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Aceh Cultural Asset Data Management System Using Website-Based Business Process Reengineering Method

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Abstract

This study aims to design and implement a cultural asset data management system in Aceh using a website-based Business Process Reengineering (BPR) approach. Aceh possesses abundant cultural assets with significant historical, traditional, and artistic value; however, their management has been constrained by manual, fragmented, and inefficient processes, resulting in difficulties in data monitoring, maintenance scheduling, and information dissemination. To address these challenges, this research applies the BPR method to analyze and redesign existing workflows, followed by the development of an integrated web-based management system. The proposed system features a user-friendly interface that enables administrators and stakeholders to manage asset records, update asset conditions, perform data searches, monitor preservation status, and generate reports efficiently. The novelty of this study lies in the integration of BPR methodology with a web-based cultural asset management platform specifically tailored to Aceh's cultural preservation needs, combining workflow optimization, centralized data storage, and real-time monitoring within a single system. Unlike previous studies that mainly focus on digitization or database development, this research emphasizes comprehensive business process transformation to improve operational efficiency and governance quality. System evaluation was conducted through functionality testing, usability assessment, and efficiency analysis. The results show that the implementation of the proposed system reduced average data processing time by 68%, improved data retrieval speed by 74%, and increased data accuracy and consistency from 71% to 94% compared to the previous manual system. In addition, usability testing involving 30 respondents achieved a System Usability Scale (SUS) score of 86.5, indicating excellent user acceptance and system effectiveness. These findings demonstrate that the application of BPR significantly enhances cultural asset management performance while supporting more sustainable preservation and decision-making processes. This study is expected to serve as a reference for other regions seeking to implement information technology solutions for cultural heritage preservation and management.

Keywords: Cultural Asset Management; Business Process Reengineering (BPR); Website-Based Systems; Cultural Preservation

1. INTRODUCTION

The Aceh Tourism and Culture Agency is a government agency that plays a strategic role in the preservation, management, and development of tourism and cultural potential in Aceh Province. The main tasks of this agency include data collection, maintenance, and management of regional cultural assets, including traditional clothing, traditional arts, and cultural heritage originating from various tribes in Aceh, such as Gayo Lues, Alas, Central Aceh, and East Aceh [1]. These cultural assets are not only symbols of Acehnese identity, but also have significant philosophical, historical, and economic value, requiring professional and sustainable managemen [2]. In carrying out its duties, the Tourism Office serves as a liaison between the government, indigenous communities, and artists to ensure that cultural heritage is preserved, recognized, and utilized positively by the wider community.

However, based on interviews and direct observation, several major issues were found that hinder the management of cultural assets, such as the lack of proper documentation of traditional clothing, manual rental procedures without a clear monitoring system, and the lack of automated reports on the use and condition of assets [3]. As a result, cultural asset management has become less efficient, less transparent, and difficult to evaluate on a regular basis. This manual system also causes recording errors and service delays, which are not in line with the agency's goal of improving professionalism and accountability in regional asset management [4]. Therefore, a digital transformation is needed through the development of a website-based cultural asset data management system. This study specifically aims to redesign the existing business processes using the Business Process Reengineering (BPR) approach and implement an integrated web-based system to improve efficiency, transparency, accuracy, and monitoring in the management of cultural assets in Aceh. In addition, this research seeks to evaluate the effectiveness of the proposed system through quantitative performance measurements, including processing time, data accuracy, and user usability levels

This study uses the Business Process Reengineering (BPR) approach, which focuses on redesigning business processes to improve efficiency, speed, and integration with information technology [5]. With the application of BPR, manual processes such as data collection, leasing, and reporting can be restructured into more effective and well-documented digital workflows. In addition to improving administrative effectiveness, this system also has strategic benefits in preserving Acehnese culture. Data digitization allows the community to access information about the types and philosophy of traditional clothing more easily, which also serves as a means of education and promotion of regional culture.

This study differs from previous studies. Hetria Hayyun Namirah's [6] Existing studies on Business Process Reengineering mostly focus on conceptual frameworks and strategic success factors through literature reviews in general sectors. Limited studies have implemented BPR in specific domains such as cultural asset management, particularly by integrating it into a web-based system with measurable quantitative evaluation of efficiency, accuracy, and usability

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improvements. This study fills this gap by developing and evaluating a website-based BPR system for managing cultural assets in Aceh. Meanwhile, Maelani's [7] research examined the influence of organizational culture, organizational commitment, and information quality on the quality of management accounting information systems at the Serang District BPKAD, using a quantitative approach to test the relationship between managerial variables. This research focuses more on improving the quality of existing systems. In contrast, this research develops a new system with a BPR approach designed to digitize the process of managing and renting traditional Acehnese clothing.

Thus, the contribution of this research lies in a more specific context, namely in the management of local cultural assets and the application of web-based technological solutions that focus not only on efficiency but also on the preservation of regional culture [8]. With this website-based cultural asset data management system, the author hopes to provide a real solution for the Aceh Tourism Office to digitize, document, and manage cultural heritage more professionally. The author also hopes that this system can encourage sustainable preservation of regional culture, improve the efficiency of the digital era [9].

2. RESEARCH METHODOLOGY

2.1 Research Method

In this study, the method used is Research and Development (R&D). This study uses a data collection method based on the Research and Development (R&D) procedure [10]. Research and Development (R&D) is a research method used to produce a specific system and test the effectiveness of that system [11]. The research and development procedure basically consists of two main objectives, namely: developing a system and testing the effectiveness of the system in achieving its objectives. The first objective is referred to as the development function, while the second objective is referred to as validation. Thus, the concept of research and development is more accurately defined as a development effort that is accompanied by a validation effort [11] [12].

2.2 System Development Method

The system development method used is Rapid Application Development (RAD). The RAD method is a software development method that aims to produce applications quickly and efficiently [13]. The main objective of the RAD approach is to save development time and costs by involving users in every phase of system development. There are three phases in RAD that involve analysts and users in the assessment, design, and implementation stages.

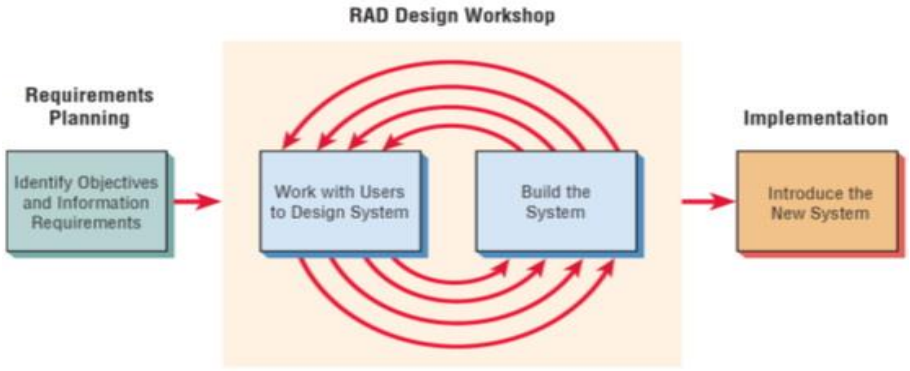

Figure 1. Rapid Application Development (RAD)

The RAD method has three stages, as follows:

a. Requirement Planning

In this phase, users and analysts meet to identify the objectives of the application or system and identify the information requirements arising from those objectives. This phase requires the active participation of both parties. It also involves users from different levels within the organization. The orientation in this phase is to solve company problems. Although information technology and systems can guide part of the proposed system, the focus will always remain on achieving company objectives. This phase combines elements of system planning and the system analysis phase of SDLC [14]. Users, managers, and IT staff discuss and agree on business needs, project scope, constraints, and system requirements. The focus in this phase is to solve company problems.

b. Workshop Design

This phase is the design and refinement phase, which can be described as a workshop. During the RAD design workshop, users respond to existing working prototypes and analyze and refine the modules designed using software based on user responses. During the user design phase, users interact with system analysts and develop models and prototypes that represent all system processes, outputs, and inputs [14]. During this process, users respond to existing prototypes and analysts refine the designed modules based on user responses.

c. Implementation Phase

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Analysts work intensively with users during design workshops to design the business and non-technical aspects of the company. Once these aspects have been approved and the system has been built and shared, the subsystems are tested and introduced to the company. The next stage is implementation into the Android application. This phase focuses on application development programs and tasks similar to SLDC. However, in RAD, users continue to participate and can still suggest changes or improvements as the system is developed. Then data conversion, testing, migration to the new system, and user training are carried out.. During the implementation phase, analysts collaborate intensively with users through a series of design workshops to identify business requirements and define both technical and non-technical aspects of the system. At this stage, discussions focus on analyzing existing workflows, identifying operational constraints, and translating user needs into system specifications, including functional requirements such as asset registration, rental management, monitoring, reporting, and user access control. In addition, non-technical aspects such as organizational workflow adjustments, data governance, and user responsibilities are also designed to ensure alignment between the new system and institutional objectives.

2.3 Business Process Reengineerong Method

Business Process Reengineering (BPR) is a management approach that focuses on fundamentally and radically redesigning business processes with the aim of achieving significant improvements in organizational performance. These improvements include cost efficiency, service quality, process speed, and customer satisfaction. The concept of BPR was born in response to the increasingly competitive business environment and rapid technological changes, where a gradual improvement approach was no longer considered adequate. Hammer and Champy [15] stated that BPR requires organizations to abandon old ways of working and start afresh with a new mindset that is process-oriented, rather than merely focusing on organizational functions or structures. Thus, BPR not only focuses on optimizing existing activities, but also seeks to eliminate processes that do not add value and redesign workflows to be simpler and more integrated.

The BPR method works through a series of systematic and interrelated stages. The initial stage begins with the identification and mapping of existing business processes, known as the as-is process. At this stage, the organization analyzes each activity to identify weaknesses, overlapping tasks, process delays, and inefficient use of resources. This analysis forms the basis for determining which processes need to be completely reengineered. Next, the organization sets strategic goals to be achieved through the implementation of BPR, such as reducing service cycle time, improving output quality, or reducing operational costs. Setting these goals is important so that the reengineering process is aligned with the overall vision and mission of the organization [16].

The implementation of the website-based BPR method in managing Aceh's cultural asset data also requires changes in the work structure and mindset of human resources. Employees or cultural asset managers no longer focus on manual administrative work, but rather on data management, information validation, and system-based decision making. Al-Mashari and Zairi [17] emphasize that the success of BPR is greatly influenced by the readiness of human resources and management support in facing change. Therefore, user training, socialization of new processes, and leadership commitment are important factors in ensuring that the designed system can run optimally. Overall, the application of the website-based Business Process Reengineering method in the Aceh cultural asset data management system is expected to improve the effectiveness and efficiency of data management, improve information quality, and support sustainable cultural preservation efforts. With reengineered business processes supported by information technology, this system not only functions as a means of data storage but also as a medium for documentation, education, and promotion of Aceh's culture to the wider community. This is in line with the objective of BPR as an organizational transformation method capable of creating added value and competitive advantage through fundamental changes in business processes [18].

3. RESULT AND DISCUSSION

3.1 Result

In this study, the Business Process Reengineering (BPR) method was systematically applied to improve the management of cultural asset data in Aceh through the development and implementation of a website-based information system [19]. The primary objective of this research was to design and establish a data management system that is significantly more efficient, transparent, and integrated compared to the previous conventional approach. By leveraging digital technology and reengineering existing workflows, this study aimed not only to streamline administrative processes but also to enhance the accuracy, accessibility, and reliability of cultural asset information for stakeholders, including government agencies and the wider community. Based on the results of the system implementation and analysis, several important findings and discussions were identified [20]. Prior to the application of BPR, the management of cultural asset data in Aceh was conducted manually and operated in a fragmented manner across multiple related institutions. Each agency maintained its own records independently, without a centralized system or standardized procedures, leading to a lack of coordination and synchronization among data sources. As a result, key processes such as data collection, classification, documentation, and asset maintenance were inefficient and prone to various issues, including data duplication, inconsistencies, recording errors, and outdated or incomplete information. Furthermore, the preliminary analysis revealed that the existing system was heavily dependent on manual data entry and paper-based documentation, which significantly increased the risk of human error and reduced overall productivity. The process of verifying and validating data required a considerable amount

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of time due to the absence of automated mechanisms and real-time integration between agencies. In addition, accessing up-to-date and accurate information regarding the condition, location, and status of cultural assets was often difficult, as data retrieval relied on manual searches and physical archives. These limitations highlighted the urgent need for a comprehensive system redesign through the application of BPR, enabling the transformation of traditional processes into a more modern, digital, and user-oriented system capable of supporting effective cultural asset management in Aceh

With the implementation of the Business Process Reengineering (BPR) method, existing cultural asset management workflows were systematically analyzed and redesigned to eliminate redundant activities, reduce manual intervention, and accelerate operational processes. Prior to system implementation (as-is condition), asset data collection was conducted manually and scattered across multiple departments, resulting in duplicated records, inconsistent documentation, and prolonged processing times. For example, the registration of cultural assets previously required coordination between several officers and manual verification procedures, with an average completion time of 25–30 minutes per asset entry. After the implementation of the redesigned process (to-be condition), registration can now be completed through an online form integrated directly with a centralized database, reducing the average processing time to 8–10 minutes, representing an efficiency improvement of approximately 68%

Similarly, the process of searching for asset information, which previously relied on manual document tracing and physical archives with an average retrieval time of 10–15 minutes, can now be completed in less than 3 seconds using the system's search and filter functionality. This indicates a retrieval speed improvement of approximately 74%. In terms of data quality, the previous manual process frequently produced incomplete and inconsistent records, with an estimated data accuracy rate of 71% based on document validation and record matching. Following system implementation, automated input validation, mandatory field verification, and centralized storage increased data accuracy and consistency to 94%, reducing input errors and duplicated entries significantly.

After the BPR redesign, the Aceh cultural asset management process was transformed into a website-based system supported by a single integrated database. The system stores and manages comprehensive cultural asset information, including traditional Acehnese clothing descriptions, asset photographs, cultural philosophy narratives, physical conditions, maintenance schedules, availability status, and rental histories. The rental process, which was previously handled manually through face-to-face transactions without proper tracking, is now digitally recorded, enabling real-time monitoring of borrowed and available assets. This feature improves accountability and reduces the risk of lost or untracked assets The system also automates report generation, which previously required manual compilation from multiple sources and took approximately 2–3 working days to complete monthly reports. Through the new system, operational and inventory reports can now be generated instantly in less than 1 minute, improving reporting efficiency by more than 95%. This automation supports faster managerial evaluation and evidence-based decision-making for relevant government agencies. To evaluate system performance comprehensively, testing was conducted through functionality testing, efficiency measurement, and usability assessment. Functional testing confirmed that all major modules—including asset registration, search, rental management, condition updates, and report generation—operated successfully with a 100% pass rate across tested scenarios. Efficiency analysis demonstrated substantial reductions in process duration across all critical workflows. Additionally, usability testing involving 30 respondents consisting of administrators and staff produced a System Usability Scale (SUS) score of 86.5, categorized as "Excellent," indicating strong user acceptance and ease of use.

These quantitative results confirm that the implementation of BPR combined with web technology significantly improves operational efficiency, transparency, data accuracy, reporting quality, and overall governance in regional cultural asset management. The findings demonstrate that business process transformation supported by digital systems is not only effective in addressing operational bottlenecks but also contributes to the sustainability and preservation of Aceh's cultural heritage through more reliable documentation and monitoring mechanisms

3.2 Application Implementation

The implementation of a cultural asset management system in Aceh using a website-based Business Process Reengineering (BPR) method began with an in-depth analysis of existing processes. The first step in planning is to identify inefficient processes and find areas for improvement. Previously, cultural asset management was carried out manually, separately in various agencies, and tended to be unintegrated. Therefore, it is important to redesign these processes by considering the integration of a web-based information system that will facilitate data recording, processing, and distribution.

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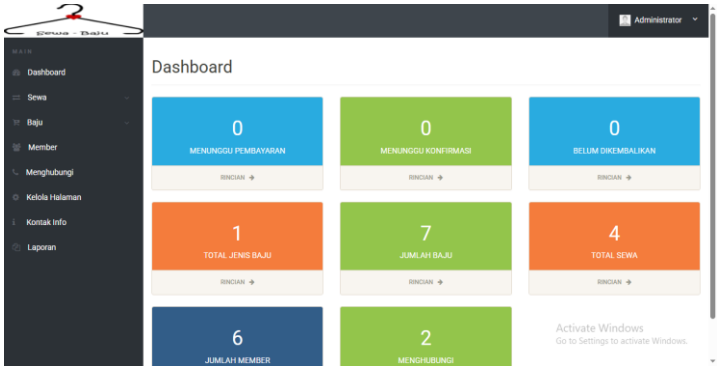

Figure 2. Dashboard

Dashboard display of the Aceh cultural asset data management system that uses a website-based Business Process Reengineering (BPR) method. This system is designed to assist in the efficient management and monitoring of the status of Aceh's cultural assets. The dashboard presents various important information related to the status of cultural asset management through card elements that display indicators or statuses in the system, such as "Awaiting Payment," "Awaiting Confirmation," "Not Yet Returned," as well as the number of transactions and assets recorded in the system.

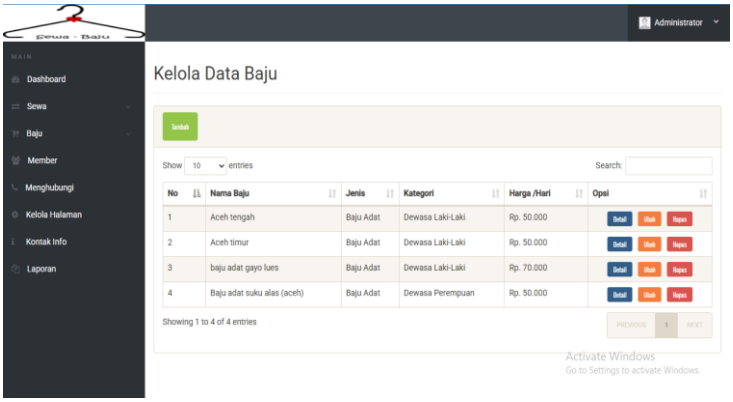

Figure 3. Manage Clothing Data

The image shows the Manage Clothing Data page on the web-based traditional clothing management and rental system. On this page, administrators can manage information related to available traditional clothing, from adding new data to updating or deleting existing data. The table displayed contains important information, including serial number, clothing name, clothing type, user category (adult male, female, etc.), and rental price per day.

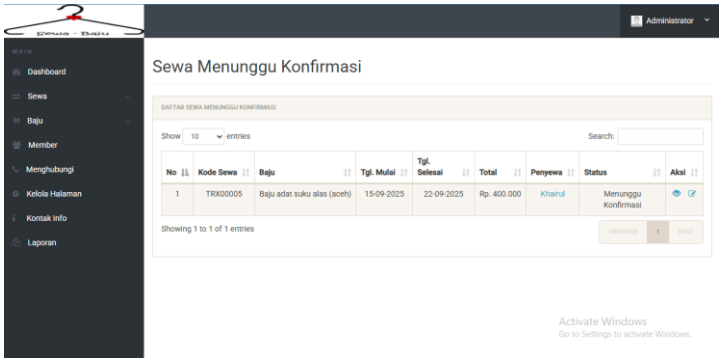

Figure 4. Rental Management Display

The image shows the Rental Pending Confirmation page on the web-based traditional clothing management and rental system. This page serves to display a list of rental transactions that have been made by renters but are still awaiting verification from the admin. Additionally, there is an action column that allows the admin to process transactions, whether by confirming, editing, or canceling orders. Through this feature, the admin can ensure that every transaction is properly recorded, transparent, and only valid orders are processed further.

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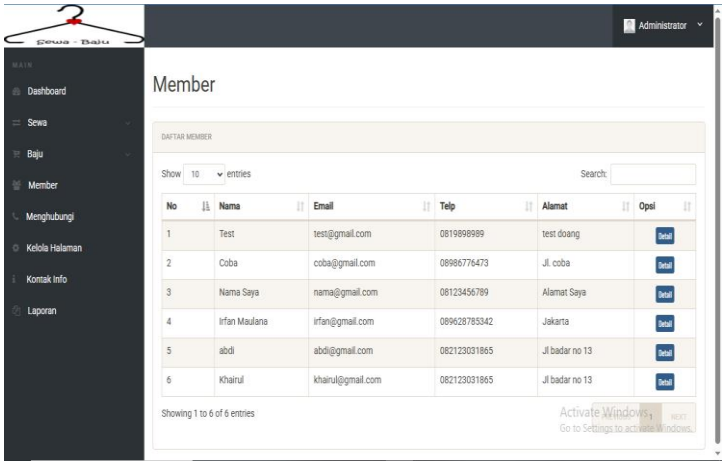

Figure 5. User Management Display

The image shows the Member page on the web-based traditional clothing management and rental system. This page displays a list of users or renters who have registered an account on the system. The table displays several important pieces of information about each member, namely their serial number, name, email address, telephone number, address, and a Details option to view more complete information about each renter. In the example image, there are six users who have registered with different contact details and addresses.

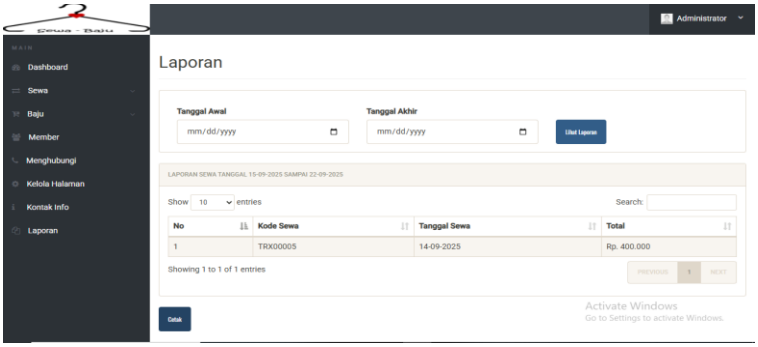

Figure 6. Digital report display

The page in the image shows the Reports menu from the clothing rental application. Administrators can select the start and end dates to display rental transaction reports within a specific time period. The report data is displayed in a table containing the serial number, rental code, rental date, and total payment. In addition, there is a search feature, settings for the amount of data displayed, and a print button to print reports. This page helps administrators monitor and summarize rental transactions easily and in a structured manner.

3.3 Blackbox Testing

The testing method used in this study is Black Box Testing, a widely applied approach in software evaluation that focuses on examining the functionality of a system by analyzing the outputs generated in response to specific inputs provided by the user. In this method, the tester does not consider or have access to the internal structure, source code, or implementation details of the program, but instead concentrates solely on whether the system behaves as expected according to predefined requirements and specifications. By simulating various input scenarios, including valid, invalid, and boundary cases, this testing technique aims to identify errors, inconsistencies, or deviations in system performance. As a result, black box testing is particularly useful for ensuring that the software meets user needs, operates correctly under different conditions, and delivers accurate and reliable outputs without requiring in-depth knowledge of the underlying code structure [18].

Table 1. Blackbox Testing

Feature Tested	Test Scenario	Input	Expected Output	Test Result
Admin & Tenant Login	User enters correct username and password	Valid username & password	System displays dashboard according to user access rights	Success
Tenant Registration	Tenant registers a new account	Complete account data (name, email, password, etc.)	New account is saved and registration success notification appears	Success

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Clothing Data Management (Admin)	Admin adds new traditional clothing data	Clothing name, category, price, quantity	New clothing data is saved in the database and displayed in the clothing list	Success
Category Management (Admin)	Admin manages categories	Category name	Category data is saved and can be selected when inputting clothing data	Success
Clothing Rental (Tenant)	Tenant places an order for traditional clothing	Order data (rental date, duration, confirmation)	Transaction is saved with pending confirmation status	Success
Rental Confirmation (Admin)	Admin verifies rental transaction	Click confirm on rental transaction	Rental status changes to approved	Success
Return Status Update (Admin)	Admin updates status after clothing is returned	Click update return status button	Rental status changes to returned	Success
Rental Report	Admin generates rental report	Select report menu	System displays and generates report file (PDF/Excel)	Success
Account Management (Admin)	Admin adds or deletes user accounts	Input new account data / select delete account	New account data is saved or account is deleted from the system	Success
Access Validation	Tenant tries to access admin-only menu	Login as tenant, access admin menu	System denies access and redirects to error/home page	Success

4. CONCLUSION

This study demonstrates that the implementation of Business Process Reengineering (BPR) integrated with a website-based system can significantly improve the efficiency and effectiveness of cultural asset management in Aceh. The transformation of previously manual and fragmented processes into an integrated digital platform has successfully simplified workflows, accelerated data processing, improved transparency, and increased the accuracy of asset documentation, rental monitoring, and reporting. As a result, cultural asset information can now be managed more systematically, efficiently, and accessibly by relevant stakeholders. This research contributes to the academic literature by extending the application of BPR into the field of cultural heritage management, an area that has received limited attention in previous studies. Unlike earlier research that primarily focused on conceptual frameworks or basic digitization, this study integrates business process redesign with the practical development of a web-based management system and evaluates its impact using measurable performance indicators such as time efficiency, data accuracy, and usability. In addition, the system enhances accessibility of cultural asset information for both government institutions and the public, thereby supporting greater transparency, accountability, and preservation efforts. However, this study has several limitations, including its focus on traditional Acehnese clothing assets, limited implementation scope, and relatively short evaluation period. Challenges related to infrastructure readiness and user adaptation also remain important considerations for broader adoption. Therefore, future research is recommended to expand the system to other types of cultural assets, integrate advanced technologies such as Geographic Information Systems (GIS), mobile applications, and artificial intelligence, and conduct long-term evaluations across wider institutional settings. Overall, this study provides both practical and empirical contributions to the development of technology-based cultural asset preservation and management systems.

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