Section A-Research paper
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Novel software to Simplifying Complaints with Mobile Solutions Using Cross Platform Development

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Abstract. According to the Press Information Bureau, around 2 million complaints are registered throughout India and almost one-fourth of the complaints are left unattended. Raising a complaint is a complicated and time-consuming task, as the user or person who raises the complaint must visit the respective office to do so. This was the system used to raise complaints until the evolution of smartphones. In the era of smartphones and improved communication, people are able to raise complaints in the respective department's complaints and grievances section. However, having separate platforms for each department is confusing and it is hard to remember those platforms' web addresses. As a solution to this, a common platform has been developed in the form of an Android app, which can be accessed anytime once installed. This app is cost-effective for the departments to maintain. It acts as a portal to register a complaint and follow the status of the complaint. It also provides a module that helps to take a photograph of any problem that upload its image, text description and location of the complaint. With the common platform, extended functionality of posting complaints to higher officials when the complaint is left unattended or unsolved until a certain period of time is also available. Through this platform, unattended or unsolved complaints are known to the higher officials as well as the public, which could make the solving of the complaints faster by the officers.

Keywords: Complaints, Grievances, India, Smartphones, Android app, Common platform, Cost-effective, Complaint module, Higher officials, Public.

1 INTRODUCTION

The main goal of government offices is to serve the needs of citizens and resolve the issues in their surroundings, to promote a peaceful and harmonious life. These offices provide fundamental services and assistance to the public, including healthcare, education, public safety, infrastructure and social welfare programs.

Filing a complaint in a government office can be a challenging task, especially for citizens who are unfamiliar with the process. To initiate the complaint procedure, it is essential to identify the appropriate government agency responsible for the service in question. Once identified, the complaint can be registered either in person at the relevant government agency's office or online.

With the increased use of modern technology, many people opt to file complaints online to save time and reduce the cost of in-person visits to government offices. However, complainants may not be aware of the correct department or procedures for submitting complaints, as the relevant department's platforms are not widely known to the public. To address this issue, we propose the Complaint Raiser app, which serves as a common platform for filing complaints across all departments. By providing a centralized platform, the app aims to alleviate confusion and simplify the complaint filing process. In the last decade, the cost of smart mobile devices has decreased significantly, making them accessible to the general population. These devices come equipped with various features, such as GPS location tracking and camera functionality and that have inspired our idea.

The Complaint Raiser app was developed using Flutter and Firebase. This app categorizes complaints based on their types such as Solid Waste Management, Drainage, Storm Water Drain, Road and Traffic, Factories, Water Supplies etc. Additionally, complaints are divided based on their locations.

The workers or service providers have a separate app to view and resolve complaints, while higher officials have another app to track unattended complaints. This enables officials to address unresolved complaints within a reasonable amount of time. The App User Interface (UI) and the functionality is developed using the cross-platform development tool called Flutter and all the data will be stored on the Firebase Real-time database.

2 LITERATURE SURVEY

Viral Patel, Daanyaal Kapadia, Deval Ghevariya, and ShiburajPappu [1] have developed an Android application that targets Android smartphone users. This application utilizes a web-based interface that enables the Central Admin to direct the state admin to attend to complaints. Vishesh K. Kandhari et.al [2] have proposed an architecture for a grievance mobile application in which the current location of the user is fetched using the Google Maps API upon registering a complaint. They have suggested a priority-based system where if a complaint is not addressed within a specific time frame, it will be forwarded to the senior authority. Dhananjay R. Kalband, Priyanka Kulkarni, Uma Nagarseka, and Aditi Mhapsekar et.al [4] have created an Android application that enables users to report road and traffic-related complaints via speech, using GSM-SMS and GPS technology. The GPS coordinates are automatically generated and added to the end of the complaint information, which is then stored in the database by the SMS server. Similarly, Umar Farooq et.al [3] have also developed a system with similar functionality in their research. Yoon Yeh Tan, Yin Ping Ng, Kim Nee Goh, Yoke Yie Chen, and KamaruzamanJusoff [5] developed a road management system that collects GPS coordinates on a smartphone. The complaint, along with its description and GPS information, is then sent via SMS to the server. The data is retrieved and stored in the database, and the information is plotted on Google Maps.

Aaditeshwar Seth et.al [6] has discussed mobile and social media application in the public grievance. Sudeep J [7] have developed a system that utilizes an Android app as the client interface and a Cloud platform for storing data received from clients through the mobile app. They use the Haversine algorithm to calculate the distance between two latitudes and longitudes, representing the distance between two locations on the Earth's surface, using the formula:

$$d/R = (\cos\theta_1\cos\varphi - \cos\theta_2\cos\varphi) + (\cos\theta_1\sin\varphi - \cos\theta_2\sin\varphi) + (\sin\theta_1 - \sin\theta_2). \quad (1)$$

where d represents the distance, R represents the radius of the Earth, θ_1 and θ_2 represent the latitudes, and φ represents the difference in longitudes.

Julia Meik, Christian Brock and Markus Blut [8]. It is a paper that processes customer Collaboration and deals with the innovative service delivery by merging knowledge from two areas of research - customer complaint Processing and Service Management. [12] "An analysis of Online Customer Complaints: Implications for Web Complaint Management", supports customer dissatisfaction that is a part of the Web-based Complaint Management and online customer service is provided in an exceptionally good manner with fast customer complaints response. Osman Nasar, EnayatAlkhider [10] gives an idea of the system that manages complaint. Its main objective is to make easier to manage, monitor, track, and resolve complaints. It also enables the company identify target areas, and track complaints. Jin-Lan Liu, Jiankang, Yin Bai, Xin Zhang [12] is targeting the areas that deals with the Loyalty, Voicing trends of the complaint and ability to handle the complaints.

3 SYSTEM ARCHITECTURE

As depicted in Fig. 1 the proposed system consists of three applications namely

1. Client App
2. Worker App
3. Higher Official App

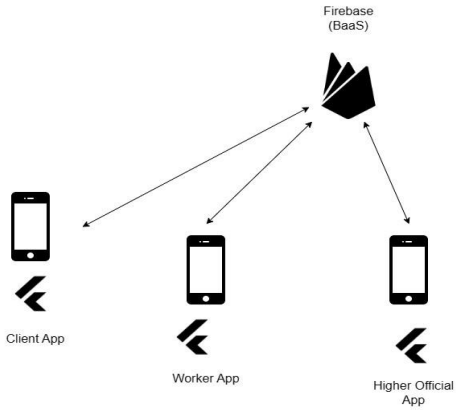

Fig. 1. Connecting Flutter to Firebase

The two main components that are used for developing the system are the

1. Flutter (for development of the App)
2. Firebase (for the storage of the data)

3.1 Flutter

Flutter is a cross-platform UI toolkit that is designed to allow code reuse across operating systems such as iOS and Android, while also allowing applications to interface directly with underlying platform services. Flutter apps run in a Virtual Machine that offers a stateful hot reload of changes without needing a full recompile. For release, Flutter apps are compiled directly to machine code, whether Intel x64 or Advanced RISC Machine instructions or to JavaScript if targeting the web. Architecture of Flutter SDK is depicted in the Fig. 2. Flutter is designed as an extensible, layered system. It exists as a series of independent libraries that each depend on the underlying layer. No layer has privileged access to the layer below, and every part of the framework level is designed to be optional and replaceable.

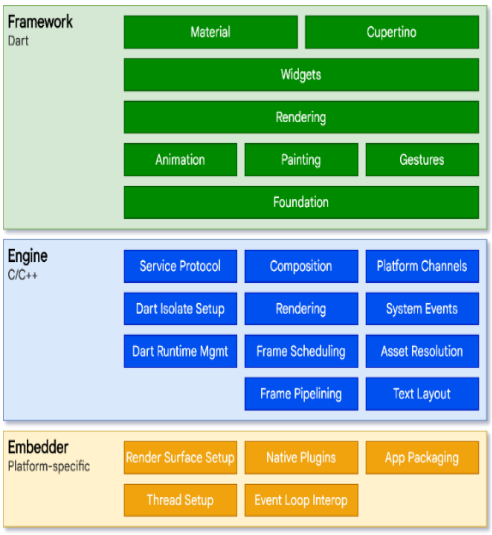

Fig. 2. Flutter Architecture

3.2 Firebase

Firebase is a Backend-as-a-Service (BaaS) app development platform that provides hosted backend services such as a real-time database, cloud storage, authentication, crash reporting, machine learning, remote configuration, and hosting for your static files. Firebase is a set of backend cloud computing services and application development platforms provided by Google. It hosts databases, services, authentication, and integration for a variety of applications, including Android, iOS, JavaScript, Node.js, Java, Unity, PHP, and C++. As shown in the Fig. 3 Firebase itself acts as a backend and does the work of authentication and the part of data storage without setting up the server for deployment also the plans for Firebase are more flexible. It is not a tedious task to set up a Firebase server and it is not necessary to set up a separate server for storage and retrieval of the data.

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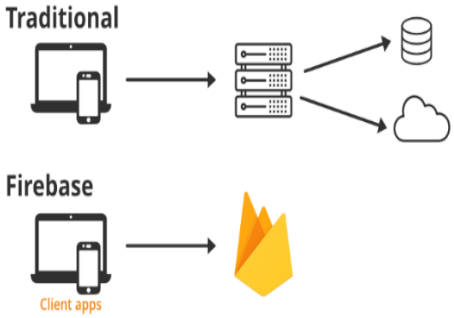

Fig. 3. Firebase vs Traditional Connectivity

4 DESIGN IMPLEMENTATION

The Android application enables users to file any type of complaint with complaints classified into complaint types and subtypes. The app's main feature is the automatic capture of complaint location in the form of latitude and longitude coordinates when registering a complaint, reducing human errors and saving the user time. Users can easily file complaints using the mobile application, as demonstrated in Fig. 4 and Fig.5

Workers from various states can use the app to log in, and their location will be automatically captured based on the zip code. Users can easily update the location of Complaints as shown in the Fig. 6 relevant location will be displayed to the officials, and they can check complaints received in a specific region of their state. Once a worker has solved a complaint, they can send details of the resolved issue, along with an image of the completed work, to the admin, as shown in Fig. 7

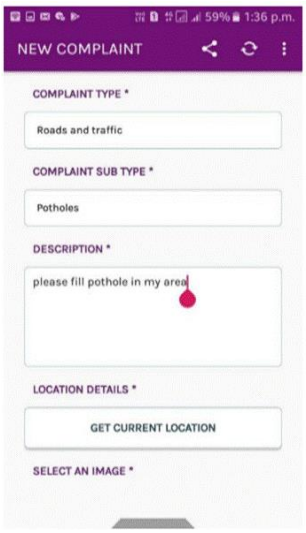

Fig. 4. Complaint form

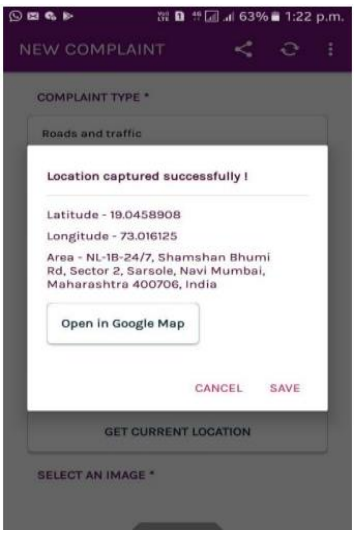

Fig. 5. Location Recording

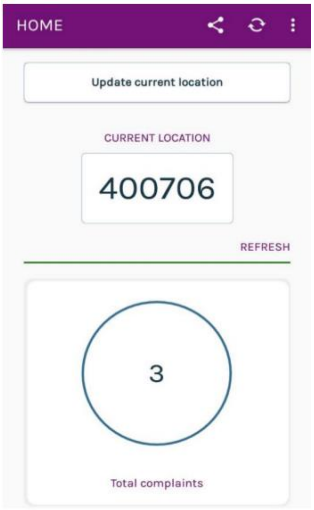

Fig. 6. Update location

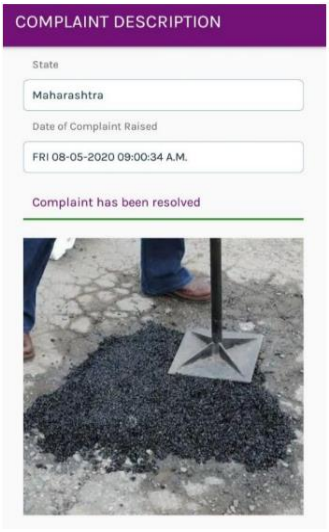

Fig. 7. Complaint Description

5 RESULT DISCUSSION

This paper is useful for transferring the distributed service to a centralized service where all the compliant types can be stored in a single cloud platform which is more flexible and cost-effective.
These are great advantages of the proposed system:

1. The usage of cloud platform makes the application backend more flexible.
2. The application is highly scalable as the cloud platform is expandable.
3. The system runs efficiently on the Android platform, providing faster performance.
4. The system is cross-platform compatible, as the chosen component supports cross-platform development.
5. The system supports real-time notifications using FCM.

6 CONCLUSION

This paper proposes and implements an autonomous system for filing grievances, providing an easy and flexible way for users to make complaints. The system uses a cost-effective method for storing data and is designed as a low-resource utilization tool for registering complaints. As most people in our country have access to smartphones and the internet, the system only requires a smartphone for users to file a complaint, making it a convenient and accessible option for filing grievances.

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