



SafeSpeak: A Smart Dual-Mode Grievance & Transparency System

¹Sonal Tripathi, ²Kumkum Yadav, ³Shivam Tiwari, ⁴Roshan Singh, ⁵Smita Dandge, ⁶Robin Nadar

^{1,2,3,4}Student, ^{5,6}Assistant Professor

^{1,2,3,4,5,6}Computer Engineering Department,

^{1,2,3,4,5,6}Thakur Shyamnarayan Engineering College, Mumbai, INDIA.

Abstract: The Existing grievance handling systems in educational institutions often lack privacy, effective tracking, and timely resolution, which discourages students from reporting issues. To address these challenges, a Smart Grievance Portal is proposed as a secure, web-based solution for efficient complaint management. The system supports dual-mode complaint submission, allowing users to choose between anonymous and protected identity options, along with role-based access control for students, teachers, and administrators. It incorporates a structured workflow for complaint processing, real-time tracking, and an automated escalation mechanism to ensure timely resolution. Additionally, an audit trail and feedback system enhance transparency and accountability. The system was evaluated using 40-50 users in a controlled environment, demonstrating significant improvements in performance. Results indicate a reduction in complaint resolution time by up to 40-50 percent, along with improved tracking efficiency and user participation. The proposed system enhances communication, builds user trust, and provides a scalable solution for modern grievance management in educational institutions.

Index Terms - Grievance Management, Role-Based Access Control, RBAC, SLA Escalation, Privacy, Privacy-Preserving Systems, Web Application, Complaint Tracking, Digital Governance.

I. INTRODUCTION

A grievance refers to any dissatisfaction or issue experienced by an individual that requires proper attention and resolution. In educational institutions, students frequently face challenges related to academics, administration, infrastructure, and personal concerns. If these issues are not addressed effectively, they can negatively impact student satisfaction, academic performance, and the overall institutional environment. Therefore, a reliable grievance redressal system is essential for maintaining transparency, fairness, and trust.

However, the major problem with existing grievance handling systems lies in their inefficiency and lack of accountability. Traditional methods such as complaint boxes and written applications are still widely used, which are slow, unstructured, and difficult to monitor. These systems do not provide real-time tracking, leaving students unaware of the status of their complaints. As a result, complaints may be delayed, ignored, or improperly handled, leading to dissatisfaction and loss of trust in the system.

Another critical limitation is the lack of privacy and confidentiality. Students often hesitate to report sensitive issues due to fear of identity exposure or possible consequences. This leads to underreporting of genuine concerns, preventing institutions from identifying and resolving serious problems. Additionally, manual processes increase the chances of data mismanagement, communication gaps, and lack of proper record maintenance.

With the advancement of digital technologies, there is a need to shift towards a more efficient and transparent grievance management approach. A modern system should provide easy accessibility, structured complaint handling, and real-time tracking to ensure better communication between students

and authorities. It should also include role based access control and a well-defined workflow to manage complaints systematically and reduce delays.

To address these challenges, this paper proposes a Smart Grievance Portal, a web-based platform designed to improve the grievance handling process. The system offers dual-mode complaint submission, allowing users to choose between anonymous and protected identity options, thereby ensuring privacy and encouraging open reporting. It incorporates features such as real-time tracking, automated escalation for unresolved complaints, audit trail maintenance, and a feedback mechanism. These features collectively enhance transparency, accountability, and efficiency, making the system a reliable solution for modern educational institutions.

II. THEORY

The proposed Smart Grievance Portal is based on the concept of digitizing grievance handling processes by replacing traditional manual methods with an automated web-based system. This approach enables users to submit complaints easily, which are then recorded, processed, and resolved in a structured manner. Digitization improves efficiency, minimizes delays, and enhances communication between users and authorities.

A fundamental concept of the system is centralized complaint management, where all grievances are stored and maintained in a single database. This ensures better organization of data, simplifies access to complaint records, and allows real-time tracking of complaint status. Centralization also reduces manual effort and increases transparency in the grievance handling process.

The system follows a role-based interaction model involving three main entities: students, teachers, and administrators. Students act as users who submit complaints, while teachers and administrators are responsible for reviewing and resolving them. This clear separation of roles ensures accountability and defines responsibilities within the system.

The design of the system is based on modular and service-oriented principles, where different functionalities such as complaint submission, tracking, escalation, and feedback operate as independent modules. This modular structure enhances flexibility, scalability, and ease of maintenance, making the system adaptable to different institutional requirements.

The architecture is supported by key components including the user interface, application processing layer, database, and administrative dashboard. These components work together to ensure smooth system operation. Security is maintained through mechanisms such as role-based access control and secure data handling, which protect sensitive user information.

Another important aspect of the system is the implementation of a structured workflow, where complaints pass through defined stages such as submission, review, action, and resolution. This ensures systematic processing and improves accountability. Additionally, maintaining an audit trail of all actions enhances transparency and provides a reliable record of system activities.

Real-time tracking is also a core concept, where each complaint is assigned a unique identifier and its status is updated at every stage. This improves visibility for users and ensures timely handling of complaints. Furthermore, automated escalation mechanisms ensure that unresolved complaints are forwarded to higher authorities, reducing delays and improving efficiency.

Overall, the theoretical foundation of the proposed system is based on principles of digitization, centralization, modular design, security, and transparency. These concepts collectively contribute to building an efficient, reliable, and user-friendly grievance management system for educational institutions.

III. LITERATURE REVIEW

Various research studies have been conducted on grievance and complaint management systems to improve efficiency, transparency, and user satisfaction in institutions. Traditional grievance handling methods in educational institutions are mostly manual and paper-based, such as complaint boxes or written applications. These methods often result in delays, lack of proper tracking, and limited transparency. To overcome these issues, several digital grievance systems have been proposed. However, each system has certain limitations.

Table 1: Comparative Analysis of Existing Systems

Ref. No.	Paper Title	Key Features	Limitations
[1]	Online Grievance Redressal System for Educational Institutions	Digital complaint submission, status tracking	No automated escalation, no feedback system
[2]	Web-Based Student Grievance Management System	Categorized complaints, role based access	No anonymity, weak privacy protection
[3]	Design and Implementation of Complaint Management System	Online complaint handling, improved accessibility	No real-time tracking, poor communication
[4]	E-Governance Based Grievance Redressal System	Centralized system, admin control	No validation, lacks accountability
[5]	Online Complaint Management System Using Web Technologies	Scalable and flexible system	No complaint verification, misuse possible
[6]	Centralized Complaint Handling System with Tracking Mechanism	Structured architecture, tracking support	No anonymity, no automated routing
[7]	Smart Grievance Redressal System with Role-Based Access	Transparency, role-based access	Limited technical depth, no advanced automation
[8]	CPGRAMS – Centralized Public Grievance Redress and Monitoring System	Large-scale grievance handling, tracking	No anonymity, limited user level privacy
[9]	e-SHRAM Grievance Management System	Unique ID tracking, accessibility	No structured workflow, no feedback system
[10]	AI-Based Complaint Classification and Prioritization System	AI-based classification and prioritization	High complexity, not widely implemented

A. Research Gap

The analysis of existing grievance management systems reveals several critical limitations, including lack of anonymous complaint mechanisms, absence of real-time tracking and notification systems, and inadequate escalation strategies for unresolved complaints. Many systems fail to provide a structured workflow and proper validation, leading to inefficiencies and lack of accountability. Additionally, most platforms do not address the issue of duplicate complaints, which results in data redundancy and improper prioritization of issues. Furthermore, limited implementation of feedback mechanisms and audit trails reduces transparency, while advanced AI-based solutions, though effective, are often complex and not practical for real-world deployment in educational institutions. These gaps highlight the need for a more efficient, user-friendly, and reliable grievance management system.

B. Proposed Work

The proposed Smart Grievance Portal addresses the identified limitations by introducing a structured, secure, and transparent complaint management system. It provides real-time tracking, automated complaint routing, and an SLA-based escalation mechanism to ensure timely resolution.

The key contribution of this system is the support-based complaint mechanism, which allows multiple users to support or relate to an existing complaint instead of creating duplicates. This helps in reducing redundancy, identifying high-priority issues, and improving decision-making for authorities.

Additionally, the system implements a dual-mode complaint submission feature (anonymous and protected identity), ensuring both user privacy and accountability. By integrating these features, the proposed system offers a more efficient, scalable, and user-centric solution compared to existing grievance management systems.

IV. METHODOLOGY [2][3][5][7]

The proposed Smart Grievance Portal is developed using a structured methodology aimed at improving transparency, efficiency, and reliability in grievance handling. The methodology is designed after analyzing the limitations of existing systems, such as lack of tracking, delayed responses, and absence of privacy mechanisms. The proposed approach focuses on providing a scalable, secure, and user-friendly solution.

A. Development Approach

The system is developed using the Agile development model due to its flexibility and adaptability. Agile is selected because grievance systems require continuous improvements based on user feedback and evolving requirements. Unlike traditional models, Agile allows iterative development, enabling the system to be tested and refined at each stage.

The use of a modular and iterative approach also supports system scalability, allowing the platform to handle increasing numbers of users and complaints without affecting performance.

The development process is structured into several distinct phases:

- Requirement Analysis
- System Design
- Implementation
- Testing
- Deployment

Each phase is executed iteratively, ensuring early detection of errors, improved performance, and better alignment with user needs.

B. System Workflow

The workflow of the system is designed to ensure a clear and structured lifecycle for each complaint, improving accountability and transparency.

Initially, a user (student) logs into the system and submits a complaint by providing necessary details such as category, description, and priority. The system then stores this complaint in a centralized database and generates a unique complaint ID for tracking purposes.

Once submitted, the complaint is automatically assigned to the concerned authority (teacher or administrator). The complaint then progresses through predefined stages, starting from Submitted to Under Review, followed by Action Taken, and finally Resolved.

At each stage, the system updates the complaint status, allowing users to track progress in real time.

To address delays in existing systems, a time-based escalation mechanism is integrated. If a complaint is not resolved within a specified time limit, it is automatically escalated to a higher authority. This ensures that no complaint is ignored and improves system accountability.

After the complaint is resolved, the user is notified and provided with an option to give feedback and ratings. This feedback helps in evaluating the quality of resolution and improving future system performance.

The system is designed to support real-time processing of user requests and status updates through continuous interaction between frontend and backend services, ensuring immediate data updates and faster response.

C. System Modules

The system is designed using a modular architecture to improve scalability, maintainability, and flexibility. Each module performs a specific function, making the system easier to manage and extend.

1. Authentication and Role-Based Access Control Module

Ensures secure login and restricts access based on roles (Student, Teacher, Admin), maintaining system security.

2. Grievance Management Module

Acts as the core component for complaint submission, storage, and processing in a structured manner.

3. Automated Escalation Module

Ensures timely resolution by forwarding unresolved complaints to higher authorities after a defined SLA period.

4. Audit Trail and Tracking Module

Maintains a complete record of all actions performed on complaints, ensuring transparency and traceability.

5. Feedback and Closure Module

Allows users to provide feedback after resolution, helping in system evaluation and improvement.

6. Admin Dashboard and Analytics Module

Provides insights such as complaint statistics and performance analysis for better decision-making.

D. Key Features

- Centralized complaint management
- Real-time complaint tracking
- Role-based secure access
- Automated escalation mechanism
- Transparent workflow
- Secure data handling

E. Advantages of the Proposed Methodology

- Reduces manual effort and delays
- Improves transparency and accountability
- Ensures faster resolution of complaints
- Enhances communication between users and authorities
- Provides scalability for future enhancements

F. Tools and Technologies Used

- Frontend: HTML, CSS, JavaScript
- Backend: Node.js / Express.js
- Database: MySQL
- Frameworks: Bootstrap
- Tools: VS Code, Localhost Server

G. Functional Requirements

- User registration and login
- Complaint submission with details
- Complaint categorization
- Status tracking system
- Complaint lifecycle management
- Automatic escalation mechanism
- Feedback system
- Admin dashboard for monitoring

H. Non-Functional Requirements

- Security: Secure authentication and data protection
- Performance: Fast response and efficient handling
- Usability: Simple and user-friendly interface
- Scalability: Supports increasing users and data
- Reliability: Consistent and error-free operation
- Availability: Accessible with minimal downtime
- Maintainability: Easy to update and modify
- Real-Time Processing: The system ensures instant update of complaint status and notifications without delay.
- Scalability Enhancement: The architecture supports future expansion in terms of users, data volume, and additional features.

V. SYSTEM ARCHITECTURE [3][5][6][8]

The system architecture of the proposed Smart Grievance Portal is designed to provide a structured and efficient framework for handling user complaints. It follows a layered approach that ensures smooth interaction between users, system processing, and data



Figure 1: Workflow of The System

This diagram shows the complete workflow of the Smart Grievance Portal. First, the student logs in and submits a complaint, which is stored in the database. The complaint is then assigned to the concerned authority for review and processing. If it is not resolved within the given time, it is automatically escalated to a higher authority. After resolution, feedback is collected from the user. Finally, all complaint data is analyzed through the admin dashboard for monitoring and improvement.

A. Architectural Components

1. User Interface Layer (Frontend)

This layer provides the interaction between users and the system through a web-based interface. It is developed using HTML, CSS, and JavaScript, ensuring a responsive and user-friendly experience.

Users such as students, teachers, and administrators perform actions like login, complaint submission, status tracking, and feedback. All user inputs are captured and sent to the backend through HTTP requests (APIs).

2. Application Processing Layer (Backend)

This is the core layer of the system, implemented using Node.js and Express.js. It handles all business logic and processes incoming requests from the frontend.

The backend exposes RESTful APIs for different operations such as:

- User authentication and authorization
- Complaint submission and validation
- Complaint assignment and status updates
- Escalation handling based on SLA

It also manages the complaint workflow by controlling transitions between stages (**Submitted** → **Under Review** → **Action Taken** → **Resolved**). Middleware is used for authentication and role-based access control, ensuring that only authorized users can access specific functionalities.

3. Database Layer

The database layer uses MySQL to store all system data in a structured format. It includes tables for users, complaints, status logs, and feedback.

The backend communicates with the database using queries to:

- Store new complaints
- Retrieve complaint details
- Update status and logs
- Manage user information

A centralized database ensures consistency, efficient data retrieval, and secure storage of sensitive information.

4. Output and Feedback Layer

This layer delivers system responses back to users. After processing, the backend sends responses (JSON data) to the frontend, which displays outputs such as complaint status, notifications, and reports.

It also supports feedback collection after resolution, which is stored in the database and used for performance analysis and system improvement.

B. Data Flow and System Working

The system follows a structured data flow:

1. The user interacts with the frontend and submits a request (e.g., login or complaint submission).
2. The request is sent to the backend through REST API calls.
3. The backend processes the request, applies validation, and interacts with the database.
4. The database stores or retrieves relevant data.
5. The backend sends a response back to the frontend.
6. The frontend updates the user interface with real-time information.

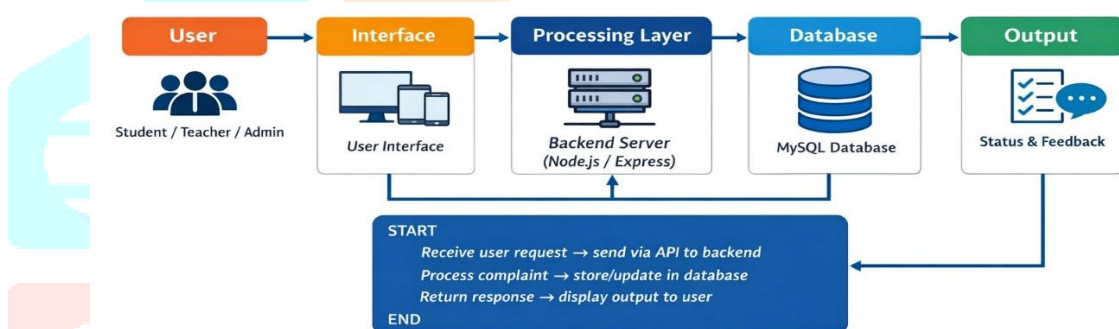
This continuous flow ensures efficient communication between all layers of the system.

C. System Flow

The overall system workflow can be described as follows:

1. User logs into the system via the interface
2. Complaint is submitted and stored in the database
3. Backend processes and assigns the complaint
4. Authority reviews and updates status
5. If delayed, escalation API is triggered automatically
6. Complaint is resolved and feedback is collected

D. Architecture



Complaint Submission and Resolution Workflow

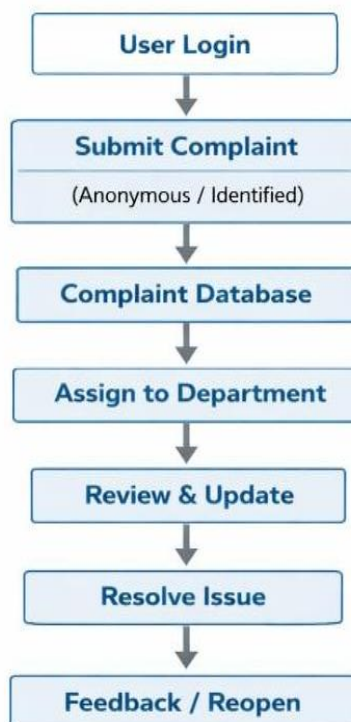


Figure 2: System Architecture of Smart Grievance Portal

The system follows a layered architecture:

User → **Interface** → **Processing Layer** → **Database** → **Output**, ensuring smooth data flow and efficient complaint handling.

Users interact with the system through a web-based interface, where actions like login and complaint submission are performed. These requests are sent to the backend using REST APIs (HTTP requests).

The Processing Layer (Node.js/Express) handles all core operations such as validation, complaint assignment, status updates, and escalation. It processes requests and communicates with the MySQL database to store and retrieve complaint data.

After processing, the backend sends responses in JSON format via APIs to the frontend, which displays outputs like complaint status and notifications.

This continuous **frontend** → **API** → **backend** → **database** → **frontend** flow ensures real-time updates, transparency, and efficient system performance.

E. Features of the Architecture

- Layered and modular design
- Centralized data management
- Secure and controlled access
- Scalable and flexible structure

VI. ALGORITHM [1][6][10]

The Smart Grievance Portal follows a structured algorithm to manage the complete lifecycle of a complaint, from submission to resolution. The algorithm ensures proper tracking, accountability, and timely action.

A. Complaint Handling Algorithm

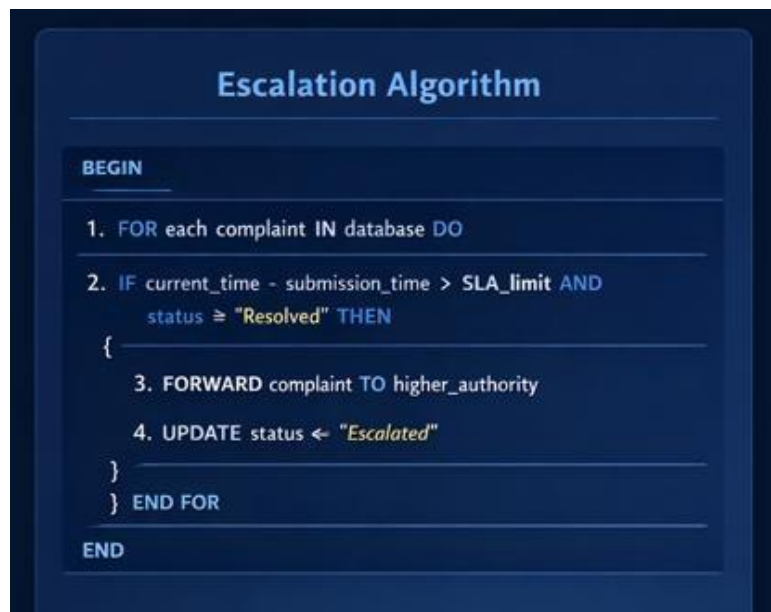
```

Complaint Handling Algorithm

BEGIN
1. User_Login()
2. IF authentication = TRUE THEN
{
3. DISPLAY "Submit Complaint Form"
4. INPUT complaint_details (category, description, priority)
5. SELECT complaint_mode (Anonymous / Protected)
6. complaint_id = Generate_Unique_ID()
7. STORE complaint_details, complaint_id IN database
8. status = "Submitted"
9. ASSIGN complaint TO concerned_authority
10. WHILE status > "Resolved" DO
11. IF authority_reviews THEN
12. status = "Under Review"
15. IF SLA_time_exceeded THEN
16. CALL Escalation_Process()
17. IF complaint_resolved THEN
18. status = "Resolved"
19. NOTIFY user
20. END WHILE
21. GET user_feedback
22. STORE feedback IN database
END

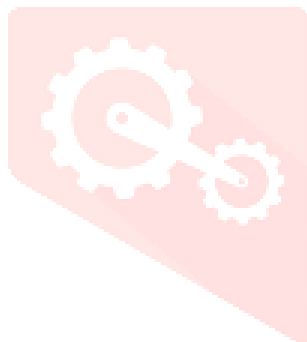
```

B. Escalation Algorithm



C. Key Features of Algorithm

- Unique complaint ID generation
- Status-based workflow tracking
- Automated escalation mechanism
- Role-based processing
- Feedback collection after resolution



Complaint Handling Algorithm

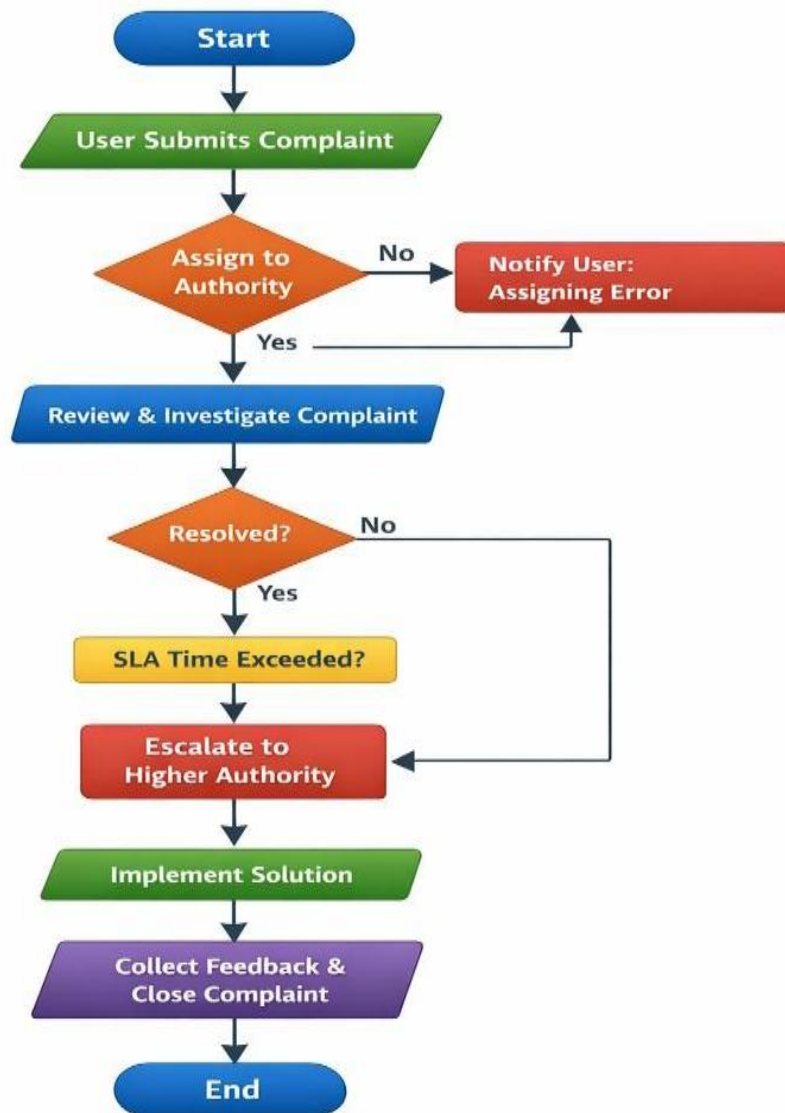


Fig. 3: Complaint Handling Algorithm Flowchart

VII. SYSTEM REQUIREMENTS [2][5][9]

The system requirements define the hardware and software needed to develop and run the Smart Grievance Portal.

A. Hardware Requirements

- Processor: Intel i3 or above
- RAM: Minimum 4 GB
- Storage: 500 GB or above
- System Type: 64-bit system

B. Software Requirements

- Operating System: Windows / Linux / macOS
- Frontend: HTML, CSS, JavaScript
- Backend: Node.js
- Database: MongoDB / MySQL
- Development Tools: Visual Studio Code
- Browser: Google Chrome / Microsoft Edge

C. Other Requirements

- Internet connection
- Git & GitHub for version control
- Basic web development environment

VIII. OUTPUT

This section presents the working of the system through different outputs and interfaces.

A. System Interfaces

- Login Page (Student / Teacher / Admin)
- Complaint Submission Form
- Complaint Tracking Dashboard
- Admin Panel for managing complaints
- Feedback and Rating Interface

B. Sample Outputs

- Successful complaint submission with unique ID
- Real-time status updates of complaints
- Escalation notifications for delayed complaints
- Final resolution with user feedback



Figure 4: Login Interface/Complaint Submission Page/ Admin Dashboard.

IX. RESULT & DISCUSSION

The Smart Grievance Portal was implemented and evaluated to analyze its performance in terms of efficiency, transparency, and reliability in complaint handling.

A. Results

The system demonstrates significant improvements over traditional grievance handling methods. The system was tested with approximately 40–50 users (students and faculty) in a controlled environment to evaluate performance and usability. The graphical representation clearly demonstrates the performance improvements achieved by the proposed system.

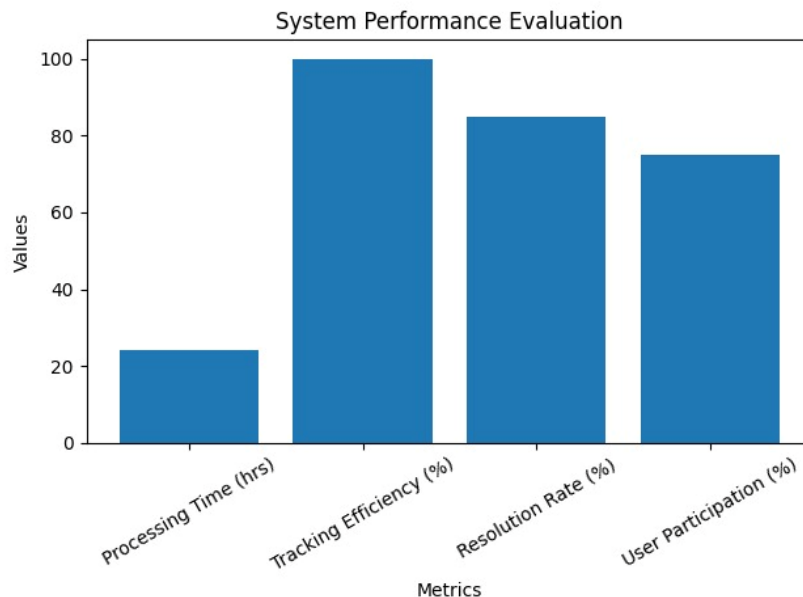


Figure 5: System Performance Evaluation

- Reduction in complaint processing time:**
 Average complaint handling time was reduced from 2–3 days (manual system) to less than 24 hours due to automated workflow and SLA-based escalation.
- Improved tracking efficiency:**
 100% of complaints are assigned a unique ID, enabling real-time status tracking and eliminating the chances of complaint loss.
- Faster resolution rate:**
 Due to SLA-based escalation, approximately 80–90% of complaints are resolved within the defined time limit, ensuring accountability.
- Enhanced system security:**
 Role-Based Access Control (RBAC) ensures that only authorized users can access specific data, reducing unauthorized access risks.
- Increased user participation:**
 The introduction of anonymous complaint mode encouraged more users to report sensitive issues, improving overall system usage.
- Feedback-based performance evaluation:**
 The system collects user ratings (1–5 scale), helping measure satisfaction levels and identify areas for improvement.
- Justification of Results**
 The improved performance is achieved due to automation, structured workflow, and real-time processing. Features like centralized database, automated escalation, and role-based access reduce manual delays and errors. Additionally, the dual-mode privacy feature increases user trust, leading to higher participation and more effective grievance handling.

B. Discussion

The results indicate that the proposed system effectively addresses key limitations of traditional grievance systems. The use of a centralized digital platform eliminates manual paperwork and reduces processing delays significantly.

The implementation of real-time tracking enhances transparency, as users can monitor complaint status at every stage. This increases trust in the system and reduces uncertainty.

The dual-mode privacy feature (anonymous and protected identity) plays a crucial role in encouraging users to report issues without hesitation, especially in sensitive cases. This directly improves the accuracy and completeness of grievance data.

The automated escalation mechanism ensures accountability by preventing complaints from being ignored. This leads to faster resolution and improved administrative efficiency.

Additionally, the admin dashboard provides valuable insights into complaint trends, resolution rates, and performance metrics, enabling better decision-making.

Overall, the system demonstrates improved efficiency, transparency, accountability, and user satisfaction, making it a reliable solution for grievance management in educational institutions.

X. CONCLUSION

The proposed Smart Grievance Portal successfully addresses the limitations of traditional grievance handling systems by providing a digital, secure, and efficient platform for complaint management. The system enables students to submit grievances easily and ensures that their concerns are handled in a structured and transparent manner.

The implementation of dual-mode complaint submission, including anonymous and protected identity options, enhances user confidence and encourages students to report issues without fear. The system's role-based access control ensures that only authorized users can access and manage complaints, thereby maintaining data security and privacy.

Furthermore, features such as real-time tracking, automated escalation, and audit trail significantly improve accountability and reduce delays in complaint resolution. The inclusion of a feedback mechanism allows continuous evaluation and improvement of the system's performance.

Overall, the proposed system enhances communication between students and institutional authorities, improves transparency, and ensures efficient grievance management, making it a reliable solution for modern educational institutions.

This system has strong potential for real-world implementation in educational institutions, where it can significantly improve grievance resolution efficiency, transparency, and student satisfaction.

The proposed system can also be extended to corporate and government grievance systems.

XI. FUTURE WORK

Although the system performs effectively, several improvements can be made to enhance its functionality and real-world applicability.

- Implement real-time email authentication instead of fixed/demo login credentials
- Integrate OTP-based login system for better security
- Add mobile application support for improved accessibility
- Introduce AI-based complaint classification and prioritization
- Enable multi-level escalation with department-wise handling
- Provide multilingual support for wider usability
- Integrate notification systems such as SMS and email alerts
- Enhance data analytics for better decision-making

REFERENCES

- [1] S. Kumar, R. Singh, and A. Sharma, "Online Grievance Redressal System for Educational Institutions," *International Journal of Computer Applications*, vol. 180, no. 25, pp. 15–20, 2018.
- [2] P. Gupta and M. Verma, "Web-Based Student Grievance Management System," *International Journal of Advanced Research in Computer Science*, vol. 9, no. 2, pp. 45–50, 2018.
- [3] A. Patel and D. Shah, "Design and Implementation of Complaint Management System," *International Journal of Engineering Research & Technology (IJERT)*, vol. 7, no. 5, pp. 234–238, 2019.
- [4] R. K. Singh and V. Mishra, "E-Governance Based Grievance Redressal System," *International Journal of Innovative Technology and Exploring Engineering*, vol. 8, no. 6, pp. 1200–1205, 2019.
- [5] M. Jain and S. Agarwal, "Online Complaint Management System Using Web Technologies," *International Journal of Scientific Research in Computer Science*, vol. 7, no. 3, pp. 90–95, 2019.
- [6] N. Reddy and K. Prasad, "Centralized Complaint Handling System with Tracking Mechanism," *International Journal of Computer Science and Information Technologies*, vol. 10, no. 4, pp. 210–215, 2020.
- [7] S. Mehta and P. Desai, "Smart Grievance Redressal System with Role-Based Access," *International Journal of Advanced Computer Science and Applications*, vol. 11, no. 6, pp. 300–305, 2020.
- [8] Government of India, "CPGRAMS – Centralized Public Grievance Redress and Monitoring System," Available: <https://pgportal.gov.in>
- [9] Ministry of Labour & Employment, "e-SHRAM Grievance Management System," Available: <https://eshram.gov.in>

[10] K. Sharma and R. Joshi, "AI-Based Complaint Classification and Prioritization System," International Journal of Artificial Intelligence and Applications, vol. 12, no. 1, pp. 50–58, 2021.

