Digital transformation of population administration: Enhancing data accessibility in local communities

Ozzi Suria, Putri Taqwa Prasetyaningrum, Irfan Pratama

Department of Information Systems, Faculty of Information Technology,
Universitas Mercu Buana Yogyakarta
Jl. Jembatan Merah No. 84C Gejayan, Yogyakarta, 55283, Indonesia

ABSTRACT

This community service initiative addresses the need for an efficient population administration system in RT3/RW3, Rejowinangun Utara Village, Magelang, where several key issues hinder effective data management. These problems include manual record-keeping with logbooks, which may increase the risk of errors and data loss, limited accessibility to population information, and challenges in adopting digital technology due to limited technical knowledge and infrastructure. To resolve these problems, this activity is conducted in four phases: data gathering, system development, evaluation, and user training. During the data-gathering phase, discussions with the community leader and the collection of family record data were conducted to identify specific needs and challenges. The system development phase focused on creating a user-friendly web-based Population Administration System (PAS) tailored to these requirements. In the evaluation phase, the system was tested and refined based on feedback from the community leader to ensure functionality and usability. The user training phase provided hands-on experience to the community leader, enabling independent use of the system for managing data and generating demographic summaries. The implementation of PAS successfully transformed administrative processes into digital and improved data accessibility for the local community.

How to cite: Suria, O., Prasetyaningrum, P. T., & Pratama, I. (2025). Digital transformation of population administration: Enhancing data accessibility in local communities. *Abdimas: Jurnal Pengabdian Masyarakat Universitas Merdeka Malang,* 10(1), 92-103. https://doi.org/10.26905/abdimas.v10i1.14983

1. INTRODUCTION

In this digital era, the use of digital systems in various fields, such as library data administration (Setiawansyah et al., 2021), village data administration (Afrianto et al., 2022), population records (Satya et al., 2021), and healthcare management (Artauli et al., 2024; Sary et al., 2022), and educational records (Mustofa et al., 2021), has become essential for assisting users in efficiently processing data. Implementing digital systems allows for the rapid, streamlined management of data and information accessible from anywhere, significantly enhancing productivity and work effectiveness. For example, in healthcare, digital systems facilitate patient record management, ensuring accurate and quick access to medical histories (Sary et al., 2022), while in educational institutions, digital systems simplify student record management, enabling seamless tracking of academic progress and attendance (Mustofa et al., 2021). The benefits of digital systems extend beyond accessibility; they also improve data accuracy, reduce operational costs

✉ Corresponding Author: **Ozzi Suria**: Tel. +62 274-584922 │E-mail: ozzisuria@mercubuana-yogya.ac.id

by minimizing the need for physical storage, and provide structured reporting that supports better decision-making (Martínez-Peláez et al., 2023). Moreover, digital systems strengthen data security measures, protecting sensitive information with encryption and controlled access.

The local community leaders in RT3/RW3, Rejowinangun Utara Village, Magelang, have identified the need for more effective data management solutions. With a population of 75 people across approximately 30 households, the current manual approach to managing records, as displayed in Figure 1, consumes time and effort and is susceptible to errors, posing risks such as inaccuracies that complicate higher-level administrative decision-making. Furthermore, the limited accessibility of this manually maintained data prolongs administrative processes. This situation underscores the urgent need for a digital population administration system, which could significantly enhance community management and align with modern data processing standards.

Figure 1. Stack of family records and logbook for recording community activities

Several issues were identified through an initial survey with community leader: (1) No dedicated document on population demographics currently exists. All record-keeping activities are still conducted manually using a logbook, which may increase the chances of errors and data loss; (2) Limited accessibility to information hampers services to residents and slows down decision-making processes at higher administrative levels. For example, this affects the distribution of "Bantuan Langsung Tunai" (BLT) for underprivileged residents from the government, aid distribution from the village office *(Kelurahan)*, and direct aid assistance from the Mayor of Magelang; (3) The community also facing the challenges in adapting technology, including limited knowledge of the necessary technological infrastructure for the digitization process and limited technical skills in using computers.

From the issues identified, the solution to the problems faced by partners requires a comprehensive approach that not only focuses on system development and digitalization but also considers user training. Based on those requirements, a web-based Population Administration System (PAS) is designed to facilitate data administration processes, thereby increasing information accessibility. The system is not just a technical solution, but a reflection of the community's needs and challenges. However, its success depends on the partner's ability to overcome technical obstacles encountered in the field. Previous community service activities, such as training in system usage to support village administration services (Hidayatullah et al., 2023; Rianto et al., 2019), enhancing BUMDes (Village-Owned Enterprises) management and accounting skills (Situmorang, 2020), and BUMDes financial reporting (Alfian et al., 2022), have shown positive results, providing users with a better understanding of the usage of information system technology.

Thus, in addition to system development, efforts are made to ensure that new technology is effectively integrated into current administrative processes and that relevant users gain insights into using the PAS. With the agreement and support of the partner, this activity will be carried out according

to a mutual understanding of the need for improvements and modernization in data management. This activity aims to support the transition from a manual, paper-based population administration system to a web-based digital system, enhancing data accessibility for the local community. The potential benefits of this initiative are significant, including streamlined administration of population data, reduced risk of errors and data loss, and increased confidence in technology use. Ultimately, this effort aims to modernize local governance and set a model for other communities to adopt similar digital transformations for improved public service.

2. METHODS

To achieve the goals of this digital transformation initiative, a comprehensive approach was adopted, encompassing four key steps: (1) Data gathering; (2) System development; (3) Evaluation, and (4) User training. These steps are illustrated in Figure 2. Each step was carefully planned to address specific challenges in administration, focusing on creating an accessible and secure digital platform tailored to the community's needs.
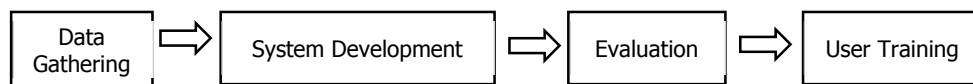

Figure 2. Steps of implementation

Data Gathering

The data gathering process begins with a discussion involving the community leader of RT3/RW3, Rejowinangun Utara Village, Magelang. The discussion took place in Jl. Kalingga 34, Magelang. The topics discussed focused on issues related to data administration and plans for Population Administration System (PAS) development. Through this meeting, comprehensive input was gathered to understand specific needs and identify expectations for the new system. Additionally, this step provides valuable insights into current data management challenges, including manual processes and accessibility issues, which will guide the design of a user-centered system. This initial phase aims to collect as much relevant feedback as possible to ensure that PAS development aligns closely with community requirements and priorities.

System Development

After conducting interviews with the community leader, the development phase focused on creating a functional population administration system tailored to meet the specific needs and challenges identified during the interview. The PAS development utilized the waterfall method, a structured and step-by-step approach well-suited for projects with clearly defined requirements. Recent studies highlight several benefits of using the waterfall method in system development, including enhanced project predictability (Thesing et al., 2021) and well-defined project scopes and goals (Rachma & Muhlas, 2022). The waterfall method used in this activity is illustrated in Figure 3.

The system development phase is focused on creating detailed blueprints for the software, including data structures, user interfaces, and workflow processes. During the development phase, the system was built according to these specifications, with each component carefully implemented to ensure proper functionality. After completion, the system was thoroughly tested to identify and resolve any issues, ensuring it operated smoothly and was easy for users to navigate.
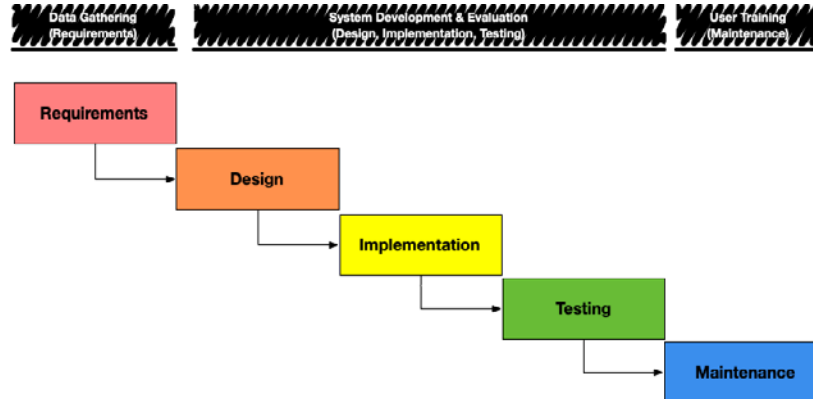
Figure 3. Waterfall method for Population Administration System (PAS) development with four activity steps

Evaluation

Once the system was fully developed, an evaluation phase was conducted in collaboration with the community leader to assess its functionality, usability, and effectiveness in addressing the community's needs. This collaborative evaluation involved testing the system's performance to ensure all functionalities work as expected. Feedback was gathered directly from the community leader to identify any areas for improvement. Additionally, the evaluation focused on verifying data accessibility, which are essential for smooth administrative operations. This phase aimed to refine the system based on actual user experiences, enhancing its overall reliability and effectiveness before full implementation.

User Training

A focused training session for using the Population Administration System (PAS) was organized to facilitate the transition to the new digital system. Training sessions were designed to familiarize the community administrator with the system's functions and features, ensuring they could use it confidently and effectively. Hands-on activities were included to help the administrator develop practical skills, such as data entry and interpreting demographic reports. The goal of this phase was to equip the community administrator with the necessary knowledge and skills to manage the system independently, promoting long-term sustainability in population data management.

3. RESULTS AND DISCUSSION

The community service activities were conducted in four key steps to ensure the successful implementation of the Population Administration System (PAS). These steps included data gathering to understand community needs, system development to create a tailored solution, evaluation to assess its effectiveness, and user training to familiarize administrators with the new system. This structured approach aimed to deliver user-friendly system that meets the community's needs.

The activities were carried out through a series of well-defined steps. The first step involved collecting data through a discussion with the community leader of RT3/RW3, Rejowinangun Utara Village, Magelang, held at his residence. During the system development and evaluation phases, the Population Administration System (PAS) development process was conducted online, with regular progress updates shared with the community leader. Once the system was completed, user training was organized in collaboration with the community leader and conducted online over two sessions. The first session provided an overview of the system's functions and features, while the second session was

a more focused training session with the community leader as the sole participant, providing hands-on guidance in using the system effectively. This structured approach ensured active involvement and a deep understanding of PAS.
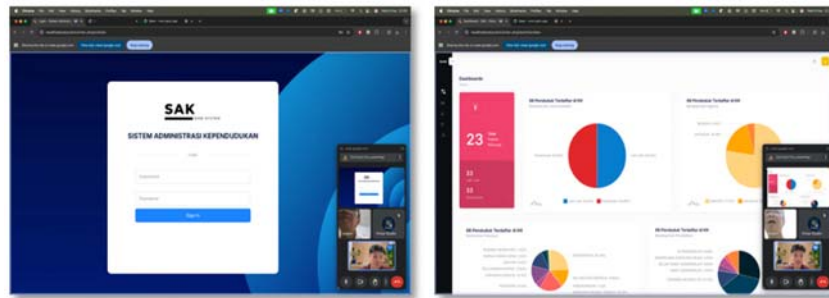

Figure 4. User training session, hands-on in using the Population Administration System

Implementation Process

Data gathering

During the data gathering process, family record data from RT3/RW3, Rejowinangun Utara Village, Magelang, was collected as a crucial component for the subsequent system development. This data is the foundation for creating an accurate and comprehensive Population Administration System (PAS) tailored to the community's needs. Additionally, an interview with the community leader was conducted to gain a deeper understanding of his specific requirements for the system. The discussion primarily focused on identifying the format in which demographic information should be displayed to meet his needs effectively.
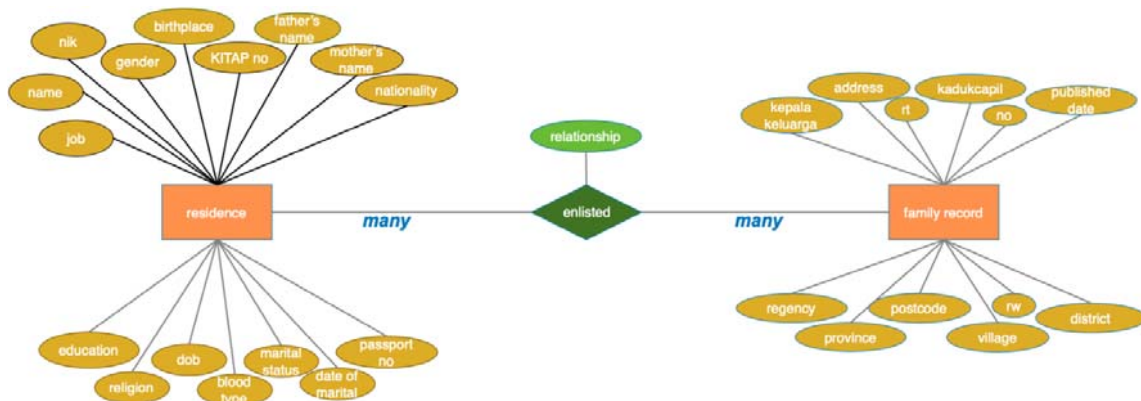

Figure 5. Entity Relationship Diagram (ERD) of family records

The data collected from family records during this phase was analyzed and modeled to create an Entity-Relationship (ER) diagram, as illustrated in Figure 5. This process involved identifying key entities (orange), attributes (yellow), and relationships (green) within the data to represent the structure of population information accurately. The ER diagram provided a clear and organized framework for understanding how the system should store, process, and access data. This model served as the foundation for the system development phase, guiding the creation of functionalities that align with

the community leader's specific requirements for presenting demographic information effectively. By modeling the data, the development process ensured a robust and scalable design that addresses current administrative needs.

System development

Population Administration System (PAS) development followed a structured approach to create a functional and user-centered platform. It is developed using the CodeIgniter 4 framework, running on PHP version 8.3 with MySQL 5.7.39 as the database engine to ensure modern and efficient performance. The backend interface was designed specifically for the community leader as the primary user, focusing on ease of navigation and functionality to support administrative tasks. The Entity-Relationship (ER) diagram illustrated in Figure 5 displayed the database design. This included defining tables, relationships, and attributes to reflect the attributes in the family records. The outcome of the database design in this phase is presented in Figure 6.

The interface sample of the PAS system is shown in Figure 7, featuring the login page on the left and the family record menu on the right. The login page provides a secure access point for authorized users using a valid account to enter the system. The family record menu is a page for managing population data in family groups.

Evaluation

Once the PAS system was developed, it was deployed online and made accessible online. To ensure smooth functionality, re-testing was conducted online, verifying that all features operated as intended under real-world conditions. After completing the testing phase, the system was demonstrated to the community leader, providing a comprehensive overview of its functionalities and capabilities. During this demonstration, the leader was encouraged to explore the system and provide feedback based on practical needs and usability. This feedback was collected and carefully evaluated to identify potential adjustments or enhancements to improve the system further. The evaluation phase ensured that the system met the community leader's expectations and aligned closely with the administrative requirements of the community.

Based on the evaluation session conducted on October 25, 2024, the community leader provided additional feedback, emphasizing the need for a clear and concise one-page summary of analyzed information derived from the inputted data. The requested summary should include key details such as total population, total families, and population distribution by gender, religion, occupation, and education. These requirements were evaluated and subsequently implemented into the system to enhance its usability and relevance to the community's needs. The adjustments aimed to ensure that the system could provide a comprehensive yet straightforward overview of demographic information at a glance. Implementing these features addressed the community leader's requests and improved the system's practicality for decision-making purposes. Details of these additions and their implementation will be further discussed in the discussion section.

User training

The user training phase was conducted on October 31, 2024, in two sessions to ensure the community leader could effectively operate the PAS system. The first session focused on understanding the system's menus and functionalities, providing a comprehensive overview to ensure the community leader fully understood its capabilities. The second session was a hands-on training, where the community leader was guided through practical tasks such as entering data, modifying records, and

reading a concise population summary from the dashboard menu. This interactive approach allowed the community leader to apply the knowledge gained in the first session, ensuring confidence in using the system independently. These training sessions were designed to equip the community leader with theoretical knowledge and practical skills for effectively managing data in the system.
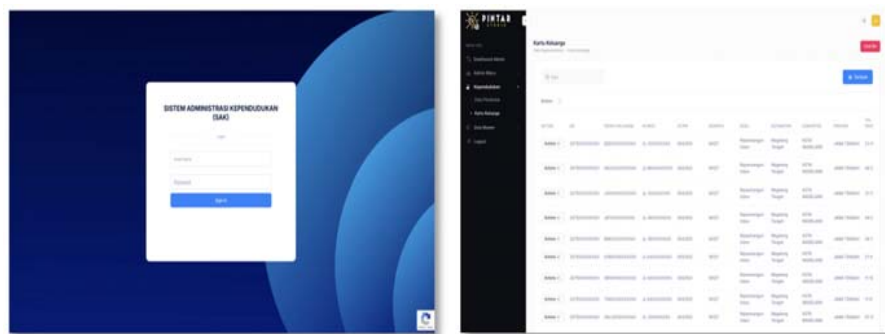

Figure 6. Designer view of entities' relationships

Figure 7. Login interface (left) and family record menu (right)

Activity Materials

As illustrated in Figure 2, the activities were carried out over an eight-month schedule to ensure a structured and thorough implementation process. Each phase, from data gathering to user training, was carefully planned and executed to address specific objectives and deliverables. The timeline was designed to provide adequate time for each activity, ensuring quality and alignment with the community's needs. Detailed descriptions of each phase and its corresponding activities are provided in Table 1, offering a clear overview of the workflow and progress throughout the project.

Table 1. Activity schedule

Phase 1	Data Gathering
Time	March-April 2024
Activities	- Conducting a meeting with community leader of RT3/RW3, Kelurahan Rejowinangun Utara, Magelang - Formalizing a collaboration agreement with the community leader - Outlining the plans and methods for developing Population Administration System (PAS)
Phase 2	**System Development**
Time	May-September 2024
Activities	**Website Development** - Build the web-based system using the CodeIgniter 4 framework and PHP 8.3 - Design and implement the user interface with a focus on simplicity and accessibility for the primary user (community leader) **Database Design and Integration** - Create the database structure based on the Entity-Relationship (ER) diagram (Figure 5) - Configure the database to support population data storage, retrieval, and analysis **Feature Implementation** - Develop core system functionalities, including data entry, modification, deletion, and report generation **System Configuration** - Ensure the system is properly configured for online deployment, including server setup and security measures **Internal Testing** - Conduct thorough testing of the system's features and functionalities to identify and resolve potential issues - Validate the performance of the system in a controlled environment to ensure reliability and usability
Phase 3	**Evaluation**
Time	October 2024
Activities	**System Demonstration** - Present the developed PAS system to the community leader, highlighting key features and functionalities. - Gather detailed feedback from the community leader regarding usability, clarity of information, and any additional features needed. **System Refinement** - Implement the suggested changes by adding a dashboard menu to present concise demographic summaries, including population distribution by gender, religion, occupation, and education.
Phase 4	**User training**
Time	October 2024

Activities	**Session 1: System Overview**
	- Introduce the PAS system's menus and functionalities in detail
	- Provide a comprehensive explanation of the system's capabilities to ensure a clear understanding
	Session 2: Hands-On Training
	- Guide the community leader through practical tasks such as:
	   - Entering new data
	   - Modifying existing records
	   - Generating and reading a concise population summary from the dashboard
	- Allow the community leader to practice using the system to apply the knowledge gained during the first session
	- Focus on helping the community leader gain confidence in operating the system independently

Discussion

The discussion of this activity will focus on the data input process and development of the User Interface (UI) for the Population Administration System (PAS). Based on the outcomes of the Data Gathering phase and as illustrated in Figure 5, the system development adopted a bottom-up approach. This approach began with structuring the database and core functionalities before building the UI to ensure seamless integration between the backend and the user-facing components. The UI was designed to prioritize simplicity and usability, aligning with the community leader's requirements. The goal was to create an interface that supports efficient data entry and modification and provides clear, concise demographic summaries.

The primary goal of developing the UI for this system is to ensure that each family's data is presented in a format resembling a real-life family record. To achieve this, the data input process is outlined in Figure 8. Each step in the process is assigned a dedicated menu within the system.
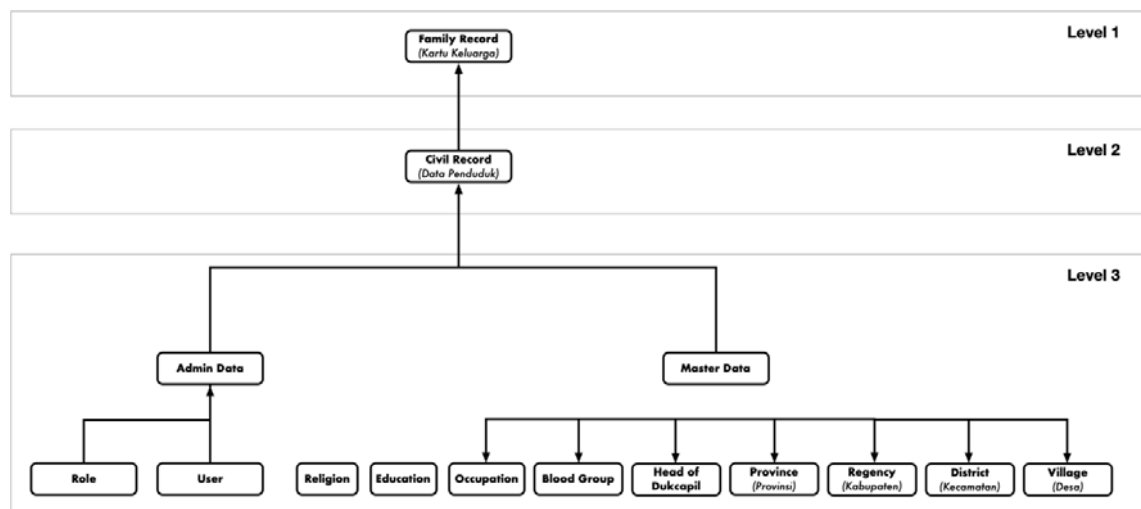

Figure 8. Bottom-up data level input process in PAS

As illustrated in Figure 8, the data input process begins at Level 3, where foundational data, including admin data (roles, users) and master data (religion, education, occupation, blood group, head of dukcapil, province, regency, district, and village), is entered. The admin data pertains to the user accounts that will log into the system, while the master data provides essential reference information that will be utilized to create civil records in level 2. The relationships between these entities are detailed in Figure 6, ensuring a clear understanding of their dependencies.

After completing all necessary data input at Level 3, the data input process may continue to Level 2. At level 2, the individual civil records are created, and personal details for each family member are compiled within the printed legal family records. The data input process at this level is repeated for every individual from all legal family records in RT3/RW3, Rejowinangun Utara Village, Magelang. Once the Civil Records are complete, the process proceeds to Level 1, where the entered civil record data is grouped based on the corresponding legal family records. This step results in a set of Family Records (Kartu Keluarga) that the community leader can view in a familiar and standardized legal format for family records. This structured approach ensures accuracy and alignment with existing administrative standards.

During the data input process at Level 2 and Level 1, support was provided to the community leader by pre-entering 70 percent of the data, including Civil Records and Family Records. The remaining 30 percent of the data was reserved for use during the User Training phase, allowing the community leader to independently practice key tasks such as entering, modifying, and organizing records. This hands-on approach was designed to help the community leader become familiar with the system's functionalities while gaining confidence in managing population data. The positive result of this user training phase shows similar results to the other community service activities in implementing information systems for public needs (Anam et al., 2018; Farmani et al., 2024; Wibowo et al., 2024). The system not only supports the community leader in managing records but also provides the capability to generate a summarized view of the population in the local community, ensuring data is both actionable and accessible.

4. CONCLUSION AND RECOMMENDATIONS

Implementing the Population Administration System (PAS) successfully facilitated the transition from a manual, paper-based population administration system to a web-based digital platform. This initiative not only improved data accessibility but also empowered the community leader in RT3/RW3, Rejowinangun Utara Village, Magelang, with the knowledge and skills needed to manage population data independently. The structured approach, consisting of data gathering, system development, evaluation, and user training phases, ensured that the system met the community's specific needs and administrative requirements. Key features such as a concise demographic summary dashboard and user-friendly interfaces contributed to the practicality and usability of the PAS. Collaborative evaluation and training sessions further reinforced the system's effectiveness, addressing feedback and promoting confidence in its use. This project is a model for modernizing local governance through digital transformation, demonstrating how tailored technological solutions can enhance public services and inspire similar initiatives in other communities.

A limitation of this paper is the inability to implement the system for the entire community simultaneously due to several field constraints. In a single village, there are approximately 100 community leaders, and it is impractical to gather all of them at once due to their advanced age and busy schedules. Although approaching the local village head was an option, it would not provide comprehensive system requirements, as the community leaders are the primary stakeholders for the developed system. Therefore, initial collaboration was focused on one community leader to introduce and refine the system concept. Moving forward, the system will be gradually rolled out to other community leaders in phases to ensure broader adoption and effectiveness. Sharing the knowledge and experience gained from implementing the Population Administration System (PAS) in RT3/RW3, Rejowinangun Utara Village, Magelang, with other local communities is essential. This dissemination can encourage wider adoption of digital systems, enhancing administrative efficiency and public service delivery. Additionally, feedback from other community leaders will be crucial and can serve as part of the system evaluation for future development phases.

REFERENCES

Afrianto, I., Suryana, T., & Atin, S. (2022). Pendampingan sistem layanan publik desa digital Desa Ciwaruga dan Desa Cigugur Girang. *Jurnal Pengabdian Masyarakat TEKNO*, *3*(2), 84-90. https://doi.org/10.29207/jamtekno.v3i2.4720

Alfian, M., Kartika, D., & Ferida, A. (2022). Implementasi sistem informasi akuntansi dan administrasi berbasis digital. *DIKEMAS (Jurnal Pengabdian Kepada Masyarakat)*, *6*(1), 32–37. https://doi.org/10.32486/dikemas.v6i1.247

Anam, A. K., Ridho, M., & Rohman, F. (2017). Implementasi sistem informasi yayasan (SIYAP) terhadap kualitas tata kelola keuangan yayasan pendidikan islam di jepara. *Abdimas: Jurnal Pengabdian Masyarakat Universitas Merdeka Malang*, *2*(2). https://doi.org/10.26905/abdimas.v2i2.1815

Artauli, S., Nurohmat, N., & Nugraha, N. B. (2024). Penerapan aplikasi rekam medis untuk menajemen data pasien di Klinik Anyadellasis. *Jurnal Pengabdian kepada Masyarakat Nusantara*, *6*(1), 970-975. https://doi.org/10.55338/jpkmn.v6i1.4359

Farmani, P. I., Laksmini, P. A., & Sugianta, I. K. A. (2024). Improvement of management information system to facilitate recording and reporting for Integrated Health Service cadres. *Abdimas: Jurnal Pengabdian Masyarakat Universitas Merdeka Malang*, *9*(3), 575–587. https://doi.org/10.26905/abdimas.v9i3.12828

Hidayatullah, D. A. S., Prabowo, D. A., & Nugroho, N. E. W. (2023). Rancang bangun sistem informasi desa berbasis website menggunakan Metode Scrum. *Jurnal Teknologi Sistem Informasi*, *4*(2), 254-277. https://doi.org/10.35957/jtsi.v4i2.5313

Martínez-Peláez, R., Ochoa-Brust, A., Rivera, S., Félix, V. G., Ostos, R., Brito, H., Félix, R. A., & Mena, L. J. (2023). Role of digital transformation for achieving sustainability: Mediated role of stakeholders, key capabilities, and technology. *Sustainability (Switzerland)*, *15*(14), 11221. https://doi.org/10.3390/su151411221

Mustofa, A., Abdullah, M., Hamid, A., Ayu, R., Rohmah, F., Rohmah, N., Wilujeng, A. D., Annafiyah, A., & Sa'diyah, I. (2021). Pembuatan sistem absensi fingerprint dan monitoring kehadiran berbasis web menggunakan framework laravel di SMK Al Miftah Pamekasan. *Sewagati*, *5*(3), 335-342. https://doi.org/10.12962/j26139960.v5i3.91

Rachma, N., & Muhlas, I. (2022). Comparison of waterfall and prototyping models in research and development (R&D) methods for android-based learning application design. *Jurnal Inovatif: Inovasi Teknologi Informasi dan Informatika*, *5*(1), 36-39. https://doi.org/10.32832/inova-tif.v5i1.7927

Rianto, R., Mubarok, H., & Aradea, A. (2019). Pelatihan penerapan sistem layanan administrasi penduduk desa berbasis teknologi informasi. *Jurnal Pengabdian Siliwangi*, *5*(1). https://doi.org/10.37058/jsppm.v5i1.559

Sary, F. P., Febrianta, M. Y., Widiyanesti, S., & Moslem, M. (2022). M-KIA 79 application version 2.0 for Integrated Healthcare Center services at Posyandu Kenangan in Samarinda. *Abdimas: Jurnal Pengabdian Masyarakat Universitas Merdeka Malang*, *7*(3), 544-554. https://doi.org/10.26905/abdimas.v7i3.7064

Satya, J. B., Suhery, L., Sinlae, A. A. J., & Uliyatunisa, U. (2021). Pengembangan sistem pelayanan publik melalui sistem administrasi kependudukan menggunakan Metode Extreme

Programming. *Jurnal Sistem Komputer dan Informatika (JSON)*, *3*(2), 87-93. https://doi.org/10.30865/json.v3i2.3592

Setiawansyah, S., Megawaty, D. A., Alita, D., & Dewi, P. S. (2021). Penerapan digital library untuk otomatisasi administrasi perpustakaan. *Journal of Social Sciences and Technology for Community Service (JSSTCS)*, *2*(2), 121-127. https://doi.org/10.33365/jsstcs.v2i2.1366

Situmorang, D. M. (2020). Pelatihan dan penerapan sistem akuntansi pada BUMDes di Kabupaten Bengkayang. *Cendekia: Jurnal Pengabdian Masyarakat*, *2*(1), 58-66. https://doi.org/10.32503/cendekia.v2i1.953

Thesing, T., Feldmann, C., & Burchardt, M. (2021). Agile versus waterfall project management: Decision model for selecting the appropriate approach to a project. *Procedia Computer Science*, *181*, 746-756. https://doi.org/10.1016/j.procs.2021.01.227

Wibowo, D. W., Khairy, M. S., Rizza, M. A., Fitriana, A., & Sari, P. A. (2024). Waste management improvement with software application at Wringinsongo Village, Tumpang Regency, Malang. *Abdimas: Jurnal Pengabdian Masyarakat Universitas Merdeka Malang*, *9*(2), 307. https://doi.org/10.26905/abdimas.v9i2.12182