

THE COMPLAINT MANAGEMENT SYSTEM

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Abstract—Goal of this project is to design an intelligent ticketing system built using modern web technologies[1] that implements the processes involved in addressing a grievance related to administration in real time scenarios. In real time system, the user has to visit administrator's office to register a complaint. The Administration relies on paper work for making decisions and maintenance of historical and present data. There are high chances of such records getting lost or damaged and sometime enquires end up being lost and or unaddressed.[2] To produce reports for analysis using inconsistent or missing data leads to wrong decisions. There is no feedback system therefore, valuable feedbacks are missed or poor surveillance or lack of surveillance leads to lethargic behavior among officials. The proposed solution is to provide an intelligent ticketing system that is paperless and automated to save time and man power in an organization. The user has to login and raise a ticket that has to be addressed by the administrator and action has to be taken. If in case the ticket remains unaddressed then, escalated to higher officials and the feedback of the user is recorded. Later the feedbacks are used by the expert system for better decision making in absence of the administrator. The system can be completely autonomous in future until there is enough knowledge for the expert system to function on its own.

Keywords - user, administrator, complaint management, classification, allocation

I. Introduction

The Complaint Management System (CMS) is bridge between user and the administrator in the organization, which is designed to reduce the processing time of complaints and gather information[2]. The effectiveness of using CMS is paperless work with quick responses and ticket escalation. According to the current scenario the user has to visit administrator office which is a time consuming process and complaint has to be register in complaint book. Later, the chances of such record getting lost or damaged and some complaints remain unaddressed.

The user complaint handling becomes the important factor of the organization, thus the organization should pay attention to the complaint and solve as soon as possible. In contrast, the current complaint management system has some problems. The problems of complaint procedure and complaint management are as follows:

Problems of complaint procedure

- User has to visit admin office to register complaint

User spend a lot of time

User do not know the status of complaint

Problems of complaint management

- The Funding may not be available
- The allocation of suitable worker
- The proper analysis of data is difficult
- Complaints are not related to responsible department
- The administrator do not have option for asking further information about complaint and providing feedback
- The complaints on hold remain unnoticed

The CMS is developed to handle problems using web application which can be used in mobile as well as computer system to submit the complaint as a ticket and, a panel for the administrator to manage the tickets. The back end services provide a well organize and classify view of the tickets on the administrator panel. The unique identity number provided by the organization helps in user categorization to limit the access of user. The user does not have the permissions to forward a raised ticket to higher authorities or assign labor for a particular task as these activities may lead to inconsistency in the regular work flow of the administration. The user gets all notification regarding the status of the ticket.

The Scope of CMS would focus on maintenance and hall booking. For example, classroom maintenance, lab maintenance, restroom maintenance, office maintenance, staffroom maintenance and advance hall booking for an event.

Section (II) provides a background of the complaint management system, and related research section (III) explains about the overall of design. Section (IV) provides the information about implementation method. Section (V) presents the evaluation result from the users. Section (VI) the summation of the research.

II. BACKGROUND

A. Complaint Process

The complaint process is user's expression of dissatisfaction with the condition whether it be writing or speaking to the responsible person within the organization. Complaint management might have different priority for the problems,

therefore each organisation will have process to handle the complaints.

Complaint Management process is a set of operation that used to handle complaints in order to resolve problems. The procedures for handling complaints are as follows:

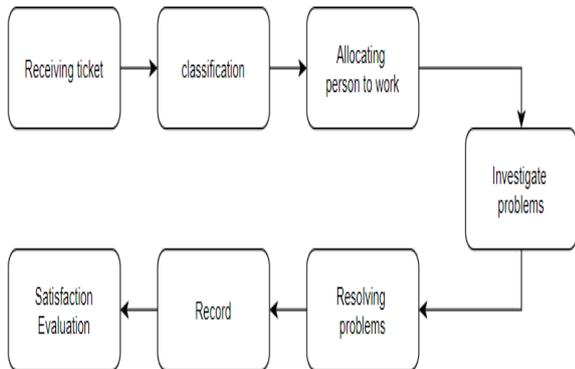


Fig.1 Process Flow

B.Related Technology

Classifying Compliant via Machine Learning

Due to the fact that the organization has to deal with several complaints, the automatically classify complaint is required to handle automatically. Thus, the benefit is saving time. Text classification is the automatic classifying of documents to predefined classes or categories based on the text in documents. There are several algorithms that are in text classification such as Rule-Based, and Decision tree. Machine learning is one of the artificial intelligence (AI), which enables the system or computer to automatically learn and improve based on the experiences and the information that received. Normally, there are two types of machine learning algorithms, which are the supervised learning and unsupervised learning. The supervised learning is learning to predict the future events using the labelled examples from the human input. For instance, human provides the information and the correct result, so the computer will learn and use the algorithm to map between the information and result, and then the computer is able to predict the result for that information. The example algorithms are Support Vector Machine, Naïve Bayes, and Gradient Boosting. In contrast, the unsupervised learning is learning without providing the result from human, therefore the computer will learn from the hidden structure of information. The example algorithms are K Nearest Neighbour and K-Mean.

Comparison with existing System

The existing system that related to CMS could be divided into these Formats, which are paperwork, application, tracking, analysis, automation. The following is the comparison of the main features of CMS and current existing system.

CMS has the strength points such as complaint status tracking, automatically complaint handling, analysis based on historical

CMS		Existing	
Paperwork	✗	Paperwork	✓
Tracking	✓	Tracking	✗
Analysis	✓	Analysis	✗
Automation	✓	Automation	✗

data, no paper work to register complain and ticket can be from anywhere.[1]

Fig.2 Comparision with Existing System

III. ANALYSIS AND DESIGN

SYSTEM ARCHITECTURE OVERVIEW

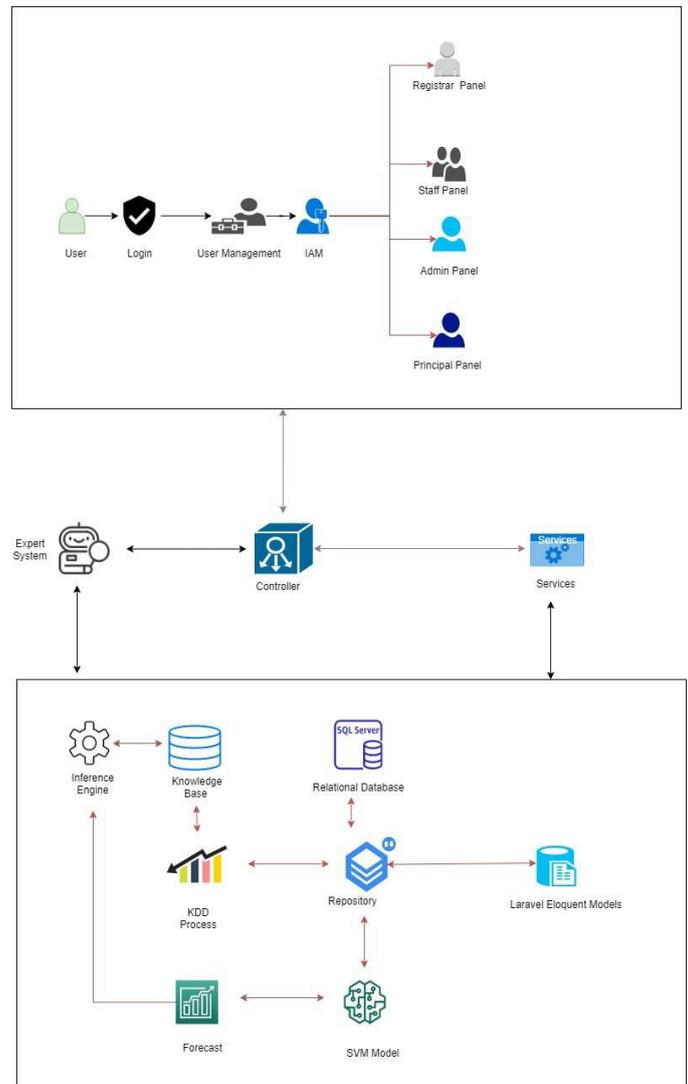


Fig.3 System Architecture

Ticket Handler

Ticket Handler manipulate a ticket based on the request of the user. Multiple controllers for all the possible actions available to the user constitute the Ticket Handler. The controllers interact with different services and repositories to manipulate data in the views and the database is manipulated using database models and their relationships (MVC Architecture). The Ticket handler helps in performing following actions:

Raise a ticket – The user raise a ticket regarding the issue or any requirement through user panel.

Hold a ticket – There are some scenarios where the system needs to hold the ticket for some time. For example, if the amount required in the ticket is unavailable in that scenario the status of the ticket will be on “Hold” for a specific time. Ticket Handler notify the administrator after exceeding the time limit decided for tickets on “Hold” to take further action.

Forward a ticket- If the ticket requires approval of higher authorities then the administrator forwards the ticket to the official to get approval. Ticket handler manage all steps taken in ticket forwarding with the help of controllers.

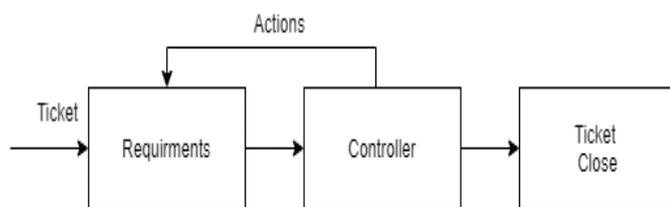


Fig.4 Ticket Handler

USER MANGER

In an organization there are multiple users with different roles. User Manger prevents unauthorized access and helps in managing the users of the system. All the users need to be respond according to their role. The user manager can add new users or remove existing users and even set roles for an existing user. The system consist of following types of users:

- Staff
- Administrator
- Registrar
- Principal
- Director

The system redirects the users to the panel according to the access level id assign to them.

IAM (Identity Access Module)

IAM helps in managing the permission of a user depending on its role in the system. For example, a user (staff) cannot have the permissions to forward a raised ticket to higher authorities or assign labor for a particular task as these activities may lead to inconsistency in the regular work flow of the administration. The actions for a user in the system are bounded by restricting their access and identifying their role. The system assign an Access Level Id to the user depending on its role. It prevents any permission conflicts among the users as the access is granted depending on their roles. For example, the administrator with access level Id higher than staff has access to more services than a staff.

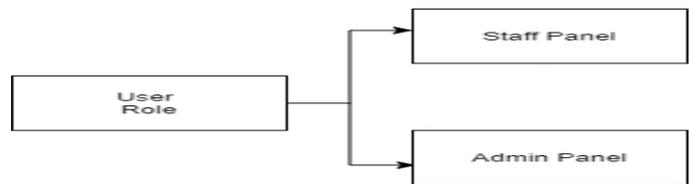


Fig 5 User Manager

USER PANEL

There are multiple users with different roles and purpose, so the system provides a different interface to perform relevant actions.

There are mainly two panels in the system:

1. **Admin Panel:** Administrator have full control over the system. Admin have permissions such as create user, manage user, add worker, and manage worker, ticket handling, and analysis. User panel has a dashboard consisting of all the tickets in ascending order according of date of ticket generation.
2. **Staff Panel:** Staff has limited access over the system. Staff have permission to raise new ticket and check the status of the tickets raised by him.

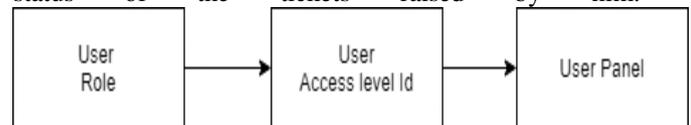


Fig.6 User Panel

FEEDBACK MODULE

Feedback Module helps the administration to assess the response for a particular issue. The feedback given by the user inform the administration about any lethargic behavior of the personnel in-charge. It helps the administration to rectify the flaws that has been reported by the users. User feedbacks can be an asset to the knowledge base used by the expert system for more clear decisions.

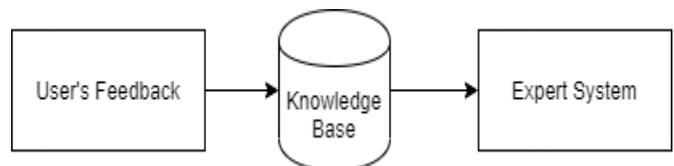


Fig.7 Feedback Module

Rating Module

Rating Module grade personnel of the organization and keeps track of their performances. It depends on the user feedback and work score which is basically calculated as the time taken to complete their work subtracted from turnaround time (TAT) of the task. It helps in more precise assignment of work among personnel for maximum efficiency. Rating help in categorization of the workers such as good, average or poor and provide some special perks to them. It helps the administration to instruct the worker to improve quality of work otherwise strict actions can be taken against him.

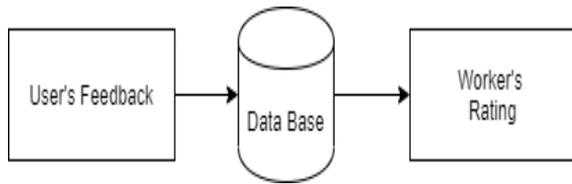


Fig. 8 Rating Module

ANALYSIS MODULE

Analysis Module help the administration to analyze subjects like expenses, labour, tickets etc.[2]

The historical data helps in analysis report generation which can be shown as graph or histogram.

For example, number of tickets generated in different categories with pending tickets can be shown in histogram over a selected period of time.

This module identify important patterns that can be an input to the knowledge base and helps the expert system to be more precise in decision making. For example, if a particular month in the year required more labour and financial expenditure for more than three years consecutively then it may be a good decision to cut down extra spending in the rest of the months to save for the needful.

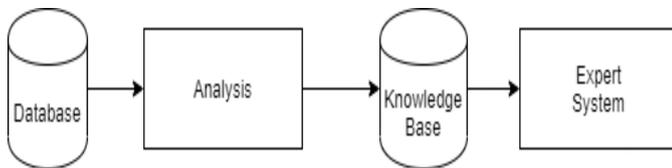


Fig. 9 Analysis module

NOTIFIER MODULE

The notifier module sends the notification to all the users. These notification can be e-mail, SMS, Push Notification. Whenever a user generates a ticket the administrator gets notification on his email and admin panel and as the administrator assign the work to labour then a push notification and SMS are sent to the labour. The user gets status of the raised ticket as the status updates in database by the administrator.

CMS use Laravel Mailer to send notification on e-mail, Twilio SMS API to send notification as SMS and AMAZON SNS to send push notification to the user.

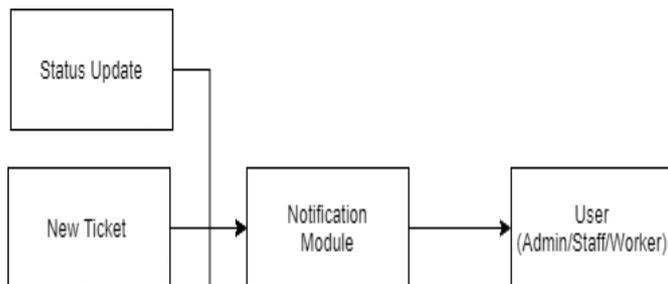


Fig. 10 Notifier Module

FORECAST MODULE

Forecast module help is forecasting certain parameter like, how much labour require for current week? Or how much the organization would have to spend on administration this month?

The forecasting can be achieved by using years of historical data about spending, labour, and consumption. The forecasting can be useful for preparedness of the administration against any sudden hike in the requirements of any user etc. Also the forecasted data can be used by the expert system to enhance its decision making. It helps the organization to prepare for the upcoming requirements in the future.

The forecast module receives data from the SVM (Support Vector Machine) which analyze the historical processed data stored in the repository.

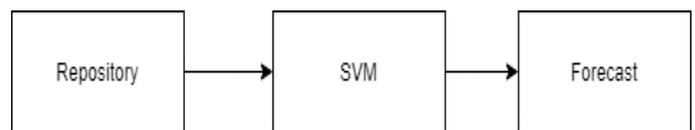


Fig. 11 Forecat Module

MACHINE LEARNING

The module uses supervised learning method, by using historical data sets generated by the users and administration to learn the responses of the admin. This data is stored in the repository. The module also uses reinforcement learning technique in parallel with the feedback module to improve its accuracy in decision making. This helps in managing the administration work in the absence of the administrator.

SVM Classifier to decide whether a feedback is negative or positive. The feedback sentence gets segmented. The segmented sentence get tokenized as positive or negative. This positive and negative tokenization is done by scoring which is processed by polarization process. The positive feedbacks are used as reward for the expert system to maximize system performance.

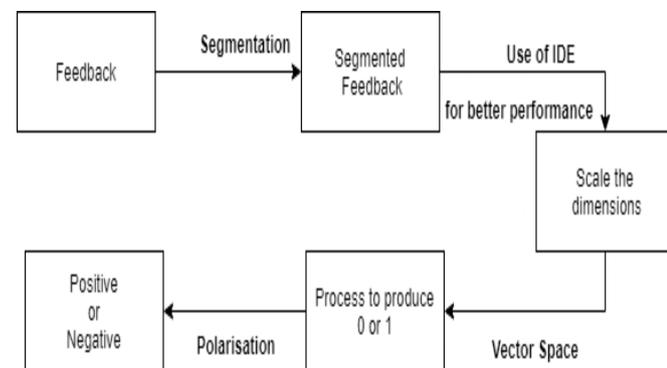


Fig. 12 SVM Process

KDD Module

Knowledge Discovery in Database is user to prioritize the tickets into following categories: high priority, medium priority and low priority.

KDD discover patterns in usage of a service, or consumption of goods by a user and the knowledge can be useful for generating an automatic response by the system in case similar pattern is observed again and stored I the repository for future.

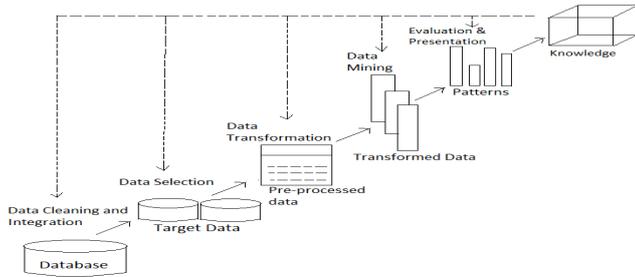


Figure 13 KDD Process

4.4.12 EXPERT SYSTEM

An expert system is a computer system that emulates the decision-making ability of a human expert. Expert systems are designed to solve complex problems by reasoning through bodies of knowledge, represented mainly as if-then rules rather than through conventional procedural code.

The expert system acts as a substitute in case the admin is not available to take decisions. [2]The expert system will only be used to address the tickets with 'High Priority' until the admin is available next day. The system cannot rely much on this feature since it only uses historical data and admin generated knowledge which can lead to wrong decisions sometimes. The response of the expert system can be improved using the user feedbacks for a ticket that has been addressed before.

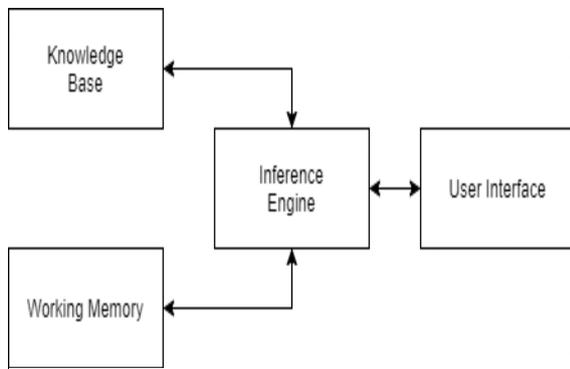


Fig.14 Expert System

IV. IMPLEMENTATION

1. LOGIN

In an organization there are users with different roles and purposes, so they need a different interface to perform relevant actions. To login in the CMS the user has to login with unique Institutional Id and password. Access level is assigned to each user by the admin. The user is directed to panel depending upon assigned access level. The user with access level "Limited" redirects to the user panel and the user with access level "moderate" redirects to the admin dashboard. After successful login into the system the user can use available services.

2. NEW TICKET

The user after successful login can generate new ticket. New ticket can be of following type:

- Services
- Consumables
- Capital Equipment
- Hall Booking

The user need to fill the form by providing following details i.e., category, subcategory, floor, building, asset code, quantity, and description regarding the complaint and submit the ticket. In capital equipment, consumables and hall booking the user has to select the option whether fund is required or not. After successful submission of the ticket the user can see the ticket on user dashboard with current status.

3. TICKET HANDLING

The administrator receives the ticket and check if the fund is required to process or not.[2] The administrator gets approval from the officials and assign the worker to finish the work and close the ticket.

In CMS each ticket has a predefined turn around time (TAT), if the admins fails to address the ticket within TAT then the ticket is escalated to the higher officials. At each stage the user gets notified through notification module.

4. FEEDBACK AND RATING

The feedback helps the administration assess the response for a particular issue.[2] As the administrator close the ticket the user gives feedback. The user has to select feedback and select the ticket then the data would filled automatically. The use has to select area in which improvement is required followed by rating. User can send the message with feedback to explain the issue in the work.

The feedback stored in the database are asset to the knowledge base which is used by the expert system for more clear decisions. Feedback and rating help is categorization of the worker as good worker or bad which help in more precise assignment of work among personnel for maximum efficiency.

5. USER AND WORKER MANAGER

The administrator has access to create or remove user and worker. Administrator selects create user option in dashboard. Administrator fills user name, email, institution id, phone, role, department, designation, access level, password, and submit the form. In manage user panel administrator can see details such as tickets generated, of all the user available in the database. Administrator can remove user from manage user.

Administrator selects create worker option in dashboard. Administrator fills worker name, email, phone, service category, and submit the form. In manage worker panel administrator can see details such as tickets assigned working hours of all the worker available in the database. Administrator can remove worker from manage worker.

V. EVALUATION

A. *Client side* Caching and CDN loads page faster and minification of each library and script boost up the loading speed of the page. Image format AVIF and PNG requires minimal data for image loading. Client side evaluation reduce the load on the server to enhance the performance.

B. *Server Side* laravel php framework establish a better connectivity with server because it request only necessary code from server requires to load the page. The server need not to compile whole code again and again. Mysql organise the data in such that only requires data is used which reduce the response time and boost up the performance of the server.

VI. CONCLUSION

Proposed system provides to provide an intelligent ticketing system that is paperless, automated, and efficient and user friendly with ticket escalation and better decision making based on the feedbacks received from the user to work in the absence of admin. The system can be completely autonomous in future until there is enough knowledge for the expert system to function on its own.

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