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SUBJECT

Integration of Requests & Proposals Forms with
The
IKTERAHET - INCHEGHALAT Platform

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Our Gratitudes

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[Larbaoui Merouan - Chertouh Okba - Mohammedi Farid]

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General Introduction

- Introduction

In today's digital world, organizations are constantly encouraged to improve the way they communicate and interact with their customers. Listening to customers and understanding their opinions has become essential for improving service quality and making better decisions. For a large organization like Sonelgaz, which serves millions of users and operates in a service-driven environment, maintaining clear and effective communication with clients is not only important but necessary to build trust and ensure continuous improvement.

Within the company, it was noticed that customer feedback was mainly collected through traditional methods such as emails and paper forms. While these methods allowed customers to share their complaints, suggestions, and opinions, they were not always efficient. It was often difficult to track who handled a specific request or to verify whether it had been properly processed. Customers themselves had no clear way of knowing if their messages were received or forwarded to the right department. In addition, manual processing slowed down responses and made it harder to analyze the collected information in a structured way.

These observations clearly showed the need for a more organized and digital approach to managing feedback. For this reason, this project proposes the development of a web-based application that centralizes and simplifies the feedback process. The goal is to create a reliable and transparent platform that connects customers with decision-makers and ensures that every submission is properly recorded and followed up. With such a system, feedback can be tracked in real time, responsibilities can be clearly assigned, and service quality can be improved.

Beyond solving operational difficulties, this solution also aims to strengthen customer satisfaction and support the company's overall performance. By adopting digital tools, the organization can improve efficiency, enhance transparency, and make more informed decisions. In this way, the project represents an important step toward modernizing internal processes and reinforcing the company's commitment to better service delivery

- Purpose of our study

The purpose of this study is to better understand the challenges the company faces in managing customer feedback and to find a practical and effective way to improve this process. By analyzing the current system, which relies mainly on traditional methods, we aim to identify its weaknesses and their impact on communication and service quality. Based on this analysis, the project proposes the development of a web-based application that simplifies feedback collection, improves transparency, and ensures better follow-up of customer requests. Ultimately, this study seeks to make communication more efficient, strengthen accountability, and enhance the overall customer experience

This work is organized into four chapters:

- **Chapter 1:** Host organization and existing system study
- **Chapter 2:** General overview of transaction monitoring
- **Chapter 3:** The analysis and design of the modeled system
- **Chapter 4:** Implementation, tools, and presentation of the developed application

CHAPTER I

Host organization and existing system study

1.1 Presentation of the organization

1.1.1 Description of SONELGAZ

Sonelgaz (Société Algérienne de l'Électricité et du Gaz) is the national public company responsible for the production, transmission, and distribution of electricity, as well as the transport and distribution of natural gas in Algeria. It operates as a strategic actor in the country's energy sector and plays a central role in ensuring energy security and supporting national economic development.

The company manages an extensive infrastructure network that covers the entire national territory, including power generation plants, high-voltage transmission lines, gas pipelines, and distribution systems. Through its specialized subsidiaries, Sonelgaz ensures the continuity of electricity and gas supply to millions of residential, commercial, and industrial customers.

As a major public service provider, Sonelgaz is committed to improving service quality, expanding access to energy, modernizing its infrastructure, and integrating new technologies into its operations. The company also contributes significantly to Algeria's socio-economic development by supporting industrial growth and improving living standards [1]

1.1.2 Historical Overview of SONELGAZ

The origins of Sonelgaz date back to 1947 with the creation of Électricité et Gaz d'Algérie (EGA), which was responsible for managing electricity and gas services during the colonial period.

After Algeria gained independence, the national authorities sought to reorganize and strengthen the energy sector to support the country's development strategy. In 1969, Sonelgaz was officially established as a national company responsible for managing electricity production, transmission, and distribution, as well as gas distribution across the country [2]

Over the years, Sonelgaz underwent several organizational and legal transformations to adapt to economic reforms and improve operational efficiency. A major restructuring process in the early 2000s led to its transformation into a joint-stock company organized as a holding group with multiple specialized subsidiaries. This restructuring separated core activities such as production, transport, and distribution while maintaining centralized strategic coordination.

Today, Sonelgaz stands as one of the largest industrial groups in Algeria, playing a fundamental role in expanding energy access, modernizing infrastructure, and supporting national development objectives



Figure 1.1: logo of the company SONELGAZ

1.2 Description of SONELGAZ Services

Sonelgaz Services is a subsidiary of the Sonelgaz Group, created in 2022 through the merger of several subsidiaries and support activities. It was established to centralize and optimize service functions for the Group.

Subsidiary Companies :

- ELIT
- TRANSMEX
- IFEG

The company operates in key areas including:

- Professional training in electricity and gas métiers
- Transport, lifting, and maintenance of industrial equipment
- Procurement, qualification, and laboratory services
- Management and protection of infrastructure and assets
- Occupational health (workplace medicine)
- Digital systems and information services

Sonelgaz Services supports the operational performance of the Sonelgaz Group through technical, logistical, administrative, and commercial services.

As of September 2024, the company employs nearly 4,000 employees and generates over 10 billion DZD in revenue, playing a strategic support role within the Group.

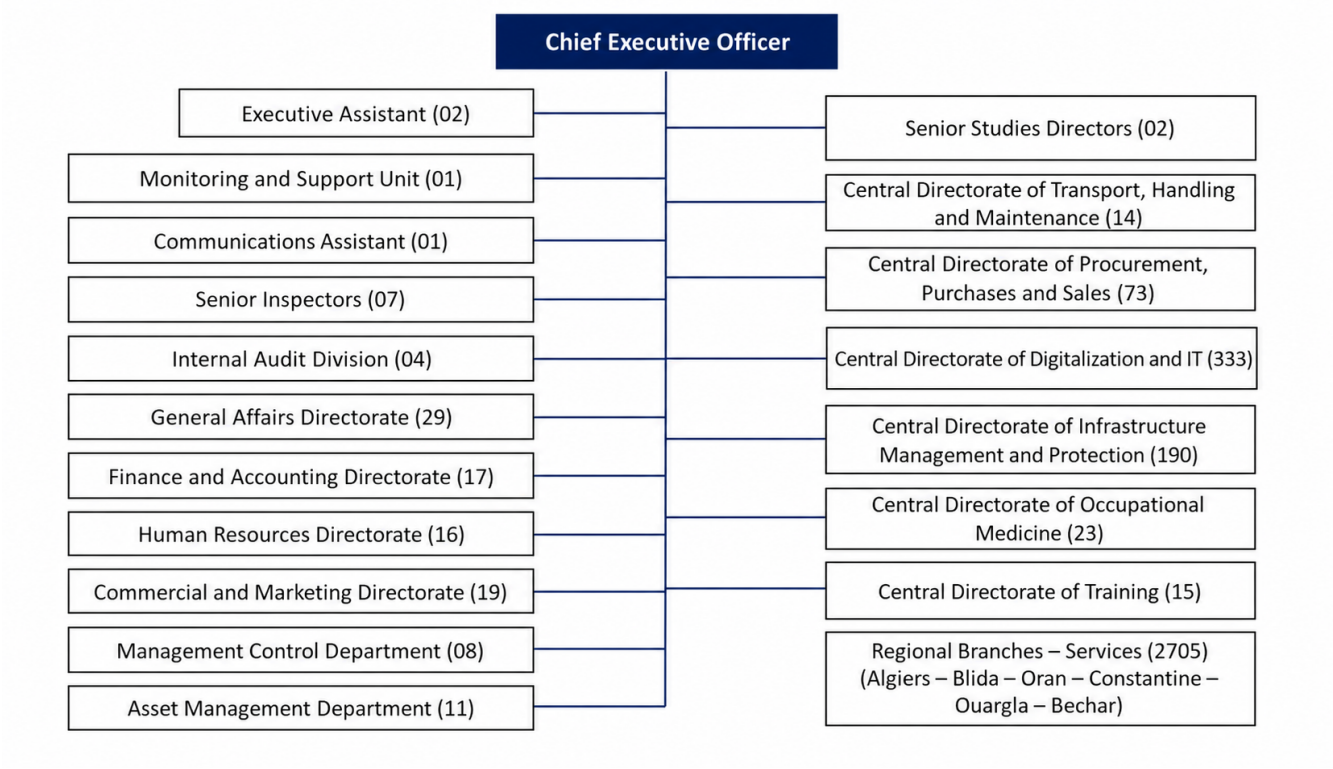


Figure 1.2: Organizational Chart of the company SONELGAZ

1.2.1 Presentation of host departement "ELIT"

ELIT (El Djazaïr Information Technology) is a wholly owned subsidiary of the Sonelgaz Group, established in January 2009 to serve as the company's IT and technological arm. Its primary mission is to develop, secure, and maintain the Group's information systems, including data center management, cybersecurity, and digital transformation initiatives [3] ELIT provides services that allow Sonelgaz customers to access and view their electricity and gas bills online through the portal consulter-factures.elit.dz, as well as make secure electronic payments. These digital services help simplify administrative procedures and improve customer convenience.

The company employs more than 150 engineers and manages critical IT infrastructures for the Sonelgaz Group, including IP telephony networks and customer databases. Through these responsibilities, ELIT plays a key role in ensuring the reliability, security, and continuity of the Group's information systems

1.3 Project Description

1.3.1 Problem Statement

At the company level, we have identified several issues related to communication and customer feedback collection. The most significant problem is the reliance on traditional feedback methods such as emails and paper forms :

- Slow processing :
  - Feedback must be handled manually, which delays responses and reduces efficiency
- Risk of data loss :
  - Paper forms can be misplaced and emails can be ignored or deleted, leading to missing information
- No real-time monitoring :
  - Management cannot quickly detect urgent issues or recurring problems
- Lack of employee accountability :
  - Traditional methods make it difficult to track who handled or responded to proposals, leading to unclear responsibilities and possible delays
- Lack of feedback tracking for clients :
  - Customers who submit their opinions cannot know whether their message was received, processed, or forwarded to the responsible department, which reduces transparency and trust

All these reasons negatively affect the company's overall performance, service quality, and customer satisfaction if they continue over time. They can lead to slower response times, unresolved issues, decreased customer trust, and damage to the company's reputation. In the long term, this may reduce competitiveness and limit opportunities for improvement and growth

1.3.2 Project Objectives

The objective of our project is to address the previously mentioned problems. To achieve this, we proposed the implementation of a web application to facilitate communication between clients and decision-makers

1.4 Conclusion

In this chapter, we identified the main problems related to traditional feedback collection methods, such as lack of traceability, accountability, transparency, and slow processing. These issues negatively affect communication, efficiency, and customer satisfaction.

To address these challenges, we proposed the development of a web-based application to digitalize and centralize feedback management, improve communication, and enhance service quality

CHAPTER II
Analysis of the Existing System

2.1 Overview of the Current System

In the current system, customer and internal requests enter Sonelgaz through multiple channels that operate independently from one another. These submission methods are not connected through a centralized digital platform, which creates fragmentation in information management. Each channel follows its own procedure, leading to inconsistencies, delays, and difficulties in coordination between departments. The absence of integration between these channels contributes significantly to the inefficiencies observed in the overall feedback and request management process

2.1.1 Submission channels

- Physical Attendance at the Agency :
  Clients must visit their local agency during working hours to submit requests or complaints. After waiting in line, they explain their issue to a commercial agent, who completes a paper form known as a "Fiche de Réclamation" or "Demande de Prestation." This process is entirely manual and requires physical presence

- Call Center (3303) :
  The call center is mainly used for emergency cases, such as gas leaks. When a client contacts the call center, the agent collects essential information including the caller's identity, address, contact details, and a description of the issue. In urgent situations, the agent records the incident in the call management system and may provide immediate safety instructions. The information is then forwarded to the appropriate technical intervention team for action. However, the system used by the call center is often separate from the administrative system used in local agencies, which results in disconnected information management and may lead to delays or gaps in follow-up

- Internal Requests (Employees) :
  Employees within Sonelgaz submit internal technical or administrative requests mainly through emails or signed paper memos sent to their supervisors. These requests are handled manually and require direct coordination between departments. Because they are not integrated into a centralized digital system, tracking their status and ensuring proper follow-up can be difficult

2.1.2 Processing workflow

After a request is submitted through one of the available channels, it enters a processing phase that remains largely manual and paper-based. The workflow involves several sequential steps handled by different departments, with limited automation or real-time

tracking. This traditional process increases processing time and creates potential delays due to physical document movement and manual coordination between offices

- Registration :
  Once a request is submitted, the paper form is stamped and officially registered. In some agencies, basic information such as the client's name, request type, and submission date may be entered into an Excel sheet or a local database. However, this data entry is not standardized across all agencies

- Physical transfer :
  After registration, the physical file is transferred from the commercial office to the technical office for further evaluation. If the offices are located in different buildings, the transfer process may take 24 to 48 hours, depending on internal logistics and administrative procedures

- assignment :
  Once the file reaches the technical office, a supervisor reviews the request and manually assigns the task to a technician. This assignment is usually done through a phone call or by providing a printed work order, without the use of an automated task management system

the tracking gap :
The system becomes particularly fragile during the tracking phase. Once the request reaches the technical office, the client is no longer informed about its progress. There is no automated notification system such as SMS or email updates. If the client wishes to know the status of the request, they must physically return to the agency, where the agent contacts the technical office to obtain information

- A new connection (raccordement) request clearly highlights the limitations of the current system. When a client submits the required documents at the agency, a physical file is created and registered. This file is then transferred to the technical department for verification, signed, and returned to the commercial agency for price calculation. During this process, the file may remain on desks awaiting approval or physical transfer between offices. Since there is no centralized digital tracking or notification system, the client is not informed about the progress and often has to revisit the agency for updates. These delays are mainly due to the absence of an integrated digital workflow rather than a shortage of technical staff

2.2 Identified Problems

Based on the analysis of the existing system, several operational and organizational problems have been identified. These issues directly affect efficiency, coordination between

departments, and customer satisfaction

- Slow Processing Time :
  The reliance on paper documents and physical file transfers significantly increases processing time. Each request must move manually from one department to another, which creates delays, especially when offices are located in different buildings. Files may also remain on desks waiting for approval or signatures, further extending the processing period

- Lack of Centralized System :
  The absence of a unified digital platform leads to fragmented information management. Data is stored in different formats such as paper forms, Excel sheets, and local databases. Since these systems are not integrated, coordination becomes difficult and information may be incomplete or inconsistent

- Lack of Traceability :
  There is no reliable mechanism to track requests in real time. Once a file is transferred, it becomes difficult to determine its exact location or current status. This lack of visibility complicates follow-up and increases uncertainty within the workflow

- Limited Employee Accountability :
  Because the workflow is handled manually, responsibilities are not clearly recorded in a structured system. It may be difficult to identify who processed a request or whether it was handled within an appropriate timeframe

- Absence of Client Transparency :
  Clients are not automatically informed about the status of their requests. Without SMS or email notifications, they must physically return to the agency to obtain updates, which reduces convenience and satisfaction

- Risk of Document Loss or Damage :
  The heavy use of paper files increases the risk of documents being misplaced, delayed, or damaged during transfer between departments

- The current system does not include automated content filtering or intelligent mechanisms to detect inappropriate or irrelevant submissions, which may increase administrative workload

2.3 Proposed solution

Given these identified limitations, it becomes essential to propose a solution capable of addressing the structural gaps observed in the current feedback management system. he proposed solution must provide an integrated, efficient, and transparent mechanism that

modernizes communication processes and enhances service delivery.
The solution should be designed to respond directly to the identified weaknesses by introducing automation, centralization, and real-time monitoring into the feedback management process

2.3.1 Key Requirements for the Proposed Solution

To effectively overcome the limitations of the existing system, the new solution should include the following essential components: - Centralized Digital Platform : A unified web-based system that integrates all submission channels into a single database

- Automated Workflow Management : Digital routing of requests between departments to eliminate physical file transfers and reduce delays
- Real-Time Tracking and Traceability : A tracking mechanism that allows monitoring of request status at every stage of processing
- Clear Role and Responsibility Management : Defined user roles (administrator, employee, client) with recorded task assignments to ensure accountability
- Client Notification System : Automated status updates to inform clients about request progress and completion
- Secure Data Storage and Backup : Protection of information through centralized storage and secure database management
- Reporting and Performance Dashboard : Analytical tools to generate statistics, measure response times, and support managerial decision-making
- User-Friendly Interface : An intuitive and accessible platform for employees and clients and the administrator to encourage adoption and efficiency
This proposed solution aims not only to digitize the feedback process but also to enhance transparency, efficiency, and accountability within the organization, thereby contributing to improved service quality and customer satisfaction

2.4 Conclusion

This chapter provided a comprehensive analysis of the existing feedback and request management system at Sonelgaz. The study revealed that the current semi-manual and decentralized approach presents several operational limitations, including slow processing times, lack of traceability, fragmented data management, limited accountability, absence of client transparency, and weak analytical capabilities. These issues collectively reduce efficiency, complicate coordination between departments, and negatively impact customer satisfaction.
The reliance on paper-based procedures and disconnected systems demonstrates that the current model is not fully adapted to the organizational scale and service expectations of

a modern public utility. The identified gaps clearly justify the need for a structured and integrated digital solution capable of centralizing information, automating workflows, and improving transparency

CHAPTER III
Proposed Solution And System Design

3.1 General Overview of the Proposed System

The proposed solution is a centralized web-based application designed to modernize and optimize the feedback management process within Sonelgaz. The system replaces the existing semi-manual workflow with a structured digital platform

The application follows a client-server architecture, a common model in web-based information systems where users interact through a browser while business logic and data management are handled on a server

The system implements role-based access control to ensure that each user (client, employee, director, or administrator) can only access functionalities corresponding to their responsibilities, thereby enhancing security and system organization [4]

Submissions are routed automatically to the appropriate director based on the selected organizational structure, reducing administrative delays and eliminating physical document transfers. In addition, the system integrates a machine learning-based spam detection module that filters suspicious messages before they enter the main workflow. Such intelligent filtering mechanisms are widely used in modern information systems to improve reliability and reduce manual workload [5]

Overall, the proposed system centralizes data, automates workflow processes, and enhances transparency, directly addressing the limitations identified in the existing system

3.2 System Actors

The proposed system involves several actors who interact with the application according to their assigned roles and responsibilities. Each actor is granted specific permissions through a role-based access control mechanism to ensure secure and organized system operation. The main actors of the system are described as follows:

3.2.1 Client

The client represents external users who interact with Sonelgaz services. Through the web platform, clients can create an account, authenticate securely, and submit new requests or feedback. During submission, the client selects the appropriate organizational structure to which the request is addressed.

Clients are able to track the status of their submissions in real time, view comments or decisions provided by the director, and access a personal dashboard displaying statistics related to their activity, such as the total number of submissions and their current status distribution

3.2.2 Employee

The employee actor represents internal users within Sonelgaz. Employees have functionalities similar to clients.
however, their submissions are related to internal company matters rather than external service requests. These may include technical, administrative, or operational issues.

Employees can submit internal requests, monitor their status, and consult comments or responses provided by the responsible director. Their access remains limited to their assigned permissions within the organization

3.2.3 Director(Decision maker)

The director acts as the decision-maker within a specific organizational structure. Each structure in the system is associated with a designated director responsible for reviewing submissions addressed to that unit.

Directors have the authority to accept or refuse submissions and provide comments or notes that become visible to the client or employee. Through their dashboard, directors can manage pending requests, review submission details, and update their status accordingly

3.2.4 Administrator

The administrator is the highest-level actor within the system and holds full management privileges. The administrator is responsible for user account management, including creating accounts, assigning roles, modifying permissions, and deleting users when necessary.

In addition, the administrator manages organizational structures and filières, including adding or removing structures and assigning directors. The administrator also supervises submissions, with the authority to reassign requests if a client selects the incorrect structure. Furthermore, spam messages detected by the AI module are accessible only to the administrator for review and validation

3.3 Functional Requirements

The functional requirements define the core services and operations that the proposed system must provide. These requirements describe how users interact with the system and how the system processes and manages submissions

Requirement	Description
User Registration and Authentication	The system allows users to create an account through a self-registration process. During registration, users provide personal information stored securely after email verification. The system supports secure login and session management. The administrator can manually create accounts and assign roles when necessary.
Role-Based Access Management	The system implements role-based access control (RBAC) to define permissions according to user roles: Client, Employee, Director, and Administrator. Each role accesses only functionalities corresponding to its responsibilities.
Submission Creation and Routing	Clients and employees can create new submissions using an online form by entering text content and selecting the appropriate organizational structure. Submissions are automatically routed to the director responsible for the selected structure.
Submission Tracking and Status Management	Users can view previous submissions, track their status (pending, accepted, refused), verify whether the submission has been read by the director, and access attached comments or decisions. A complete submission history is maintained.
Decision Processing	Directors review submissions assigned to their structure, accept or refuse them, add comments or notes, and update submission status. Users can view decisions and comments in their dashboard.
Administrative management	The administrator manages user accounts, assigns roles, manages organizational structures and filières, reassigns incorrectly routed submissions, and reviews spam-filtered messages.
AI-Based Spam Detection	The system integrates a machine learning model for automatic spam detection. Each submission is analyzed before entering the workflow. Spam messages are stored separately and accessible only to the administrator, while legitimate submissions proceed normally.
Dashboard and Statistical Reporting	The system provides dashboard functionality displaying total submissions, status distribution, and activity summaries. Directors and administrators have access to broader statistical reports for monitoring purposes.

Table 3.1: Functional Requirements

3.4 Non-Functional Requirements

In addition to the functional requirements, the proposed system must satisfy several non-functional requirements to ensure quality, performance, and long-term sustainability. While functional requirements define the services and operations provided by the system, non-functional requirements describe how the system behaves under various conditions and establish the standards for security, efficiency, reliability, and usability. These requirements are essential to guarantee that the platform operates securely, performs efficiently, remains scalable, and provides a stable user experience. The following table summarizes the key non-functional requirements of the proposed system

Category	**Description**
Security	The system applies multi-layer security including JWT authentication with expiration control, email verification, role-based access control enforced at frontend and backend levels, CORS configuration, file validation, employee MAT verification, and AI-based spam filtering.
Performance	The system ensures fast response times through automatic submission routing, optimized database queries, and efficient AI classification without noticeable delay.
Scalability	The architecture supports increasing numbers of users, submissions, and organizational structures, with modular AI integration for future upgrades.
Availability	The web-based platform is accessible through standard browsers and supports continuous operation without dependency on manual procedures.
Usability	The interface provides a structured dashboard, clear status visualization, and simplified navigation to ensure ease of use for all user categories.
Reliability	The system guarantees accurate routing of submissions, stable AI classification, and consistent enforcement of user roles and permissions.
Maintainability	The modular separation between frontend, backend, and database layers allows easy updates, debugging, and feature expansion.
Data Integrity	The system ensures secure centralized storage, prevention of duplication, controlled access, and consistent data management.

Table 3.2: Non-Functional Requirements

3.5 System Architecture

The proposed system is designed using a layered architecture to ensure separation of concerns, scalability, and maintainability. Layered architectures are widely adopted in modern information systems because they improve modularity and simplify future updates. The platform follows a structured three-tier model that separates user interaction, business logic, and data management components [6]

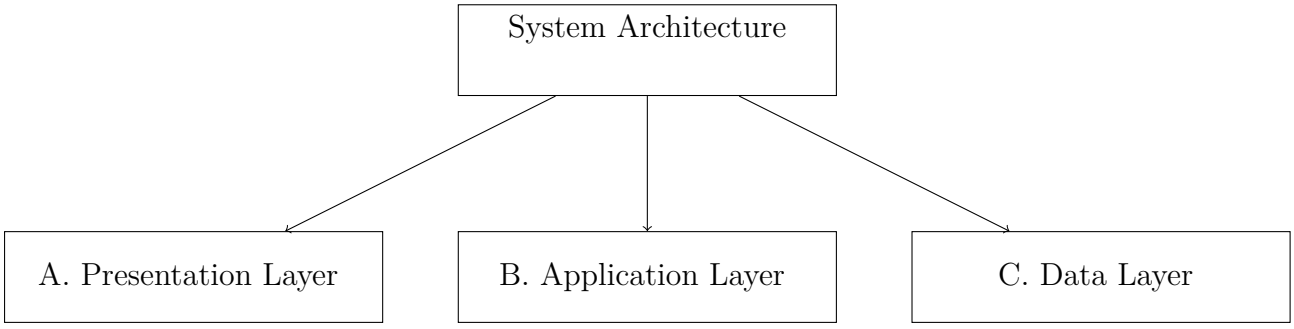


Figure 3.1: Layered System Architecture Structure

A. Presentation Layer (Frontend) :

The presentation layer represents the web-based user interface that allows clients, employees, directors, and administrators to interact with the system. It includes authentication pages, submission forms, dashboards, and management panels. The frontend communicates with the backend using secure HTTP/HTTPS protocols, which are fundamental to web application communication standards (MDN Web Docs, n.d.)

B. Application Layer (Backend) :

The application layer implements the core business logic of the system. It manages authentication using JWT tokens, enforces role-based access control, processes submission routing, and handles decision management. This separation of business logic from the user interface follows standard software engineering principles for maintainable system design [7]. The backend also integrates the AI spam detection module, which evaluates submissions before storage. Based on the classification result, submissions are either routed normally or isolated in a dedicated spam section

C. Data Layer (Database) :

The data layer ensures centralized storage and management of all system information, including user accounts, roles, submissions, comments, structures, and spam records. Centralized database systems improve consistency, integrity, and controlled access to organizational data [6]. This layer guarantees secure data handling and supports efficient retrieval of information required for dashboards and reporting

- AI Module Integration The AI module is embedded within the backend workflow.

Upon submission creation, textual content is preprocessed and analyzed using a trained logistic regression model. Machine learning models are commonly integrated into web systems to automate content filtering and improve operational efficiency [5]. If classified as spam, the submission is redirected to a restricted storage area accessible only to the administrator. Otherwise, it proceeds through the normal decision-making workflow

3.6 UML Diagrams

To model the proposed system and illustrate its structure and behavior, several UML (Unified Modeling Language) diagrams are used. UML diagrams provide a standardized way to visualize system components, user interactions, workflows, and internal relationships. In this project, use case, activity, sequence, and class diagrams are employed to represent the functional and structural aspects of the system

3.6.1 Use Case Diagram

The Use Case Diagram illustrates the interactions between system actors and the main functionalities provided by the platform. The primary actors identified in the system are the Client, Employee, Director (Decision Maker), and Administrator
- Here is an example of a simple use case diagram :

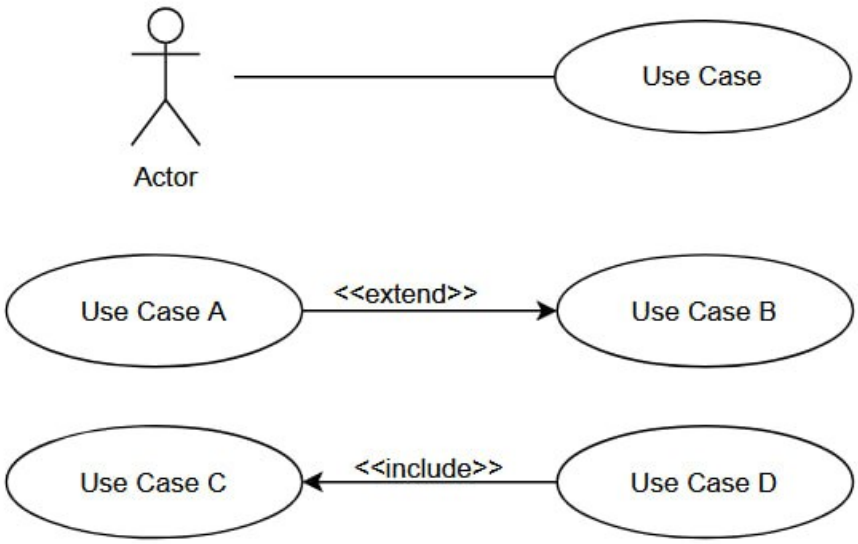


Figure 3.2: Simple Use Case Diagram

- the figure below (3.3) represent System Actors and Core Functionalities :

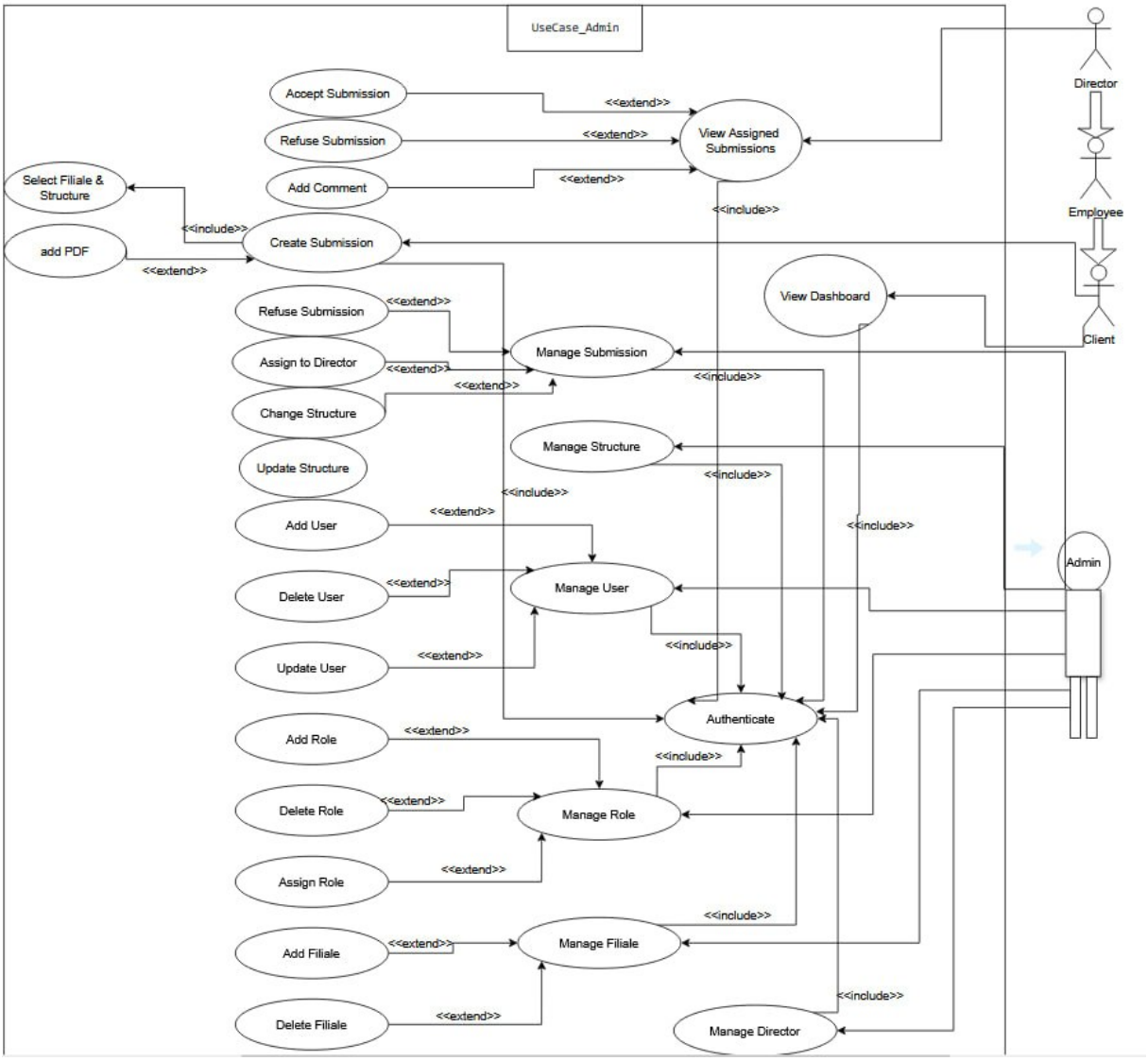


Figure 3.3: Global Use Case Diagram of the Proposed System

3.6.2 Class Diagram

The Class Diagram represents the static structure of the system and defines its main entities and relationships. The core classes include User, Client, Employee, Director, Administrator, Submission and Structure. The User class acts as a base entity with role-based differentiation. Submissions are linked to a specific Structure and may contain multiple Comments, while each Structure is managed by a Director. Spam submissions are stored separately under administrative control. This diagram clarifies the object-oriented design of the system and the relationships between its main components
-the figure below (3.4) represent System Entities and Relationships

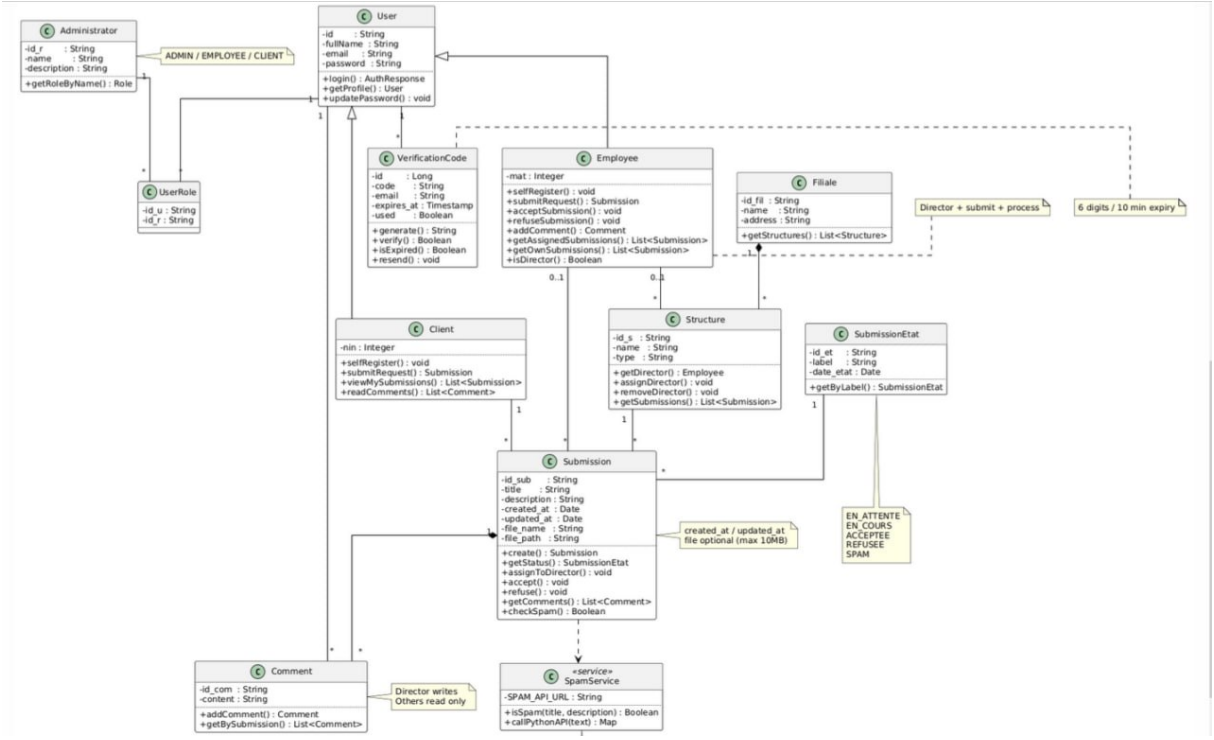


Figure 3.4: Class Diagram of the Proposed System

-Based on the previous class diagram, we obtain the relational model that contains the following tables :

- User(id_user, fullname, email, password)

- Client(nin, #id_user)

- Employee(mat, #id_user)

- Administrator(id_r, name, description)

- User_Role(#id_user, #id_r)

- Filiale(id_fil, name, address)

- Structure(id_s, name, type, #id_fil, mat)

- Submission_Etat(id_et, label, date_etat)

- Submission(id_sub, title, description, created_at, updated_at, file_name, file_path, #nin, #mat, #id_et, #id_s)

- Comment(id_com, content, #id_sub, #id_user)

- Verification_Code(id_code, code, email, expires_at, used)

3.7 AI Model Design

The proposed system integrates a machine learning-based spam detection module to automatically filter suspicious or irrelevant submissions before they enter the main workflow. This module enhances system reliability, reduces administrative workload, and protects the platform from misuse or flooding

3.7.1 Dataset Preparation and Feature Extraction

The spam detection model was trained using a dataset of approximately 30,000 text messages collected from two publicly available spam datasets and manually prepared data. Before training, the dataset was cleaned to remove noise and irrelevant elements. Since machine learning models require numerical input, the text data was transformed using the TF-IDF technique, which converts textual content into weighted numerical vectors. This process enabled the model to effectively distinguish between legitimate submissions and spam messages

3.7.2 Model Training and Evaluation

Three classification algorithms were evaluated during the experimentation phase:

- naive Bayes
- Logistic Regression
- Linear Support Vector Machine (SVM)

Each model was trained and tested using the prepared dataset. After evaluation and comparison of classification accuracy, Logistic Regression was selected as the final model due to its superior performance and stable prediction results

3.7.3 Model Integration and System Impact

The selected Logistic Regression model was integrated into the backend layer of the web application to function as an automated content filtering mechanism. When a user submits a request, the textual content is first preprocessed and evaluated by the trained model

before being stored in the database. If the message is classified as spam, it is redirected to a restricted storage area accessible only to the administrator. Otherwise, the submission continues through the standard routing workflow toward the appropriate director.

Machine learning models are widely applied in text classification tasks such as spam detection due to their effectiveness in identifying patterns within textual data [8]. Logistic Regression, in particular, is commonly used for binary classification problems because of its stability and strong performance with high-dimensional features such as TF-IDF vectors

3.8 Conclusion

This chapter presented the design of the proposed web-based feedback management system. The solution is built on a three-tier architecture and defines clear functional and non-functional requirements to ensure security, performance, and reliability.

UML diagrams were used to model system behavior and structure. The integration of an AI-based spam detection module enhances system robustness by automatically filtering suspicious submissions.

Overall, the proposed system addresses the limitations of the existing process while introducing automation, centralization, and intelligent content filtering

CHAPTER IV
Implementation

4.1 Introduction

This chapter presents the implementation of the proposed web-based feedback management system. It describes the development environment, the technologies used, and the practical realization of the main system modules. The implementation of authentication, submission management, administrative functionalities, and the AI-based spam detection module is detailed. Finally, the chapter includes system testing and an evaluation of the obtained results

4.2 Development Environment

The implementation of the proposed system was carried out using the following technologies and tools:

Frontend Development (Angular):



Figure 4.1: Angular logo

The user interface was developed using Angular, a modern TypeScript-based framework for building dynamic and responsive web applications.

Backend Development (Spring Boot):



Figure 4.2: Spring Boot logo

The backend was implemented using Spring Boot, a Java-based framework that simplifies the development of enterprise-level applications

Database System (PostgreSQL):



Figure 4.3: PostgreSQL logo

PostgreSQL was used as the relational database management system. It stores structured data including users, roles, submissions, comments, organizational structures, and spam records.

Artificial Intelligence Module (Python & Scikit-learn):

The spam detection model was developed using Python and the Scikit-learn library. TF-IDF was used for feature extraction, and Logistic Regression was selected as the final classification algorithm

Development Tools:

1.

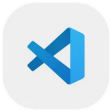


Figure 4.4: VSCode logo

Visual Studio Code (VS Code) was used for frontend development and AI model development

2.



Figure 4.5: Intellij IDEA logo

IntelliJ IDEA was used for backend development with Spring Boot

Version Control:

Git was used for source code management and version tracking throughout the development process.

4.3 System Integration

The integration phase consists of connecting the frontend, backend, database, and AI module into a fully functional and cohesive system. Each component was developed independently and then integrated to ensure seamless communication and synchronized operation

4.3.1 Client Interface Implementation

Login and signUp Interface Implementation



Figure 4.6: SignUp Interface Implementation

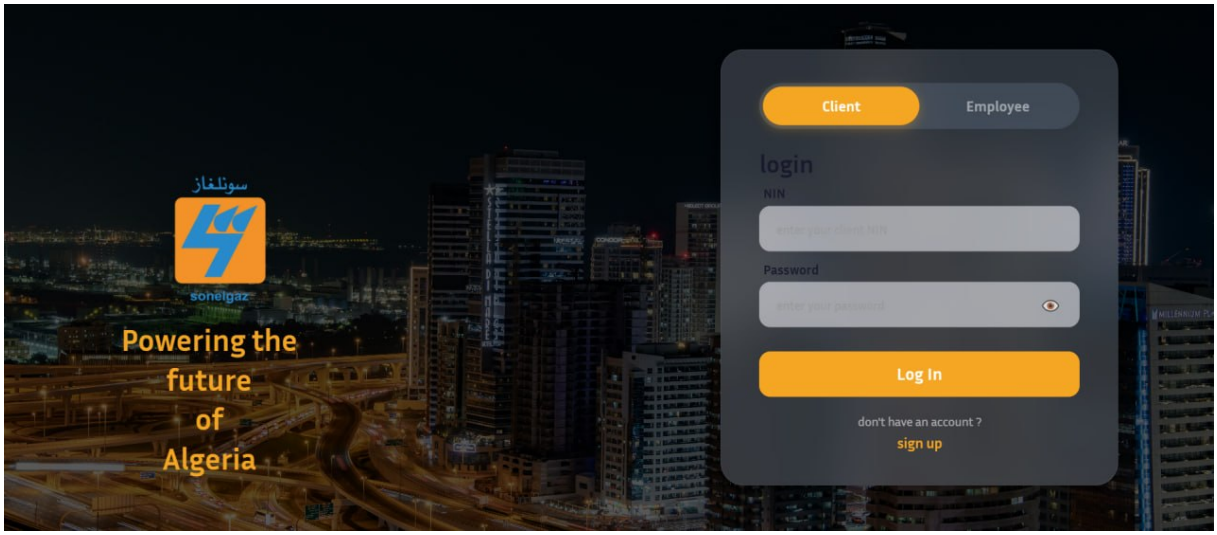


Figure 4.7: LogIn Interface Implementation

The system provides registration and login interfaces to ensure secure user authentication. During registration, users enter their personal information (fullname, NIN and the password)and verify their account through a six-digit email confirmation code. The login page allows authenticated access using valid credentials. Upon successful login, a JWT token is generated to manage secure user sessions and enforce role-based access control

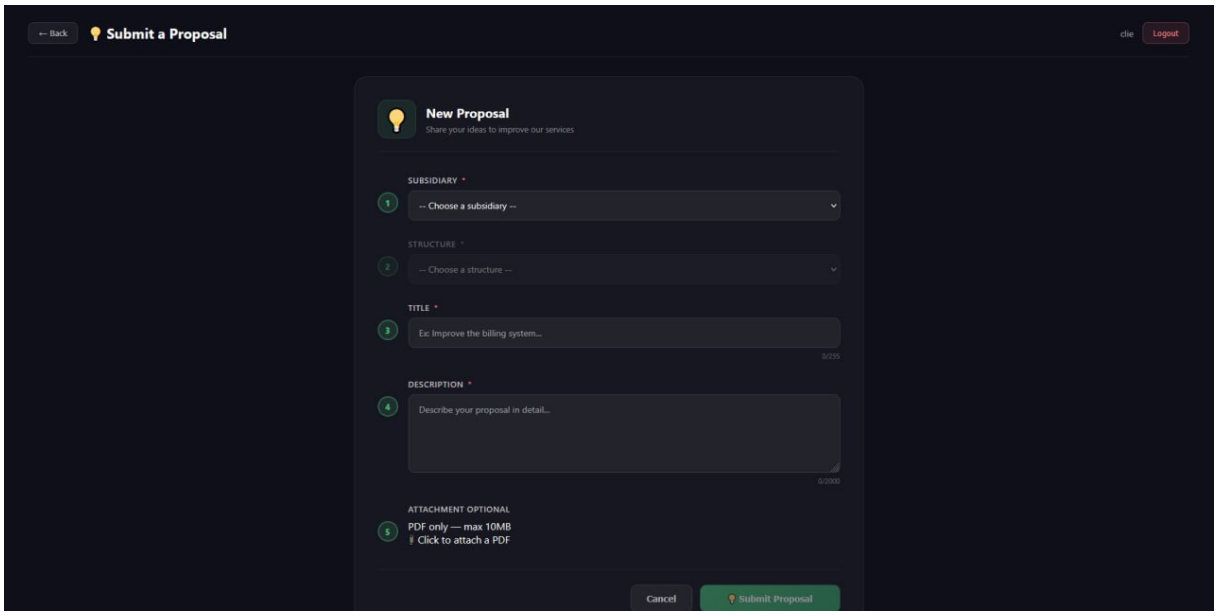


Figure 4.8: New Proposal Implementation

The submission creation interface allows clients and employees to submit new requests through an online form. Users enter the required information, including the submission title, description, and optional file attachment in PDF format. They must also select the appropriate organizational structure to which the request will be directed. Once submitted, the request is analyzed by the AI module for spam detection before being stored and routed to the corresponding director

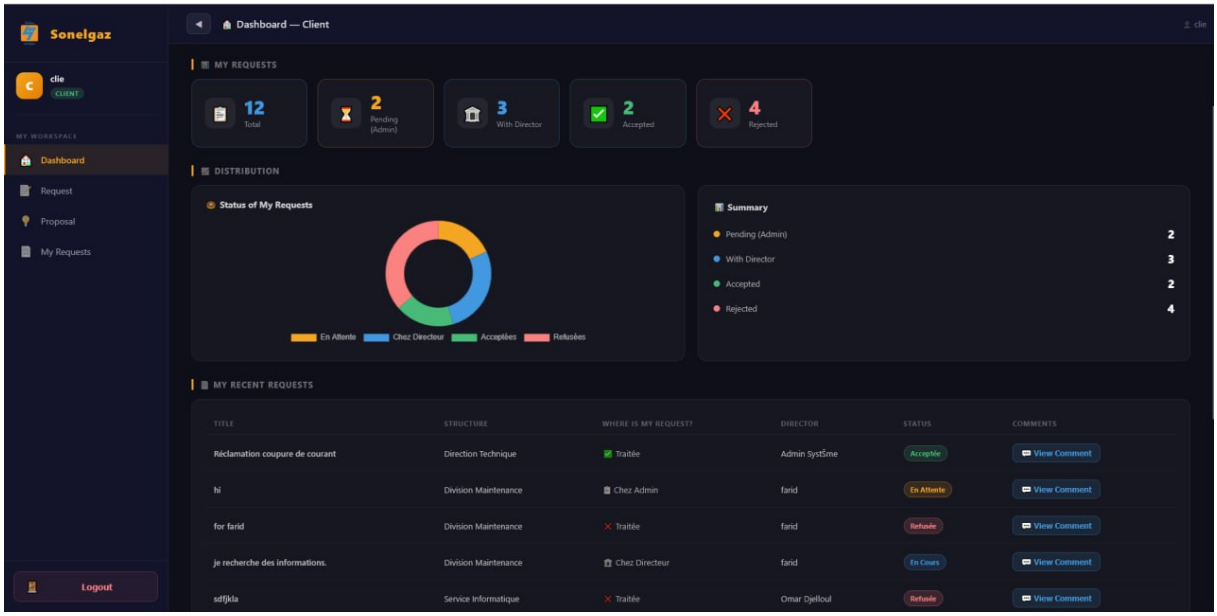


Figure 4.9: Client Dashboard Implementation

The user dashboard provides a centralized view of all submitted requests. It allows

users to access a detailed list of their submissions, including the title, creation date, current status (e.g., pending, accepted, refused), and responses from the director. The dashboard also indicates whether a submission has been reviewed and displays any associated comments

Director Interface Implementation

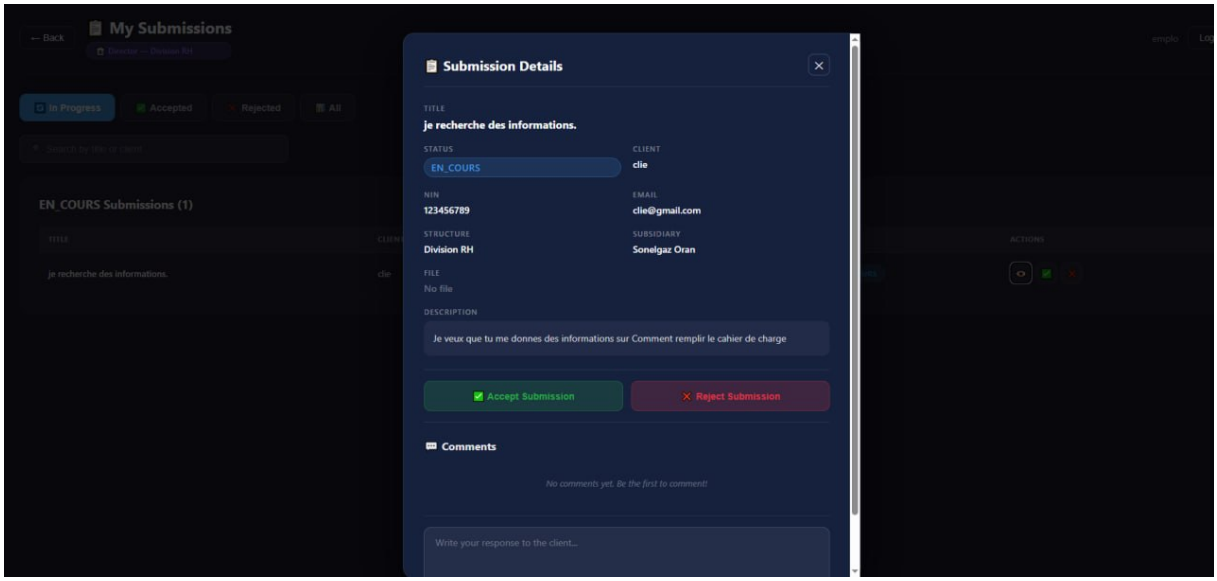


Figure 4.10: Impementation of Decision Process

The decision process allows the director to review submissions assigned to their structure and determine the appropriate action. After examining the submission details, the director can either accept or refuse the request. The selected decision updates the submission status in the system and becomes visible to the user through the dashboard

Administrator Interface Implementation

The administrator dashboard provides a centralized interface for managing the overall system. Through this interface, the administrator can monitor submissions, manage user accounts and roles, oversee organizational structures, and review spam messages detected by the AI module. This dashboard ensures full system control and facilitates efficient administrative supervision

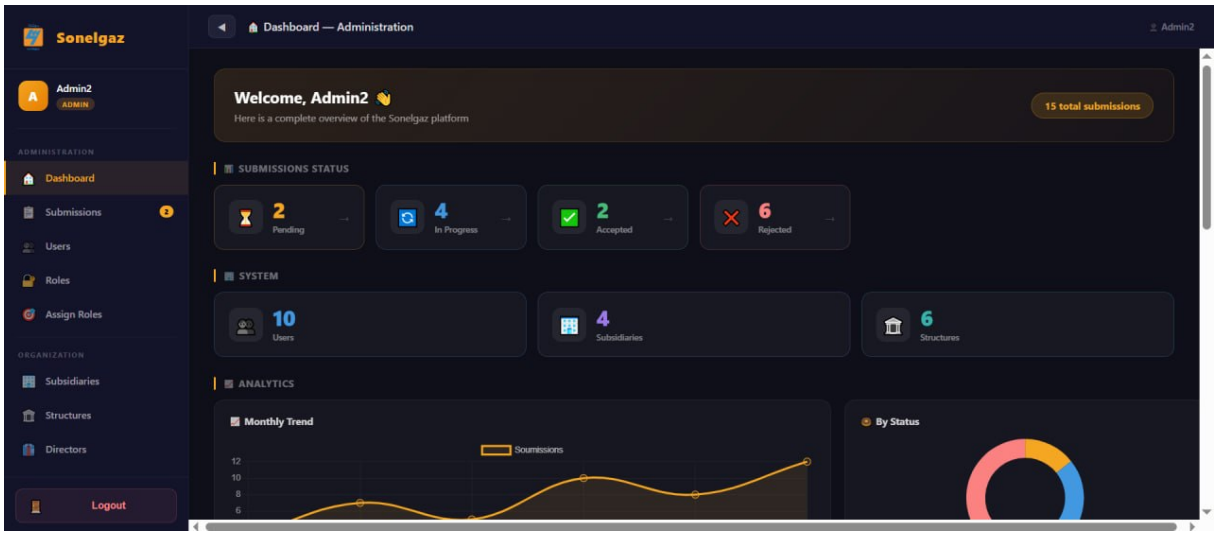


Figure 4.11: Dashboard Of The Administrator

The submission management process enables the administrator to monitor and control all system submissions. Through this interface :

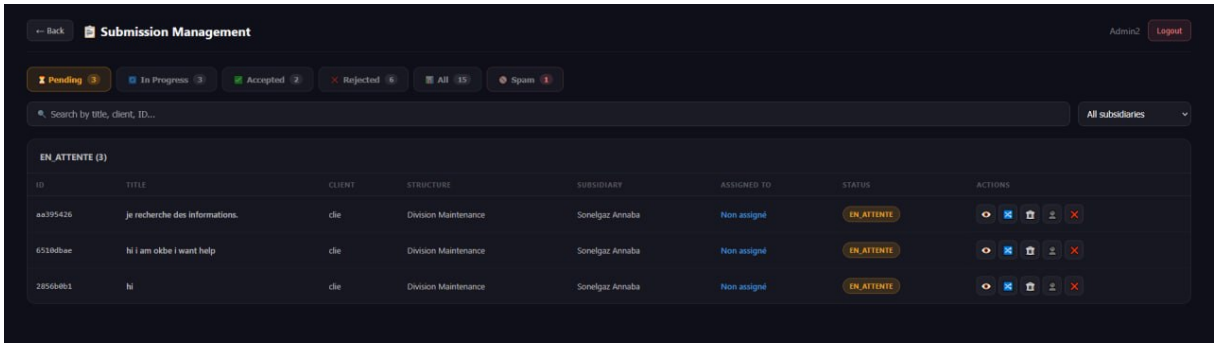


Figure 4.12: Submission Management Process

the administrator can review submission details (Pending, In Progress, Accepted .....ect), reassign requests to the appropriate structure if necessary, and ensure that each submission is properly routed and processed

In addition, the administrator can access a dedicated section displaying spam messages automatically detected by the AI model

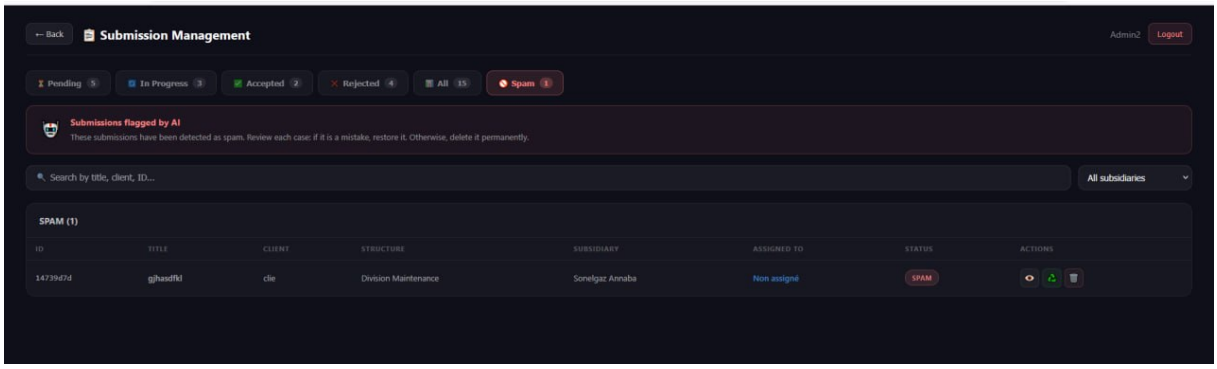


Figure 4.13: Display Spam Messages

4.4 Results and Discussion

The implementation of the proposed system produced the following results:

- **Functional Success:**
  All main modules operate correctly, including authentication, submission management, decision processing, and administrative control
- **Workflow Automation:**
  Automated routing and centralized storage reduce delays compared to the previous manual process.
- **Traceability and Transparency:** Users can track submission status and view decisions in real time through the dashboard.
- **AI Spam Filtering:** The Logistic Regression model effectively detects and isolates spam messages before entering the workflow.
- **Security Enforcement:** Role-based access control and JWT authentication ensure controlled system access.

Overall, the system meets the defined requirements and improves efficiency, reliability, and user experience

4.5 Conclusion

This chapter presented the implementation of the proposed web-based feedback management system. The system was successfully developed using Angular, Spring Boot, PostgreSQL, and an integrated AI-based spam detection module. The results confirm that the defined requirements were achieved and that the solution improves efficiency, transparency, and system reliability compared to the previous manual process.

General Conclusion

This project aimed to design and implement a centralized web-based feedback management system to modernize the existing semi-manual and decentralized workflow within Sonelgaz. The initial analysis highlighted several limitations in the current system, including slow processing, lack of traceability, limited transparency, fragmented data management, and absence of automated content filtering. These challenges justified the need for a structured and digital solution.

Based on this analysis, a comprehensive system was proposed and designed using a three-tier architecture that separates the presentation, application, and data layers. The solution introduced role-based access control to clearly define responsibilities for clients, employees, directors, and administrators. Functional and non-functional requirements were carefully defined to ensure that the system operates securely, efficiently, and reliably.

A significant contribution of this project is the integration of an artificial intelligence-based spam detection module. Using TF-IDF feature extraction and Logistic Regression, the model effectively filters suspicious submissions before they enter the main workflow. This innovation enhances system robustness, reduces administrative workload, and protects the platform from misuse.

The system was successfully implemented using Angular for the frontend, Spring Boot for the backend, and PostgreSQL for data storage. The integration phase demonstrated seamless communication between components, secure authentication through JWT, automated submission routing, and real-time tracking capabilities. The results confirmed that the proposed solution satisfies the defined requirements and significantly improves transparency, traceability, and operational efficiency compared to the previous manual approach.

Overall, this project demonstrates how digital transformation, combined with intelligent automation, can modernize organizational processes and improve service quality. The proposed system provides a scalable and maintainable foundation that can be further enhanced with additional features and advanced analytics in the future.

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