

Product-Based Design Approach for Business Process Improvement: A Case Study of the SIMARSIP System at the Malang Civil Registry Office


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ABSTRACT

This study investigates inefficiencies in the SIMARSIP digital archiving system used by the Malang City Civil Registry Office and proposes business process improvements by applying Root Cause Analysis (Fishbone and 5 Whys) and Product-Based Design, using qualitative data from interviews, observations, and document analysis as well as BPMN modeling and Bizagi simulation, which demonstrate that the redesigned processes reduce document submission cycle time by 50% (from 38 to 19 minutes), improve document search efficiency by 44%, enhance user flexibility through self-registration login features, and increase productivity despite reducing staff from five to four, thereby indicating that the integration of Root Cause Analysis and Product-Based Design is effective for modernizing digital public service systems.

Keyword : Business Process; Product-Based Design; SIMARSIP; Root Cause Analysis; BPMN; Digital Archiving.

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Article history:

Received Mar 12, 2026
Revised Mar 13, 2026
Accepted Mar 23, 2026

1. INTRODUCTION

Digital transformation in public sector services has become a necessity to enhance the performance, transparency, and accountability of government institutions. The increasing demands for fast and reliable public services push institutions to adopt digital technologies in their operational processes (Aminah, S., & Saksono 2021). In Indonesia, one of the primary institutions responsible for citizen administration and public documentation is the Department of Population and Civil Registration (Dispendukcapil). To support digital transformation, Dispendukcapil of Malang City implemented a system known as SIMARSIP (Sistem Informasi Manajemen Arsip), intended to digitize and streamline the management of civil records (Nurlinah, Ansar, M. C., & Chowdhury 2025). However, SIMARSIP still suffers from several limitations. Many of its workflows remain manual, lacking automation features that could optimize efficiency (Tangi et al. 2021). The absence of integration between modules causes repetitive tasks and delays. Furthermore, the system does not provide essential functions such as self-service account registration, forcing users to rely on IT staff for basic access. These issues not only create inefficiencies but also hinder service delivery and public satisfaction. As digital services are expected to operate seamlessly, any bottleneck in the process may result in user dissatisfaction and decreased trust in public service quality (Jabri and Ahmad 2025).

Business processes form the backbone of any organization, determining how resources are utilized and services are delivered. Weske (2007) defines a business process as a structured set of activities designed to achieve a specific organizational goal (Goel, K., Bandara, W., & Gable 2023). Within the context of government services, business processes must be optimized to meet citizen expectations and regulatory requirements. When left unchecked, outdated processes can lead to resource wastage, increased operational costs, and poor service outcomes (Darusalam, D., Janssen, M., Said, J., Sanusi, Z., & Omar 2023). In recent years, digitalization has proven to be a critical factor in improving the effectiveness and efficiency of business processes (Putra and Er 2024). (Şişu, Tîrnovanu, and Mujaya 2024) emphasize that digitalization increases organizational competitiveness by enabling real-time operations, reducing human dependency, and enhancing productivity. These transformations are particularly beneficial for public organizations that often struggle with legacy systems and bureaucracy (Chandra, A. A., & Mahendrawathi 2024). Despite its purpose, SIMARSIP has not fully realized its potential. According to internal interview, a system administrator at Dispendukcapil Malang City, the system is limited by its rigid architecture and lack of modernization (Gong, Y., Yang, J., & Shi 2020). SIMARSIP does not support real-time archiving workflows, and many processes still rely on printed forms and

manual verification. As a result, employees face significant challenges in managing digital records efficiently, and citizens experience delays in accessing services.

To address these challenges, a structured improvement strategy is necessary. This study proposes a two-pronged approach: Root Cause Analysis (RCA) to identify the sources of inefficiencies, and Product-Based Design (PBD) to guide the redesign of the business processes. RCA enables a systematic investigation of problems using tools such as Fishbone Diagrams and the 5 Whys technique, helping uncover underlying issues that are often overlooked (Arowosegbe, Hulugh, and Emmanuel 2024). Rather than treating surface symptoms, RCA digs deep into contributing factors such as human error, technological limitations, and procedural inconsistencies. Following the diagnosis of root causes, the Product-Based Design approach is applied to reengineer the SIMARSIP workflows. As described by (Dumas et al. 2013), Product- Based Design focuses on the end-product delivered by the process and designs backward from that goal. This method fits well in digital transformation efforts because it prioritizes the value and quality of the final digital record, ensuring that every activity in the process contributes meaningfully to the intended outcome. The transformational nature of PBD allows organizations to rethink and restructure their operations entirely, rather than making incremental adjustments (Gabryelczyk et al. 2024). This study combines these two methodologies with the Business Process Management (BPM) framework to analyze, model, simulate, and redesign the archiving process. Business Process Modeling Notation (BPMN) is used to visualize the "As-Is" and "To-Be" states of the process, while Bizagi software supports simulation to quantify the impact of the redesign (Cimino, A., Filice, A. C., Longo, F., Mirabelli, G., Solina, V., Mallek-Daclin, S., ... & Zacharewicz 2025). By using real workload parameters, including user volume, task duration, and staffing, the redesigned process is tested for its efficiency improvements. The motivation behind this research is not only to solve a localized operational issue but also to offer a replicable methodology for similar government institutions facing digital inefficiencies. In this context, the synergy between organizational culture and digital infrastructure is essential to enhance the flexibility and quality of public services (Ly, Ly, and Ma 2026). SIMARSIP serves as a case study for how business process reengineering can enhance service quality through structured analysis and outcome-oriented design.

2. LITERATURE REVIEW AND RESEARCH METHOD

2.1. Literature Review

The literature review outlines the theoretical foundation for this study, focusing on Business Process Management (BPM), Root Cause Analysis (RCA), and Product-Based Design (PBD). Each of these frameworks plays a vital role in shaping the research methodology and ensuring a structured approach to problem analysis and redesign.

2.1.1. Business Process Management (BPM)

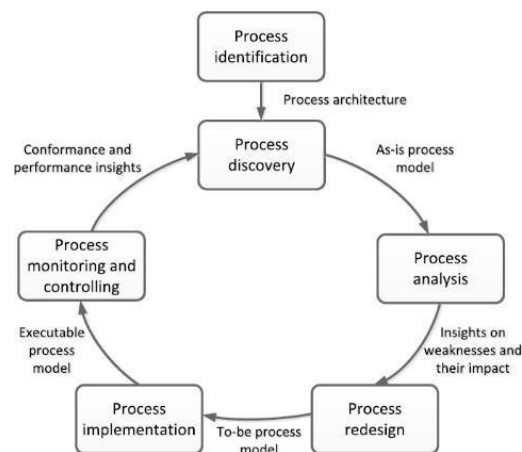


Figure 1. The Business Process Management Cycles

BPM is a systematic approach to understanding, designing, executing, monitoring, and improving business processes (Teixeira, A. R., Ferreira, and Ramos 2024). It is widely used in both private and public sector organizations to align operational processes with organizational goals. According to (Dumas et al. 2013), BPM allows organizations to evaluate existing workflows (As-Is), redesign them (To-Be), and continuously monitor their performance. The BPM lifecycle is composed of six stages: process identification, process discovery, process analysis, process redesign, process implementation, and process monitoring. By adopting

BPM, organizations can foster a culture of continuous improvement and agility, particularly important in dynamic environments such as digital public services.

2.1.2. Root Cause Analysis (RCA)

RCA is a qualitative method for identifying the origin of problems in a systematic manner (Jena 2024). Rather than addressing symptoms, RCA seeks to uncover the true causes of inefficiencies. Tools such as the Fishbone Diagram (also known as the Ishikawa diagram) and the 5 Whys technique are commonly used in RCA.

2.1.2.1. Fishbone Diagram

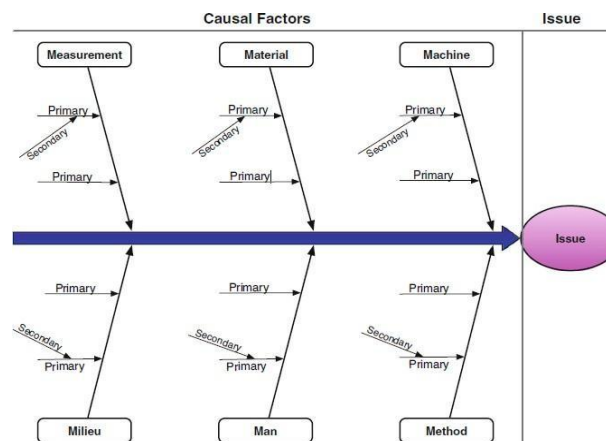


Figure 2. Fishbone Diagram

Fishbone Diagrams help organize contributing factors into categories such as people, process, technology, environment, and management, making it easier to explore different dimensions of a problem (Kumah et al. 2024). Also known as the Ishikawa or Cause-Effect Diagram, this tool is instrumental in identifying problems and understanding their contributing factors in business processes. According to (Dumas et al. 2013), the Fishbone Diagram helps break down complex issues into more manageable categories, enabling teams to trace problems to their origin. It visualizes the relationship between a specific problem and its potential causes, grouped into six standard categories known as the “6 M’s”: Machine, Method, Measurement, Man, Milie, and Material (Nandakumar and Siva 2019).

2.1.2.2. The 5 Whys Method

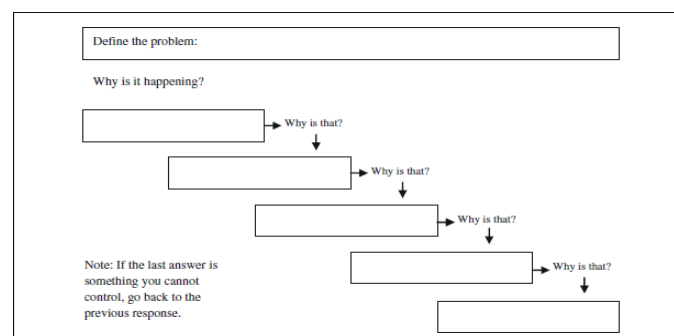


Figure 3. The 5 Whys Diagram Method

The 5 Whys technique is a complementary tool used to delve deeper into each category of the Fishbone Diagram (Garavito, Rossi, and Brancoli 2024). It involves repeatedly asking the question “Why?”—typically five times—to drill down to the fundamental root of a problem. (Olivier 2017), emphasizes its usefulness in uncovering layered and interrelated causes that may not be immediately apparent. By applying this method to each major symptom identified in the Fishbone Diagram, this study was able to validate findings and reveal the underlying structural issues within the SIMARSIP system. By integrating both tools, the RCA process in this study provided a structured yet flexible framework for analyzing complex inefficiencies in the digital archiving process at Dispendukcapil Malang.

2.1.2.3. Product-Based Design (PBD)

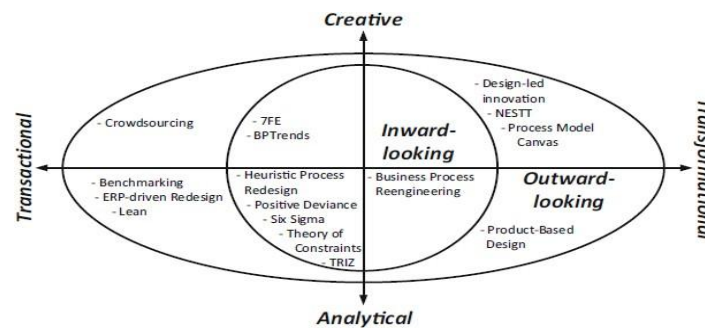


Figure 4. The Redesign Orbit

PBD is a process redesign approach classified under transformational and outward-looking methods in the redesign orbit by (Dumas et al. 2013). Unlike traditional redesign strategies that modify existing workflows incrementally, PBD focuses on the product or service being delivered (Alzahrani 2025). It begins by analyzing the desired end-product, such as a verified and accessible digital document, and then designs the necessary steps to produce that product effectively. This backward design approach ensures that each activity in the business process directly contributes to producing the final outcome. The PBD methodology consists of four phases: scoping (defining process boundaries), analysis (identifying required data and functionality), design (creating process alternatives), and evaluation (comparing options and selecting the optimal design). PBD is ideal for public service systems that produce structured outputs and require precision, consistency, and traceability—qualities essential in civil documentation. Together, BPM, RCA, and PBD provide a robust framework for diagnosing inefficiencies and designing innovative solutions. This study integrates these models to assess the current limitations of SIMARSIP, identify their underlying causes, and redesign the system for improved service quality, scalability, and user experience.

2.2. Research Method

This study uses a qualitative research approach to analyze and redesign the business processes in the SIMARSIP archiving system at Dispendukcapil Malang City. The research methodology follows the BPM lifecycle framework with a focus on Root Cause Analysis (RCA) and Product-Based Design (PBD) to identify problems and develop process improvements. The research steps are as follows:

2.2.1. Data Collection

Primary data were collected through semi-structured interviews with Dispendukcapil staff, particularly system users including IT personnel, operators, and archivists. Additional data were gathered through direct observations and document reviews. The data collected provided insight into the operational procedures of the SIMARSIP system and highlighted the challenges faced in its daily use.

2.2.2. As-Is Process Analysis

The current (As-Is) business processes were modeled using Business Process Model and Notation (BPMN) in the Bizagi Modeler software (Firmananda, F. I., Jati, P. Z., Syafriani, M., & Aryadi 2025). This phase involved identifying all stakeholders, documenting existing workflows, and identifying inefficiencies in tasks such as login, document submission, and archive search. The models served as a baseline for improvement.

2.2.3. Root Cause Identification

Inefficiencies in the As-Is processes were analyzed using Root Cause Analysis (RCA). This included the development of Fishbone Diagrams to categorize contributing factors and the application of the 5 Whys technique to each category. The combined use of these tools provided a detailed understanding of problems such as manual bottlenecks, lack of automation, training gaps, and system limitations.

2.2.4. Process Redesign with Product-Based Design

Based on the root cause findings, the business processes were redesigned using the Product-Based Design methodology. The four phases of PBD—scoping, analysis, design, and evaluation—were applied to restructure workflows with a focus on digital archive output quality, accessibility, and accuracy. Redesigned (To-Be) processes were modeled again using BPMN.

2.2.5. Simulation and Evaluation

The as-is process for viewing and archiving documents, as illustrated in Figure 7, involves the following steps: (1) the process begins when a citizen intends to request or manage official documents; (2) the citizen fills out a form manually, most likely using paper that is not integrated with the system; (3) the completed form is submitted directly to the service officer; (4) the service operator receives the form from the citizen; (5) the operator verifies the data on the form to ensure its completeness and accuracy; (6) if the data is not valid, the operator returns the form to the citizen for correction, and the citizen must resubmit it—however, if the data is valid, the process continues to the next stage; (7) the valid physical form is scanned by the operator to produce a digital version for archiving; (8) the scanned file is then manually sent to the archivist, typically via flash drive, email, or WhatsApp; (9) the archivist receives the document file for archival purposes; (10) the archivist accesses the SIMARSIP system via a web browser; (11) the scanned files are uploaded to the SIMARSIP system manually, one by one; and (12) once uploaded, the SIMARSIP system automatically stores the document in a temporary storage service (NextCloud); (13) the process ends when the document is successfully saved in the system. Despite the intention to digitize document processing, several stages of the service workflow remain manual. The submission, verification, and transfer of documents still rely on physical handling and unstructured communication channels. Additionally, the storage process is also partly manual, as only archivists are authorized to upload documents into the SIMARSIP system, and no automation exists for direct document intake from the public-facing service point.

3.2.2. Adding Log-in Process

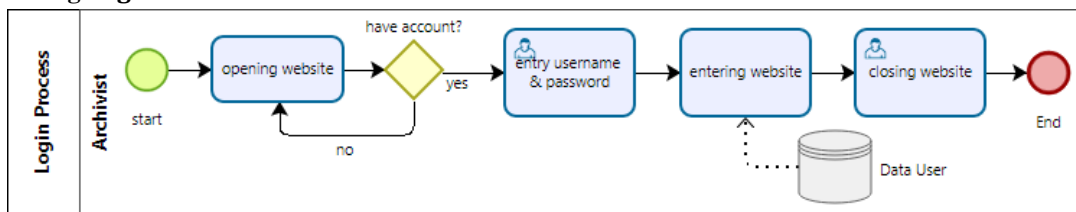


Figure 7. BPMN Diagram of Adding Login Process

The as-is login process of the SIMARSIP system, as illustrated in Figure 6, consists of the following steps: (1) the process begins when the archivist opens the SIMARSIP website; (2) the system prompts the user to confirm whether they have an existing account—if not, the process returns to the initial screen since the system does not support self-registration, but if the user has an account, they proceed by entering their username and password; (3) the system verifies the entered credentials by checking them against the database; (4) if the credentials are valid, the user is successfully logged in and granted access to the system; and (5) after completing their tasks, the user closes the website and the process ends. Access to SIMARSIP is limited to two user roles: (1) archivists, who are responsible for managing and processing archived documents, and (2) IT administrators, who are responsible for maintaining and managing the SIMARSIP system. The absence of a self-registration feature means that only users who have been manually registered by the IT staff are able to access the system.

3.2.3. Documents Search Process

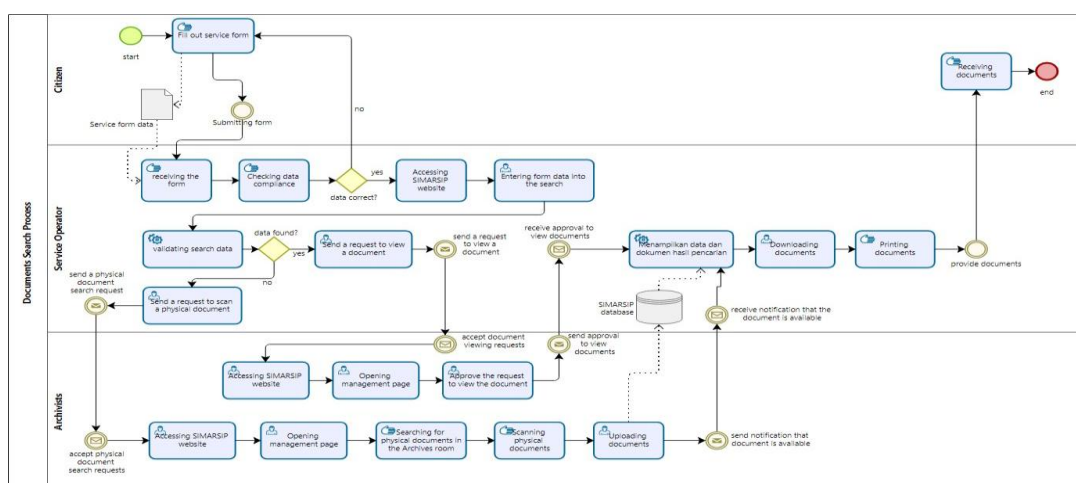


Figure 8. BPMN of Documents Search Process

The to-be business process for “Searching Documents,” as illustrated in Figure 8, involves the following steps: (1) the process begins when a citizen accesses the service portal to submit a document request; (2) the citizen fills out the request form directly through the portal; (3) the system validates the input data—if the data is invalid, a revision notification is automatically sent to the citizen for correction, but if the data is valid, it is temporarily stored in the system's database, and a unique serial number is automatically generated for tracking purposes; (4) the service operator receives the submitted form from the portal; (5) the operator logs into the SIMARSIP web system; (6) the system verifies the search request by matching the data from the portal form using the unique serial number—if a match is found, the system retrieves and displays the relevant document data, but if no match is found, the system automatically sends a physical document search request to the archivist; (7) the archivist receives a notification of the document search request via their SIMARSIP dashboard; (8) the archivist proceeds to locate the physical document in the archive storage room; (9) once found, the document is scanned using a scanner integrated with the SIMARSIP system, allowing the file to be directly uploaded and stored in the database; (10) after the data is saved, the system automatically notifies the operator that the requested document is now available in SIMARSIP; (11) the system displays the search results and confirms the availability of the document; (12) the operator then downloads and prints the document; and (13) the printed document is handed over to the citizen, and the process ends.

The redesigned to-be process reflects a more integrated system, primarily through a shared database. It improves service efficiency by eliminating redundant data entry—citizen-submitted data is automatically validated, stored, and assigned a unique serial number for easier tracking. The system also automates document search requests by notifying archivists in real-time via the SIMARSIP dashboard. Once found, scanned documents are uploaded directly into the system, accelerating access for operators. Overall, the process supports end-to-end digital service with minimal manual intervention, enhancing speed and accuracy in public document handling.

3.3. Log-in Process

Before conducting Root Cause Analysis (RCA), the researcher carried out several preliminary steps to understand and categorize problems within the SIMARSIP system. These included field observations and in-depth interviews with key staff such as IT personnel, service operators, and archivists. Common issues included slow archiving processes, feature limitations, and reliance on manual procedures. Structured interviews were conducted using the Fishbone Diagram framework, dividing causes into six main factors: Man, Method, Machine, Material, Milieu, and Measurement. Each category was used to organize interview questions and group related findings. For instance, lack of training was categorized under "Man," while delays in data processing were grouped under "Method" or "Material." The results of these interviews were then explored further using the 5 Whys technique. This iterative questioning process was applied to problems identified in each Fishbone category to trace their root causes. Not all problems were explored in depth; the analysis focused on those with the greatest impact on system inefficiency. The findings from the Fishbone and 5 Whys analysis were synthesized into the following visual and tabular summaries:

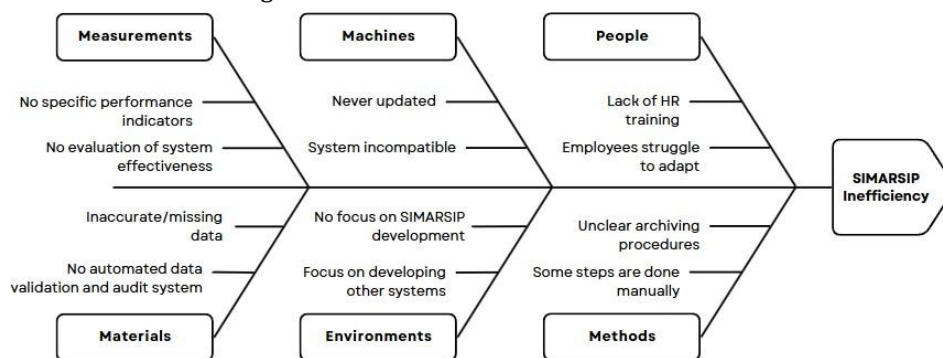


Figure 9. Fishbone Diagram

The Fishbone Diagram shown in Figure 9 above is further supported by a Root Cause Analysis, which is presented in the form of a table as follows.

Table 3. Root Cause Analysis

| Factor | Primary Issue | Direct Issue | Root Cause | Recommended solution |
|--------|---------------------------------|----------------------------------|--|--|
| Man | Difficulty adapting to SIMARSIP | Lack of training and orientation | Unstructured training policy; limited digital literacy | Develop training programs and digital competency roadmap |

| | | | | |
|-------------|---|--|---|--|
| Method | Inefficient archiving workflow | Still heavily manual | Unintegrated between SOPs and digital | Digitize and integrate SOPs |
| Material | Inaccurate or lost data | Errors in form input and transfer | No automated data validation | Implement automated validation tools |
| Machine | Underperforming SIMARSIP platform | Legacy system with limited functionality | Low prioritization in digital budget planning | Allocate funding and upgrade system |
| Milieu | System lacks responsiveness to user needs | System does not adapt to evolving needs | No feedback loop or system evaluation | Establish regular user evaluations and responsive upgrades |
| Measurement | Lack of performance evaluation | No clear KPIs or system metrics | No data-based monitoring system | Define KPIs and implement performance tracking |

In summary, the combined RCA approach revealed interconnected root causes that span technical, procedural, and organizational dimensions. Addressing these issues requires not only system upgrades but also policy changes and improved staff readiness.

3.4. To-Be Process Improvement and Modeling with Product-Based Design Method

Following the RCA findings, the SIMARSIP business processes were redesigned using a combination of the Transformational and Product-Based Design (PBD) approaches. Transformational redesign aims to overhaul the entire structure of the process, including its input, transformation logic, and output. In this case, the archiving process was reframed to ensure documents are processed digitally from the beginning, with standardized formats, clear procedures, and automated classification and retrieval. A summary of the transformation is shown in Table 4.

Table 4. Transformational Business Process Overview

| Aspect | Problem | Transformation |
|---------|---|--|
| Input | Influx of physical documents with no digitization standards | Mandatory digitalization with standardized file formats and metadata application |
| Process | Manual tasks, undocumented workflows, lack of SOPs | Manual tasks, undocumented workflows, lack of SOPs |
| Output | Inaccurate or inaccessible archives | Metadata-based storage and performance monitoring dashboard |

Product-Based Design is an approach to business process improvement that begins with the desired end product (output) and then breaks down into the activities required to produce that product. This approach is specifically designed to create processes that produce information-based products. The Product-Based Design method was applied through four key phases:

3.4.1. Scoping

Defined the end-product as a verified, classified, digital archive accessible through SIMARSIP's search function. Key stakeholders involved include the public (document providers), operators (for verification and scanning), archivists (for classification and upload), and IT staff (for system support and monitoring). The scoping stage aims to define the boundaries of business process improvement based on the final product to be achieved. This ensures that all activities analyzed and redesigned contribute directly to value creation through the final output.

3.4.2. Analysis

This stage focuses on analyzing the final product and its sub-products, along with the necessary activities to produce each sub-product. A Product Data Model is also constructed to describe the structure and attributes of the final and sub-products. The main product—a digital archive document—is decomposed into the following sub-products, each supported by specific activities:

Table 5. Final Product Decomposition Table

| Sub-products | Specific Activities |
|--------------------|--|
| Verified Document | a. Manual verification of physical documents by the service operator b. Data validation through the SIMARSIP system. |
| Digitized Document | a. Scanning of physical documents into digital formats (e.g., PDF, JPEG) b. Review of scanned files for readability and accuracy. |

| | |
|----------------------------|---|
| IT Administrators | a. Categorization by document type (e.g., Birth Certificate, ID Card, Family Card), b. Addition of metadata such as owner name, ID number, submission date, and document year. |
| Stored in SIMARSIP | a. Upload of digital archives into the system, b. Periodic backup of archive data. |
| Access & Monitoring System | a. Search functionality based on Metadata. b. Dashboard for usage statistics, archive status, and monitoring. |

This decomposition ensures that each stage of the business process contributes directly to the quality and accessibility of digital archives within SIMARSIP.

3.4.3. Design

Product-Based Process Tree (PBPT) was created to visualize these relationships. Each node represents a product or sub-product, and branches reflect the activities needed to create them. The design ensures that each task contributes directly to the final archive product shown as like figure 10 below:

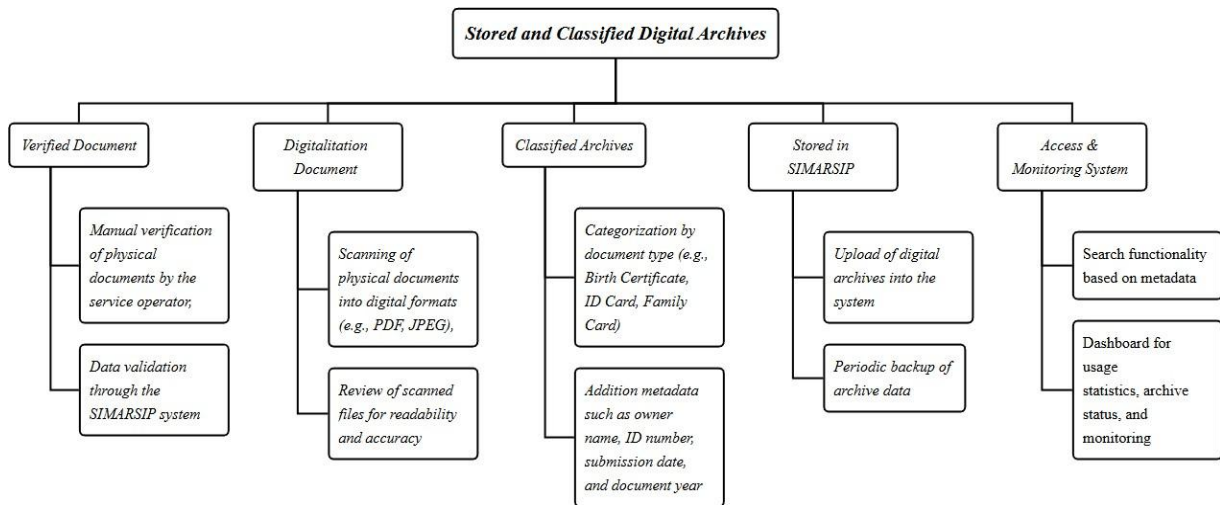


Figure 10. Product-Based Process Tree

3.4.4. Evaluation

An assessment is carried out on the suitability of the design to the needs of the organization and the effectiveness of the process in creating value. The redesigned process was assessed for:
 Effectiveness: Were non-value tasks removed and workflows shortened? Output Quality: Are documents accurate, standardized, and searchable?
 System Support: Is the system capable of managing archives with dashboard reporting?

3.5. To-Be modeling using BPMN

At this stage, the new business process is recreated by implementing solutions from the Product-Based Process Tree that was created previously, using Bizagi as a tool for creating BPMN.

3.5.1. Login & Registration Process

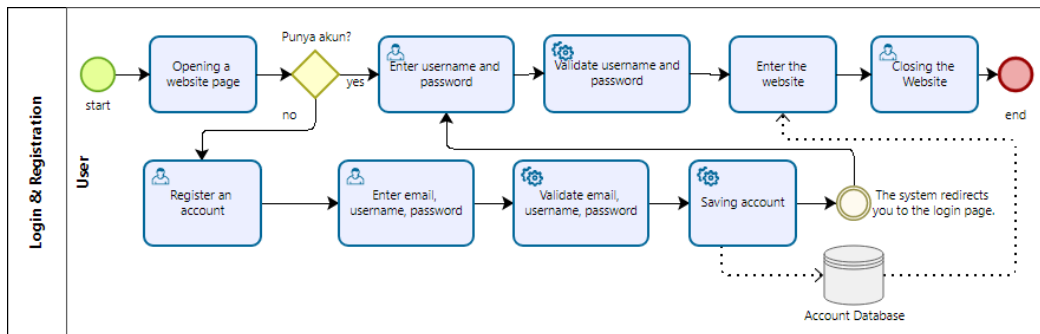


Figure 11. BPMN Diagram Login & Registration Process

The to-be business process for “Login & Registration Process” as illustrated in Figure 4.6, introduces a self-registration feature that simplifies account creation for new users. The process is as follows: (1) it begins when a user opens the website; (2) the system prompts the user with a question asking whether they already have an account. (3) If the user does have an account: (a) they enter their username and password, (b) the system validates the credentials, (c) if valid, the user gains access to the website, and (d) once finished, the user can close the site, ending the process. (4) If the user does not have an account: (a) they select the registration option, (b) fill in registration data such as email, username, and password, (c) the system validates the entered data, (d) if valid, the account is saved in the database, and (e) the system redirects the user back to the login page to proceed as previously described. (5) All validated and stored account data will be used in subsequent login processes. The addition of a self-registration feature enables new users to create their own accounts independently, removing the need for manual registration or administrator intervention. This improves accessibility and streamlines the login process for both users and system administrators.

3.5.2 Adding a New Documents Process

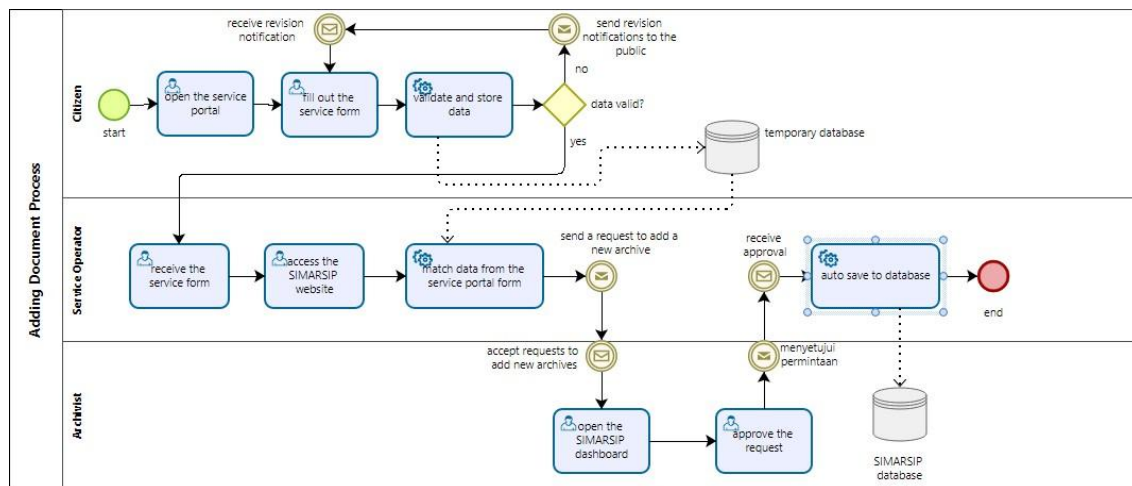


Figure 12. BPMN Diagram Adding New Document Process

The to-be business process for “Adding a New Document,” illustrated in Figure 12, introduces improved integration and automation between the public service portal and the SIMARSIP system. The process unfolds as follows: (1) the citizen initiates the process by accessing the service portal; (2) the citizen fills out the service request form through the portal; (3) the system validates the submitted data—(a) if invalid, a revision notification is sent to the citizen for correction; (b) if valid, the data is temporarily stored in the database, and the system automatically assigns a unique serial number to it; (4) the service operator receives the validated request; (5) the operator accesses the SIMARSIP web system; (6) the system verifies the form data by matching the unique serial number and then (b) sends an automated request to the archivist to add a new archive entry; (7) the archivist receives the request as a notification via their SIMARSIP dashboard—(a) the request for a new archive is displayed, and (b) the archivist approves the request; (8) the system receives the archivist’s approval; and (9) the new data and document are stored in the SIMARSIP database, completing the process. This redesigned process illustrates that the system now supports integration—albeit still limited to the database level. Nevertheless, it significantly streamlines the service workflow by eliminating redundant data entry between the portal and SIMARSIP. Validated data is automatically stored and made accessible to the operator using the unique serial number, enabling faster verification and processing. Additionally, the system now automates the document addition request by sending real-time notifications directly to the archivist’s dashboard, further improving efficiency in document management.

3.5.3 Searching Documents Process

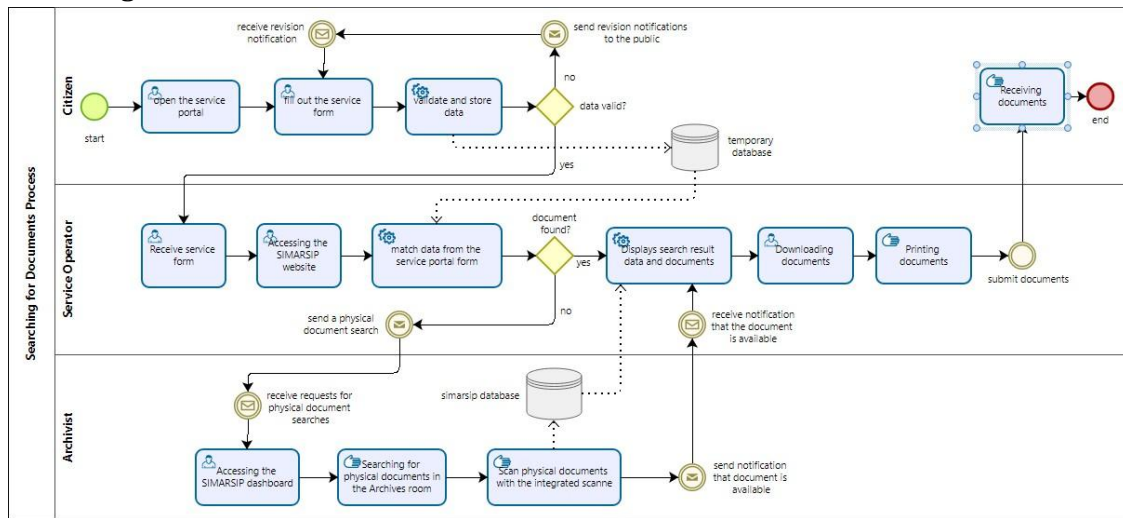


Figure 13. BPMN Diagram of Searching Documents Process

The to-be business process for “Searching Documents,” as illustrated in Figure 4.8, introduces an improved and semi-automated document retrieval workflow. The process is as follows: (1) the citizen accesses the public service portal to submit a document request; (2) the citizen fills out the request form directly on the portal; (3) the system validates the submitted data—(a) if invalid, a revision notice is sent to the citizen; (b) if valid, the data is temporarily stored in the database, and a unique serial number is automatically generated; (4) the service operator receives the request form; (5) the operator accesses the SIMARSIP system; (6) the system validates the search data by matching the serial number—(a) if a match is found, the system displays the corresponding document; (b) if not found, the system automatically sends a physical document search request to the archivist; (7) the archivist receives a system notification; (8) the archivist searches for the physical document in the archive room; (9) once found, the document is scanned using a scanner integrated with SIMARSIP, and the file is uploaded directly to the system; (10) after storage, the system sends an automated notification to the operator indicating that the document is available; (11) the system displays the search result; (12) the operator downloads and prints the document; and (13) the printed document is handed over to the citizen, concluding the process. This redesigned process demonstrates a well-integrated system, though currently limited to database-level integration. The system improves service efficiency by eliminating redundant data entry—citizen-submitted data is automatically validated and stored with a unique identifier, facilitating faster document search and tracking. Furthermore, the process of requesting a physical document search is automated through real-time notifications sent directly to the archivist's SIMARSIP dashboard. Once located and scanned, documents are instantly uploaded, accelerating availability for the operator and enhancing the overall responsiveness and accuracy of public document services.

3.6 Simulation Result and Comparison

To evaluate the effectiveness of the redesigned processes, both As-Is and To-Be models were simulated using Bizagi Modeler. The simulation parameters were based on real-world estimations from Dispendukcapil Malang, including: 20 document request users, 5 system operators, and 5 archivists. Each scenario measured the cycle time and resource load across three key processes: login, adding new documents, and document search. This section presents a comparison between the cycle times of the as-is and to-be business processes. The purpose of this comparison is to evaluate the impact of the proposed redesign on process efficiency. By measuring the duration of key activities before and after the redesign, the effectiveness of automation, system integration, and workflow improvements can be assessed. The reduction in cycle time serves as a key performance indicator of improved service delivery and reduced manual intervention.

3.6.1. Login Process

In the As-Is model, users without an account had to request one manually from IT staff, causing delays and inefficiencies. The To-Be model introduced self-registration, allowing users to sign up independently. Although the self-registration process takes additional time initially (approximately 120 seconds), it enables full process completion for first-time users, unlike the As-Is model. For existing users, the login cycle time remains identical at 40 seconds in both models.

3.6.2. Document Submission

The As-Is model involved manual handovers between citizens, operators, and archivists, using scanned physical forms and informal communication channels. This took an average of 38 minutes per request. The To-Be process implemented digital forms, automated data validation, and structured submission workflows, reducing the cycle time to 19 minutes. The staff workload also decreased significantly—despite a reduction in operators and archivists from 5 to 4 each, the process was completed faster with better resource utilization.

3.6.3. Document Search

In the As-Is process, finding documents—especially when not already digitized—required multiple manual approvals, physical archive checks, scanning, and upload. Depending on whether the document was found digitally or not, total time ranged between 45–57 minutes. The To-Be model digitized the search process with metadata-based filtering, automated notifications, and dashboard integration, reducing the time to 25 minutes (if found) or 37 minutes (if not yet digitized).

Table 6. Simulation Result

| Process | As-Is Cycle Time | To-Be Cycle Time | Efficiency Improvement |
|-------------------------|------------------|------------------|------------------------|
| Login (first-time) | Not available | 120 seconds | Fully enabled process |
| Login (existing user) | 40 seconds | 40 seconds | No Change |
| Add New Documents | 38 minutes | 19 minutes | 50% |
| Search Doc. (found) | 45 minutes | 25 minutes | 44% |
| Search Doc. (not found) | 57 minutes | 37 minutes | 35.1% |

4. CONCLUSION

In The study concludes that a combination of Root Cause Analysis and Product-Based Design can successfully address inefficiencies in digital archiving systems within public service organizations. By applying a structured problem-solving approach and backward design from desired outcomes, this research redesigned SIMARSIP's workflows to be more efficient, automated, and user-centric. Quantitative simulations confirmed substantial cycle time reductions across three critical processes—login, document submission, and search—demonstrating the impact of well-structured digital transformation. From a practical perspective, the research highlights the importance of combining stakeholder feedback with modeling tools to ensure that redesigned processes are aligned with user needs and institutional goals. The proposed solution not only resolved local challenges but also has broader implications for public agencies aiming to modernize legacy systems. Future research may explore the implementation phase of such redesigns, including integration with national databases, citizen mobile access, and real-time dashboards. Moreover, the approach can be expanded into other government sectors experiencing similar inefficiencies. The findings of this study contribute both to the field of business process redesign and to practical advancements in public sector digital transformation.

ACKNOWLEDGEMENTS

Acknowledgments are generally placed after the conclusion. Contains thanks to funding agencies, and or individuals who have assisted in conducting research and writing manuscripts.

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