### CivicFix

### Project Proposal



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1. Abstract

# CivicFix is an intelligent metropolitan management system designed to improve the urban infrastructure by streamlining the process of reporting and resolving issues related to utilities like electricity and gas. Users can capture photos of malfunctioning equipment or damaged infrastructure such as faulty electricity meters or broken gas lines. These images are analyzed using a computer vision model to categorize the issue related department and route it to the appropriate department (e.g., WAPDA for electricity, SNGPL for gas). The system automates the complaint handling process by forwarding reports to the correct department, which then dispatches a team to resolve the issue. After fixing the problem, the field team uploads proof of resolution, which is shared with the user. This proposal outlines the technological framework, objectives, and scope of the project.

1. Introduction

Urban areas in Pakistan face numerous infrastructure challenges, including issues related to malfunctioning utility equipment and inadequate public services managed by organizations like LESCO (Lahore Electric Supply Company) and SNGPL (Sui Northern Gas Pipelines Limited). Power outages, waste collection inefficiencies and gas supply disruptions are common problems that affect daily life, create safety hazards, and reduce the quality of urban living. These issues are often exacerbated by traditional reporting systems, which rely on manual processes such as phone calls or physical visits to office locations. This approach leads to delays, miscommunication between citizens and service providers, and a lack of transparency in the resolution process.

CivicFix aims to address these challenges by introducing a modern, digital complaint management system. Through its user-friendly mobile application, CivicFix enables citizens to report utility issues in real time. The platform utilizes computer vision to analyze and predict the nature and relevance of reported problems, ensuring they are automatically routed to the appropriate department—whether it is LESCO for electricity issues, or SNGPL for gas supply concerns. This automation significantly reduces response times and eliminates bottlenecks caused by manual intervention.

Additionally, CivicFix emphasizes transparency and accountability by enabling users to track the status of their complaints and view proof of resolution. This feature not only builds trust between citizens and service providers but also motivates authorities to resolve issues promptly. By bridging the gap between citizens and urban management systems, CivicFix contributes to creating smarter, more responsive cities, where public services are maintained with greater efficiency and reliability.

In summary, CivicFix offers an innovative solution to a persistent problem, combining advanced technology with user-friendly functionality to empower citizens and enhance urban living.

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1. Problem Statement

# In many metropolitan areas, citizens encounter issues with basic utilities like malfunctioning electricity meters, damaged gas pipelines. The current manual system for reporting these issues is slow and inefficient, leading to long delays in repairs and miscommunication between citizens and service providers. There is a need for a centralized, system that automates categorizes issues accurately, and routes them to the correct department to ensure timely and effective resolution.

1. Objectives

# Implement a smartphone application that uses computer vision to automatically identify and route utility-related complaints (e.g., electricity, gas ) to the appropriate department.

# Provide users with real-time notifications and status updates, allowing them to track the progress of their complaint and confirm resolution once the issue is addressed.

# Develop an admin interface for department managers to monitor complaint statuses, team assignments, and overall progress, ensuring efficient issue resolution.

1. Features/Scope

# The system will encompass the following key features:

# User-friendly Interface:

# Simple interface for capturing photos and reporting issues.

**Automated Complaint Detection and Routing:**

* Users can capture images of utility issues (e.g., malfunctioning electricity meters, gas leaks ) using their smartphones.
* A computer vision model will analyze the image, automatically detecting the type of issue and routing the complaint to the correct department (e.g., WAPDA for electricity, SNGPL for gas ).

**Real-Time Updates and Tracking:**

* Users will receive real-time updates on the status of their complaint, including acknowledgment, team assignment, and progress.
* Once the issue is resolved, the user will be notified and can confirm whether the resolution is satisfactory through the app.

**Administrative Dashboard for Monitoring:**

* An admin dashboard will be provided to department managers for tracking the progress of complaints.
* The dashboard will display real-time data on assigned teams, complaint resolution timelines, and overall efficiency, ensuring transparency and accountability in the issue resolution process.

**Proof of Resolution:**

* Photos of the fixed issue uploaded by field teams.

1. Related Work

Table 1.1: Related System Analysis

|  |  |  |
| --- | --- | --- |
| **Related System** | **Weakness** | **Proposed Project Solution** |
| WAPDA Complaint System | The WAPDA (Water and Power Development Authority) Complaint System is limited to a web-based platform.  This restricts its accessibility for users who may not have immediate access to computers or are unfamiliar with web interfaces.  Additionally, it lacks a real-time feedback loop, leaving users without updates regarding the status of their complaints or proof of issue resolution. | CivicFix provides an **Android-based platform**, making it easily accessible via smartphones.  The system integrates real-time updates and proof of resolution, ensuring users are informed about the progress of their complaints and fostering greater transparency. |
| SNGPL Complaint System | The Sui Northern Gas Pipelines Limited (SNGPL) Complaint System is also limited to a web-based platform. While functional, it is not optimized for mobile users and lacks the convenience of on-the-go reporting. | CivicFix introduces an **Android-based platform**, allowing users to report gas issues in real time from their smartphones.  This enhances accessibility and user experience by catering to mobile-first users. |

1. Proposed Methodology/System

The proposed methodology includes the following steps:

**Image Capture and Analysis:**

* Users will capture images of utility-related issues (e.g., damaged electricity meters, gas related issues, waste problems) using their smartphones.
* The captured images will be processed using a computer vision model trained to detect and categorize the type of issue.
* Based on the image analysis, the system will automatically determine the appropriate department (WAPDA, SNGPL, etc.) to handle the complaint.

**Automated Complaint Routing:**

* After issue identification, the system will route the complaint to the respective civic department for resolution.
* Each complaint will be tagged with specific metadata, including location, type of issue, and urgency, to streamline departmental response.

**Team Assignment and Real-Time Updates:**

* Once the complaint reaches the appropriate department, the system will assign a field team to resolve the issue.
* Users will receive real-time updates on their complaint status, from acknowledgment of submission to team assignment and on-site progress.
* Notifications will keep the user informed about the current stage of the resolution process.

**Issue Resolution Confirmation:**

* After the field team addresses the problem, they will upload a photo of the resolved issue through the system.
* This image will be shared with the user for verification, allowing the user to confirm that the issue has been adequately resolved.

**Administrative Dashboard for Monitoring:**

* Department managers will have access to an administrative dashboard that provides real-time data on the progress of complaints.
* The dashboard will display assigned complaints, ongoing issues, response times, and overall department performance, ensuring transparency and effective management.

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1. Tools and Technologies

* **Programming Languages**: Python (for Computer Vision Model), JavaScript (React Native for mobile app development and React for web app development)
* **Object Detection Model**: Yolo/Detectron for computer vision
* **Web Development Tool:** React for Web based Dashboard.
* **Mobile Development Tools**: React Native for Android App.
* **Backend: Spring Boot for building scalable, modular REST APIs with microservices.**
* **Database: PostgreSQL (for relational data), MongoDB (for unstructured data).**
* **AI/ML Models: Integrated via REST from Python-based services for computer vision (deployed as microservices).**
* **Real-time Communication: WebSockets with Spring or external message brokers like Kafka/RabbitMQ.**
* **Security: Spring Security with JWT.**
* **Cloud Hosting: AWS/GCP for deployment with Kubernetes/Docker for containerization.**

1. Team Members Individual Tasks/Work Division

Individual tasks of team members should be identified in the form of table, as given below.

|  |  |
| --- | --- |
| **Team Member** | **Tasks** |
| Muhammad Husnain | Lead the project and ensure team coordination.  Develop backend services using **Spring Boot**. Implement APIs for complaint submission and updates. Design and manage databases. Ensure backend scalability and security. |
| Hammad Ul Hassan | Develop the frontend interface for user interaction.  Ensure smooth integration of AI services with the application. |
| Faqeed Hassan | Implement Computer Vision for complaint routing to departments.  Integrate backend APIs with the frontend. |

1. Data Gathering Approaches
2. **User Surveys:**

* **Purpose:** Collect feedback from potential users to understand their experiences with current utility issue reporting systems, such as WAPDA, SNGPL..
* **Method:** Distribute online and offline surveys to gather quantitative and qualitative data about pain points, desired features, and usability expectations.
* **Target Audience:** Citizens who regularly report utility issues to authorities or service providers.

**2. Observation of Current Systems:**

* **Purpose:** Analyze how existing systems like web-based platforms or call centers handle complaints, including response times and tracking mechanisms.
* **Method:** Monitor and document real-world complaint handling processes and workflows.

Timeline/Gantt Chart

Based on the Work Breakdown Structure (WBS), a timeline or Gantt chart showing the allocation of time to the project phases or iterations should be developed. This Gantt chart would identify major milestones with their achievement criteria. It must contain duration estimation of all the necessary activities to be carried out during the project development along with the human resources responsible for the respective tasks. Activity dependencies are also required to be mentioned in it.



Figure 1.1: Gantt chart

# References 1. <https://ccms.pitc.com.pk/complaint> 2. <https://www.sngpl.com.pk/complaints.jsp?mdids=89>