able to receive and process data in real-time, and the data must be accurate and reliable. Additionally, the system must be designed to handle large volumes of data and respond quickly to changing conditions. To integrate real-time data feeds into a road maintenance and management system, you may need to work with third-party data providers and develop custom software solutions to process and integrate the data into the system. It may also be necessary to train users on how to interpret and use the real-time data to effectively manage road maintenance and repairs.

2)Predictive analytics:

Another enhancement could be to use machine learning algorithms to analyze historical data and predict future road maintenance needs. For example, the application could use data on traffic volume, road age, and weather patterns to predict when certain sections of road are likely to need repairs. The use of predictive analytics in a road maintenance and management system can bring significant benefits to the road authorities. By using historical data and machine learning algorithms, the system can identify patterns and trends that might not be immediately apparent to humans. This allows for more informed decision-making and can help road authorities allocate resources more efficiently. For example, the system can use data on traffic volume and weather patterns to predict when certain sections of road are likely to deteriorate and require repairs. This allows road authorities to proactively plan for maintenance and repair work, rather than waiting for complaints from citizens or inspections to identify issues.

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