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Mobile Community App: Developing Barangay Management Systems

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Abstract: *The Mobile Community App aims to modernize barangay management by streamlining essential administrative processes such as clearance requests, announcements, payments, and attendance. Focused on Barangay Pagatpatan in Butuan City, the system enables both residents and officials to interact efficiently through a centralized platform. Implemented with Agile methodology and powered by technologies like React.js and Supabase, the application significantly enhances local governance through digital transformation. A System Usability Scale (SUS) test confirmed the app's functionality, usability, and positive reception among its target users. The results affirm that the proposed solution can serve as a model for other barangays seeking digital transition.*

Keywords: Barangay Management Mobile App, Local Governance, E-clearance, Agile Methodology

1. INTRODUCTION

Barangays play a vital role in the Philippine governance structure, serving as the frontline government units for community-based public services. These services range from issuing various certifications and maintaining civil order, to health monitoring and public information dissemination. However, many of these essential functions continue to rely on paper-based systems and face-to-face transactions, which often result in inefficiency, human error, and a lack of transparency [1].

According to the Philippine Institute for Development Studies, over 80% of barangays in rural areas do not have access to digitized systems for managing administrative tasks [2]. This digital divide leads to service delays, incomplete record-keeping, and a lack of accountability in public transactions. Moreover, the COVID-19 pandemic highlighted the vulnerability of such systems, which struggled to adapt to remote operations and contactless interactions.

In light of these challenges, the Department of the Interior and Local Government (DILG) has been actively promoting the adoption of e-governance tools to streamline administrative functions. Similar efforts in other countries, such as South Korea's e-Barangay model and Estonia's X-Road platform, show that digitization can lead to increased civic participation and better resource management [3][4]. The evolution of Korea's Songdo from a U-city to a more inclusive and sustainable smart city also underscores the value of integrating citizen participation and ICT services in local digital governance [21].

Barangay Pagatpatan in Butuan City faces these very challenges. With an estimated population of 6,000 residents spread across 20 puroks, officials deal with frequent requests for clearances, irregular attendance during community events, and communication delays. Most of these tasks are handled manually, causing unnecessary burden and inefficiencies. In response, our team developed the Mobile Community App to address these problems through a user-centric, digital solution.

The Mobile Community App aims to provide a centralized platform where barangay officials and residents can communicate, transact, and access essential services with ease. This includes features such as document requests, GCash-integrated payments, attendance

monitoring, and real-time announcements. The app is developed using Agile methodology to ensure adaptability and continuous improvement based on user feedback. Barangays play a vital role in the Philippine governance structure, serving as the frontline government units for community-based public services. These services range from issuing various certifications and maintaining civil order, to health monitoring and public information dissemination. However, many of these essential functions continue to rely on paper-based systems and face-to-face transactions, which often result in inefficiency, human error, and a lack of transparency [1].

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Our project also aligns with the United Nations Sustainable Development Goal #16, which advocates for inclusive institutions and access to justice through efficient governance mechanisms. This initiative represents a scalable digital governance model that can be replicated by other barangays and municipalities across the Philippines.

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2. LITERATURE REVIEW

2.1 Mobile Technology and Community Development

Mobile technology has emerged as a powerful tool in driving community development. According to the United Nations Development Programme (UNDP) [5], mobile and digital platforms promote inclusive access to essential services, including education, financial assistance, and local governance. These tools empower underserved communities by improving communication between citizens and local institutions. Rahman and Majumder [6] emphasized that mobile technology can improve transparency, accountability, and service accessibility within communities. In the context of Barangay Pagatpatan, the integration of mobile platforms can enhance the residents' experience by providing real-time access to barangay services and updates.

2.2 Community Governance and ICT Solutions

Digital transformation in governance has become increasingly relevant as local governments seek more efficient and citizen-centric systems. Kim et al. [7] argue that integrating ICT solutions significantly boosts transparency and responsiveness in community governance. Mobile-based applications enable seamless service requests, automated record-keeping, and timely notifications.

Moreover, local efforts such as the e-BarangayPH platform in urban areas of the Philippines have shown how digital tools can support service delivery and reduce administrative bottlenecks. These platforms demonstrate the feasibility and benefits of implementing mobile governance systems at the barangay level. The Barangay Management System (BMS) complements this by enhancing data accuracy and improving the coordination between officials and residents [8].

2.3 Local Service Delivery and Community Engagement

Digital platforms have revolutionized how local government units deliver essential services and interact with their constituents. According to Singh et al. [9], the adoption of digital systems in local governance significantly improves service accessibility by automating repetitive administrative tasks such as the issuance of permits, certificates, and barangay clearances. These systems minimize manual processing errors, reduce turnaround time, and enable faster response to resident requests. In the context of Barangay Pagatpatan, the integration of digital clearance processing and attendance monitoring through the Mobile Community App is a direct application of these findings. The system not only reduces queues and paperwork but also ensures that records are well-organized and retrievable in real time.

In terms of civic engagement, Bullen [10] underscores the critical role mobile platforms play in encouraging active community participation. Such tools create a two-way communication channel between officials and residents, allowing users to receive announcements, participate in discussions, and provide feedback on local concerns. By facilitating access to information and promoting community dialogue, mobile applications foster a more inclusive governance model. The features implemented in the Pagatpatan app—such as in-app notifications, comment sections on announcements, and direct feedback forms—are designed to reflect this approach, promoting transparency, trust, and responsiveness within the community.

3. METHODOLOGY

This outlines the methodical strategy utilized to conduct the research on developing and implementing a mobile community platform initially designed for Barangay Pagatpatan, Butuan City. The platform aims to foster communication and engagement within every purok (sub-village), promoting community cohesion.

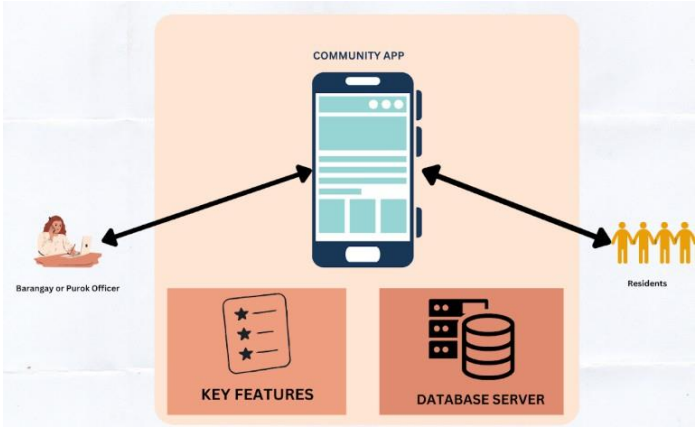


Figure 1. Conceptual Framework of the Mobile Application.

The figure showcases a digital platform designed to revolutionize community engagement and governance in a barangay. By providing a centralized online space, the platform empowers residents and barangay/purok officials to interact, share information, and collaborate more effectively.

3.1 Development Approach.

The study utilizes the agile methodology in developing the web application [11]. Agile methodology is a flexible and iterative approach to software development that emphasizes collaboration, adaptability, and continuous improvement. Activities include identifying the system's key features and functionalities and understanding the specific needs and challenges of a community application.

3.1.1 Data Gathering

This section outlines the data collection strategy for developing a mobile community app in Barangay Pagatpatan, Butuan City, using a System Usability Scale (SUS) questionnaire, a standardized tool for measuring the usability of a system or application. It consists of 10 statements with a five-point Likert scale ranging from Strongly Disagree to Strongly Agree.

3.1.2 Design Phase

This study applies the Agile methodology in the development of the Mobile Community App. Agile is a flexible and iterative software development approach that prioritizes collaboration, adaptability, and continuous user-focused improvement [11]. It is ideal for projects where user requirements may evolve over time.

3.1.3 Development

The system's front end was developed using React.js, a JavaScript library designed for building modular and reusable user interface components. React.js also facilitated efficient state management and routing through features such as useEffect, useRef, and useContext [14]. For the backend, Supabase was utilized as a scalable backend-as-a-service platform that offers a fully managed PostgreSQL database, real-time synchronization, and user authentication services [15]. To ensure cross-platform deployment, Capacitor, a native runtime by Ionic, was employed to convert the web-based solution into a mobile application, enabling integration with device-level functionalities [16].

3.1.4 Test

The testing phase encompassed unit testing, integration testing, and user acceptance testing (UAT). Unit tests verified the correctness of individual modules, while integration tests evaluated data flow and interactions between system components. UAT was conducted with barangay personnel and selected residents to ensure usability and functionality aligned with user expectations. A similar approach was used in the SmartCart project, which applied SUS testing to evaluate a collaborative mobile shopping experience, receiving strong positive feedback for its user-centered design [20]. This phase is essential in Agile development as it allows for early defect identification and continuous feedback integration [17].

3.1.5 Deployment & Maintenance

The deployment phase is a critical stage in the Agile software development cycle, marking the transition of the application from development to real-world usage. During this phase, the Mobile Community App was packaged, configured, and prepared for distribution to end users, particularly targeting Android mobile devices. To enable mobile deployment, Android APK (Android Package Kit) builds were generated using Capacitor, which allows web applications developed in technologies like HTML, CSS, and JavaScript to be converted into native mobile apps [16]. These builds underwent compatibility testing to ensure proper functionality across a range of devices and screen sizes. Once verified, the APK was prepared for deployment to target users either via direct installation or submission to app distribution platforms, adhering to standard security and compliance guidelines.

The backend of the system was hosted using DigitalOcean, a cloud infrastructure provider chosen for its scalability, performance reliability, and ease of integration with PostgreSQL-based applications [18]. The hosting environment included scalable virtual servers and load-balancing mechanisms to ensure uninterrupted access, even during periods of high usage. The database was managed via Supabase, which offered built-in user authentication, API routing, and real-time data synchronization.

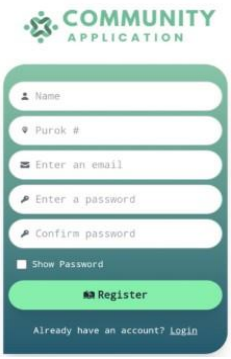
4. RESULTS AND DISCUSSIONS

This section presents, analyzes, and interprets data on the development of the Mobile Community App. It offers in-depth insights into user feedback, system functionality, and performance metrics, delivering a thorough evaluation of the mobile application's effectiveness.

4.1 *User Interface*

Figure 2. Login Interface**.**
Displays the login page of the Mobile Community App, where users enter their email and password. Access to the system is restricted to authorized personnel, including the Super Admin (Barangay Officials), Admin (Purok Officials), and User (Residents).

Figure 3. Registration Interface.



Shows the registration form for a mobile Community App. Users can enter their Name, Purok Number, Email, Password, and Confirm Password. Below the password fields, a "Show Password" checkbox enables users to toggle password visibility.

Figure 4. Super Admin Dashboard.

Illustrates the Super Admin Dashboard, where the Super Admin can view posts and announcements from all puroks. On the right side, there is an "All Purok" dropdown button that allows filtering posts and announcements for each purok.

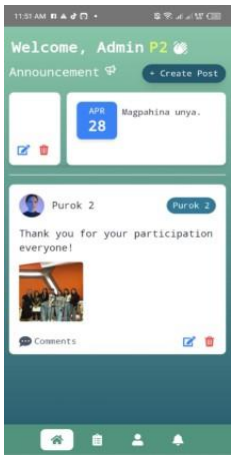


Figure 5. Admin Dashboard.

Shows the admin dashboard of the application. Admins have the authorization to create social posts and announcements. They can also reply to comments from other users. Only admins are permitted to create social posts and announcements.

Figure 6. User Dashboard.

Illustrates the User Dashboard of the Community App. The dashboard allows users to view announcements, and comment on posts made by the admin.

Ta Questions Result.

Questions	SDA	D	N	A	SA	Mean	Interpretation
I think I would like to use this app frequently.	0	0	30	25	45	4.15	Strongly Agree
I thought the app was easy to use.	0	0	22	34	44	4.22	Strongly Agree
I found the various functions in this app were all integrated.	0	0	25	30	45	4.20	Strongly Agree
I would imagine that most people would learn to use this app very quickly.	0	0	22	32	46	4.24	Strongly Agree
I felt very confident using the app.	0	0	25	30	45	4.20	Strongly Agree

***Note**: SDA = Strongly Disagree; D = Disagree; N = Neutral; A = Agree; SA = Strongly Agree.*

The results of the System Usability Scale (SUS) evaluation indicate that the Community Application is highly usable and user-friendly for its intended users, including residents, purok officers, and barangay officials

Table 2. Negative SUS Questions Result.

Questions	SDA	D	N	A	SA	Mean	Interpretation
I found the app unnecessarily complex.	60	10	30	0	0	1.70	Strongly Disagree
I think that I would need a technical person to be able to use this app.	57	20	23	0	0	1.66	Strongly Disagree
I thought there was too much inconsistency in this app.	66	0	34	0	0	1.68	Strongly Disagree
I found the app very cumbersome to use.	56	12	32	0	0	1.76	Strongly Disagree
I needed to learn a lot of things before I could get going with this app.	44	32	24	0	0	1.80	Strongly Disagree

***Note**: SDA = Strongly Disagree; D = Disagree; N = Neutral; A = Agree; SA = Strongly Agree.*

This presents an overview of the responses to negative usability statements, such as complexity, inconsistency, and the need for technical assistance, received low mean scores between 1.66 and 1.8. This strong disagreement with negative statements implies that users perceived the application as simple, consistent, and

accessible, requiring minimal learning effort. The results suggest that users do not find the system overly complex or difficult to navigate, reinforcing its effectiveness in facilitating community-related tasks.

Overall, the high usability scores and positive feedback indicate that the Community Application successfully meets user expectations, making it a practical tool for barangay and purok operations. However, further refinements based on user feedback could further enhance the overall experience.

5. CONCLUSION AND RECOMMENDATION

In conclusion, the Mobile Community Application: Barangay Management System has been successfully developed and implemented to streamline barangay operations, including announcements, attendance tracking, document processing, and in-app notifications for the residents and officials of Barangay Pagatpatan, Butuan City. Utilizing modern web technologies such as HTML5, CSS3, React.js, and Capacitor, the system ensures a seamless and responsive user experience across Mobile devices.

Additionally, the integration of a Backend-as-a-Service (BaaS) platform provides essential backend functionalities, including a fully managed PostgreSQL database, user authentication, file storage, and real-time data updates. With its high usability and efficient functionality, the Mobile Community Application effectively meets the needs of its users, improving accessibility, communication, and administrative processes within the barangay. Future enhancements based on user feedback will further refine the system, ensuring continuous improvement and sustainability.

To further enhance the Mobile Community Application: Barangay Management System, several improvements can be implemented to optimize functionality and user experience. Enhancing the UI/UX with a more intuitive design and accessible navigation will improve usability for all users. Adding offline functionality will allow users to access essential features even without an internet connection, ensuring continuous service. Implementing real-time push notifications will keep users informed of urgent updates, while role-based access control will strengthen security by restricting sensitive data access based on user roles. Introducing a QR code-based attendance system can streamline attendance tracking, reducing manual errors. To improve accessibility, multi-language support should be considered, making the app more inclusive for diverse users. An AI-powered chatbot can assist users with inquiries, reducing the need for manual support.

Additionally, optimizing app performance through faster load times and better memory management will enhance responsiveness, particularly on low-end devices. A data analytics dashboard for administrators can provide insights into user engagement and system usage, helping officials make data-driven decisions. Finally, expanding document processing features to allow users to submit and track document requests within the app will improve transparency and efficiency. By integrating these enhancements, the mobile application can further support barangay operations, improve community engagement, and provide a more seamless and user-friendly experience

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