



Department of Digital Business

Journal of Artificial Intelligence and Digital Business (RIGGS)

Homepage: <https://journal.ilmudata.co.id/index.php/RIGGS>

Vol. 5 No. 2 (2026) pp: 13110-13118

P-ISSN: 2963-9298, e-ISSN: 2963-914X

Waterfall-Based Web Application for Merah Putih Cooperative Registration in Gowa

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Abstrak

The cooperative establishment registration process at the Gowa Regency Office of Cooperatives and Micro, Small, and Medium Enterprises (MSMEs) is still predominantly carried out through manual procedures, which often causes long service times, fragmented document storage, administrative duplication, and difficulties in monitoring the status of cooperative establishment applications. This study aims to develop a web-based application for the registration of Merah Putih Cooperatives in Gowa Regency by integrating applicant submission, document uploading, officer verification, and registration data management within a single digital service platform. The research employed the System Development Life Cycle (SDLC) using the Waterfall model, consisting of requirements analysis, system design, implementation, and functional testing. Data needs and system requirements were identified through observation and interviews with relevant officers and prospective cooperative applicants. The application was implemented using PHP, HTML, CSS, JavaScript, and MySQL to support multiuser access, role-based authority, centralized data storage, and structured administrative workflows. The resulting system consists of three main modules: online registration for applicants, verification for administrators, and cooperative registration records management. Functional testing showed that the login process, registration form completion, document upload, application submission, verification status update, and data retrieval functions operated according to the specified requirements. The findings indicate that the developed application can provide a more organized, traceable, and documented mechanism for cooperative establishment registration. However, this study was limited to initial development and functional conformity testing. Future research should evaluate system usability, security, service quality, user satisfaction, and the quantitative effect of the application on administrative processing time.

Keywords: Web Application, Cooperative Registration, Information System, Public Services, Waterfall Model

1. Introduction

Digital transformation has become an integral component of reforms in organizational governance and public service delivery. In public administration, the use of digital technology extends beyond process automation to improving service accessibility, information accuracy, operational efficiency, and the quality of data-driven decision-making [1], [2].

In the cooperative and MSME sector, digitalization is regarded as an important instrument for strengthening institutional competitiveness, expanding service reach, and enhancing organizational adaptability to environmental change. Studies of Indonesian cooperatives indicate that digitalization can improve organizational capacity and competitiveness, particularly when digital innovation is supported by adequate institutional capabilities and government support [3], [4].

From an e-government perspective, web-based services should be designed not only to function technically but also to satisfy the dimensions of efficiency, reliability, trust, and user support. User acceptance of digital government systems is influenced by perceived usefulness, ease of use, and the quality of services delivered through the system interface [5]–[8].

The Gowa Regency Office of Cooperatives and MSMEs is responsible for facilitating cooperative establishment procedures. However, cooperative establishment registration at the agency is still conducted manually. This practice results in lengthy administrative processing, dependence on physical documents, the risk of lost records,

and suboptimal registration data management. These conditions demonstrate the need for an integrated system that structures application submission, verification, and records management.

Previous studies have shown that web-based information systems can improve administrative organization and service accessibility across organizational and governmental settings, including integrated public administration services, village services, cooperative systems, local government information systems, and cooperative financial management [9]–[13]. Nevertheless, research specifically addressing applications for registering cooperative establishments at the regency-level agency remains limited.

Accordingly, this study aimed to develop a web-based application for registering the establishment of Merah Putih Cooperatives at the Gowa Regency Office of Cooperatives and MSMEs. The novelty lies in integrating registration, verification, and cooperative establishment data management into a single web-based service system for a local government agency.

The administrative problem addressed in this study is not merely the absence of an online form. In a manual registration environment, information moves through several disconnected points, from applicant files, officer notes, physical folders, and informal status confirmation. When these points are not integrated, the service process becomes vulnerable to document repetition, incomplete tracking, and different interpretations among officers regarding the latest status of an application. In this context, the proposed application is positioned as a workflow-control instrument that connects submission, verification, and archiving in a more coherent administrative chain.

The Merah Putih Cooperative registration context also requires careful attention because cooperative establishment is related to legal identity, institutional accountability, member representation, and subsequent government assistance or supervision. A registration system that stores only basic applicant data is insufficient if it cannot also document supporting files, officer decisions, and verification status. Therefore, the system developed in this study emphasizes traceability. Each applicant submission must be connected to document evidence and to an administrative status that can be reviewed by authorized officers.

The use of a web platform was considered suitable because public service users may access the registration interface without installing a specific desktop application. From the perspective of e-government service quality, this platform choice is relevant to accessibility, convenience, and service continuity [5]. Nevertheless, the design does not treat technology as an automatic solution. The application must still follow the actual administrative sequence used by the agency so that digitization does not merely move manual confusion into an online screen.

Based on this background, the contribution of this study is practical and developmental. The research does not claim to measure a complete digital transformation outcome. Instead, it produces an initial application prototype that translates field requirements into registration, verification, and data management functions. This position is important because many public sector information systems fail not at the coding stage, but at the stage of aligning system logic with daily service routines, document rules, and user authority boundaries.

2. Research Methods

This study employed the System Development Life Cycle (SDLC) with the Waterfall model. The model was selected because its stages are systematic, sequential, and documented, making it suitable for system development research that proceeds from requirements identification to application function testing [14]. The research framework is presented in Figure 1.

The requirements analysis identified two user groups with distinct authorities. Applicants were responsible for submitting cooperative establishment data and documents, whereas administrators were responsible for reviewing submissions, determining application status, and managing records. This separation of roles formed the basis for designing the process flow and application interfaces.

Table 1. Functional requirements of the application

Actor	Function	Requirement description
Applicant	Login	Access the application using a registered user account.
Applicant	Registration	Enter cooperative data, person-in-charge details, and supporting information.
Applicant	Document upload	Upload the documents required for the application.

Actor	Function	Requirement description
Applicant	Submit application	Submit registration data for review by an officer.
Administrator	Verification	Review data and document completeness and update the application status.
Administrator	Data management	Display, organize, and retrieve registration records.

The functional requirements in Table 1 were subsequently mapped onto the Waterfall stages of requirements analysis, design, implementation, and testing. Figure 1 summarizes the relationship among the initial problem, development stages, and system outputs.

In the requirements analysis stage, the manual procedure was decomposed into a sequence of service activities. These activities included applicant identity recording, cooperative profile recording, document completeness checking, application submission, officer review, status determination, and administrative storage. This decomposition was necessary because the application was expected to represent the real service flow rather than only provide a static digital form. The analysis also identified data fields that should be mandatory and data fields that could be handled as supporting information.

The applicant role was designed with limited authority. Applicants can only enter their own cooperative establishment data, upload supporting documents, submit the application, and view the status of their submission. This limitation protects administrative functions from unauthorized access and reduces the possibility that applicants modify records after verification. Conversely, the administrator role was given access to the verification list, document review functions, application status updates, and records management. The separation of these roles became the basis for the use case design.

During the design stage, the database structure was prepared to support relational storage among user accounts, cooperative profiles, submitted documents, verification status, and administrative notes. A centralized database was required because fragmented storage was one of the main weaknesses of the manual process. In practical terms, the database design supports searching, sorting, and retrieving registration records based on applicant identity, cooperative name, submission status, and document completeness.

The interface design followed a simple service-oriented structure. The applicant interface prioritizes form clarity, upload access, and submission confirmation. The administrator interface prioritizes data tables, verification action buttons, document access, and status information. This distinction is important because the two users do not have the same task burden. Applicants need guidance to submit complete information, while administrators need efficiency to inspect many records with a consistent decision pattern.

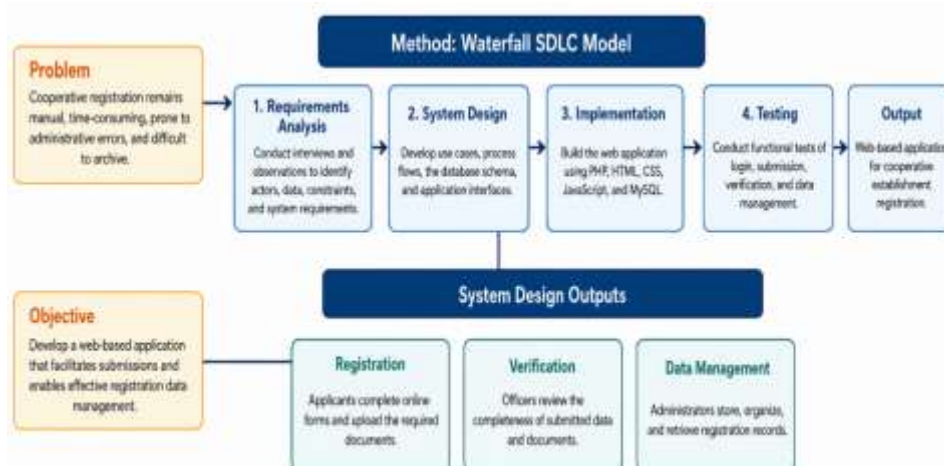


Figure 1. Research method framework

The first stage was requirements analysis. Interviews and observations were conducted with officers at the Gowa Regency Office of Cooperatives and MSMEs and members of the public applying to establish cooperatives. The analysis identified system actors, required data, constraints in the manual procedure, and the expected application outputs.

The second stage was system design. Unified Modeling Language (UML), particularly a use case diagram, was used to represent user interactions with the system. This stage also included database design and interface design for the registration, verification, and data management pages.

The third stage was system implementation. The application was developed as a web-based system using PHP for server-side processing, HTML, CSS, and JavaScript for the user interface, and MySQL for the database. A web platform was selected to support multiuser access and centralized data management.

The fourth stage was system testing. Functional testing was conducted to determine whether the login, registration submission, verification, and data management features operated in accordance with the basic user requirements. Functional testing assessed the consistency among requirements, implementation, and system outputs [15].

The tests were organized around the primary use scenarios. Each function was evaluated by comparing the user action, application response, and resulting output. Performance, security, and user acceptance were outside the scope of this study. Consequently, the test results demonstrate only the conformity of the core functions with the specified requirements.

The testing procedure used a functional conformity approach. Each scenario was examined by executing the normal user action and observing whether the system response matched the expected output. For example, the login function was considered conforming when the system accepted valid credentials and directed the user to the correct dashboard according to the assigned role. The registration function was considered conforming when the applicant could complete the required fields, upload documents, and submit the application without breaking the workflow.

This testing scope was intentionally limited. The objective of the study was to verify whether the first version of the application could represent the core administrative process. Consequently, the testing did not yet include stress testing, penetration testing, cross-browser testing, or formal usability measurement. These omissions are not treated as minor issues. They define the boundary of the findings and become the basis for recommending further evaluation before the application is deployed as a full public service system.

3. Results and Discussions

The study produced a web-based application for registering the establishment of Merah Putih Cooperatives to support administrative processes at the Gowa Regency Office of Cooperatives and MSMEs. The system comprises three principal modules: registration, verification, and data management. Figure 2 summarizes the system features, user roles, and functional outputs.

3.1. System Module Interpretation

The first module is the online registration module. This module transforms the applicant-facing side of the service from a document-submission activity into a structured digital entry process. The form fields guide applicants to provide cooperative identity, cooperative address, responsible person data, contact information, cooperative type, and required supporting documents. This arrangement reduces the possibility that essential information is scattered across separate papers or submitted without a consistent format.

The second module is the verification module. In this module, officers can review submitted data and supporting documents before determining the status of the application. Verification is not only a technical action of opening uploaded files. It is also an administrative control point because the officer must judge whether the data entered by the applicant are complete, whether the supporting files are available, and whether the submission can proceed to the next administrative stage. The module therefore creates a clearer boundary between applicant submission and officer decision.

The third module is the data management module. This module enables administrators to maintain registration records after applications have been submitted and verified. The value of this module becomes visible when the agency needs to locate historical registrations, check pending applications, count submitted records, or trace previous verification actions. Compared with physical folders, a searchable digital record provides a stronger basis for administrative continuity.

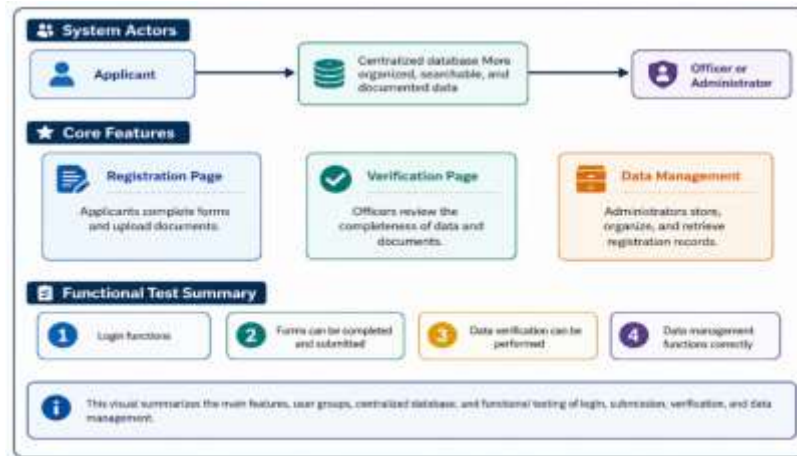


Figure 2. Main features and functional outputs of the application

The registration page enables applicants to complete a cooperative establishment application form online. This feature reduces reliance on in-person procedures and paper documents. The verification page enables officers to review the completeness of applicant data and uploaded documents. The data management page enables administrators to store, organize, and retrieve registration records systematically.

The login function becomes the first control point in the application. The system separates applicant and administrator access so that each user receives a dashboard consistent with his or her role. This design supports basic accountability because every submission or verification action is associated with an authenticated account. Although the study did not test advanced security mechanisms, the role-based login structure already provides a foundation for access control.

The document upload function strengthens the registration module because cooperative establishment requires evidence beyond text entry. In manual services, supporting documents may be separated from the main form or stored in different folders. In the developed application, uploaded documents are linked to the applicant submission. This linkage makes document review more orderly and helps administrators identify incomplete applications without manually comparing several physical files.

The system serves two principal user groups: members of the public as applicants and officers or administrators as system managers. The use case diagram in Figure 3 shows that applicants can log in, complete the form, upload documents, and submit an application. Administrators can log in, verify data and documents, and manage registration data and records.

On the registration page, applicants enter the cooperative name, address, person-in-charge details, telephone number, cooperative type, and supporting documents. The form consolidates information that was previously distributed across physical documents. The submitted data provide the basis for administrative review, thereby linking application submission and verification within a single workflow.

On the verification page, administrators can view the list of applications, document completeness, and application status. Role-based interface separation prevents applicants from accessing management functions while granting administrators access to review and records functions. The authority assigned to each actor is illustrated in Figure 3.

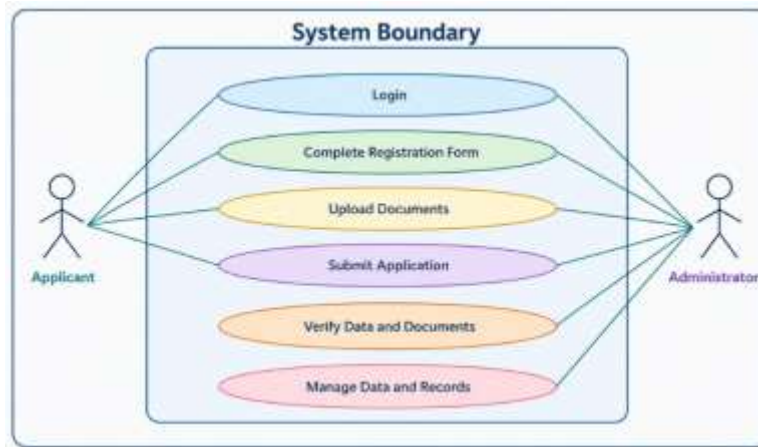


Figure 3. Application use case diagram

The centralized database enables registration information to be stored more systematically and retrieved more easily than manual records. This finding is consistent with previous studies showing that web-based information systems support orderly data management, service accessibility, and administrative process efficiency [9], [10], [12]. Figure 4 presents the system workflow from login to records management.

The workflow in Figure 4 begins when an applicant logs into the system, completes the form, and uploads the required documents. Once the application is submitted, the data are stored in a centralized database. The administrator then reviews the data and documents, updates the application status, and organizes the records. Each stage generates information required by the next stage, thereby maintaining continuity between submission and verification.

The workflow also clarifies responsibility transfer between users. Before submission, the applicant is responsible for data completeness. After submission, the administrator becomes responsible for evaluating the submitted record. This transfer of responsibility is important in public service administration because it reduces ambiguity regarding who must take the next action. A visible status indicator helps both parties understand whether an application is still pending, already verified, or requires further administrative attention.

The continuity shown in Figure 4 indicates that the application is not designed as a collection of isolated pages. The registration page, verification page, and records page are connected by the same data flow. This characteristic distinguishes the system from a simple online form. A simple form may collect information, but it may not automatically support officer review and structured records management. The developed application attempts to close that gap by connecting front-office submission with back-office verification.

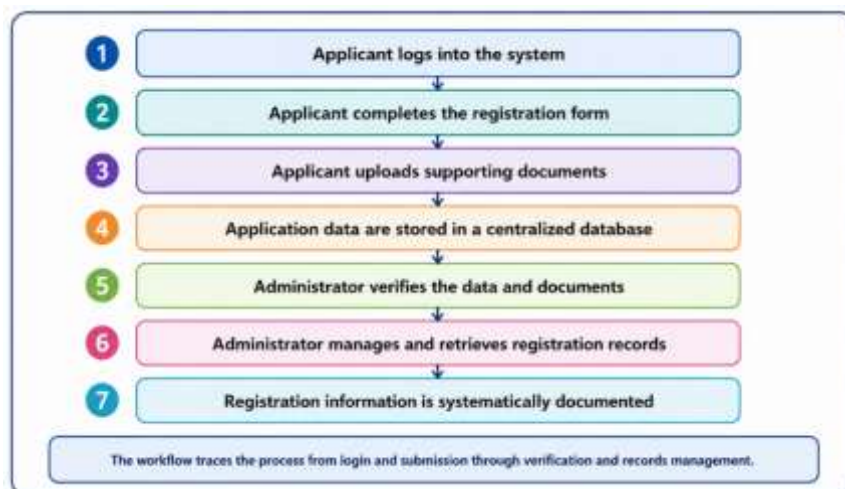


Figure 4. Registration application workflow

Testing covered user login, form completion and submission, data and document verification, and registration information management. The results showed that users could access the system, submit application data, and upload documents. On the administrator side, the system supported application verification and registration data management. Figure 5 presents mockups of the login, registration, and verification pages.

Table 2. Functional testing results

No.	Scenario	Expected output	Result
1	User login	The user can access the system according to the assigned role.	Conforms
2	Registration submission	The form can be completed, documents can be uploaded, and data can be submitted.	Conforms
3	Application verification	The administrator can review data and update the application status.	Conforms
4	Data management	The administrator can display, organize, and retrieve registration data.	Conforms

Table 2 shows that all primary scenarios produced the expected outputs. These results confirm the conformity of the core functions with the design but do not assess response time, load resilience, data security, or user experience. The principal interface mockups are shown in Figure 5.

3.2. Discussion of Functional Findings

The functional test results show that the application can execute the minimum service cycle needed for cooperative establishment registration. The cycle begins with login, continues with registration submission and document upload, moves to administrative verification, and ends with data management. This result is meaningful because the core weakness identified during requirements analysis was the absence of an integrated mechanism for handling these steps. Integration is therefore the main functional achievement of the application.

The finding is consistent with studies that report the usefulness of web-based information systems for administrative organization and service accessibility [9], [10]. In this study, the same principle appears in a more specific domain, namely cooperative establishment registration at a regency-level agency. The system does not merely provide a digital archive. It also gives officers a verification workspace and gives applicants a clearer submission path.

The Waterfall model influenced the character of the developed system. Because the stages were sequential, the system requirements were first stabilized before implementation. This approach is useful for public administration cases where the basic process is relatively known and where documentation is important [14]. However, the same sequential logic may become a limitation if service rules change rapidly after implementation. For this reason, later development should allow structured revisions based on user feedback and agency policy changes.

From a service quality perspective, the application has the potential to support efficiency, reliability, and information availability, which are central dimensions in e-government services [5]. Still, potential must be separated from measured effect. The current study confirms that the application functions can operate. It does not yet prove that applicants experience higher satisfaction, that officers complete verification faster, or that the number of administrative errors decreases after implementation.

The system also opens a path for better institutional memory. In manual procedures, an officer change or staff rotation may disrupt knowledge of ongoing applications because status information may be located in individual notes or physical folders. A centralized data management module reduces this dependence on individual memory. This benefit is especially relevant for local government agencies that handle repeated administrative services with similar document patterns over time.

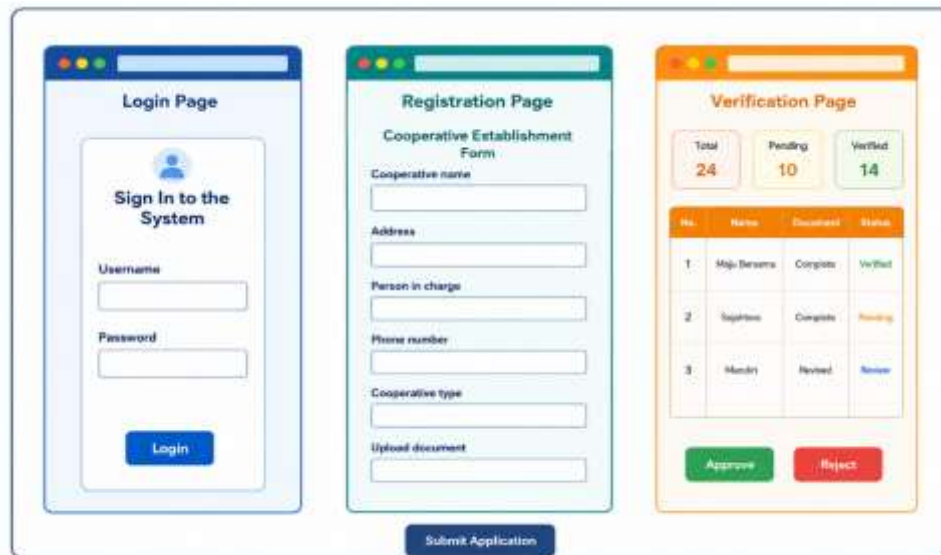


Figure 5. Mockups of the login, registration, and verification pages

Functionally, the application satisfied the basic requirements established during the requirements analysis. However, this study addressed only initial design and implementation. The potential improvement in service efficiency therefore cannot yet be interpreted as a quantitatively demonstrated effect. Further evaluation should measure website service quality, user acceptance, ease of use, user satisfaction, and service time before and after system implementation [5]–[8].

From a public service perspective, integrating registration and verification provides a basis for more consistent recordkeeping because applicant data, documents, and application status are stored within the same system. This benefit remains a functional potential rather than an empirically measured outcome. The study did not compare manual and digital service durations, administrative error rates, or user satisfaction levels.

Another limitation concerns the scope of testing. The system was tested only for its core functions and was not evaluated through security testing, device compatibility testing, network performance testing, or usability testing. These evaluations are required before large-scale implementation so that system quality can be assessed not only in terms of functional correctness but also reliability and user acceptance.

Security requires particular attention in future development because registration data may contain personal identity information, contact details, and organizational documents. A public service application should not only be accessible, but also protect submitted data from unauthorized access, accidental disclosure, and manipulation. Future versions should therefore include password policy improvement, upload validation, access logging, backup procedures, and more explicit user authorization rules.

Usability evaluation is also necessary. A system that works functionally may still be difficult for applicants who are unfamiliar with online public services. The registration form should be tested with actual users to determine whether field labels are understandable, upload instructions are clear, error messages are helpful, and the status display is easy to interpret. This evaluation can be linked to perceived ease of use and user acceptance, which remain important in e-government adoption studies [6]–[8].

For quantitative evaluation, future research can compare manual and digital registration using measurable indicators. These indicators may include average submission time, number of incomplete applications, officer verification duration, frequency of document resubmission, number of pending cases, and user satisfaction score. Such indicators would move the study beyond functional conformity into service performance assessment.

Overall, the application developed in this study should be understood as a first-stage digital service artifact. It provides the structural foundation for online cooperative establishment registration, but it still needs broader validation before being interpreted as a complete service innovation. The strongest contribution at this stage is the

translation of manual administrative needs into an integrated web-based workflow that can be tested, refined, and expanded in subsequent research.

4. Conclusion

This study developed a web-based application for registering the establishment of Merah Putih Cooperatives at the Gowa Regency Office of Cooperatives and MSMEs. The application integrates online registration, data and document verification, and records management within a single system, and functional testing confirmed that all principal functions operated in accordance with the specified basic user requirements. The main implication of the study is that cooperative establishment registration can be organized through a more traceable digital workflow when applicant submission, document upload, officer verification, and data management are integrated within one platform. The system provides a functional basis for reducing fragmented records and for improving the continuity of administrative handling. Nevertheless, the results should be interpreted within the development scope of this research. The study has several limitations. Functional testing confirmed system conformity with basic requirements, but the application has not yet been evaluated using usability, security, performance, or user satisfaction measures. Future research should conduct broader testing with applicants and officers, compare administrative processing time before and after system use, and strengthen data protection mechanisms before the system is implemented at a wider operational scale.

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