

CivikTrack: A Smart Complaint Management and Escalation System for Public Grievance Redressal

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Abstract—The skill in dispatching legal wrongs raised by the people promptly is a vital element of a transparent, accountable and citizen-focused government. Most current systems are however characterized by sluggishness in reactions, inability to provide real time monitoring, insufficient transparency, the absence of horizontal coordination among the various levels of government and poor citizen participation. This article will showcase a digital platform, CivikTrack, a smart and multi-layered complaint management and escalation system, that I developed to assist the government agencies in managing grievances in a better way. The system is built with the MERN stack: MongoDB, express, react and node etc., to provide an easy to use and scalable interface to both the residents and the authorities. Routing and managing complaints is easy with the hierarchical nature of the CivikTrack workflow that is organized based on the administrative levels (i.e., village, mandal, and district). An additional beneficial aspect of the platform is the automatic escalation engine; it holds the platform accountable and informs the authorities on higher tiers about unresolved complaints within a specific time limit and thus prevents stacking and neglect. Moreover, the system also has a community-based voting process enabling people to endorse the ideas that will positively impact more inhabitants and improve participatory politics. Other features are the possibility of providing multimedia evidence, tracking progress in real-time, as well as the implementation of the role-based access control. Different administrative roles can have custom dashboards that enhance greater visibility and operation. Someone without technical training can easily browse and use CivikTrack. Through the combination of automation, systematic governance processes, and active participation of citizens, the proposed solution will help make the efficiency of complaint resolutions much higher, enhance administrative responsibility, decrease the time of response, and increase people's confidence in the digital ecosystems of governance. Moreover, the data-driven nature of the system allows the authorities to address the trends of grievances and make informed policy

decisions to change the situation in the long term. Altogether, CivikTrack is a scaled design of smart governance, and it can be implemented in various regions of administration and the sphere of the public service.

Keywords — E-Governance; Public Grievance Redressal; Complaint Management System; MERN Stack; Role-Based Access Control; Automated Escalation System; Citizen Engagement; Digital Governance.

I. INTRODUCTION

A. Background and Motivation

Over the past few years, the phenomenon of digital governance has become highly relevant, and governments are trying to offer efficient, transparent, and citizen-centric services. The redressal systems of grievances in the society are important aspect of this change since citizens can report on problems about the infrastructure, utilities and the services offered by the government. In most areas, however, particularly in the developing countries, grievances concerning bad roads, water supply, sanitation and power failures mostly go unattended because of poor communication systems and absence of effective monitoring systems.

The conventional complaint management systems are either paper-based or have simple online complaint management systems, which act mainly as a complaint registration system and fail to provide effective follow-ups. Such systems do not have real-time tracking, systematic workflows, and accountability procedures, which cause delays in resolving and less citizen confidence. People are often unable to find accountable officials and are not timely informed about the progress of their complaints.

As web technologies rapidly evolve and more e-governance structures are implemented, there is an increasing need to find intelligent systems that can automatize and simplify the grievance management system. Structured workflow, transparent communication with citizens, and timely addressing of issues can be achieved by developing a well-designed digital platform that can bridge the gap between citizens and authorities. This has the incentive of creating a modern, scalable and efficient complaint management system that would overcome the weaknesses of current methods.

B. Challenges in Existing Systems

Although digital grievance platforms have been adopted, there are various challenges that remain in the existing systems that curtail their effectiveness. Lack of a formal structure in escalation is one of the greatest problems. The complaints lodged at lower levels of administration may take long before any action is taken since there is no monitoring and accountability.

Most systems fail to give real-time updates and, as a result, citizens find it hard to monitor the action of their complaints. Such invisibility diminishes faith in governance systems and it discourages citizens to take an active part.

Also, the current systems tend to have a lack of prioritization mechanisms. Every complaint is handled the same way irrespective of its magnitude and the population of the victims. This leads to the delay of critical issues as less important issues are dealt with. Additionally, the lack of assistance in providing multimedia evidence decreases the validity of complaints and complicates the process of evaluation of the real state of matters by authorities.

Scalability and accessibility are important issues, too. There are numerous platforms that do not support the high number of users or complaints. In addition, the system may possess complicated user interfaces hence non-technical users may find it hard to interact with the system. These are the issues that indicate that a more sophisticated, organized and easy-to-use grievance management system is required.

C. Research Objectives

The main aim of this study is to conceive and produce an intelligent, expandable and effective system of redressal of grievances by the masses that enhances

communication between the people and the government and at the same time maintains transparency and accountability. CivikTrack is proposed to overcome the shortcomings of the traditional complaint management systems by providing automation, workflow structure and integrating citizen participation mechanisms.

The particular aims of the research are:

1. To implement a hierarchical complaint management system which correlates with the administrative levels like village, mandal and district.
2. To adopt automated escalation process that will see to it that unresolved complaints are reported to authorities at higher levels within set time constraints.
3. To come up with a real time complaint tracking system which will enable citizens to see the progress of their complaints at each step.
4. to implement a system of community voting so that citizens can express and vote on issues that impact more people.
5. To offer role-based access control (RBAC) to various levels of administration, so that there is a secure and controlled access to the functionalities of the system.
6. To enable multimedia evidence submission (images and videos) for improving the authenticity and clarity of complaints.
7. To develop a user-friendly and friendly interface that will be easily adopted by users with different levels of expertise.

The proposed system will help to improve the efficiency of the grievance redressal procedures and lead to the establishment of transparent and citizen-centered governance by fulfilling these goals.

D. Paper Contributions

In this paper, some of the essential contributions to the enhancement of the system of redressal of grievances of the population by an organized and technologically-oriented method are introduced. The suggested CivikTrack system is a combination of the latest web technologies and governance processes aimed at providing a perfect and efficient solution. The main contributions of this work are as follows:

- A hierarchical model of complaint management which resembles the administrative system in real world i.e. village, mandal, and district, to assure an orderly and systematic process of complaint management.

- A process of automatic upgrading of complaints, which is dynamically moved to the higher authorities with regard to preset schedules, thus minimizing delays and enhancing accountability.
- Community-based voting system where citizens can jointly draw attention to, and rank issues and problems of high impact are given priority.
- A real-time tracking system that offers transparency through provision of status of complaints and updates to the users on the complaint status and updates during the process of resolving complaints.

A role-based access control framework, which guarantees access by various users, such as citizens and government authorities, is secure and controlled.

- Multimedia evidence submission support, which increases the authenticity and credibility of complaints.
- An easy to use and scalable software architecture that has been developed on the MERN stack and can handle high numbers of users and data effectively.

All these contributions substantiate how CivikTrack will solve the gaps in the current systems and offer a viable, scalable, and citizen-friendly solution to contemporary e-governance.

II. RELATED WORK

One significant field of study in e-governance has been in the area of public grievance redressal systems, which aim at enhancing the aspects of transparency, efficiency, and accountability in the delivery of public services. Different methods have been suggested to computerize the complaint handling procedures, such as centralized portals, workflow-based systems, and data-driven governance models. Although such systems have simple features, they may not include more sophisticated features, including automated escalation, involvement of the community, and real-time analytics. This section examines the current literature in the field of grievance management systems, e-governance platforms, and other technologies, noting their shortcoming and pinpointing gaps that are filled by the proposed CivikTrack system.

A. E-Governance Grievance Systems

The Centralized Public Grievance Redress and Monitoring System (CPGRAMS) by the Government of India should be mentioned among the most popular public grievance systems. It enables citizens to make complaints online, and keep track of their status. Although CPGRAMS offers a centralized site of registering complaints, it is more of a forwarding complaint to the respective departments and does not offer an automated escalation to complaints with strict time limits. Also, there is little real-time communication between the government and citizens, which minimizes transparency. There are also a number of state-level grievance portals developed to deal with local problems. Most of these platforms lack structured workflow that corresponds with the administrative levels resulting in inefficiencies in handling complaints.

As seen in recent research in e-governance, it is important to consider incorporating digital platforms with organized administrative processes to enhance service delivery. Nevertheless, the majority of current applications are limited to digitization, but not to intelligent automation, and much better efficiency, prioritization, and user interaction are possible.

B. Workflow and Complaint Management Systems

The workflow-based systems have been successful in many industries where they are used to automate routine tasks and promote their output. Workflow solutions contribute a lot in the management of complaints by standardising the numerous processes involved when it comes to handling and managing complaints, which includes submission, verification, processing and ultimately resolution. Such elements as the state transitions, job routing, and multi-step approvals are among the most advanced elements of the workflow that are incorporated in the classical Business Process Management (BPM) systems [1]. Nevertheless, these systems can be very challenging to govern people, as they are intricate, require expert infrastructure and are not easily edited.

One of the main concerns of the modern web-based complaint management solutions is the integration of processes into application logic. These platforms help to appoint complaints, monitor progress and keep tabs on remedies, making them all possible [2]. They however lack important escalation procedures hence delaying the effectual resolution. In the absence of

automatic escalation, system efficacy can be adversely affected as lower-level problems can remain unaddressed.

C. Citizen Engagement and Community Participation

The involvement of citizens in the success of e-governance systems is a key factor since participation will assist in highlighting and prioritizing the problems of the people more efficiently. The traditional grievance systems are mostly based on registration and resolution of complaints but offer few chances to the citizens to engage or contribute in other ways than just the registering of complaints. Such failure to engage lowers the effectiveness of such systems and restricts community.

The recent studies focus on the significance of participatory forms of governance, where citizens are actively involved in decision-making activities [4]. Social media which has in-built community feedback mechanisms like voting or rating systems can help authorities to know which issues have high impact based on the collective interest of the people. These methods enhance prioritization and make sure that resources are allocated.

Some of the new online platforms have presented user interaction characteristics like feedback features and social interaction tools [5]. Nonetheless, such implementations in many cases are restricted to certain areas and are not thoroughly incorporated into the system of public grievances. In addition, the lack of formalized integration between participation of citizens and administrative processes minimizes their implications on the decision-making.

The CivikTrack system will be used to improve the involvement of citizens by introducing a community voting feature, which will enable users to give their support to the complaints raised. This aspect allows the authorities to pinpoint the issues that concern the bigger population and make them a priority.

D. Technology Trends and Research Gap

With the help of such frameworks as MERN (MongoDB, Express.js, React.js, and Node.js), modern applications are developed based on scalable and modular architecture. This enables the management of a high volume of data with ease, but maintain user friendliness and scalability on the fly [6]. To build electronic platforms facilitating the complex working process and real-time interactions,

these technologies can serve as a solid basis in the field of e-governance. One of the security measures that are eminent is Role-Based Access Control (RBAC) which ensures that a user is only allowed to access resources that they are authorised to have access to. It is beneficial to enhance the stability of the system and minimise the risk of unauthorised access, all of which is critical [7]. Although these technologies are available, the majority of grievance management systems in use today lack the ability to combine community input, real time analytics and auto-escalation into a single platform. The existing systems usually concentrate on some rather than considering the entire grievance process, e.g., registration of complaints or tracking. This has led to a tremendous deficiency in research in moving towards intelligence, scalable and citizen centered systems.

CivikTrack system proposed fills this gap by combining hierarchical workflows, automatic escalation, community voting, real-time tracking and secure access control into one integrated platform, which improves the transparency, efficiency and accountability of service delivery by the government.

III. PROBLEM STATEMENT

Even though there are digital grievance redressal systems, there is still a huge disparity in terms of effective, transparent and responsible oversight of complaints by the citizens. The majority of current systems only serve as elementary complaint-reporting systems with no workflow and lead to delays and a deficit of follow-up. Lack of automated means of escalation means that complaints are not dealt with at lower levels of administration and citizens are forced to bypass the system by going to the higher authorities manually. Also, a lack of transparency and real-time information lowers the trust of citizens in the systems of governance. Systems used now do not prioritize issues in terms of their effect because there is no system to include community feedback or overall significance of complaints. Moreover, the lack of proper support of multimedia evidence diminishes the validity and clarity of reported issues, and authorities have a hard time assessing and resolving them. These constraints demonstrate that an all-encompassing, scalable, and smart grievance management system is necessary to provide timely disposition, increase accountability, and encourage citizen involvement by providing

organized work processes, automated escalation, and prioritization by community.

IV. SYSTEM OVERVIEW

The proposed system, CivikTrack, is a smart and scalable e-governance system that aims to enhance redressal of grievances by citizens through organized workflows, automation, and the involvement of citizens. The system combines registering complaints, monitoring, escalation and resolution into a single digital platform that is harmonized with administrative hierarchies, that is, with village, mandal, and district levels. It makes sure that the complaints are not only documented but actively monitored and realized within a specified period of time. CivikTrack is created in the client-server format, whereby the frontend offers a user-friendly interface to the citizens and authorities and the backend handles business logic, data processing and communications between various system components. The platform also facilitates real-time updates, which allow the users to see the status of complaints in each phase of the resolution process.

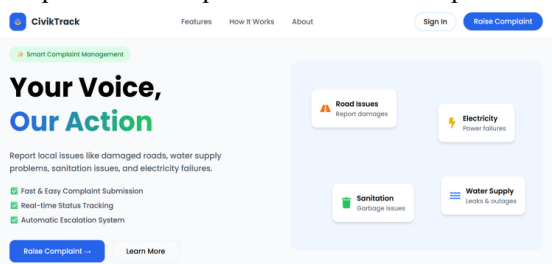


Fig. 1. CivikTrack System – User Interface Overview — Landing Page

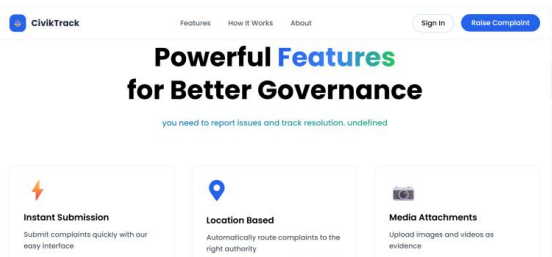


Fig. 2. CivikTrack Complaint Submission and Escalation Workflow

Among them is the automatic escalation tool that alerts the higher-ups when complaints are not addressed within the stipulated time. Time wastage is reduced and responsibility at the administration level is promoted. The community voting attribute of the voting system enables authorities to focus on other more urgent issues because the users can signify that

they appreciate an issue that has impacts on more individuals. Some of the people that may access the role-based dashboards in the system are the citizens, the village chiefs, heads of mandals and district administrators. To only give controlled access of the functionality inside the system, all roles are granted given rights and functions. CivikTrack is an alternative solution to the current grievance management that involves the automation of processes, structured processes, and citizen engagement.

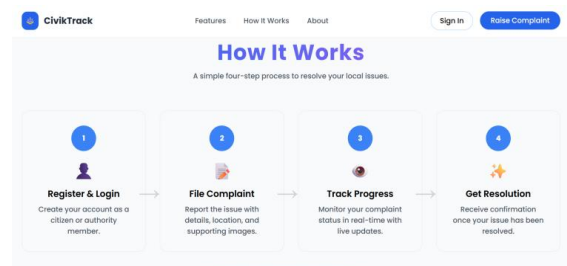


Fig. 3. CivikTrack Complaint Submission and Escalation Workflow

V. SYSTEM ARCHITECTURE

A. Frontend Architecture

The existing client-server architectures have the ability to be scaled, efficient, and secure with regard to communications between users and authorities; CivikTrack is no different. The three points of interest with regard to the system are the frontend, backend, and the database. The purpose of each component is known.

React.js is used on the front end of the system, built in the Vite-based build environment which adds to its high performance, responsiveness, and usability. Through the citizen and authority dashboards, users can connect with the system and view its status and statistics, as well as make complaints. The interface will be easy to use and navigate by even people untrained in technical practices.

B. Backend Architecture and Validation Pipeline

The backend is composed of the application logic, API routing and front-to-database interactions, and it is developed with Node.js and Express. Important backend tasks include user identification, resolve complaints, escalation logic and notification processing. This is done in order to enable sharing of data between the different components of the system through the use of RESTful APIs.

All the data about users, complaints, multimedia evidence, and system logs are going to be stored in

MongoDB. NoSQL architecture of it enables easier management of large scale datasets and also provides flexibility in data storage. To make mapping possible, the database is geared to accommodate hierarchical data.

Some of the security measures implemented include Role-Based Access Control (RBAC)-based authentication and authorisation and JSON Web Tokens (JWT)-based authentication and authorisation. Provided by these safeguards, user access is restricted to only that information and functionality which is directly relevant to their job duties. The introduction of validation and access control on both API and database level also further ensures the integrity of the data and prevents the unauthorised access.

This design will enable the system to be scalable, secure, and able to support the real-time interaction with high speed and reliability.

VI. AUTHENTICATION AND AUTHORIZATION

A. Authentication Mechanism

Authentication is a very important part of CivikTrack system as it allows only authorized users to enter the system. The system adopts a secure authentication method based on the JSON Web Tokens (JWT) which can be used to verify stateless and efficient users. When a user logs in to the system, a token that includes user vital information like user ID, role and access privileges is generated. The same token is then utilized to verify the later request without the need to undergo repeated operations of logging in. The system has several user roles such as the citizens, village level authority, mandal level authority, and district level administrators. A secure login process is used to authenticate each user and the identity of the user is verified before system resources are granted to the user. The use of tokens enhances performance and scalability, as there is no need to store information of the session on the server.

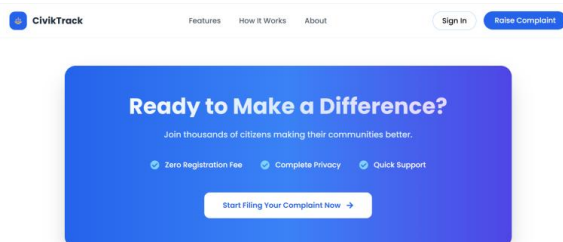


Fig. 4. Citizen-Centric Grievance Management Interface

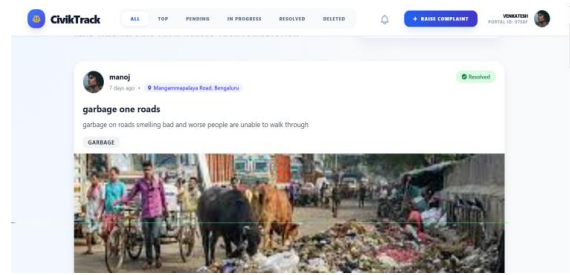


Fig. 5. Public Complaint Feed and User Dashboard

In order to increase the security, tokens are set to expire time and sensitive operations must be revalidated. The system also deploys the input validation system and secure password handling system to avoid unauthorized access. This will guarantee the protection of user information and system capability against typical security risks.

B. Authorization and Role-Based Access Control

The CivikTrack system applies Role-Based Access Control (RBAC) to guarantee that each user only has access to functionalities and data that he or she is authorized to access given his/her role. Users are assigned a particular role like citizen, village authority, mandal authority, or district authority and permissions are granted accordingly.

Citizens can also file complaints, post multimedia evidence, monitor the status of complaints and also vote within the community. Authorities of villages can access and handle complaints allocated to this or that area, amend the complaint status, and post evidence of resolution. The authorities at the mandal level can access the complaints at the escalation level, village performance analytics, and reassign or address the issues. District level authorities can see the entire system and can track system performance, intervene in cases that have not been resolved and can analyze system wide data. RBAC mechanism has strict access controls by validating the user roles in each request. Sensitive data can not be accessed without authorization checks, ensuring that each API endpoint is secured. This tiered access control strategy will improve the security of the system, data integrity, and appropriate governance at all administrative levels.

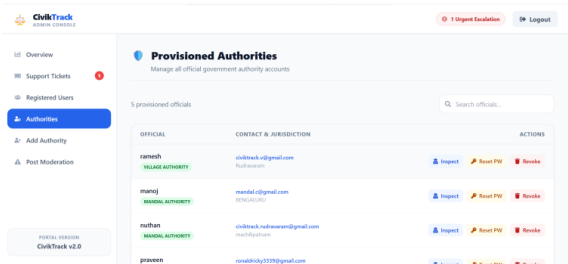


Fig. 6. Role Management Service Hub — Dynamic RBAC Configuration

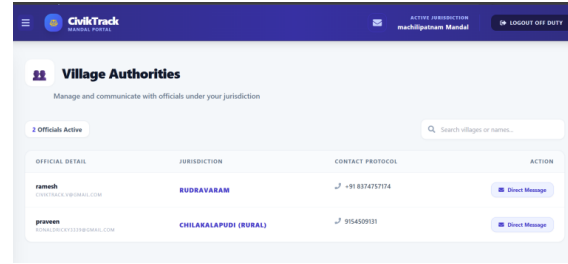


Fig. 11. Mandal-Level Authority Management Dashboard

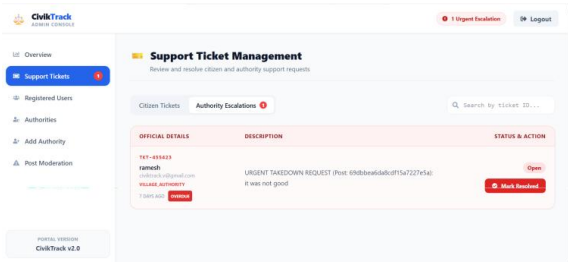


Fig. 7. Citizen and Authority Ticket Tracking System

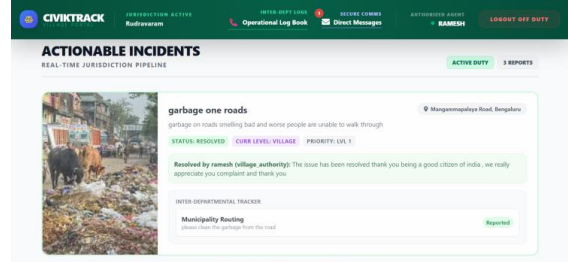


Fig. 12. Village -Level Authority Management Dashboard

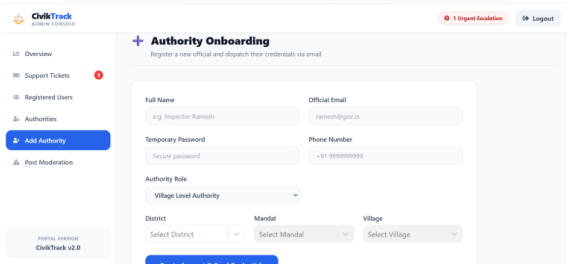


Fig. 8. Administrative Authority Registration System

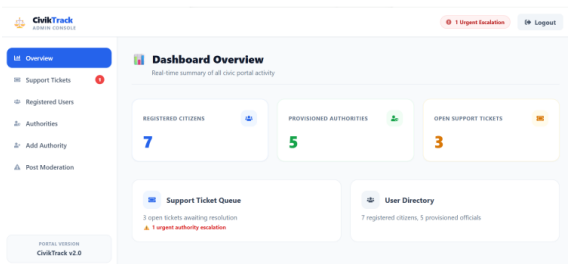


Fig. 9. Admin Dashboard: System Activity & Metrics

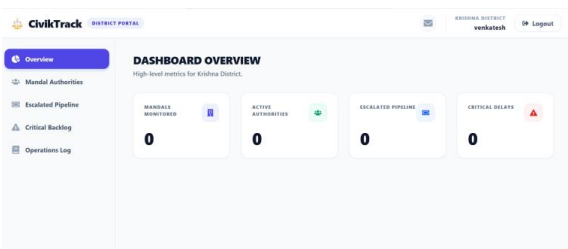


Fig. 10. Audit Overview — Real-Time Activity and Security Insights

VII. SCALABILITY AND PERFORMANCE

A. System Scalability

The modern e-governance systems need scalability as they should be able to process many users and complaints at the same time. The CivikTrack system is developed based on a scalable client-server architecture which can handle the growing workloads effectively without affecting the performance. Stateless communication of RESTful APIs helps in ensuring that multiple requests can be processed autonomously and the system can support a number of users at the same time.

The back-end design, which is based on Node.js and Express.js, allows processing requests asynchronously. This contributes more responsiveness to the system even under the high load conditions. In case you have many data that concerns the user interaction and complaints, then you should consider migrating to MongoDB a non-relational database that can easily allow using horizontal flexibility of data storage and scaling. Allocation of resources depending on demand is possible when using the system over a cloud service. Load balancing is the only way when it comes to serving traffic that comes in, with its numerous servers it is reliable and highly available. At this layout, the system will still be responsive and reliable even during its busiest periods.

B. Performance Optimization

CivikTrack provides good performance of the systems through numerous optimisation techniques at both application and database levels. Among the tricks that one can use is to enhance effective API architecture which simplifies the RESTful endpoints in order to conserve unnecessary data transmission and to enhance performance in response. The asynchronous processing on the backend makes the ability to process multiple requests at a time without impacting the performance of the system possible.

VIII. RESULTS AND DISCUSSION

With the implementation of the CivikTrack system, massive integration has been realized in the efficiency and transparency of dealing with complaints made by the people. Through the system, the citizens can be able to make complaints, attach documentation and even follow-up on the status of their concerns on the organised platform at any given time. Role-based dashboards will enable the authorities of various administrative levels to handle complaints and have them handled within a short period of time.

The additional transparency offered by the system is one of its key benefits. When they can see the position of their concerns, people are less doubtful and have more faith in the system. Minimisation of delays and minimisation of carelessness at the bottom level is through the automatic escalation procedure, which conveys the unattended complaints to higher users. The integration of community vote system increases the participation of citizens since they have a chance to help in meaningful issues. This also enables the authorities to focus on complaints according to societal interest and utilise resources in a more effective way. Moreover, the system tracks the processes at multiple administration levels and tracks the activity of different authorities, enhancing responsibility.

Technically, the system has proven to perform reliably with an efficient system handling user requests and complaint information. Scalable technologies are used to make sure that the platform can support growing workloads without experiencing considerable performance decline. On the whole, the findings show that CivikTrack is a viable tool to enhance the process of grievance management and

can be further developed to facilitate the work of larger government agencies.

IX. FUTURE WORK

Another way to improve the CivikTrack system is to introduce more sophisticated functionality and technologies to enhance the functionality and scalability of the system. The creation of a specific mobile application is one of the possible enhancements as it would make access to it more accessible and enable users to report and monitor complaints more easily.

The second valuable addition is the fact that Artificial Intelligence (AI) is used to categorize and prioritize complaints automatically. Complaint data can be analyzed using machine learning algorithms to determine the patterns and predict the urgency of issues, and authorities would have a more effective response because networks would provide audit guarantees of tamper-evident audits.

To gain a better understanding of the source of the problems, and the regions potentially problematic, geographical mapping of complaints can also be visualized with the help of GIS (Geographic Information Systems). In such an understanding, the policy makers would be position to be precautionary and make decisions based on facts. Customers can also be kept aware of progress alternations, as well as escalation status by the introduction of real-time notification systems using either SMS or mobile notification systems. System efficacies can be even further enhanced by integrating with other online services and government databases and also the ability to provide a one stop governance platform. These upcoming enhancements to CivikTrack will serve to produce a more smart, scalable, successful, e-governance system.

X. CONCLUSION

The paper discusses CivikTrack which is a smart and scalable digital platform based on process, automation and interaction between the citizens to make the people more responsive in getting their concerns addressed. The method is an enhancement of the conventional complaint management systems by eliminating ills like delay in addressing problems, lack of responsibility, and transparency. CivikTrack operates on a hierarchy work flow which is not

comparable to the hierarchy of the administration and even offers quick and effective way of handling complaints within the schedule allotted.

Automated escalation minimizes delays as it routes the complaints that are not resolved to a superior level, enhancing accountability at various administrative levels. The fact that it includes a community voting mechanism increases the participation of the citizens and allows prioritization of the issues based on their importance to the population. Moreover, role-based access control and real-time tracking help enhance the transparency and safe operations of the system. Current web technologies guarantee that the system is scalable, reliable, and able to cope with immense amounts of data and users. The findings illustrate that CivikTrack is a good and efficient solution to modernizing grievance management systems and improving the delivery of the public services.

In general, the suggested system leads to the development of digital governance via efficiency, transparency, and decision-making that is citizen-focused. It can be applied on a bigger scale and be adjusted to other government services, which will eventually enhance the quality of government and enhance trust in the state. This piece of work has provided a firm ground on how to create smart, open, and citizen-led systems of governance in future.

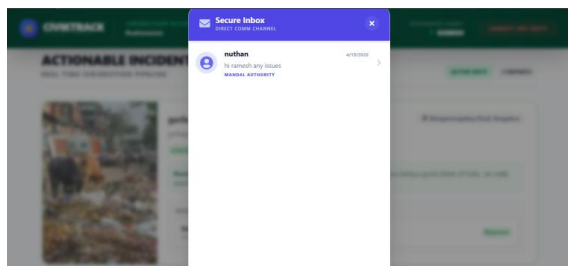


Fig. 15. Chat Panel — Real-Time Workflow Approval and Rejection Alerts

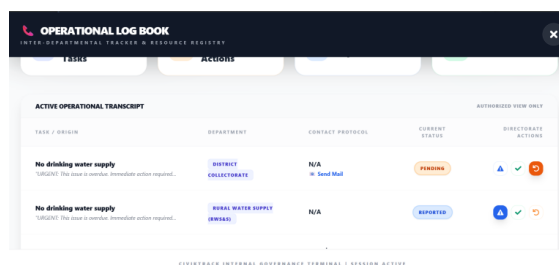


Fig. 16. Operational Log Book – Inter-Departmental Task Tracker

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