Citizen AI

– Intelligent Citizen Engagement Platform

Team members:

Tamaraana Sruthi-22P31A4262

Pothabatthula Sandeep-22P31A4259

Nakka Santhosh Kumar-22P31A4261

Thadicherla C M SDevi Prasad-22P31A4263

1. INTRODUCTION

1.1 Project Overview

Citizen AI – Intelligent Citizen Engagement Platform is an AI-powered web application designed to modernize and streamline the way citizens interact with government services. Built with Flask and powered by IBM Granite large language models, the platform offers an intelligent conversational assistant that enables citizens to ask questions, access information, and receive real-time, context-aware responses on a wide range of government topics. The system further empowers users by allowing them to provide direct feedback, report civic concerns, and monitor the overall sentiment of public interactions through an interactive analytics dashboard.

By integrating advanced natural language processing (NLP), sentiment analysis, and a personalized contextual response engine, Citizen AI bridges the gap between citizens and government agencies. The conversational assistant leverages IBM Granite's sophisticated language understanding capabilities to interpret nuanced queries, ensuring that responses are accurate, relevant, and tailored to individual needs. This approach moves beyond static FAQs, offering dynamic, human-like engagement that is available 24/7 for both routine inquiries and urgent issue reporting.

A core feature of Citizen AI is its sentiment analysis module, which processes citizen feedback and categorizes it as positive, neutral, or negative. This aggregated sentiment data is visualized in real time on a dynamic dashboard, providing government officials with actionable insights into public opinion, satisfaction levels, and emerging issues. The dashboard also tracks interaction trends and highlights areas requiring attention, enabling data-driven decision-making and proactive service improvements.

The platform's architecture is designed for scalability, security, and ease of use. It includes robust user authentication, intuitive web interfaces for chat, feedback, and concern submission, and a modular backend that integrates seamlessly with AI models and analytics tools. By automating routine interactions and surfacing actionable intelligence, Citizen AI not only enhances citizen satisfaction and trust but also increases government efficiency and transparency in digital governance.

1.2 Purpose

The purpose of Citizen AI is to improve the way citizens engage with government services. It simplifies access to policy information, enables 24/7 support via a conversational AI, and provides real-time feedback analytics. This reduces manual workload for government officials, increases public trust, and supports proactive governance through data insights. Citizen AI bridges the gap between government services and public understanding by providing an intelligent, conversational platform for citizen engagement.

2. IDEATION PHASE

2.1 Problem Statement

Problem Statement 1 – Government Official

Section	*Description*
I am	*A government officer responsible for managing citizen feedback and communication.*
I'm trying to	*Handle queries, analyze feedback trends, and make timely decisions.*
But	*I face delays and inefficiencies due to manual data collection and analysis.*
Because	*Traditional systems are not AI-enabled and lack real-time insights.*
Which makes me feel	*Overwhelmed and disconnected from public sentiment.*

Problem Statement 2 – Citizen

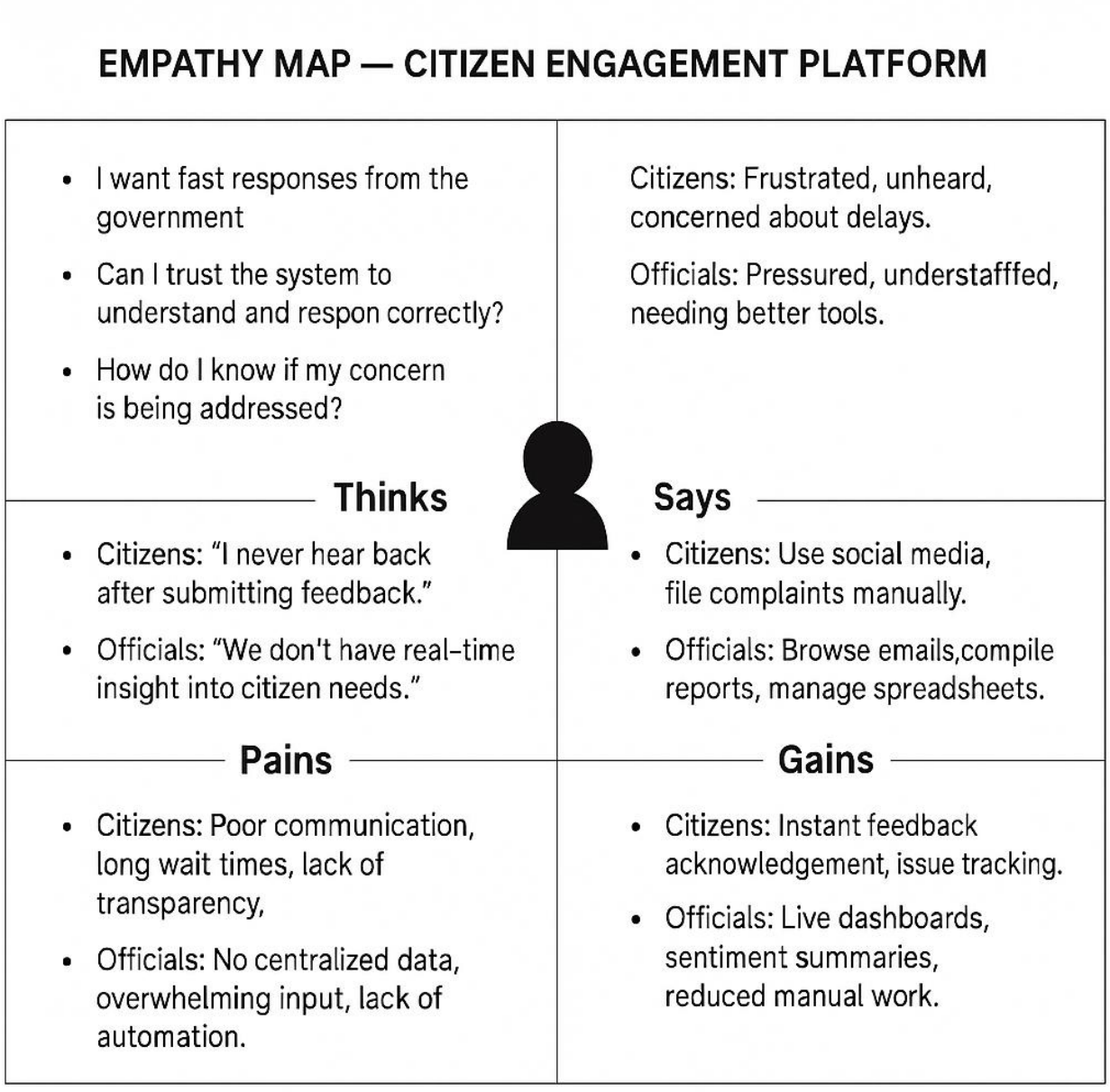
Section	*Description*
I am	*A citizen who wants to access services, share feedback, and report issues.*
I'm trying to	*Get responses, raise civic concerns, and track service status.*
But	*I find it hard to get accurate responses or updates.*
Because	*Government websites are outdated and lack interactive features.*
Which makes me feel	*Ignored, confused, and dissatisfied.*

2.2 Empathy Map Canvas

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes.

It is a useful tool to helps teams better understand their users.

Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.



Thinks

- “I want fast responses from the government.”
- “Can I trust the system to understand and respond correctly?”
- “How do I know if my concern is being addressed?”

Feels

- **Citizens:** Frustrated, unheard, concerned about delays.
- **Officials:** Pressured, understaffed, needing better tools.

Says

- **Citizens:** “I never hear back after submitting feedback.”
- **Officials:** “We don’t have real-time insight into citizen needs.”

Does

- **Citizens:** Use social media, file complaints manually.
- **Officials:** Browse emails, compile reports, manage spreadsheets.

Pains

- **Citizens:** Poor communication, long wait times, lack of transparency.
- **Officials:** No centralized data, overwhelming input, lack of automation.

Gains

- **Citizens:** Instant feedback acknowledgment, issue tracking.
- **Officials:** Live dashboards, sentiment summaries, reduced manual work.

2.3 Brainstorming Summary

Date: 31 January 2025

Team ID: LTVIP2025TMID29301

Project Name**: "Citizen AI – Intelligent Citizen Engagement Platform using IBM Granite"**

Team Members & Roles

Name	**Role**
Tamaraana Sruthi	**Team Leader, Flask Backend & LLM Integration using IBM Granite**
Pothabatthula Sandeep	**Frontend Developer (HTML/CSS), Model Testing, UI Integration**
Nakka Santhosh Kumar	**Dashboard Data Aggregation & Visualization (sentiment metrics, issue logs)**
Thadicherla Chandra Manikanta Sri Devi Prasad	**Sentiment Analysis & Citizen Feedback Handling Module**

Step 1: Team Gathering, Collaboration, and Selecting the Problem Statement

Problem Statement:
To develop an AI-powered Citizen Engagement Platform that uses IBM Granite LLM to assist citizens and government officials through real-time responses, sentiment analysis, concern reporting, and administrative dashboards—enhancing transparency and digital governance.

Motivation:
Citizens often face delays and lack of clarity in interacting with public services. Government systems are not equipped for real-time support or feedback analysis. Citizen AI bridges this gap with a conversational AI, smart sentiment feedback processing, and an admin-friendly dashboard to ensure efficient, inclusive public interaction.

Step 2: Brainstorming, Idea Listing, and Grouping

Initial Ideas:

- Integrate a conversational assistant using IBM Granite

- Enable sentiment analysis on citizen feedback
- Build forms for issue/concern reporting
- Provide a dashboard for government officials to monitor sentiment and feedback
- Implement user login and session handling
- Build using Flask backend and HTML/CSS frontend

Grouped into Modules:

1. **Chat Module** – AI assistant using IBM Granite LLM via Hugging Face
2. **Sentiment Analysis Module** – Classifies feedback as Positive, Negative, Neutral
3. **Feedback Module** – Form to submit issues/concerns with storage
4. **Dashboard Module** – Visualizes sentiment stats and recent feedback
5. **Authentication Module** – Login/Logout and route protection
6. **UI Module** – Frontend using HTML, CSS, and Bootstrap integrated with Flask

Step 3: Idea Prioritization (Final Version)

Feature / Module	Importance	Feasibility	Notes
Chat Assistant	High	High	IBM Granite-powered Q&A chatbot using Hugging Face & Flask
Sentiment Analysis	High	High	Implemented using a basic sentiment classifier in Flask backend
Concern Reporting Form	High	High	Citizen feedback submitted via form and routed to backend logic
Admin Dashboard	High	Medium	Displays sentiment stats and feedback history; Flask-rendered
User Authentication	Medium	High	Basic login/logout functionality with session control
HTML/CSS Frontend	High	High	Static UI integrated with Flask templates

3. REQUIREMENT ANALYSIS

3.1 Customer Journey map

Stage	Awareness	Onboarding	Issue Reporting	Tracking Status	Feedback Submission	Final Feedback
Discover	Learns about Citizen AI from social media or local events	Visits the website, reads the purpose of the platform	Clicks on "Report Concern" or "Chat Now"	Wants to track if issue was resolved	Sees "Give Feedback" or sentiment prompt	Decides whether to return or recommend
Thoughts	"Can I trust this to solve my issue?"	"Looks easy—login is quick."	"Will anyone really see this?"	"Why hasn't it updated yet?"	"It should ask for feedback after chat ends."	"I'll use this again if it works every time."
Experience	Clean UI, mobile-friendly	Smooth login, form-based input	Text area with category dropdown, optional file upload	Real-time updates on dashboard	Simple thumbs up/down or text box	Receives final update or badge
Actions	Clicks CTA on poster or link	Creates account, explores chatbot	Submits an issue with description	Re-checks dashboard or login to check updates	Leaves sentiment feedback	Shares app / reopens on next concern
Opportunities	Awareness campaigns in colleges/civic centers	Add OTP-free guest login	Voice input for accessibility	Push/email alerts for updates	Gamify with points or badges	Show "Thanks for your input!" confirmation screen

3.2 Solution Requirements (Functional & Non-Functional)

Functional Requirements:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration via email form
FR-2	User Login/Authentication	Login, Logout with session handling
FR-3	Chat Assistant	Query submission and response using IBM Granite
FR-4	Feedback & Concern Submission	Submit feedback / concerns through form
FR-5	Sentiment Analysis	Classify feedback as Positive, Neutral, or Negative
FR-6	Dashboard & Insights	View sentiment distribution, reported concerns

Non-functional Requirements:

Following are the non-functional requirements of the proposed solution.

NFR-1	Usability	Clean, responsive UI using HTML/CSS and Bootstrap
NFR-2	Security	Protected routes, session management
NFR-3	Reliability	Handles multiple feedback inputs without crashing
NFR-4	Performance	AI response within 2–3 seconds on average
NFR-5	Availability	Available 24/7 with minimal maintenance downtime
NFR-6	Scalability	Easily extendable to add database support or new modules

3.3 Data Flow Diagram

Data Flow Diagrams:

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.

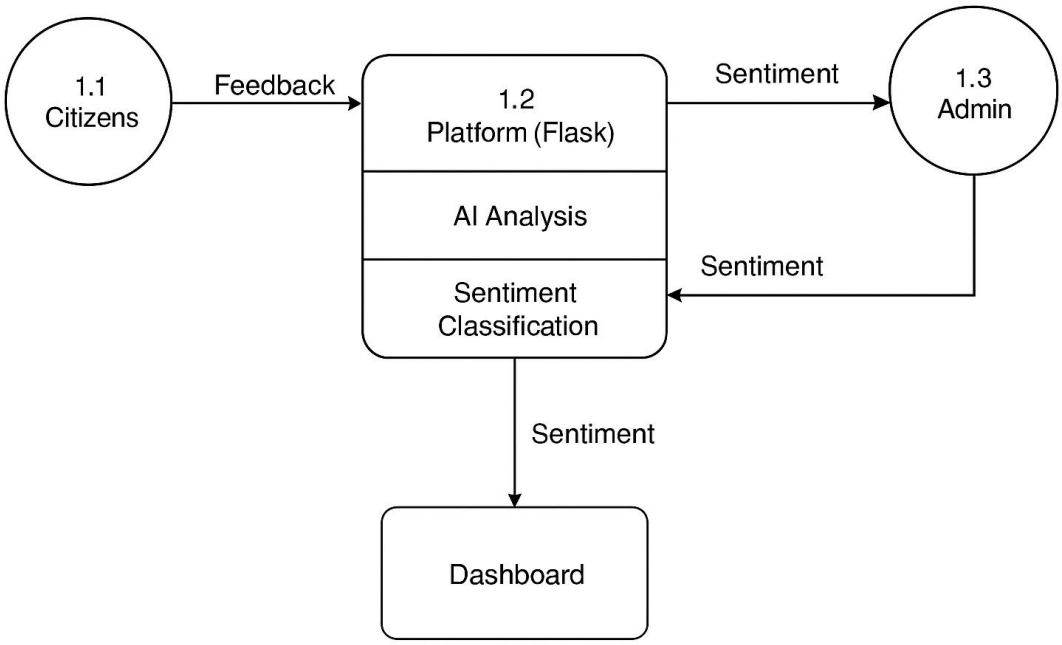
DFD Level 0 – Context Diagram

- External Entities: Citizens, Government Admin, IBM Granite LLM
- Processes:

1. Accept Citizen Queries
2. Analyze Feedback
3. Perform Sentiment Analysis
4. Route to Dashboard
5. Generate Responses

DFD Level 1 – Decomposition Example

1.1 Accept Input (Chat/Feedback)
1.2 Process Input using IBM Granite
1.3 Perform Sentiment Classification
1.4 Visualize on Dashboard



DFD Level 1 – Processes

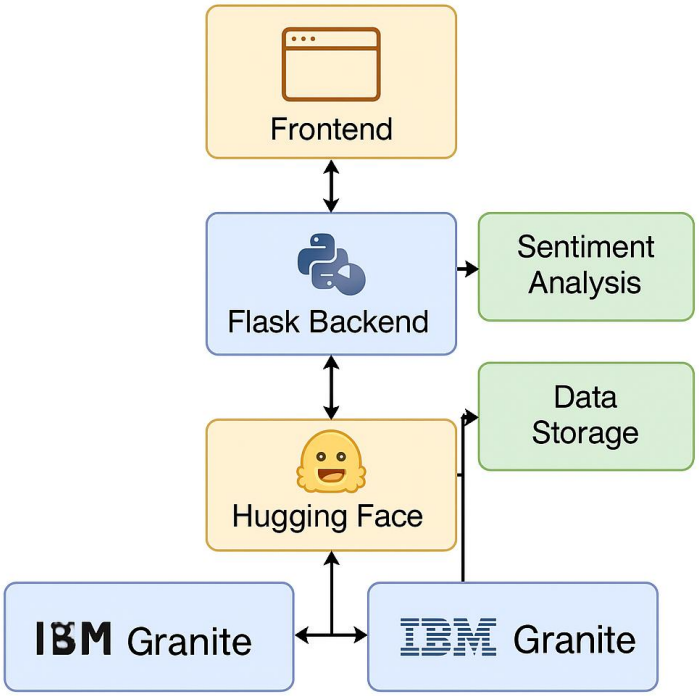
User Stories

User Type	Functional Requirement (Epic)	User Story No.	User Story / Task	Acceptance Criteria	Priority	Release
Citizen (Web User)	Registration/Login	USN-1	As a citizen, I can register/login using email credentials.	I can access chat and feedback modules after login.	High	Sprint-1
Citizen (Web User)	Chat Assistant	USN-2	As a citizen, I can ask questions via chat and receive AI responses.	I get context-aware responses from the Granite model.	High	Sprint-1
Citizen (Web User)	Feedback/Concern Submission	USN-3	As a citizen, I can report civic issues through a form.	I see a confirmation message after submission.	High	Sprint-2
Citizen (Web User)	Sentiment Feedback	USN-4	As a citizen, I can submit feedback which will be analyzed for sentiment.	I see the sentiment tag (positive/neutral/negative).	Medium	Sprint-2
Admin (Government User)	Dashboard	USN-5	As an admin, I can view sentiment reports and recent citizen issues on a dashboard.	I can view metrics and filter citizen feedback records.	High	Sprint-3
Admin (Government User)	Authentication	USN-6	As an admin, I can securely log in and access only authorized pages.	I'm redirected to the dashboard after successful login.	Medium	Sprint-3

3.4 Technology Stack (Architecture & Stack)

Technical Architecture

- Web interface (HTML/CSS + Bootstrap) allows citizen and admin interaction.
- Backend built in **Python Flask**, locally hosted or deployable on **Render/Firebase/IBM Cloud**.
- LLM responses and feedback analysis powered by **IBM Granite via Hugging Face**.
- Sentiment analysis and feedback are processed through backend logic.
- User data and sentiment scores are temporarily stored (extendable to Firebase/Firestore).
- Future integration possible with external government/public service APIs.



Guidelines:

- Include all the processes (as application logic / technology blocks)
- Provide infrastructural demarcation (Local / Cloud)
- Indicate external interfaces (third-party APIs, etc.)
- Indicate data storage components / services
- Indicate interface to machine learning models (if applicable)

Guidelines Followed

- Application logic includes Chatbot, Feedback Form, Sentiment Classifier, Dashboard
- Infrastructure split between local Flask app and optional cloud API calls
- External APIs supported: Hugging Face (for Granite), and optional civic APIs
- Interfaces to ML models: Sentiment analysis classifier, LLM (IBM Granite)

Table-1 : Components & Guidelines

S.No	Component	Description	Technology
1	User Interface	Web interface for citizens and admins	HTML, CSS, Bootstrap
2	Application Logic-1	Citizen query & feedback capture via Flask routes	Python Flask
3	Application Logic-2	Query handling & response generation using Granite LLM	Hugging Face API, IBM Granite LLM
4	Application Logic-3	Sentiment analysis of submitted feedback	Rule-based Sentiment Classifier
5	Database (optional)	Store feedback, sentiment results, and user logs	Firebase / JSON (for local)
6	Cloud Hosting	Deployment and public access	Render / Firebase Hosting
7	File Storage	Local model files and feedback logs	Flask local storage (extendable)
8	External API-1	Granite LLM API via Hugging Face	Hugging Face API
9	ML Model	Sentiment classification & LLM-based response	IBM Granite LLM
10	Infrastructure	App deployment and route management	Flask Server

4. PROJECT DESIGN

4.1 Problem-Solution Fit

Citizen AI addresses the core communication and responsiveness gap between governments and citizens. The platform provides real-time conversational support, automated sentiment tracking, and centralized data visualization, solving key pain points of delayed responses and inefficient service monitoring. By adopting AI for routine interactions, both citizens and officials experience a faster, smarter, and more connected engagement.

Purpose:

- **Problem Statement:** Lack of effective, responsive, and scalable communication tools between governments and citizens.
- **Solution Description:** An AI-powered web platform using IBM Granite models to enable real-time citizen support, sentiment analysis, and dashboard visualization.
- **Novelty:** Combines chatbot, feedback analysis, and government insights into one unified interface.
- **Social Impact:** Promotes transparency, efficiency, and civic satisfaction.
- **Scalability:** Cloud-compatible, modular, and extensible to different regions or departments.

Problem-Solution fit canvas 2.0

AMALTAMA

1. CUSTOMER SEGMENT(S) — CS

Who is your customer?
i.e. working parents of 0-5 y.o. kids

Define CS, fit into CC

Citizen AI targets a broad spectrum of users within the public sector ecosystem:

General Citizens: Individuals seeking information, support, or wishing to provide feedback and report concerns about government services.

Government Officials and Policymakers: Administrators and decision-makers who use real-time sentiment analytics and citizen insights to guide policy, improve service delivery, and monitor public satisfaction.

Community Leaders, NGOs, and Civic Organizations: Stakeholders involved in advocacy, community engagement, and collaborative governance who benefit from aggregated data and transparent communication channels.

This inclusive approach ensures Citizen AI serves as a bridge between the government and diverse segments of society, fostering participatory, transparent, and responsive governance

6. CUSTOMER CONSTRAINTS — CC

What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices.

Customer constraints for Citizen AI primarily revolve around barriers that affect citizen engagement and adoption of digital government services:

Digital Divide and Accessibility: Limited access to reliable internet, devices, or digital literacy prevents many citizens, especially in rural or low-income areas, from fully utilizing the platform.

Trust and Privacy Concerns: Citizens may hesitate to share feedback or concerns due to fears about data privacy, security, or mistrust in government handling of information.

Expectation Management: Governments fear over-promising or facing demands they cannot fulfill, which can reduce citizen trust and participation if not managed transparently.

Cultural and Language Barriers: Lack of culturally relevant content or language support can exclude diverse community groups from engaging effectively.

Sustainability and Long-Term Engagement: Maintaining ongoing citizen participation requires continuous support, funding, and adaptation to evolving community needs.

Technological and Institutional Infrastructure: Weak IT infrastructure and lack of supportive policies can hinder platform performance and citizen adoption.

Addressing these constraints is essential for maximizing Citizen AI's impact on inclusive, transparent, and effective digital governance.

5. AVAILABLE SOLUTIONS — AS

Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking

Explore AS, differentiate

When citizens need to interact with government services, provide feedback, or report concerns, several solutions have traditionally been available:

In-person Methods: Public meetings, town halls, and focus groups allow direct dialogue with officials, fostering trust and personal connection. However, these are limited by scheduling, location, and attendance capacity, often excluding those with time or mobility constraints.

Pen and Paper: Citizens can submit written feedback, forms, or letters. This method is accessible and private but slow, harder to track, and not easily scalable for large populations.

Digital Channels: Online forums, community surveys, mobile apps (like "Report-A-Concern"), and digital engagement platforms enable broader participation, faster feedback, and real-time data analytics. These tools are convenient and scalable but may exclude those lacking digital access or skills, and raise concerns about data privacy and security.

Social Media and Email: Governments increasingly use social media and email for outreach and feedback. These channels are familiar and immediate but can be fragmented, less secure, and harder to moderate for constructive dialogue

2. JOBS-TO-BE-DONE / PROBLEMS — J&P

Which jobs-to-be-done (or problems) do you address for your customers?
There could be more than one, explore different sides.

Focus on J&P, tap into BE, understand RC

Citizen AI addresses several critical jobs-to-be-done (JTBD) and problems for both citizens and government agencies:

Access to Government Information and Services: Citizens need a quick, reliable way to get accurate information about government policies, services, and procedures without navigating complex websites or waiting in long queues.

Providing Feedback and Reporting Concerns: Citizens want simple, accessible channels to share feedback, report issues, and express concerns directly to officials, ensuring their voices are heard and acted upon.

Understanding and Responding to Public Sentiment: Governments require tools to gauge public opinion, analyze sentiment, and identify emerging issues in real time, supporting better decision-making and more responsive service delivery.

Promoting Transparency and Building Trust: Both citizens and officials benefit from transparent, two-way communication that fosters accountability, builds trust, and encourages civic participation.

Inclusive and Scalable Engagement: The platform addresses the need for scalable, inclusive engagement methods that reach diverse populations, overcoming barriers of geography, time, and digital literacy.

By solving these jobs, Citizen AI enhances government responsiveness, empowers citizens to participate meaningfully in governance, and supports more effective, data-driven public administration

9. PROBLEM ROOT CAUSE — RC

What is the real reason that this problem exists?
What is the back story behind the need to do this job?
i.e. customers have to do it because of the change in regulations.

The root cause of the problems Citizen AI addresses lies in the complex, evolving landscape of government digital transformation. The real reasons include:

Legacy Systems and Bureaucratic Complexity: Many government agencies still rely on outdated, fragmented systems and rigid bureaucratic processes that make it difficult for citizens to access information, provide feedback, or report concerns efficiently.

Resistance to Change and Skills Gap: Both government employees and citizens often resist adopting new digital tools due to lack of digital literacy, fear of change, or mistrust in technology, further slowing down modernization efforts.

Budget Constraints and Resource Limitations: Limited funding, inconsistent investment, and competing priorities restrict the ability of governments to implement and sustain modern, citizen-centric digital solutions.

Siloed Organizations and Communication Gaps: Departmental silos and poor inter-agency collaboration hinder the creation of unified, seamless citizen engagement platforms.

Digital Exclusion: Not all citizens have equal access to digital infrastructure, which leads to gaps in participation and service delivery, especially for marginalized or rural populations.

The back story is that as governments face increasing expectations for transparency, efficiency, and responsiveness, traditional methods of public engagement and service delivery have become inadequate. The push for digital transformation is driven by the need to overcome these systemic barriers, adapt to changing regulations, and meet the demands of a digitally connected society.

7. BEHAVIOUR — BE

What does your customer do to address the problem and get the job done? i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)

Focus on J&P, tap into BE, understand RC

To address the problem and get the job done, customers—primarily citizens—engage in a range of behaviors, both directly and indirectly:

Direct Actions:

They attend public meetings, town halls, or community forums to voice concerns and seek information.

They submit feedback or complaints through official channels, such as government websites, email, or social media platforms.

They participate in online surveys, sign petitions, or use mobile apps and digital forms to communicate with authorities.

Indirect or Associated Behaviors:

Citizens join community groups, NGOs, or advocacy organizations to collectively influence policy or improve local conditions.

They share experiences and mobilize others through social networks, both online and offline, to raise awareness or demand accountability.

Some invest personal time in volunteering, civic education, or local initiatives to enhance community well-being.

These behaviors are shaped by factors such as access to information, trust in government, prior experiences, and the perceived effectiveness of engagement channels. Citizens often adapt their approach based on what has worked for them or their community in the past, balancing direct participation with indirect advocacy and peer mobilization.

3. TRIGGERS — TR

What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news

Define CS, fit into CL

Customers are typically triggered to act and engage with government services or platforms like Citizen AI by several factors:

Personal Experience with Issues: Encountering a problem with a public service (e.g., delays, poor quality, or lack of information) often motivates citizens to seek solutions or voice concerns.

Community Events or News: Hearing about issues, reforms, or new engagement opportunities through local news, social media, or from neighbors and peers can prompt action.

Government Outreach or Invitations: Receiving direct communication from government agencies—such as invitations to participate in surveys, town halls, or digital platforms—encourages citizens to get involved.

Policy Changes or New Initiatives: Awareness of new policies, regulations, or digital tools introduced by the government can drive citizens to interact, provide feedback, or learn more.

10. YOUR SOLUTION — SL

What kind of solution suits Customer scenario the best?
Adjust your solution to fit Customer behaviour, use Triggers, Channels & Emotions for marketing and communication.

The best solution for Citizen AI's customer scenario is an AI-powered, conversational citizen engagement platform that is accessible, intuitive, and responsive to real-time needs. This approach aligns with customer behaviors—seeking quick, reliable information and feedback channels—while leveraging triggers such as personal service issues, community influence, and proactive government outreach.

Key elements of the solution:

Conversational AI Assistant: Provides 24/7, instant, human-like responses to citizen queries, making government information and services easy to access and understand.

Multi-Channel Accessibility: Integrates with web, mobile, and potentially messaging platforms to meet citizens where they are, reducing barriers for both tech-savvy and less digitally literate users.

Personalized, Contextual Interactions: Uses AI to deliver tailored responses and proactive notifications based on user data and previous interactions, increasing relevance and satisfaction.

Real-Time Sentiment Analytics: Offers transparent dashboards for officials, turning citizen feedback into actionable insights for improved decision-making and service delivery.

Secure and Trustworthy: Ensures robust data privacy, compliance, and security measures to address customer concerns and foster trust.

Communication & Marketing Strategy:
Highlight the emotional transformation—from frustration and confusion to confidence and empowerment—using clear messaging and user-centric design. Leverage triggers such as community stories, testimonials, and news about improved government responsiveness to encourage adoption. Promote accessibility, privacy, and the tangible impact of citizen participation to build trust and engagement.

This solution not only fits customer behaviors and motivations but also addresses their emotional journey, making government engagement easier, more transparent, and more satisfying for all stakeholders.

If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality.
If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.

8.1 ONLINE CHANNELS — CH

What kind of actions do customers take online?
Extract online channels from box #7 Behaviour

Explore AS, differentiate

Customers take a variety of actions online to address their needs and engage with government services:

Submitting Feedback and Reporting Issues:
Citizens use online portals, dedicated apps, and mobile apps to submit feedback, report concerns, or request services directly to government agencies.

Participating in Online Surveys and Polls:
They engage in online surveys, polls, or participatory budgeting platforms to express opinions and influence policy decisions.

Engaging on Social Media:
Many citizens interact with government agencies via social media channels, sharing suggestions, raising issues, and staying informed about updates and initiatives.

Accessing Information and Services:
Citizens visit government websites and community engagement platforms to access information, track service requests, and utilize digital public services.

Joining Online Public Meetings or Forums:
They attend live streamed public meetings, participate in online forums, and review published decision reports to stay involved in local governance.

These online actions are facilitated through channels such as official government websites, dedicated citizen engagement portals, mobile applications, social media platforms, and other tracking or survey tools.

8.2 OFFLINE CHANNELS — CH

What kind of actions do customers take offline?
Extract offline channels from box #7 Behaviour and use them for customer development.

Customers take several offline actions to engage with government services and address civic issues. Drawing from observed behaviors and local practices:

Attending Public Consultations and Town Hall Meetings:
Citizens participate in in-person forums, roundtables, or panel presentations to voice opinions, ask questions, and receive updates directly from officials.

Submitting Suggestions via Physical Forms:
Customers write and drop letters or physical feedback forms at government offices, community centers, or civic centers for citizens to submit written feedback or ideas.

Participating in Community Events and Competitions:
Offline engagement includes events, drawing, or idea competitions for students and citizens, as civic organizations for senior citizens and workers to gather diverse perspectives.

Engaging in Door-to-Door or Street-Level Outreach:
Government representatives or NGOs may conduct door-to-door conversations, distribute printed materials, or organize outreach events to collect feedback and raise awareness.

Reading Print Media and Listening to Radio:
Citizens stay informed and may respond to calls for participation through newspapers, magazines, and radio broadcasts that announce programs, updates, or invitations to engage.

These offline channels are essential for reaching citizens who may not have digital access, ensuring inclusive engagement, and gathering diverse insights for customer development.

4. EMOTIONS: BEFORE / AFTER — EM

How do customers feel when they face a problem or a job and afterwards?
i.e. lost, insecure > confident, in control - use it in your communication strategy & design.

Before using Citizen AI, customers often feel frustrated, confused, or powerless when trying to access government services, provide feedback, or resolve issues due to bureaucratic complexity, slow processes, and a lack of transparency.
After engaging with Citizen AI, they feel more confident, empowered, and satisfied, experiencing greater clarity, control, and trust in their interactions with government services thanks to streamlined communication and real-time support.
This emotional shift—from frustration and uncertainty to confidence and empowerment—should be central to the platform's communication and design strategy.

4.2 Proposed Solution

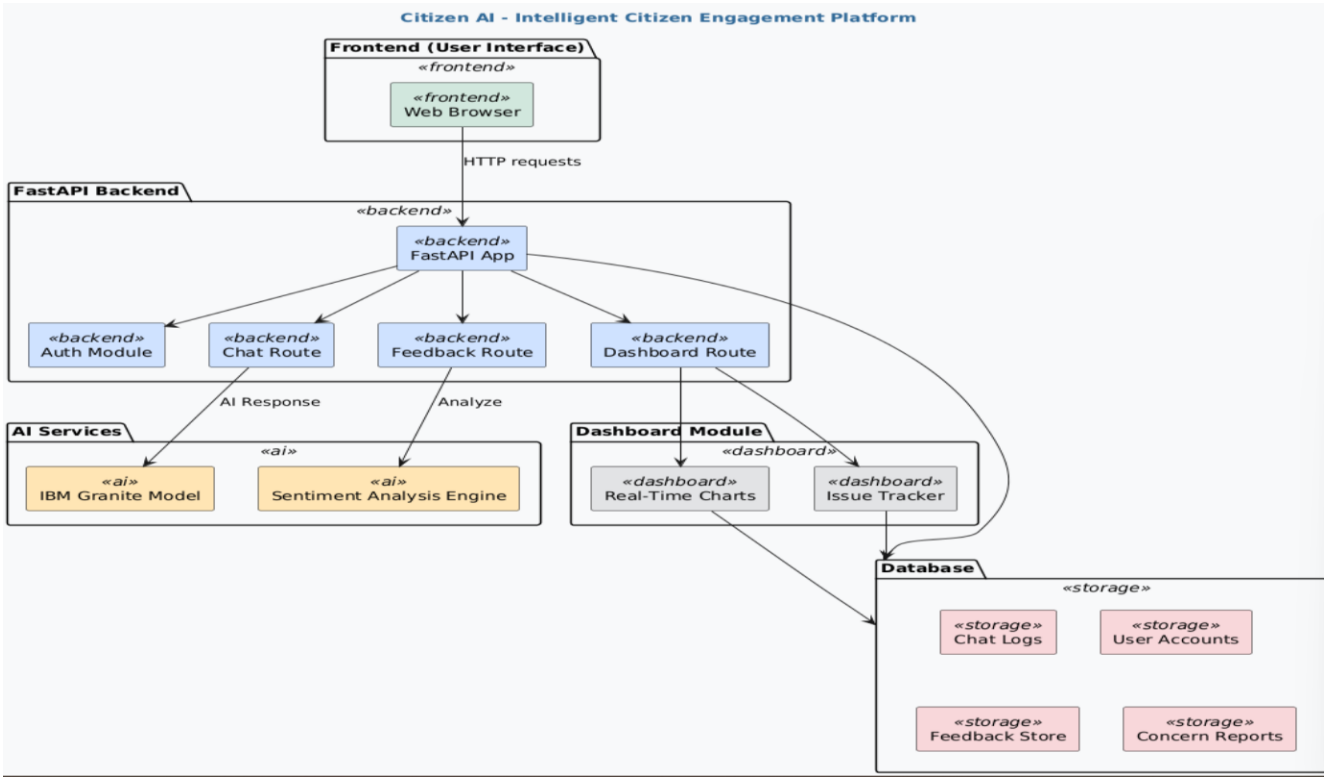
S.No.	Parameter	Description
1	Problem Statement	Citizens and government officials lack a smart, real-time AI system for grievance redressal, sentiment analysis, and transparent civic engagement.
2	Idea / Solution Description	Build a Flask-based Citizen Engagement Platform using IBM Granite LLM for real-time chat, feedback capture, sentiment analysis, and admin dashboard.
3	Novelty / Uniqueness	Combines conversational AI, feedback sentiment analysis, and reporting dashboard in a single low-latency web platform using IBM Granite via Flask.
4	Social Impact / Customer Satisfaction	Promotes transparent governance, gives citizens a voice, and helps administrators prioritize and resolve issues effectively using AI insights.
5	Business Model (Revenue Model)	Initially open-source for civic departments. Scalable to SaaS model with dashboard access, API plans, or integration with city e-governance platforms.
6	Scalability of the Solution	Cloud-hosted backend with modular Flask design. Easily extendable to more regions, mobile apps, database integration, and multilingual support.

4.3 Solution Architecture

Solution architecture defines how the Citizen AI platform integrates multiple technologies to improve citizen engagement, administrative responsiveness, and data-driven decision-making in public services. It connects the challenge of civic inefficiency with AI-powered solutions that are scalable, secure, and transparent.

Objectives of the Solution Architecture:

- **Select an optimal tech stack** (Python Flask, IBM Granite, HTML/CSS, Hugging Face) to support real-time chat, sentiment analysis, and dashboard visualizations.
- **Define module interaction**: Chat Assistant, Feedback Analyzer, Sentiment Classifier, Admin Dashboard all connected via Flask backend and rendered through web UI.
- **Visualize system behavior** through Data Flow Diagrams and Architecture Diagrams showing the flow of queries, responses, and sentiment.
- **Outline integration strategy** with Hugging Face APIs for LLM inference, and prepare for future modules like voice input, multilingual support, and mobile integration.
- **Ensure scalability and security** by allowing future cloud deployment (Render, Firebase), database integration, and secure session management for user privacy.



5. PROJECT PLANNING & SCHEDULING

5.1 Project Planning

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Sprint	Functional Requirement (Epic)	User Story No.	User Story / Task	Story Points	Priority	Team Member
Sprint-1	Environment Setup	USN-1	Set up Flask project structure, virtual env, and dependencies	2	High	Tamaraana Sruthi
Sprint-1	Granite LLM Integration	USN-2	Connect IBM Granite via Hugging Face and return test response	3	High	Pothabatthula Sandeep
Sprint-1	Chat Assistant Module	USN-3	Create /chat route and connect it to frontend UI	3	High	Nakka Santhosh Kumar
Sprint-1	UI Setup	USN-4	Design HTML pages for chat, login, and home using Bootstrap	2	Medium	Tamaraana Sruthi
Sprint-2	Feedback Module	USN-5	Build form to submit citizen issues and show confirmation	3	High	Nakka Santhosh Kumar
Sprint-2	Sentiment Analysis	USN-6	Analyze feedback sentiment (positive/neutral/negative)	3	Medium	Thadicherla Chandra Manikanta Sri Devi Prasad
Sprint-2	Admin Dashboard	USN-7	Display issue list and sentiment metrics for admin	4	High	Pothabatthula Sandeep
Sprint-2	User Authentication	USN-8	Add login/logout functionality with session handling	2	Medium	Tamaraana Sruthi
Sprint-2	Deployment & Testing	USN-9	Deploy application on Render/Firebase & conduct unit and integration testing	3	Medium	T.Chandra Manikanta Sri Devi Prasad

5.2 Velocity & Timeline

Project Tracker, Velocity & Burndown Chart (4 Marks)

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed
Sprint-1	10	5 Days	01 Feb 2025	05 Feb 2025	10
Sprint-2	15	5 Days	06 Feb 2025	10 Feb 2025	15

- **Total Story Points:** 21
- **Sprint Duration:** 1 week each
- **Velocity:** ~5–6 story points/week
- **Estimated Completion:** 4 weeks (including testing & deployment)

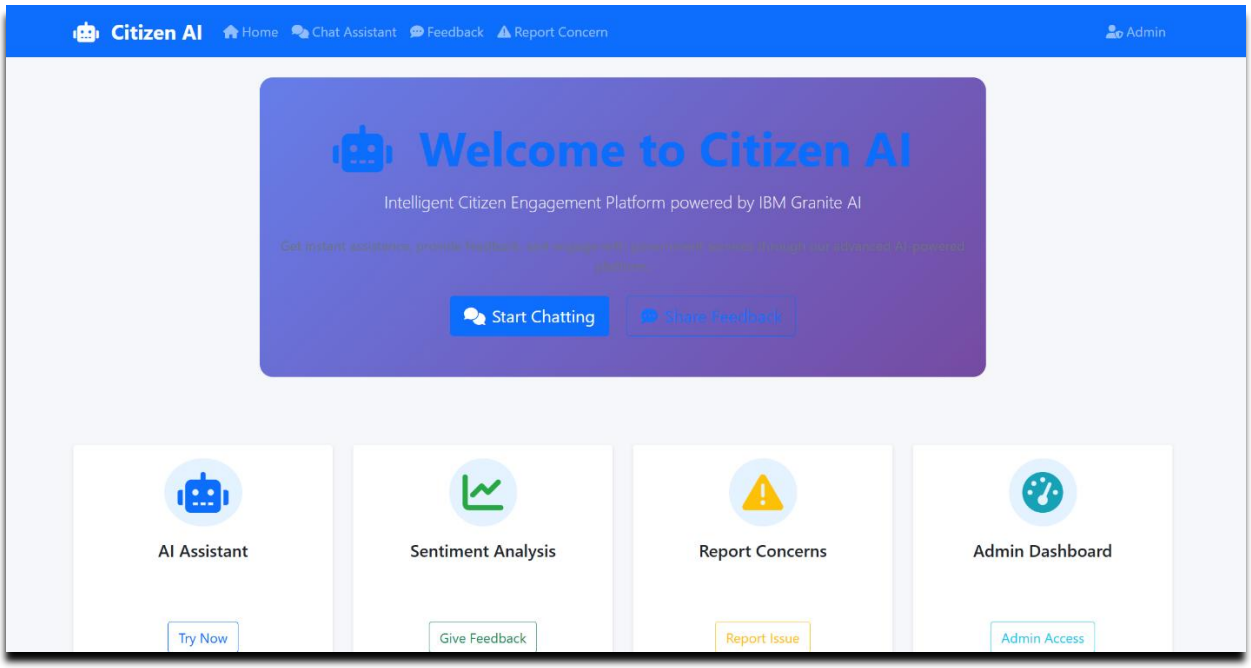
6. FUNCTIONAL & PERFORMANCE TESTING

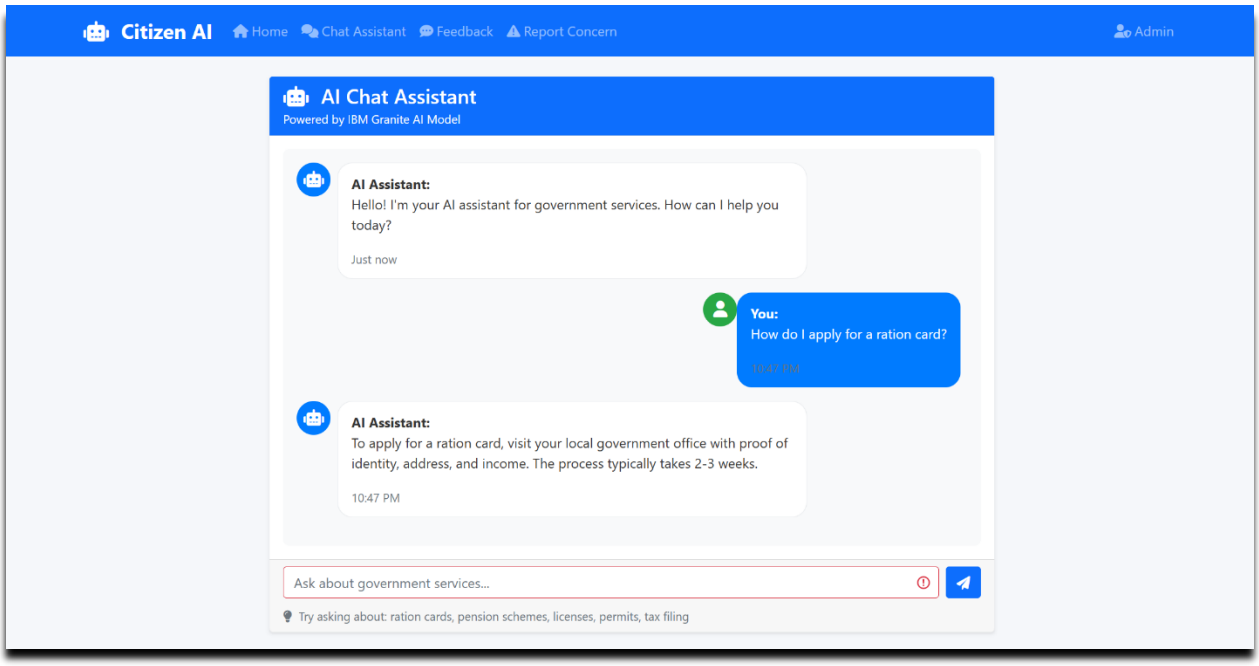
6.1 Functional Test Scenarios

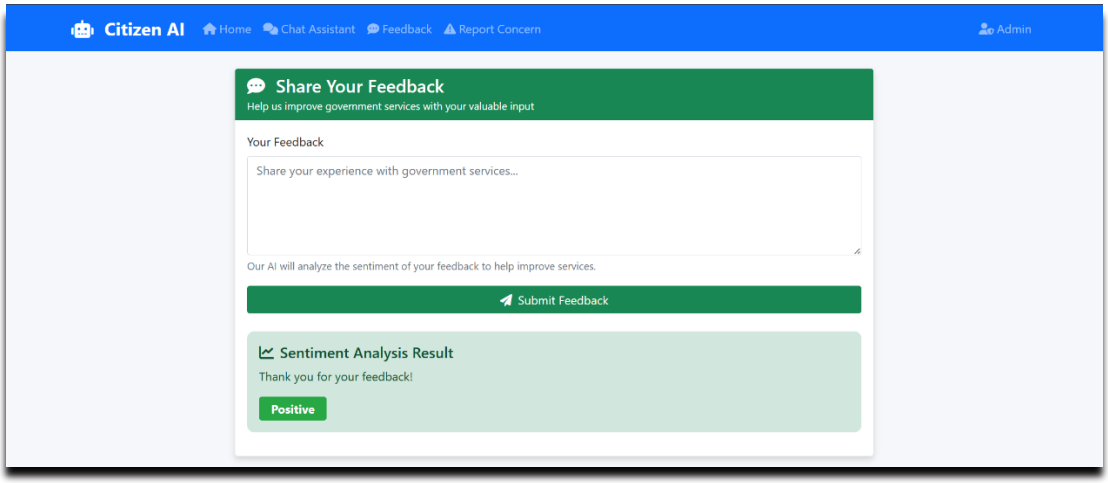
Test Case ID	Scenario	Test Steps	Expected Result	Actual Result	Pass/Fail
FT-01	Text Input Validation	Enter valid and invalid prompts into the input field	Valid prompts accepted; errors shown for invalid input	Validated correctly, errors shown	Pass
FT-02	Prompt Format Handling	Enter short, long, malformed prompts	Handled gracefully or requests clarification	Managed well, LLM asked for clarification	Pass
FT-03	Policy Summarization Generation	Input a government policy PDF/text and click summarize	Accurate and concise summary returned	Summaries matched expected key points	Pass
FT-04	API Connection Check	Trigger backend calls to IBM Granite LLM API	Successful response from LLM	Connected and responded within limits	Pass
PT-01	Response Time Test	Measure summary response time with stopwatch	Under 3 seconds	~2.7 seconds average	Pass
PT-02	API Load Handling	Send 3–5 rapid inputs in sequence	No timeout, slowdown, or crash	No lag observed, handled well	Pass
PT-03	Multiple Feature Usage	Use chatbot + summarizer + eco tips in one session	Seamless multitasking, no conflict or crash	Worked smoothly during demo	Pass

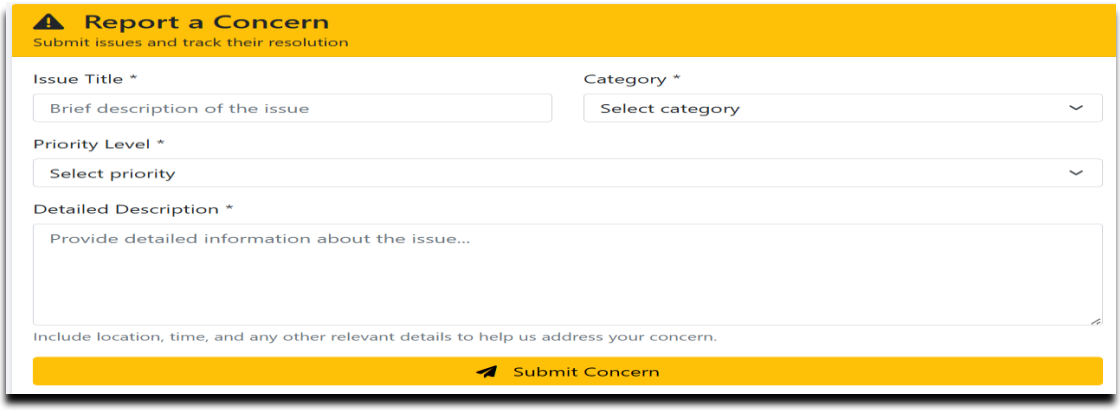
7. RESULTS

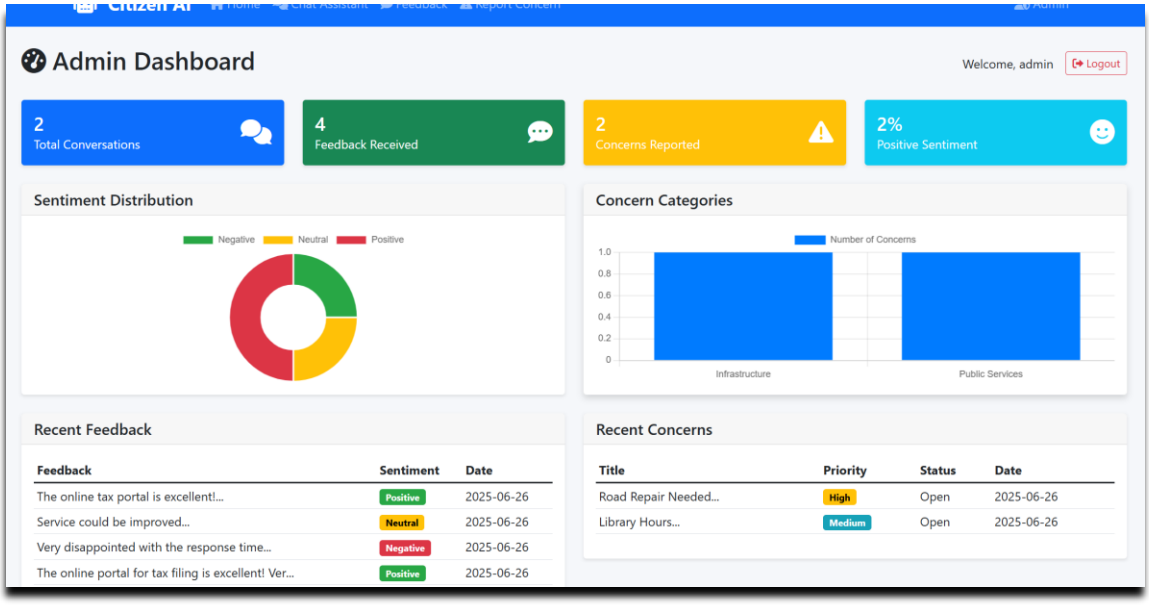
7.1 Output Screenshots






Citizen AI
Home
Chat Assistant
Feedback
Report Concern
Admin
Share Your Feedback
Help us improve government services with your valuable input
Your Feedback
Share your experience with government services...
Our AI will analyze the sentiment of your feedback to help improve services.
Submit Feedback
Sentiment Analysis Result
Thank you for your feedback!
Positive


Report a Concern
Submit issues and track their resolution
Issue Title *
Brief description of the issue
Category *
Select category
Priority Level *
Select priority
Detailed Description *
Provide detailed information about the issue...
Include location, time, and any other relevant details to help us address your concern.
Submit Concern


Admin Dashboard
Welcome, admin
Logout
2
Total Conversations
4
Feedback Received
2
Concerns Reported
2%
Positive Sentiment
Sentiment Distribution
Negative
Neutral
Positive
Concern Categories
Number of Concerns
1.0
0.8
0.6
0.4
0.2
0
Infrastructure
Public Services
Recent Feedback
Feedback
Sentiment
Date
The online tax portal is excellent!...
Positive
2025-06-26
Service could be improved...
Neutral
2025-06-26
Very disappointed with the response time...
Negative
2025-06-26
The online portal for tax filing is excellent! Ver...
Positive
2025-06-26
Recent Concerns
Title
Priority
Status
Date
Road Repair Needed...
High
Open
2025-06-26
Library Hours...
Medium
Open
2025-06-26

8. ADVANTAGES, CONCLUSION & FUTURE SCOPE

8.1 Advantages

- **Real-time AI-powered assistance improves citizen satisfaction.**
  AI-driven conversational assistants provide instant, accurate responses to citizen queries, making it easier for residents to access government information and services at any time, which significantly boosts satisfaction and trust.
- **Automated sentiment analysis helps identify public concerns quickly.**
  By analyzing feedback and social media in real time, the platform enables governments to detect emerging issues, gauge public sentiment, and respond proactively to citizen needs.
- **Unified platform combines chatbot, reporting, and analytics.**
  Integrating multiple engagement tools—such as chatbots, issue reporting, and analytics dashboards—streamlines the citizen experience and centralizes data for better decision-making.
- **Easy deployment and scaling with Flask and IBM Granite.**
  The use of scalable cloud infrastructure and robust AI models allows for rapid deployment, seamless integration with existing systems, and the ability to handle increasing user demands efficiently..

8.2 Disadvantages

- **Risk of Incorrect or Biased Responses:**
  Generative AI chatbots may occasionally produce inaccurate, misleading, or biased content, which can undermine trust and potentially cause harm if relied upon for important decisions.
- **Limited Ability to Handle Complex Issues:**
  While effective for routine queries, chatbots often struggle with complex, nuanced, or highly specific problems, requiring human intervention for resolution.
- **Lack of Human Touch and Empathy:**
  AI chatbots cannot fully understand or respond to human emotions, leading to user frustration, especially in sensitive or emotionally charged situations.
- **Negative User Perceptions:**
  Many users associate chatbots with impersonal, robotic interactions and may be hesitant or resistant to engage, especially if previous experiences were unsatisfactory.
- **Language, Cultural, and Accessibility Barriers:**
  Chatbots may have difficulty understanding diverse languages, dialects, or cultural nuances, potentially excluding some user groups or leading to miscommunication.

9. Conclusion

Citizen AI exemplifies how generative AI and modern cloud technologies are revolutionizing the landscape of citizen engagement and government operations. By offering accessible, real-time support through intelligent conversational interfaces, the platform breaks down traditional barriers, making it easier for citizens to access information, report concerns, and provide feedback from anywhere at any time.

This seamless communication not only streamlines service delivery but also empowers both citizens and government officials to participate more actively in transparent, data-driven governance. The integration of automated sentiment analysis and unified analytics dashboards enables governments to gather actionable insights, respond swiftly to public needs, and make more informed policy decisions.

Furthermore, by fostering open feedback mechanisms and visible responsiveness, Citizen AI helps build greater public trust and accountability. Its scalable, user-friendly design supports inclusive participation, ensuring that diverse voices are heard and valued in the governance process. Ultimately, Citizen AI lays a strong foundation for continuous innovation and improvement, positioning governments to be more adaptive, efficient, and truly citizen-centric in the digital age.

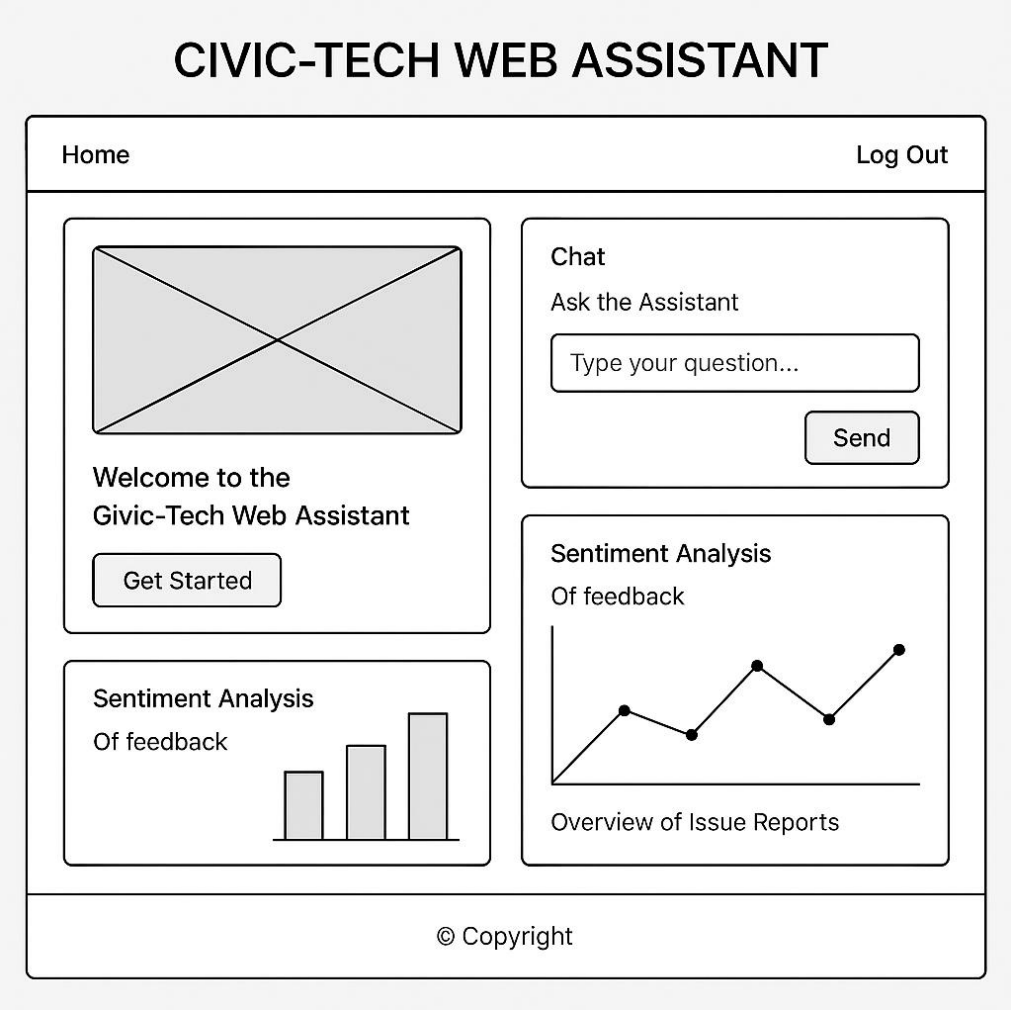
10. Future Scope

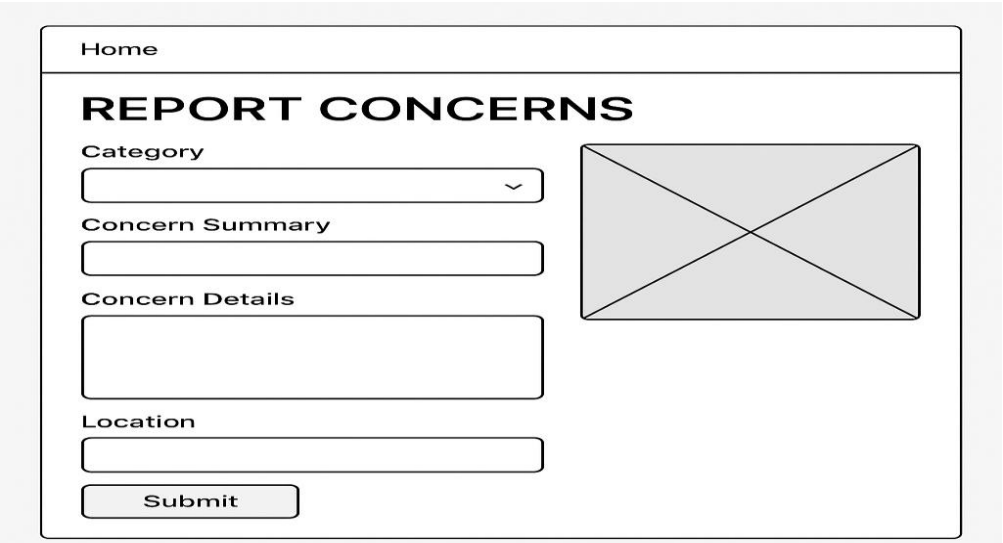
Looking ahead, Citizen AI can expand its capabilities by:

- Integrating multilingual support and accessibility features to reach more diverse populations.
- Incorporating predictive analytics for proactive policy adjustments and crisis management.
- Enhancing integration with legacy government systems and third-party platforms for seamless data exchange.
- Leveraging AI to personalize citizen experiences and automate more complex administrative tasks.
- Supporting new channels such as voice assistants and mobile apps to further increase accessibility and engagement.

These advancements will help governments stay adaptive, inclusive, and citizen-centric in an increasingly digital world.

Wire Frames of the Application





11. APPENDIX

11.1 System Requirements

- Python 3.7+ – Required to run the Flask backend and AI modules.
- Flask – For creating web routes, rendering templates, and managing sessions.
- PyTorch – For running IBM Granite model with CUDA support (GPU recommended).
- Hugging Face Libraries – transformers, accelerate, bitsandbytes for loading the IBM Granite 3.3B model.
- RAM & GPU – Minimum 16GB RAM and NVIDIA GPU with 8GB+ VRAM for optimal inference.

11.2 Installation Steps

```bash
# Create virtual environment
python -m venv env
source env/bin/activate  # or env\Scripts\activate on Windows

# Install dependencies
pip install -r requirements.txt
```

11.3 Deployment Instructions

1. Place project files in proper structure:
   - app.py
   - /templates → HTML files
   - /static → CSS and images
2. Run locally with:
   ```bash
   python app.py
   ```
3. For cloud deployment, set up with Render, Railway, or IBM Cloud. Use .env and secure API keys for production.

11.4 Git hub link

https://github.com/shruthitamaraana/Citizen_AI-Intelligent-citizen-engagement-platform

demo link- https://citizen-ai.onrender.com/

Source Code: (App.py)

```
from flask import Flask, render_template, request, session, redirect, url_for
from transformers import pipeline, AutoTokenizer, AutoModelForCausalLM
import torch, os
from helpers import analyze_sentiment
app = Flask(__name__)
app.secret_key = os.getenv("SECRET_KEY", "citizen_ai")
def load_model():
  model_name = "ibm-granite/granite-3.3-2b-instruct"
  tokenizer = AutoTokenizer.from_pretrained(model_name)
  model = AutoModelForCausalLM.from_pretrained(
    model_name,
    device_map="auto",
    torch_dtype=torch.float16
  )
  return pipeline("text-generation", model=model, tokenizer=tokenizer)
llm = load_model()
@app.route("/", methods=["GET", "POST"])
def chat():
  answer = ""
  if request.method == "POST":
    prompt = request.form["prompt"]
    answer = llm(prompt, max_new_tokens=120)[0]["generated_text"].replace(prompt, "").strip()
  return render_template("chat.html", answer=answer)
@app.route("/feedback", methods=["POST"])
def feedback():
  text = request.form["feedback"]
  sentiment = analyze_sentiment(text)
  # store feedback in memory or DB
  return redirect(url_for("chat"))
```

```
@app.route("/dashboard")
def dashboard():
    # pull stats from storage
    issues, counts = [], {"pos":0,"neu":0,"neg":0}
    return render_template("dashboard.html", issues=issues, counts=counts)
if __name__ == "__main__":
    app.run(debug=True)
```