Web-Based Credit Score Conversion Assessment System Using The Repository Pattern Based On PermenPAN-RB Number 1 of 2023

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Abstract

The performance evaluation of civil servants (PNS) is fundamental to ensuring accountability and effectiveness in public administration. However, current processes often face challenges in data accuracy, transparency, and accessibility. This study develops a web-based Credit Score Conversion Assessment Information System, specifically designed to comply with the regulatory shift introduced by PermenPAN-RB Number 1 of 2023, which transitions from activity-based counting to performance predicate conversion. A key contribution of this research is the implementation of the Repository Pattern, which decouples business logic from data access to enhance system maintainability and scalability against future regulatory updates. The research follows a prototyping methodology, involving needs analysis, architectural design, implementation, and functional testing. The results demonstrate that the system, named SmartPAK Untad, significantly improves the efficiency of credit score management and ensures data integrity through integrated synchronization with the SISTER platform. This developed system serves as a robust digital model for performance management across various government agencies in Indonesia..

Keywords *— Civil Servants, Credit Score, Information System, Repository Pattern, Web*

1. INTRODUCTION

In today's digital era, digital transformation has become a crucial factor in enhancing the efficiency and effectiveness of various sectors, including the public sector. Managing the performance of civil servants (PNS) is one area that requires improvement through the utilization of information technology. The Regulation of the Minister of State Apparatus Empowerment and Bureaucratic Reform (PermenPAN-RB) Number 1 of 2023 [1] has established a new scheme for credit score conversion assessment for civil servants. However, the implementation of this scheme often faces challenges due to assessment systems that are not yet fully digitalized, resulting in issues related to data accuracy, time efficiency, and process transparency.

The challenges in implementing credit score conversion assessments highlight the need for an information system that can address issues of data inconsistency, difficulties in data management and access, as well as a lack of transparency in the assessment process. Therefore, this study aims to address the problem of how to design an efficient, accurate, and easily accessible credit score conversion assessment information system and how the

repository pattern can be applied in system development to enhance maintainability and scalability.

Previous studies serve as analytical references to enrich discussions and highlight differences with the current research. Several related studies provide comparisons and insights for this research. For instance, Nunyai et al. (2023) developed a credit score assessment application for lecturers at FMIPA Universitas Lampung using the waterfall development method to streamline the evaluation process [2]. Similarly, Chotib et al. (2020) created a web-based credit score assessment system for Kopertais Wilayah I DKI Jakarta using the prototype development method [3]. Widyastuti et al. (2019) designed a credit score calculation system featuring functions such as credit acquisition input, validation of recognized limits, score calculation, cumulative credit display, and acquisition details [4]. Additionally, Minartiningtyas et al. (2018) focused on building a credit score calculation information system for lecturers at STMIK STIKOM Indonesia [5]. Lastly, Kusuma et al. (2018) introduced a model for assessing functional lecturer credit scores. These studies collectively emphasize the importance of efficient, accurate, and accessible credit score systems, providing a foundation for designing a more scalable and maintainable solution through modern system development approaches [6].

While previous studies have developed various credit score systems, they predominantly address the older, cumulative-based assessment schemes. The novelty of this research lies in its specific alignment with the fundamental regulatory shift introduced by PermenPAN-RB Number 1 of 2023, which transitions from activity-based counting to performance predicate conversion. Furthermore, unlike existing systems that often tightly couple business logic with data access, this study introduces the Repository Pattern to ensure high maintainability and scalability [7], [8]. This architectural choice provides a robust solution for government institutions to adapt to frequent regulatory updates without requiring a complete system overhaul [9].

2. RESEARCH METHOD

The materials used in this study include data from the Legal, Governance, and Personnel Division of Tadulako University, specifically the 2022 lecturer credit score integration data obtained from the Integrated Information System (SISTER) managed by the Ministry of Education, Culture, Research, and Technology for lecturers at Tadulako University. The assessment process adheres to the guidelines set by Ministerial Regulation of State Apparatus Empowerment and Bureaucratic Reform (PermenPAN-RB) Number 1 of 2023 concerning Functional Positions as shown in Figure 1.



SALINAN

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PENDAYAGUNAAN APARATUR NEGARA
DAN REFORMASI BIROKRASI
REPUBLIK INDONESIA

PERATURAN MENTERI PENDAYAGUNAAN APARATUR NEGARA DAN
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Figure 1. PermenPAN-RB Number 1 of 2023

2.1. Research Materials

These materials and tools ensure the effective design, development, and evaluation of system. The tools utilized in this research are:

1) Hardware:
   Computer with Intel Core i5-13420H of CPU, 16GB of RAM, dan 512GB of SSD storage.
2) Software:
   - Visual Studio Code as the primary code editor.
   - Laravel Framework with Inertia.js for backend development.
   - ReactJS and Typescript for frontend development.
   - MySQL for database management.
   - Nginx for PHP web server.

Several data collection techniques were employed in this study, as follows:

a) Data Retrieval
   The researcher retrieved the 2022 lecturer credit score integration data within Tadulako University through the Integrated Information System (SISTER) managed by the Ministry of Education, Culture, Research, and Technology as shown in Figure 2.

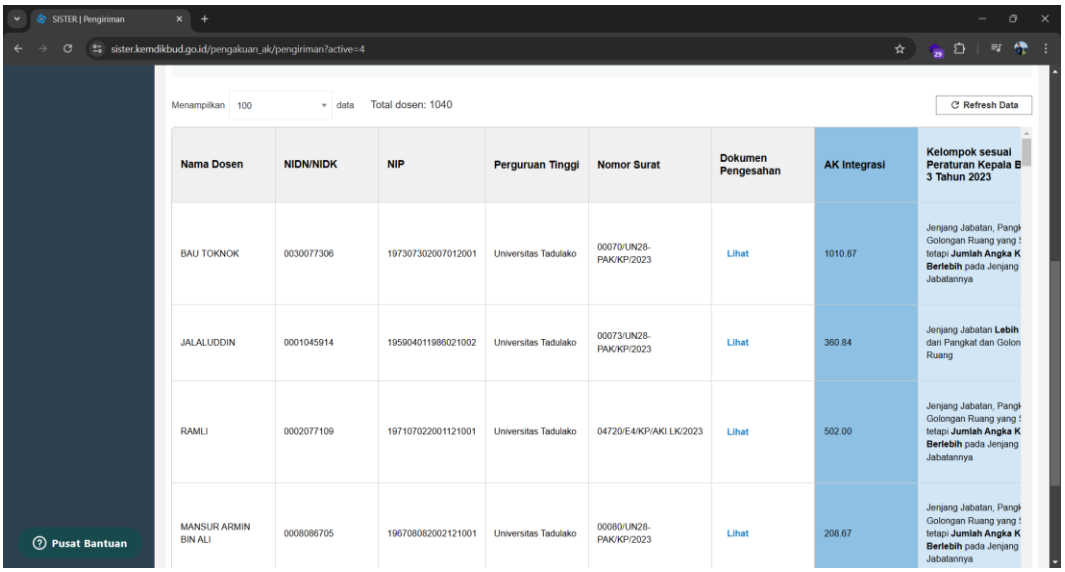


Figure 2. Credit Score Integration of SISTER

b) Literature Study

The researcher conducted a literature review related to the development of information systems using the repository pattern and the regulations governing credit score conversion assessments with relevant government regulations and applicable laws [10].

2.2. System Development

The system development method used in this study is the prototyping as shown in Figure 3. Prototyping is an initial version of a software system designed to provide an overview of the system being developed and to identify potential problems and solutions [11].

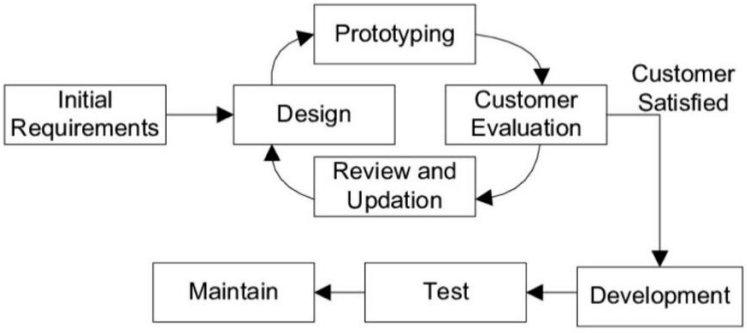


Figure 3. Prototype Model

Several stages are involved in this study to ensure smooth implementation and successful outcomes [12], [13]. These research stages are illustrated in Figure 4 below.

3. SYSTEM DESIGN

Information systems play a crucial role in enhancing efficiency and accuracy across various business processes, including the public sector. One of the primary challenges in managing the performance of Civil Servants (PNS) lies in the assessment of credit score conversion, which is often hindered by technological limitations, data inconsistencies, and a lack of transparency. With the issuance of Ministerial Regulation of State Apparatus Empowerment and Bureaucratic Reform (PermenPAN-RB) Number 1 of 2023, there is a need for a system that can accommodate the new requirements for credit score assessment within universities through a digital and transparent approach.

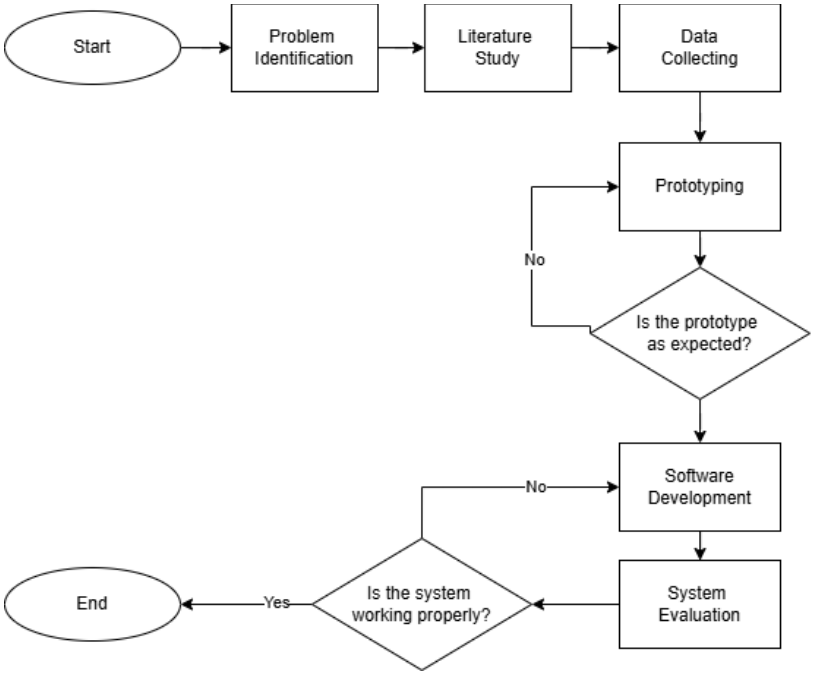


Figure 4. Research Stages and Flowchart

This research aims to develop a Web-Based Credit Score Conversion Assessment Information System, referred to as SmartPAK Untad, utilizing the repository pattern as a method for managing data and organizing code structure. This approach is designed to support system efficiency, accuracy, and scalability.

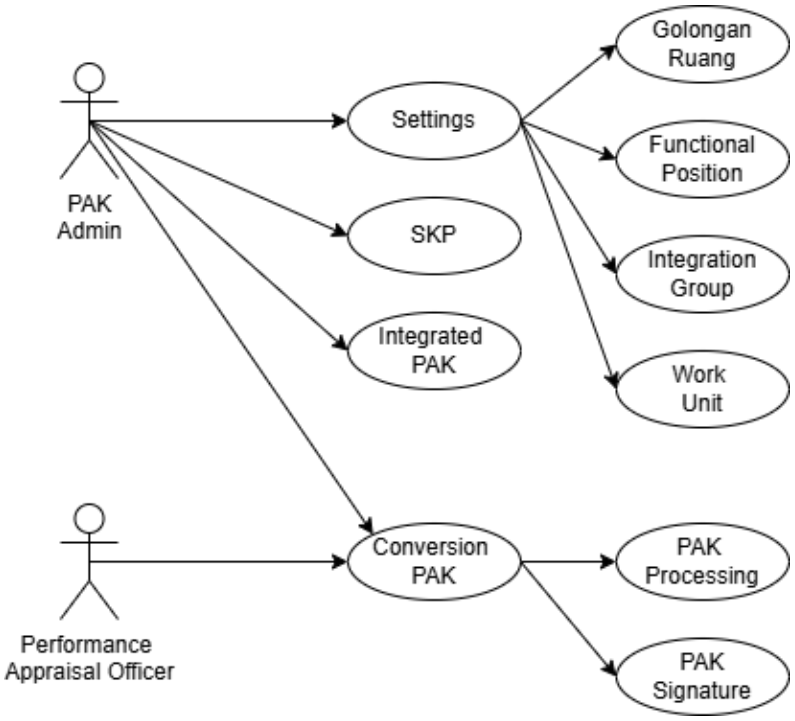


Figure 5. Use Case Diagram

3.1. Repository Pattern

The Repository Pattern is a widely adopted design pattern in software development that provides a structured approach for managing data access and business logic separation [14]. It serves as a bridge between the domain layer (business logic) and the data access layer (persistence layer), ensuring clean, maintainable, and testable code. Furthermore, the Repository Pattern has been widely applied in various system development projects, as evidenced by several previous studies [15], [16]. This approach improves code maintainability with this benefits:

1) Separation of Concerns
   The repository pattern separates data access logic from the business logic, leading to cleaner and more modular code. This allows developers to focus on application features without worrying about the underlying database operations.
2) Testability
   By abstracting the data access layer, repositories make it easier to write unit tests. Mock implementations of the repository can replace actual database connections during testing, enabling faster and isolated testing processes.
3) Flexibility and Maintainability
   If the underlying database or data source changes (e.g., switching from MySQL to PostgreSQL), the repository layer can adapt with minimal changes to the business logic. This flexibility simplifies maintenance and system upgrades.
4) Code Reusability
   The repository can centralize common queries and data access methods, making them reusable across different parts of the application.

5) Improved Readability
Queries and data access logic are abstracted into well-defined repository methods, making the code more readable and easier to understand.

3.2. Implementation

The repository pattern can be applied modularly to various desired processes. Figure 8 illustrates an example of a process structure implementing the repository pattern, specifically a service for processing the Credit Score Assessment (PAK) Conversion document in PDF format. This process consists of three documents: Credit Score Integration Conversion, Cumulative Credit Score Accumulation, and Credit Score Conversion Assessment.

This approach simplifies application development, especially when adjustments to regulations are required in the future [17]. By separating program logic and the document layout or view [18], the implemented repository pattern as shown in Figure 6.

```
app/
|-- Repositories/
|   |-- PdfRepository.php
|
resources/
|-- views/
|   |-- pdf/
|       |-- konversi.blade.php
|       |-- akumulasi.blade.php
|       |-- penetapan.blade.php
|
routes/
|-- web.php
```

Figure 6. Repository Pattern Implementation Example

The implementation of the PdfRepository class, which encapsulates the core logic for rendering various HTML templates into a unified PDF document, is illustrated in Figure 7. By centralizing this logic within a repository, the system ensures that document generation is decoupled from the controller, thereby enhancing code maintainability [19].

```php
<?php

namespace App\Repositories;

use Barryvdh\DomPDF\Facade\Pdf;

class PdfRepository
{
    public function generateCombinedPdf(array $data)
    {
        // Render HTML dari masing-masing template
        $html1 = view('pdf.konversi', compact('data'))->render();
        $html2 = view('pdf.akumulasi', compact('data'))->render();
        $html3 = view('pdf.penetapan', compact('data'))->render();

        $combinedHtml = $html1 . '<div style="page-break-after: always;"></div>'
                      . $html2 . '<div style="page-break-after: always;"></div>'
                      . $html3;

        // Generate PDF
        return Pdf::loadHTML($combinedHtml)->setPaper('a4', 'portrait');
    }
}
```

Figure 7. Implementation of the PdfRepository Class for PDF Generation Logic

To utilize this repository, the application controller employs dependency injection to call the PDF generation logic. This approach allows the PdfController to remain clean and focused solely on handling HTTP requests, as demonstrated in the code snippet shown in Figure 8.

```php
<?php

namespace App\Http\Controllers;

use App\Repositories\PdfRepository;

class PdfController extends Controller
{
    protected $pdfRepository;

    // Dependency Injection
    public function __construct(PdfRepository $pdfRepository)
    {
        $this->pdfRepository = $pdfRepository;
    }

    /**
     * Generate combined PDF for PAK
     *
     * @return \Illuminate\Http\Response
     */
    public function generatePakPdf()
    {
        $data = [
            'nama' => 'Nouval Trezandy Lapatta',
            'nip' => '19910112201504100 2',
            'karpeg' => 'B00021668',
            'ttl' => 'TOLI-TOLI / 1991-01-12',
            'jenis_kelamin' => 'L',
            'golongan' => 'Penata / III/C / 2023-04-01',
            'jabatan' => 'Lektor / 2023-02-01',
            'unit_kerja' => 'Universitas Tadulako',
            'angka_kredit_tahunan' => [
                ['tahun' => '2022', 'periode' => 'AK Integrasi', 'predikat' =>
'Sangat Baik', 'prosentase' => '150%', 'koefisien' => '25', 'angka_kredit' =>
'111'],
                ['tahun' => '2023', 'periode' => 'Desember', 'predikat' => 'Sangat
Baik', 'prosentase' => '150%', 'koefisien' => '25', 'angka_kredit' => '37.5'],
            ],
            'total_kredit' => 148.5,
        ];

        // Generate PDF melalui Repository
        $pdf = $this->pdfRepository->generateCombinedPdf($data);

        // Stream PDF ke browser
        return $pdf->stream('Dokumen_PAK.pdf');
    }
}
```

Figure 8. Dependency Injection of PdfRepository Within PdfController

Finally, to make the PAK generation functionality accessible to users via a web browser, a specific route is defined to map the request to the controller's method. The definition for this endpoint is depicted in Figure 9.

```php
use App\Http\Controllers\PdfController;

Route::get('/generate-pak-pdf', [PdfController::class, 'generatePakPdf'])-
>name('generate.pak_pdf');
```

Figure 9. Route Definition for Accessing the PAK Generation Endpoint

The implementation of this structure ensures that modifications to the PDF document layout do not interfere with the routing logic or the main controller, strictly adhering to the principle of Separation of Concerns. The following is a summary explanation of the workflow

for processing the Credit Score Assessment (PAK) Conversion document using the repository pattern structure and classes described above:

1) Controller
   - Responsible for handling requests through the route.
   - Calls the repository to execute the PDF generation function.
2) Repository
   - Combines the logic for generating the PDF document.
   - Manages the rendering of the PDF document template.
3) View Template
   - Defines the layout of the PAK PDF document template.
   - Generates the HTML structure before being rendered as a PDF.

The business process for generating the PAK document is illustrated in Figure 10. The system will record the Integrated Credit Score (AK Integrasi), if available, then convert the performance predicate based on SKP achievements and accumulate the converted Credit Scores before finally generating the PAK Conversion document.

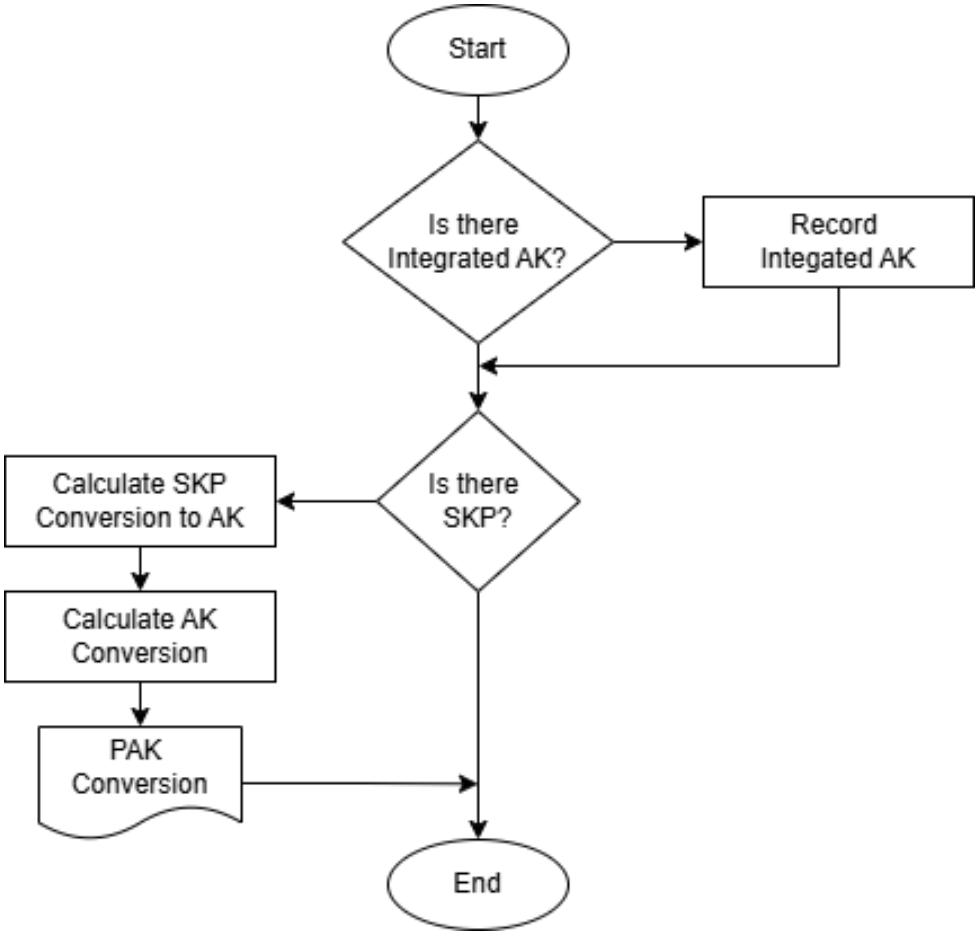


Figure 10. Flowchart of the PAK Conversion Document Business Process

The flowchart for the PAK Conversion Document business process typically includes the following steps:

1) Start
2) Input Integrated Credit Score (AK Integrasi)

3) Check for Integrated Credit Score Availability
   - If available → proceed to conversion.
   - If not → terminate process or prompt for data input.
4) Convert Performance Predicate Based on SKP Achievement
5) Accumulate Converted Credit Scores
6) Generate PAK Conversion Document (in PDF format).
7) Store/Export Document
8) End

4. RESULTS AND DISCUSSION

This section presents the outcomes of the research and provides an in-depth discussion of the findings. The development and implementation of the Web-Based Credit Score Conversion Assessment System (SmartPAK Untad) using the repository pattern successfully addressed the challenges in performance assessment, particularly for Civil Servants (PNS) within Tadulako University.

1) Homepage

The homepage serves as the primary interface displayed when users first access the application. This page provides an overview of the system and acts as the main entry point for navigating to other functional modules within the application.

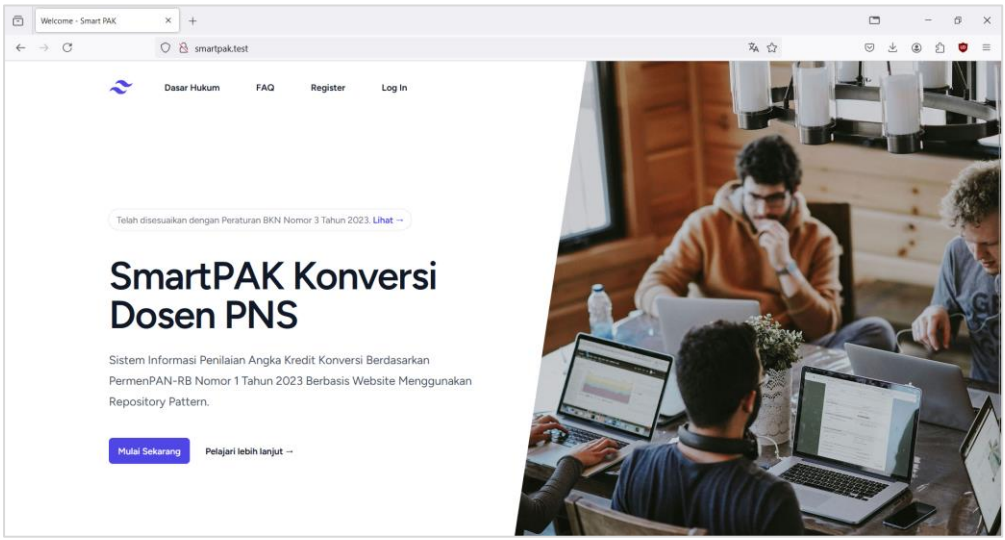


Figure 11. Homepage

2) Integration Group Configuration Page

The integration group configuration page is designed to manage the initial system settings required for application operation. This page facilitates the configuration of integration groups, which function as the foundational parameters for data synchronization and system interoperability.

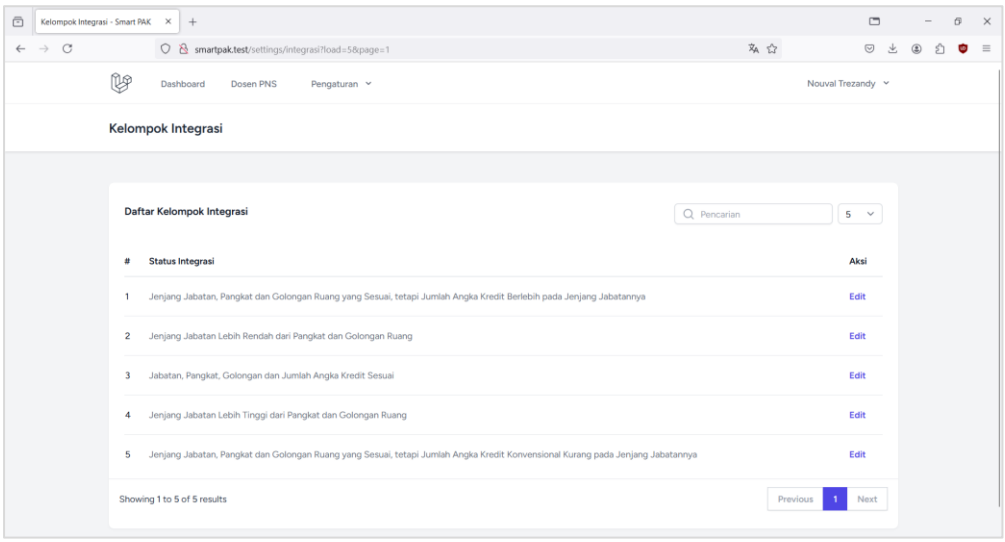


Figure 12. Integration group configuration page

3) Civil Servant Lecturer Page

This page presents a nominative list of civil servant lecturers affiliated with the university. The information displayed includes the lecturer's full name, academic title, organizational unit, rank classification, and most recent functional position. This data serves as a reference for subsequent performance evaluation and credit score processing.

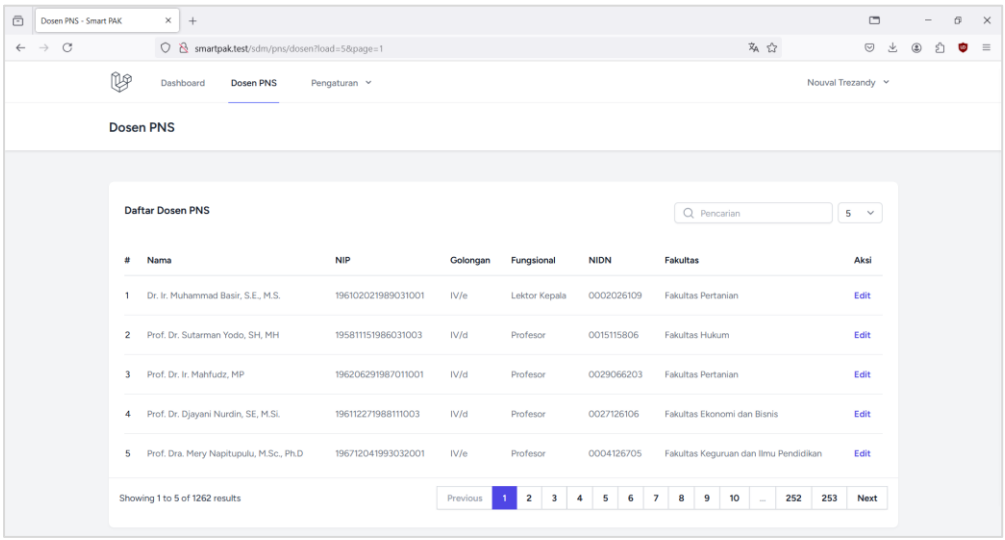


Figure 13. Civil servant lecturer page

4) Performance Predicate (SKP) Page

The performance predicate (SKP) page contains a compilation of annual lecturer performance assessments derived from the Employee Performance Target (SKP) documents. Performance predicates listed on this page are systematically converted into credit scores in accordance with prevailing regulations and institutional assessment standards.

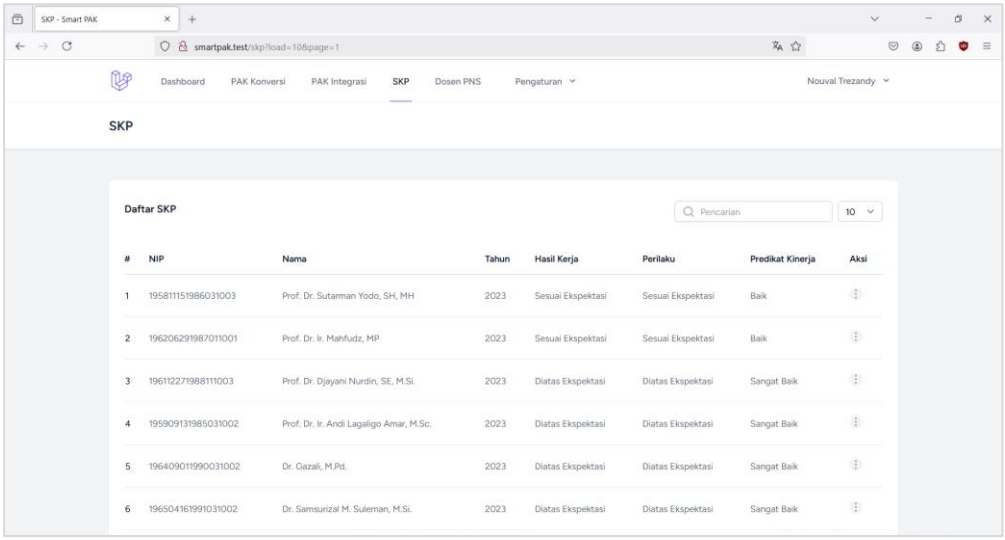


Figure 14. Performance predicate (SKP) page

5) Integrated PAK Page

The integrated PAK page displays a consolidated list of lecturer credit scores for the 2022 assessment period. These data are imported from the Integrated Information System (SISTER) platform and represent the aggregated credit achievements of lecturers at Tadulako University.

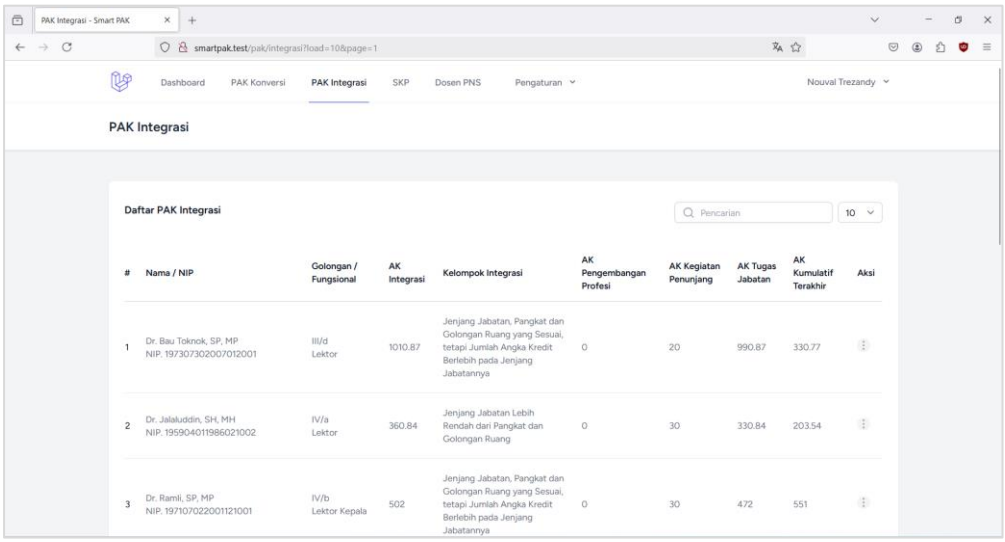


Figure 15. Integrated PAK page

6) PAK Conversion Page

The PAK conversion page provides a list of lecturers who are eligible to undergo the credit score conversion process. Eligibility is determined based on the integration of lecturer credit scores and their corresponding SKP performance predicates, ensuring that the assessment process adheres to established evaluation criteria.

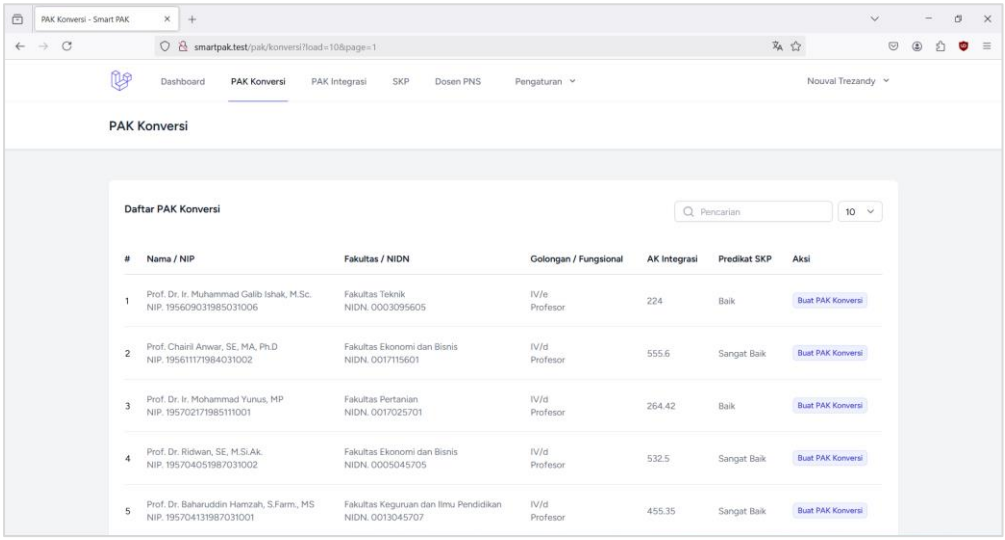


Figure 16. PAK conversion page

7) PAK Document Result Page

The PAK document result page presents the output of the credit score conversion process in the form of a structured PAK Conversion Document that consists of the following three pages:

- Conversion of performance predicate to credit scores.
- Annual accumulation of converted credit scores.
- Determination of the final credit score conversion assessment results.

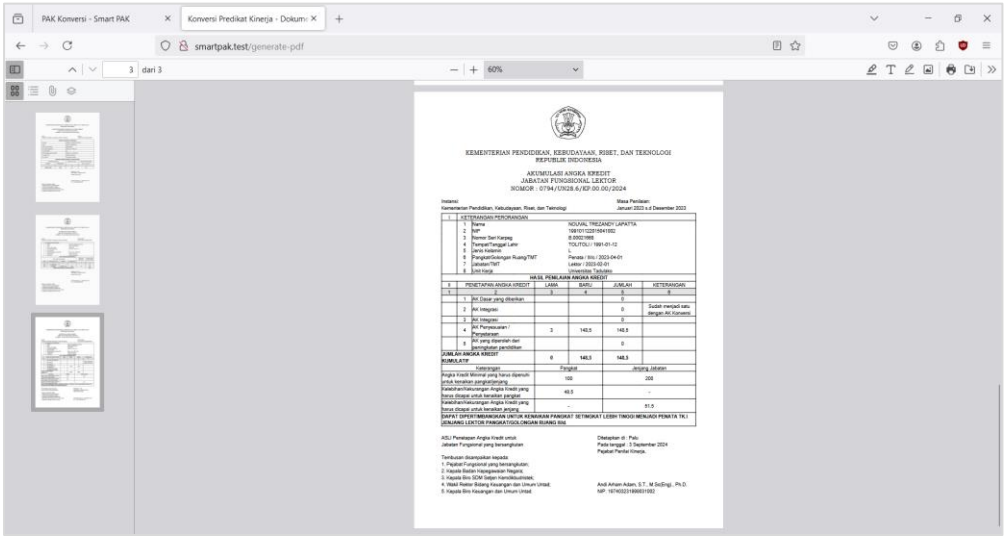


Figure 17. PAK document result page

5. CONCLUSION

Based on the results of this research and development, the Web-Based Credit Score Conversion Assessment Information System has been successfully designed to support the performance evaluation of Civil Servants (PNS) in accordance with PermenPAN-RB Number

1 of 2023. The application of the repository pattern has proven beneficial for improving system maintainability and scalability, making it easier to manage and expand the system in the future. The system enhances the efficiency of the assessment process, ensures data accuracy, and promotes transparency in managing credit score conversions. To maximize its potential, further testing in broader operational environments is recommended to identify additional feature needs or improvements. Integrating the system with existing Personnel Information Systems can streamline employee data management and overall performance monitoring. Providing user training for PNS and administrators is essential to ensure effective utilization of the system's features. Additionally, strengthening cybersecurity measures, such as data encryption and strict access controls, is critical to safeguard sensitive data and maintain the integrity of performance evaluations. Overall, the developed system offers significant potential for implementation in government institutions and serves as a model for digitalizing performance assessment in the public sector.

6. ACKNOWLEDGEMENT

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