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Smartdesa Application for Hamparan Perak Village Using Crowdsourcing for Community Reporting

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Abstract

The development of digital technology presents opportunities to improve public services at the village level. Hamparan Perak Village faces challenges in delivering information, which still relies on bulletin boards, long wait times at the village office for mail administration and limited communication channels for residents to submit reports or complaints. To address these challenges, the multiplatform Smartdesa application was developed with a crowdsourcing reporting feature. Residents can submit reports and vote on other reports to prioritize their handling. The application was built using React Native for Android and Next.js for the web admin system, with Express.js as the backend, MySQL as the database, and JavaScript as the programming language. Testing results show that the application accelerates report processing and encourages active community participation in digital village management. Several obstacles were also identified, such as limited digital literacy among some users and sometimes unstable internet connections. Nevertheless, the Smartdesa application shows great potential for implementation in other villages as part of e-Government or smart village initiatives.

Keywords: Application, Smartdesa, Multipaltform, Crowdsourcing

1. INTRODUCTION

The rapid advancement of digital technology necessitates continuous adaptation, influencing many aspects of life, including governance. Technology is being increasingly integrated into all levels of society, with government institutions playing a critical role in enhancing the well-being of citizens [1]. As administrative services, information dissemination, and communication between citizens and government become more essential [2], the need for efficient systems in governance grows. Community engagement remains a crucial component in achieving good village governance [3].

In Hamparan Perak Village, significant challenges persist in communicating information and providing administrative services. Traditional methods, such as bulletin boards and in-person meetings, limit the speed and reach of vital

information, leaving some residents uninformed. Additionally, the manual handling of mail results in delays, and the limited communication channels make it difficult for residents to submit reports or complaints, prolonging the resolution process.

Despite these challenges, the Smartdesa application [4] was developed as a solution to enhance communication and administrative services at the village level. The application integrates a crowdsourcing-based community reporting system [5], enabling residents to submit reports, vote on others' reports, and prioritize issues. This approach promotes faster handling of urgent matters and encourages active participation, increasing accountability within village governance.

However, while the Smartdesa application offers a promising solution, its implementation is not without limitations. The development of smart villages [6] requires a careful balance between technological integration and active community participation [7]. The success of village information systems [8] that support smart governance depends on how well these systems are adopted and utilized by both citizens and administrators. Additionally, despite the potential of multiplatform applications [10] to streamline integrated village management [11], there is a need for further research on how such systems can optimize citizen engagement and improve administrative efficiency.

This research aims to address these gaps by developing a more effective, multiplatform Smartdesa application with enhanced crowdsourcing features [14], ultimately increasing citizen participation and improving access to village services. By doing so, it seeks to bridge the current limitations in communication and administrative service delivery, providing a more efficient and participatory model for village governance.

2. METHODS

This research utilizes a qualitative approach, employing methods such as observation, interviews, and literature review [15]. The study is descriptive, focusing on the analysis of meaning and processes. Theoretical frameworks are applied to ensure relevance to the field context, with an emphasis on observing and deeply understanding the phenomena under investigation [16].

2.1. Data Collection Methods

The following data collection methods were employed to gather relevant information [17]:

1) Observation, Direct observation was conducted in Hamparan Perak Village to assess the existing village conditions and the manual reporting system

prior to the implementation of the Smartdesa application. This allowed for the identification of issues with the current system and the specific features that were required to improve communication and service delivery.

2) Interviews, Semi-structured interviews were conducted with 5 residents and 2 village administrators, selected using purposive sampling. Residents were chosen based on their experience in submitting reports and interacting with village administration. This ensured that the information gathered was directly relevant to understanding the challenges faced by the community in the manual reporting system.
3) Literature Review, A comprehensive review of books, academic journals, and online resources was conducted to explore the concepts of crowdsourcing, village information systems, and community reporting applications. This review provided a theoretical foundation for the design and development of the Smartdesa application.

System Development Methodology

The Smartdesa application was developed using the Waterfall model [18], a structured and sequential approach to system development. The Waterfall method was chosen for its clear, distinct phases that ensure systematic project management and the alignment of outputs with project goals. Each phase yields specific outputs, such as requirements documents, UML designs [19], prototypes, and test reports, allowing for well-organized development. Figure 1 illustrates the stages of the Waterfall model used in the development of the Smartdesa application.

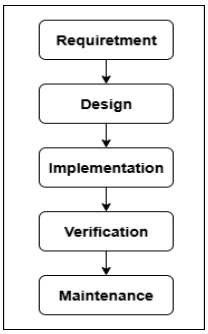

Figure 1. Waterfall Method

Waterfall Model Stages in Smartdesa Application Development as follow.

1) Needs Analysis

The needs analysis phase took place during the planning stage and focused on identifying user needs to produce a prototype that addressed those requirements

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[21]. This phase involved understanding the profile of Hamparan Perak Village, analyzing the limitations of the existing manual reporting system, and designing a new crowdsourcing-based reporting system. In the new system, residents can submit reports with photographic evidence and vote on others' reports. Reports with 50 or more votes are automatically prioritized for follow-up, streamlining communication and encouraging more participation.

The crowdsourcing method applied in the Smartdesa application allows residents to report village issues with evidence such as photos. Other residents can vote on these reports, and if a report reaches 50 votes, it is flagged for immediate action by the village administration. This approach accelerates problem resolution, improves accuracy, and fosters citizen engagement [22]. Figure 2 is crowdsourcing methods.

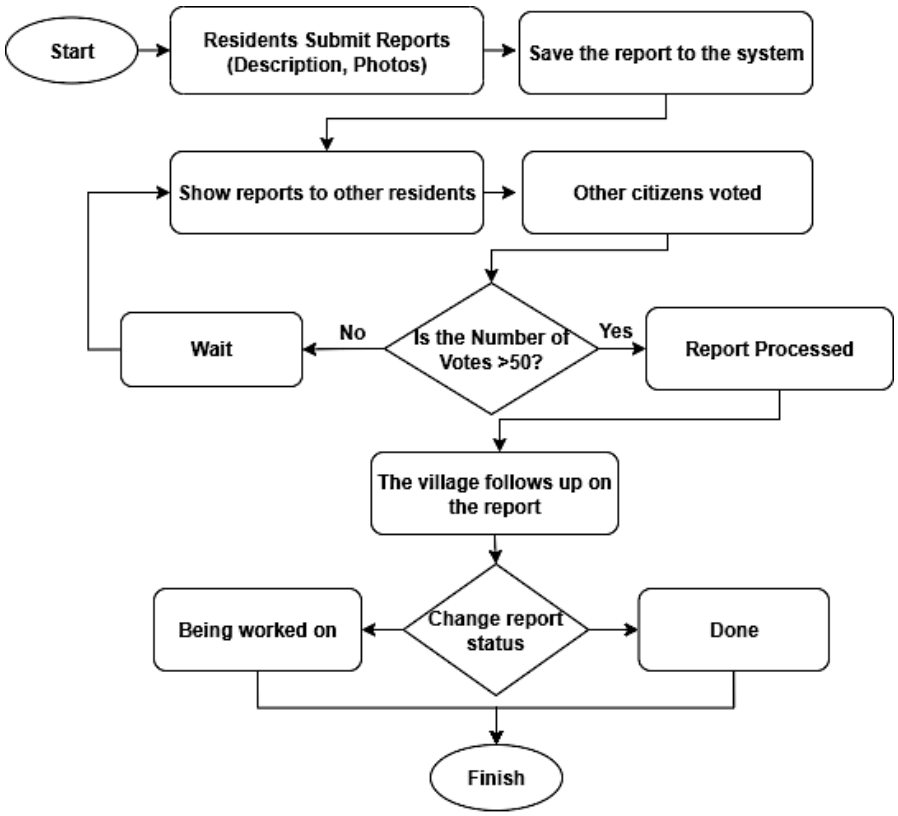

Figure 2. Crowdsourcing Methods

2) Design

The design phase utilized Unified Modeling Language (UML) [23] to create detailed application designs. This included the development of various UML

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diagrams (e.g., use case, activity, sequence, and class diagrams), the creation of a MySQL database schema [24], and the design of a user-friendly interface to simplify the reporting and data management processes. The design aimed to ensure that the application was intuitive for both residents and administrators. Figure 3 shows the UML diagrams and the application's database design, providing a visual representation of the application's structure and functionality.

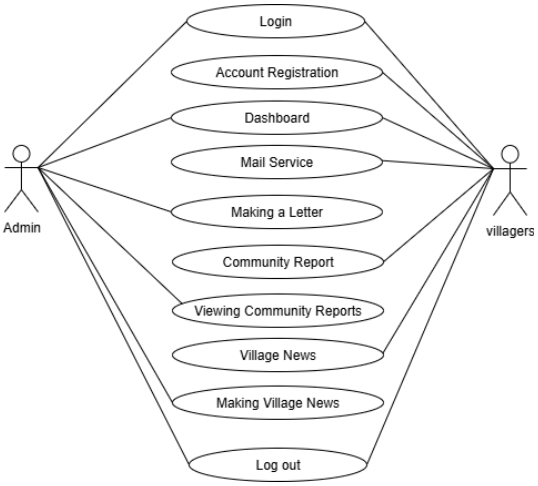

Figure 3. Use Case Diagram

3) Implementation (Coding)

The Smartdesa application was developed using React Native [25] for the Android platform (for residents) and Next.js [26] for the web platform (for village administrators). The backend API was built using Express.js [27], while MySQL was used to manage the application's database. This combination of technologies allowed for smooth functionality across both platforms, enabling residents to submit reports via Android, while administrators could manage reports and access administrative tools through the web interface.

4) Testing

The testing phase involved 5 residents and 2 administrators who tested the application's key features. Residents tested the report submission and voting functionalities, while administrators evaluated the report management tools. Feedback was gathered through interviews and observations, focusing on usability, clarity, and efficiency of the reporting system. The feedback was analyzed qualitatively to identify areas for improvement. Figure 3 visually represents the testing methodology, showing the feedback loop and the testing process.

5) Maintenance

After the initial deployment of the Smartdesa application in Hamparan Perak Village, ongoing maintenance and system updates were conducted. These updates were based on user feedback, ensuring the application evolved in response to real-world usage and continued to meet the needs of both residents and administrators.

3. RESULTS AND DISCUSSION

3.1 Smartdesa Application

The primary outcome of this research is the successful development of the Smartdesa application, a multiplatform-based solution designed to improve communication and administrative services in Hamparan Perak Village. The application integrates key features such as a crowdsourcing-based reporting system, user-friendly interface designs, and an efficient administrative management system for both residents and village officials. Testing results demonstrate the effectiveness of this digital approach in addressing the village's governance challenges.

The initial analysis phase involved a detailed examination of the existing communication and administrative processes in Hamparan Perak Village. The manual systems for reporting issues, submitting requests, and disseminating information were found to be inefficient, leading to delays in problem resolution and limited access to services. The analysis confirmed the need for a multiplatform application to improve communication, automate administrative tasks, and streamline the reporting process. The Smartdesa application was designed to address these issues, providing both residents and administrators with a more efficient and accessible solution.

In the design phase, the Use Case Diagram (Figure 3) was created to map out the system's key functionalities. This diagram visually represents the relationship between the two primary actors Admins and Residents, and the corresponding system features. For instance, residents can submit reports, view village news, and request official letters, while administrators can manage these reports, create village news, and handle mail requests. The use case diagram ensured that the application's features aligned with user needs and expectations.

The user interface design was developed with simplicity and functionality in mind. The Admin Login Page (Figure 4) serves as the gateway for administrators to access the system, while the Admin Dashboard Page (Figure 5) provides a summary of important data, such as the number of pending letter requests, community reports, and village news updates. Administrators can easily navigate

to different sections of the application, such as Mail Management (Figure 6), where they can review incoming requests and update their status, or the Community Report Page (Figure 7), which allows admins to manage and resolve resident-submitted reports. Additionally, the Village News Page (Figure 8) enables administrators to post updates and announcements for the community.

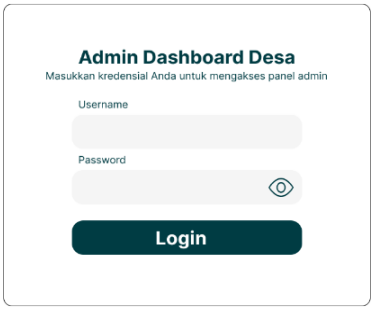

Figure 41. Admin Login Page

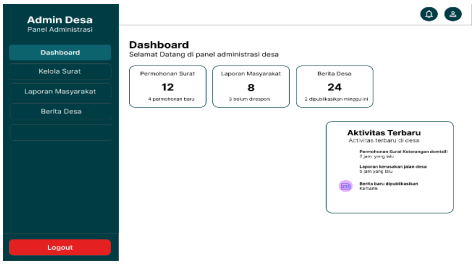

Figure 5. Admin Dashboard Page

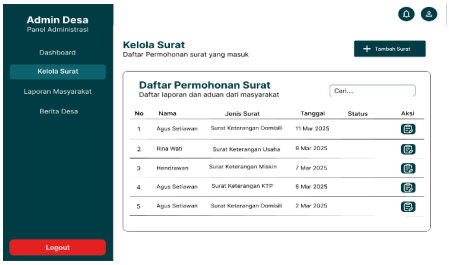

Figure 6. Mail Management Page

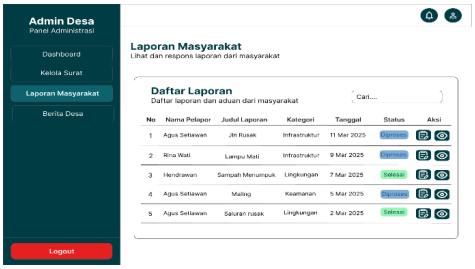

Figure 7. Community Report Page

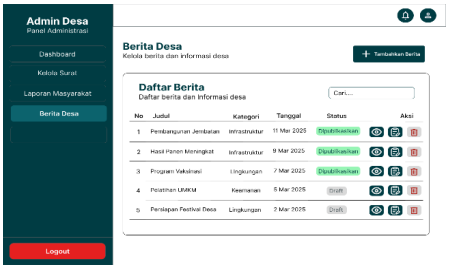

Figure 8. Villager News Page

For residents, the application provides an intuitive platform to interact with village services. The Villager Login Page (Figure 9) allows residents to sign in and access their personal accounts, and if they are new users, they can register through the Registration Page (Figure 10). The Villager Dashboard Page (Figure 11) provides quick access to essential features such as mail services, community reports, and village news. The Citizen Letter Service Page (Figure 12) allows residents to request

official documents such as certificates, streamlining administrative procedures. On the Personal Data Entry Page (Figure 13), residents can update their personal information to ensure accurate records.

Figure 9. Villager Login Page

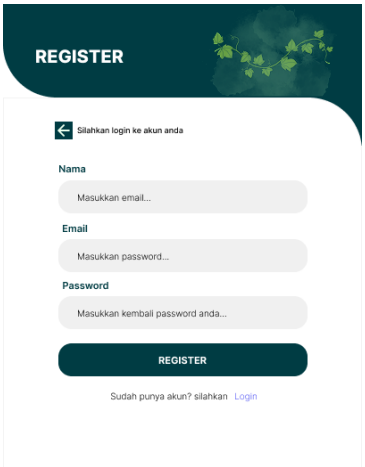

Figure 10. Villager Account Registration Page

Figure 2. Villager Dashboard Page

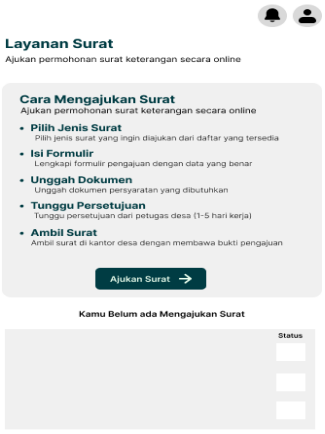

Figure 12. Citizen Letter Service Page

The **Community Reports Page** (Figure 14) displays a list of reported issues from residents, allowing others to vote on issues they feel are most important. The **Reporting Interface** (Figure 15) provides a form for residents to submit new complaints, complete with options to upload supporting evidence such as photos.

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This feature encourages active participation from residents and ensures that issues are addressed more efficiently.

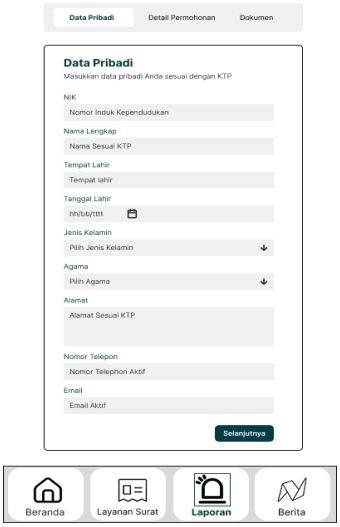

Figure 3. Personal Data Entry Page

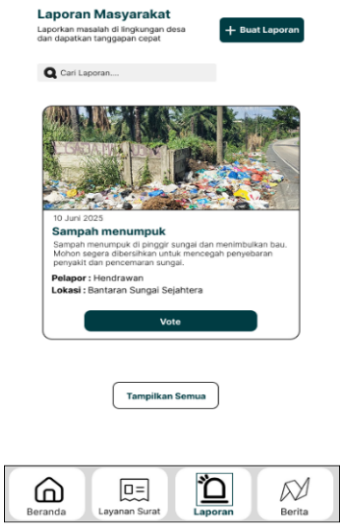

Figure 4. Community Reports Page

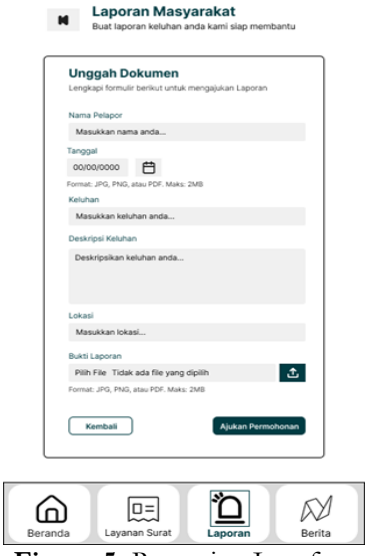

Figure 5. Reporting Interface

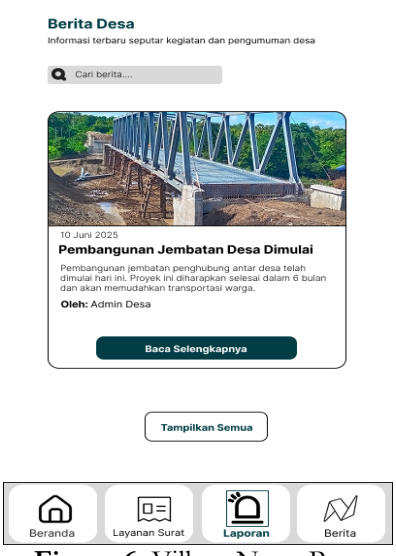

Figure 6. Village News Page

Additionally, the Village News Page (Figure 16) displays the latest updates on community activities, programs, and village development. The About the Village Page (Figure 17) provides a brief history of Hamparan Perak Village, including

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information on its vision, mission, and development goals. This section helps residents connect with the village's progress and long-term objectives.

Figure 7. About the Village Page

During the testing phase, both residents and administrators were involved in assessing the functionality and usability of the Smartdesa application. Feedback from these tests indicated that the application improved the efficiency of reporting and service request management. The crowdsourcing feature, where residents can vote on the priority of reports helped ensure that the most pressing issues were addressed promptly. The clear and accessible interface also facilitated ease of use, resulting in higher levels of engagement from the community.

The Smartdesa application offers a comprehensive and effective solution for improving governance and public service delivery in Hamparan Perak Village. By integrating key features such as crowdsourcing-based reporting, mail management, and real-time communication through village news, the application significantly enhances the efficiency of village administration. The successful testing and positive feedback from both residents and administrators demonstrate that Smartdesa has the potential to serve as a model for other villages aiming to modernize their governance systems.

3.2. System Testing

After the development of the Smartdesa application, a series of tests were conducted to ensure that all features functioned as expected. The testing process involved both residents and administrative staff to verify the system's performance and usability across different user roles. The results of these tests confirmed that

the application met the functional requirements and provided a seamless experience for both residents and administrators.

The testing was carried out using Black-box Testing methodology, which focuses on validating the system's outputs based on various inputs without examining the internal workings of the application. Taable 1 is a summary of the Black-box Testing results.

Table 1. Blackbox Testing

No	Input/Output Design (Admin)	Expected Outcome	Result
1	Login to the system	Displays the Login Page	Valid
2	View Dashboard Page	Displays the Dashboard Page	Valid
3	View Mail Management Page	Displays Mail Management Page	Valid
4	View Community Report Page	Displays Community Report Page	Valid
5	View Village News Page	Displays Village News Page	Valid
No	**Input/Output Design (Citizen)**	**Expected Outcome**	**Result**
1	Login to the apllication	Displays the Login Page	Valid
2	Register	Displays the Registration Page	Valid
3	View Dashboard Page	Displays the Dashboard Page	Valid
4	View Citizen Letter Service Page	Displays Citizen Letter Service Page	Valid
5	View Personal Data Entry Page	Displays Personal Data Entry Page	Valid
6	View Community Reports Page	Displays Community Reports Page	Valid
7	View Reporting Page	Displays Reporting Page	Valid
8	View Village News Page	Displays Village News Page	Valid
9	View About the Village Page	Displays About the Village Page	Valid

As shown in Table 1, the system was tested against various scenarios, and in all cases, the expected outcomes were met, indicating that the application's core functions worked as intended. Both residents and administrative staff reported that the application significantly streamlined several administrative processes, including community reporting, village news management, and mail correspondence.

Feedback from users revealed that the system provided a more efficient way to manage reports and deliver updates, enhancing overall communication between the village administration and residents. The seamless flow of information and simplified reporting procedures were particularly appreciated by both groups. As a result, the Smartdesa application demonstrated clear benefits, ensuring that village governance tasks could be managed more effectively, with increased transparency and participation.

Disscussion

This research resulted in a multi-platform Smartdesa application with key features: crowdsourcing-based mail administration, village news, and community reports. Residents can submit reports, add photos, and vote on other reports, while village staff can monitor reports in real time. The interface was designed for both the

mobile (React Native) and web admin (Next.js) versions, with functional testing demonstrating that all features functioned as designed in Hamparan Perak Village.

Compared to traditional manual methods, the crowdsourcing feature has been shown to increase community participation and expedite report completion. Validation of reports by the community before being forwarded to the village enhances transparency and accountability. However, the effectiveness of this feature is highly influenced by the level of community involvement. In digitally literate communities, participation tends to be high and problem resolution is faster. Conversely, in populations with low digital literacy, participation is limited, which can reduce the effectiveness of crowdsourcing.

Some challenges encountered during testing and implementation included user unfamiliarity with digital input, limitations of older devices, and the limited scale of the test population. The system design uses UML use case diagrams to visualize the main functions and crowdsourcing flow, so that the Smartdesa application is proven to be efficient, easy to use, and ready for multiplatform, while overcoming the limitations of the previous manual system.

4. CONCLUSION

This research led to the development of the multiplatform Smartdesa Hamparan Perak application, comprising an Android application for residents and a web-based admin platform for village administrators. Designed to enhance the efficiency of public services, the application leverages crowdsourcing to improve the community reporting feature. The study's findings demonstrate that crowdsourcing significantly boosts citizen participation, accelerates problem resolution, and enhances both accountability and efficiency in village governance. The integration of the Android app with the admin website highlights the potential of Smartdesa Hamparan Perak as a model for digital, community-driven smart villages. By emphasizing responsiveness and fostering active participation, Smartdesa sets a strong precedent for other villages aiming to modernize public service delivery through technology.

For future development, there are several opportunities to further improve the Smartdesa application. Adding real-time notifications could enhance user engagement by providing timely updates on report statuses or new village news. Integration with other local databases could streamline administrative processes and improve data accuracy, while incorporating educational modules could help raise digital literacy among residents, ensuring broader participation in digital governance. Additionally, expanding the system's implementation to other villages would provide valuable insights into the adaptability and effectiveness of the platform in diverse community settings. Future research could also focus on

longitudinal studies to assess the long-term impact of Smartdesa on citizen engagement, service quality, and administrative efficiency. Such research would offer a deeper understanding of how e-government technologies can contribute to sustainable village development and help shape future strategies for digital transformation in local governance.

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