

Designing a Web-Based Enterprise Resource Planning System Using the CodeIgniter Framework for Business Process Optimization

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Abstract

Enterprise Resource Planning (ERP) is an integrated system designed to improve efficiency and accuracy in company information management. This study aims to design and implement a web-based ERP system at CV Triraksa Jaya Mandiri as a solution to various operational issues, such as manual data processing, reporting delays, and the lack of integration between divisions. The system development method applied is Extreme Programming (XP), as it is flexible to changes and supports rapid iterations. The system consists of seven main modules: Finance, Human Resources, Supply Chain Management, Customer Relationship Management, Warehouse Management System, Document Management, and Business Intelligence. The technologies used include the CodeIgniter 4 framework, Bootstrap 5, Chart.js, PhpSpreadsheet, DomPDF, and MySQL as the database. The implementation results show that the system streamlines business processes, improves operational efficiency, and produces accurate real-time reports. The Business Intelligence module is capable of presenting financial and operational data in the form of graphical visualizations and insights based on actual data trends. System testing using User Acceptance Testing (UAT) and black-box testing demonstrated that all modules functioned successfully according to the designed scenarios, with an overall success rate of 100% and a high level of user satisfaction. This study proves that a web-based ERP system is an effective solution to support the digitalization of business processes in small and medium enterprises (SMEs).

Keywords: ERP; Information Systems; Web; CodeIgniter; Business Intelligence

1. INTRODUCTION

The rapid development of information technology has driven various industrial sectors toward digitalization using Enterprise Resource Planning as an integrated backbone for resource management [1], [2]. ERP systems serve as a critical pillar for management control, significantly impacting both the efficiency and accountability of modern firms [3], [4]. Implementing these systems is essential for enhancing financial reporting accuracy and general management efficiency across diverse business operations [5], [6]. Recent bibliometric analyses indicate that the concept of integrating ERP is a central theme in the management of the Micro, Small, and Medium Enterprises sector [7], [8].

The use of integrated systems has become a dominant trend in the development of modern industrial and infrastructure frameworks [9], [10]. Many MSMEs in Indonesia still face significant challenges due to manual data management and non-integrated information systems [11], [12]. These manual processes often result in critical information delays and a lack of visibility into real-time operational reports [4], [6]. Small firms are

typically receptive to new technologies but are frequently hindered by substantial resource and financial limitations [11], [12]. Integrated technology solutions help MSMEs overcome resource gaps to support better strategic planning and long-term business performance [13], [14].

Strategic multi-tool integration within ERP environments provides a significant advantage for businesses seeking modular flexibility [2]. The use of open-source ERP modules allows small businesses to reduce costs while making their internal workflows more transparent [15], [16]. Customized ERP solutions have been proven to dramatically improve supply chain visibility and business innovation in industrial clusters [17]. Business architecture frameworks, such as TOGAF, have been successfully applied to design integrated systems specifically for machinery distribution companies [18]. Web-based ERP implementations in the clothing sector have replaced manual handling with integrated sales and production tracking [19], [20]. Case studies on furniture MSMEs show that Odoo-based systems effectively resolve transaction report issues and data redundancy [21].

Open-source fleet management modules have optimized operational processes and documented archives for transportation service providers [22]. Implementation research in the weaving industry demonstrates that ERP systems foster more integrated and efficient supply chain changes [23]. Global perspectives on the cosmetics industry highlight the effectiveness of ERP in managing complex sales and distribution processes [14]. Comparative analyses of tools such as Odoo and Openbravo suggest that software choice must align strictly with specific business management needs [24], [25].

2. METHODOLOGY

The ERP system was developed using the Extreme Programming methodology, an Agile framework prioritized for its emphasis on intense developer-user collaboration, iterative growth, and rapid adaptability to shifting requirements [26], [27]. XP is particularly valued for its flexibility and speed, making it an effective choice for projects that require a dynamic response to evolving business needs [27].

The implementation followed the standard XP lifecycle across four primary stages:

1. Planning: This phase focused on understanding client needs by gathering requirements and translating them into user stories, which served as the foundation for the software's functional features .
2. Design: System modeling was conducted to create a simple yet modular architecture for the seven core ERP modules.
3. Coding: The application was implemented using the PHP programming language and the CodeIgniter 4 framework. Supporting technologies included Bootstrap 5 for the user interface, MySQL for data management, and libraries like Chart.js, PhpSpreadsheet, and DomPDF for reporting.
4. Testing: Quality was maintained through continuous feedback cycles, including unit testing during development and User Acceptance Testing to validate that the final system met all functional requirements specified in the user stories.

Developed as a web-based application to ensure broad organizational access, the system progressed through short, iterative cycles. Each increment was evaluated by stakeholders to ensure alignment with business objectives before initiating the next development sprint. A flowchart of system development using the XP model can be seen in Figure 1 below:

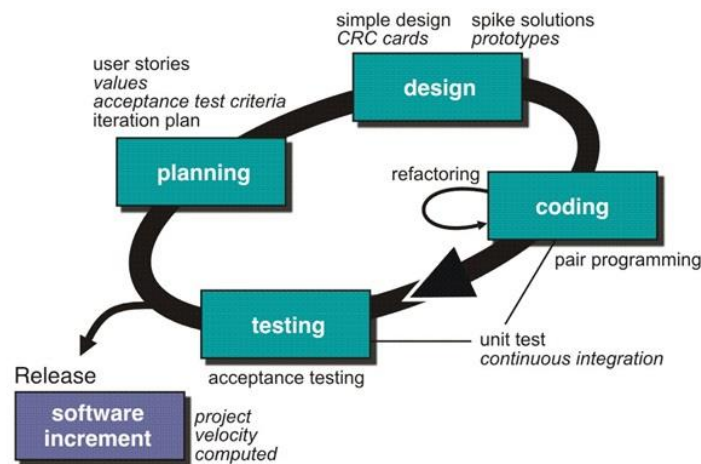


Figure 1XP Model Flowchart

3. RESULTS AND DISCUSSION

At this stage, the ERP system has been successfully developed and implemented at CV Triraksa Jaya Mandiri using the Extreme Programming (XP) approach. The system is web-based using the CodeIgniter 4 framework, supported by technologies such as Bootstrap 5 for the user interface, Chart.js for data visualization, DomPDF for report printing, PhpSpreadsheet for Excel export, and MySQL as the primary database.

The implementation results show that all key ERP modules—Finance, HR, Supply Chain Management (SCM), Customer Relationship Management (CRM), Warehouse Management System (WMS), Documents, and Business Intelligence (BI)—have been effectively integrated. Each module has a specific function but is interconnected within a centralized system[14].

One of the system's key results is the Business Intelligence (BI) dashboard, which displays a real-time summary of business performance. This BI dashboard dynamically displays data on profit and loss, payroll expenses, shipments, and the number of documents and invoices. The system's advantages are also evident in operational process efficiency, reduced data redundancy, and increased speed of information access between divisions.

System testing results indicate that all features function as intended and can be used effectively by users. Compared to the previous manual system, this ERP system minimizes recording errors, accelerates business processes, and provides a comprehensive overview of the company's financial and operational conditions. [15]

3.1 Needs Analysis

The needs analysis for the NeedLakban ERP system is divided into three leading user roles: Admin, Warehouse Admin, and User. Each role has different needs and access rights according to its responsibilities: (1) Admin Needs:

Manage all ERP modules: Finance, HR, CRM, WMS, Documents, and Business Intelligence (BI); Record and verify financial journals; Manage employee payroll data; Manage customer and interaction history (CRM); Manage incoming and outgoing mail documents; Monitor business performance through the BI dashboard. (2) Warehouse Admin Needs: Exclusive access to the Warehouse Management System (WMS) module. Manage stock data, incoming goods, and outgoing goods. Record and update goods delivery status. Provide stock reports to the Admin. (3) User Requirements: Limited access to viewing and performing specific input on the module. Business Intelligence (BI): Viewing a summary of displayed data. Customer Relationship Management (CRM): Viewing

customer information and making requests. Documents: Accessing or uploading documents according to granted access rights. Each role is designed to support work process efficiency without overlapping authority, while maintaining the security and integrity of data within the system.

3.2. Design

In the design stage, a data model and system flow are created to support ERP system development. The design includes Entity Relationship Diagrams (ERDs) and Unified Modeling Language (UML) tools such as Use Case Diagrams, Activity Diagrams, and Class Diagrams. Entity Relationship Diagrams (ERDs) describe the relationships between data entities within the system. UML is used to describe the structure and user interactions with the system in detail.

3.3. Entity Relationship Diagram (ERD)

The following is a draft of an Entity Relationship Diagram depicting the data structure in TulisLakban's ERP system:

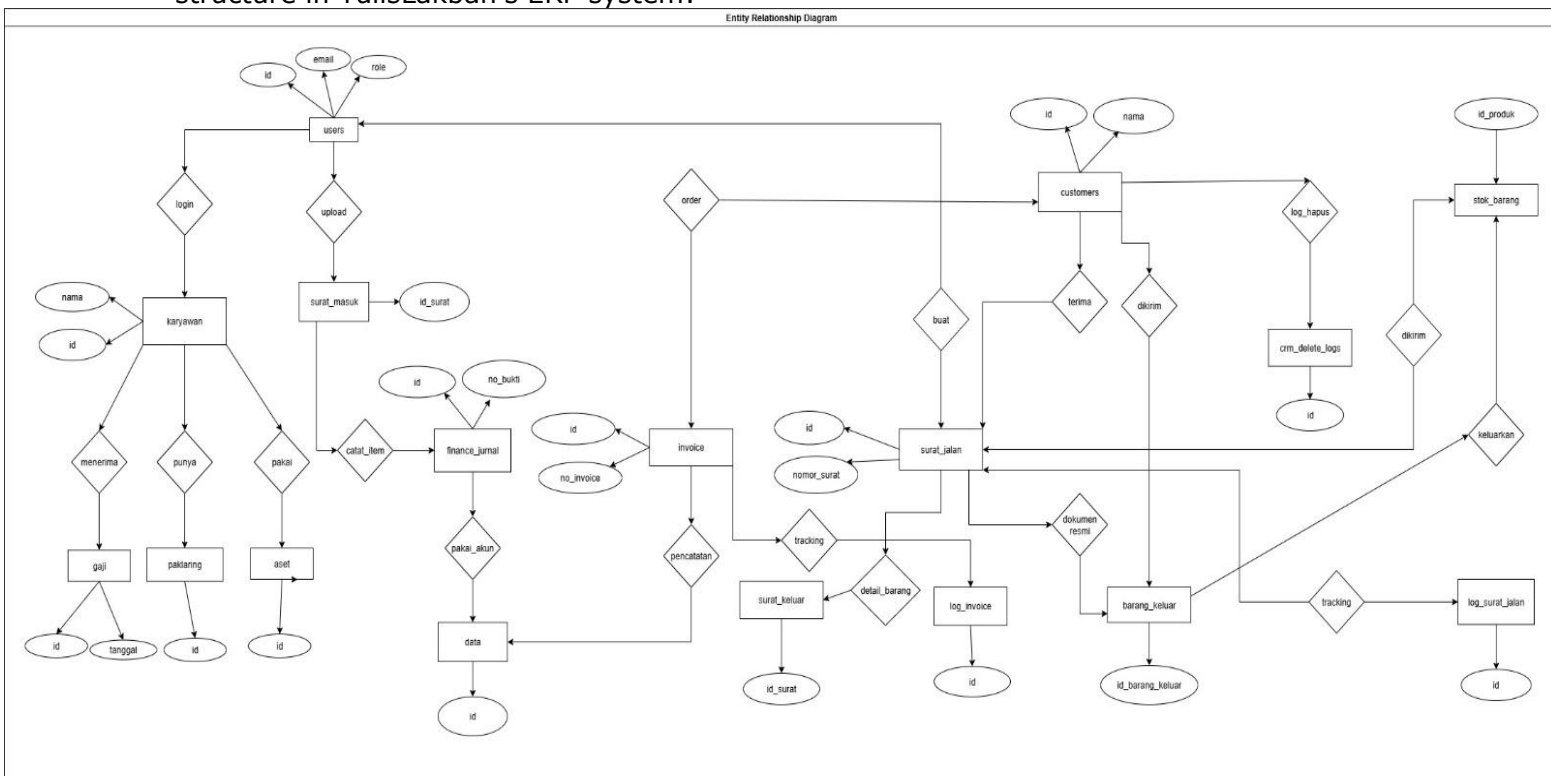


Figure 2. Entity Relationship Diagram

Figure 2. Entity Relationship Diagram (the figure depicts sixteen main entities: Account, General Journal, Inventory, Employee, Salary, Delivery Order, Customer, Delivery Note, Invoice, Stock, Outgoing Goods, Incoming Documents, Outgoing Documents, Users, Roles, and Activity Log, which are interconnected through various relationships. One-to-One (1:1) relationships exist between Salary and Employee, as well as between Delivery Note and Employee, indicating that one salary record is only associated with one employee, and one delivery note is also only owned by one employee. One-to-many relationships are used for several entities, such as:

- Account with General Journal (one account can have multiple journal transactions).
- Customer with Delivery Note and Invoice (one customer can have multiple delivery notes and invoices).

- c) Stock with Outgoing Goods (one item can be issued multiple times).
- d) User with Activity Log (one user can have multiple activity records).

Each entity has attributes that support data management according to its function, such as Inventory, which has attributes such as purchase date, quantity, and depreciation, and final value; Incoming/Outgoing Documents that store information on letter numbers, senders/recipients, and attached files; and Business Intelligence that extracts data from various entities to display in summary and graphical form. With these comprehensive relationships and attributes, TulisLakban.com's ERP system is able to manage financial, HR, logistics, document, and report data in an integrated manner, thus supporting business processes ranging from transaction recording, asset and employee management, goods distribution, to structured report creation.

3.4. Use Case Diagram

Use Case Diagrams describe the interactions between users and the system. In NeedLakban ERP, the following is a design of the Use Case Diagram in the NeedLakban ERP system:

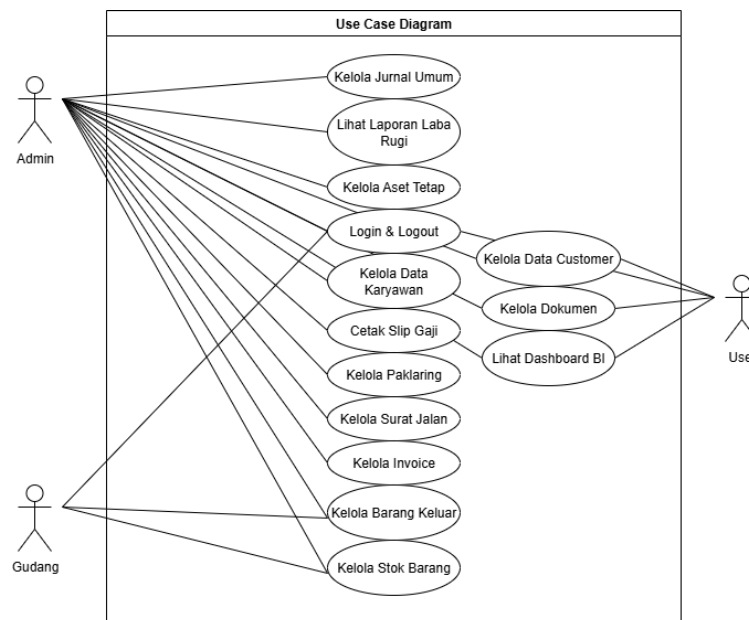


Figure 3. Use Case Diagram

Table 1
Description Usecase Diagram

No	Use Case	Actor	Description
1	Manage Journal General	Admin	Admin can add, edit, delete, and filter transaction finance daily in form journal general.
2	Look Report Profit Make a loss	Admin	Admin can view and download report profit make a loss based on period certain in PDF format.
3	Manage Asset Still	Admin	Admin manages asset data fixed, including addition, editing, depreciation, and deletion of asset data.
4	Manage Employee Data	Admin	Admin inputs, edits, and deletes employee data as well as export data to PDF or Excel.
5	Print Pay Slip	Admin	Admin creates and prints pay slips for employee based on period certain.

6	Manage Paklaring	Admin	Admin creates and prints letter information work (paklaring) for employees who have resigned.
7	Manage Delivery Notes	Admin	Admin can create, edit, delete and print letter road for delivery goods to customer.
8	Manage Invoices	Admin	Admin can create, edit, delete, and print sales invoices.
9	Manage Goods Go out	Admin, Warehouse	Admin and Warehouse Admin take notes expenditure goods from warehouse based on delivery to customer.
10	Manage Stock of Goods	Admin, Warehouse	Admin and Warehouse Admin monitor and update stock data goods available in the warehouse.
11	Manage Customer Data	Admin, User	Admin and User manage customer data, including adding, editing, deleting, and exporting data.
12	Manage Document	Admin, User	Admin and User can upload, edit, delete, and look for document in / out based on filters.
13	View BI Dashboard	Admin, User	Admin and User can view the Business Intelligence dashboard for monitor data summary and graphs interactive from various module.

3.5. Activity Diagram

Activity Diagram shows channel activity system from beginning until end in every module. The flow illustrated in a way details in the picture following:

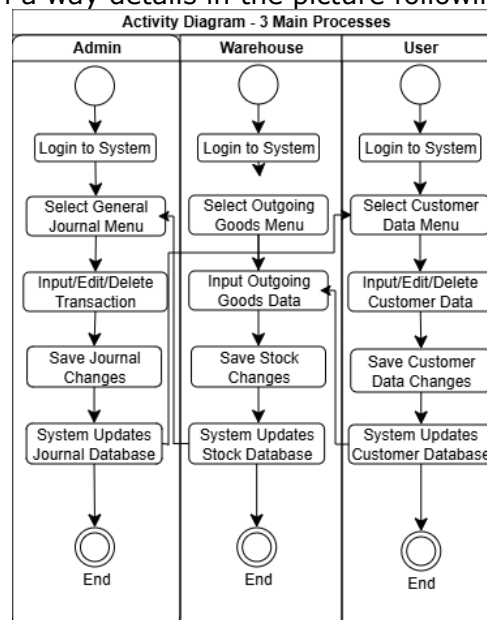


Figure 4. Activity Diagram

3.6. Class Diagram

Class diagram above describe six twelve main classes, namely Accounts, General Journal, Inventory, Employees, Salaries, Clearance Certificates, Customers, Delivery Notes, Invoices, Stock Items, Outgoing Goods, Incoming Documents, Outgoing Documents, Users, Roles, and Activity Logs , which are connected through

1:M or M:1 relationship for form channel structured and interconnected ERP system integrated. This diagram covers three levels, namely class name, attributes for describe the data managed, and the methods For CRUD (Create, Read, Update, Delete) operations. Each class has function specific, such as: Accounts → saves a list of accounts finances used in recording journal general. General Journal → notes debit and credit transactions in accordance selected account. Inventory → manage asset data fixed, including calculation depreciation and value end. Employee → saves employee data, position, and date Sign in. Salary → manage payroll data employee based on period certain. Paklaring → create and save letter information Work For employees who leave. Customer → manage customer data like name, address, and number telephone. Mail → note document delivery goods to customer. Invoice → create document bill sale to customer. Stock of goods → monitor quantity and location stock goods in the warehouse. Goods Out → record goods that come out from warehouse in accordance request or delivery. Incoming Document → save archives document enter from party external. Document Out → save archives document out sent to party external. Users → manage user login account data system. Roles → stores a list of roles user (Admin, Warehouse Admin, User). Activity Log → records history activities performed by users in system .

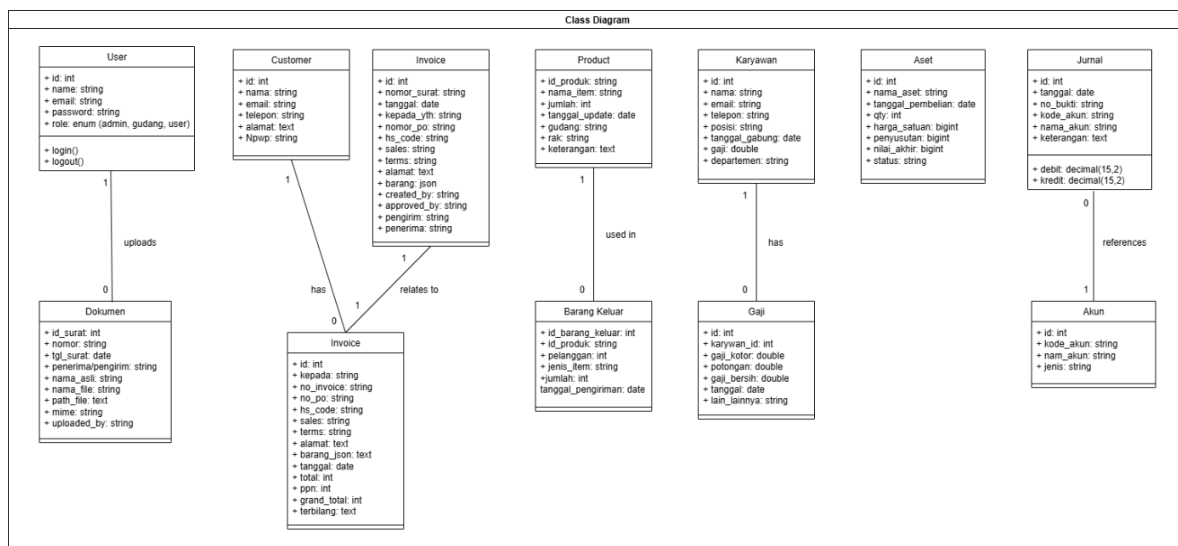


Figure 5. Class Diagram

3.7. Implementation

- Following appearance interface on the ButuhLakban.com ERP system website :
- (1) Home Page



Figure 6. Page Main Admin

The homepage displays the ERP system dashboard of PT. Butuh Lakban Indonesia, which presents company information, vision and mission, and a list of products sold in a structured, real-time manner. This page serves as both an initial information center and the primary navigation for accessing system modules such as finance, HR, SCM, CRM, and warehouse management.

(2) Financial Module Page

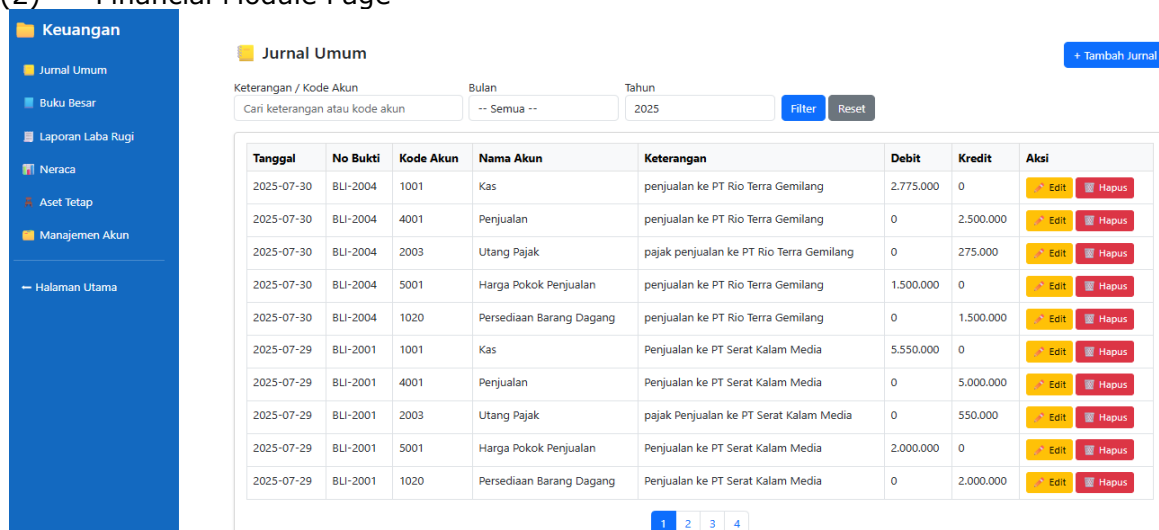


Figure 7. Appearance Journal General

The General Journal page in the Finance module is used to record and display accounting transactions in a structured manner based on date, account, and debit-credit values. This page features data filters, journal entries, and edit and delete functions, making it easier for users to manage and control their company's financial data.

Keuangan

Jurnal Umum

Buku Besar

Laporan Laba Rugi

Neraca

Aset Tetap

Manajemen Akun

Halaman Utama

Buku Besar

Masukkan Kode Akun (contoh: 1001)

Tampilkan Reset

1001 - Kas

Tanggal	No Bukti	Keterangan	Debit	Kredit	Saldo
2025-07-28	SA-001	saldo awal kas	100.000.000	0	100.000.000
2025-07-29	BLI-2001	Penjualan ke PT Serat Kalam Media	5.550.000	0	105.550.000
2025-07-29	BLI-2002	Penjualan ke PT Mega Mulia Abadi	2.664.000	0	108.214.000
2025-07-29	BLI-2003	Penjualan ke PT Arshaka Berkah Mandiri	9.990.000	0	118.204.000
2025-07-30	BLI-2004	penjualan ke PT Rio Terra Gemilang	2.775.000	0	120.979.000

1002 - Bank

Tanggal	No Bukti	Keterangan	Debit	Kredit	Saldo
2025-07-29	SG-001	pembayaran Gaji Karyawan Bulan Juli	0	17.400.000	-17.400.000

1020 - Persediaan Barang Dagang

Tanggal	No Bukti	Keterangan	Debit	Kredit	Saldo
2025-07-29	BLI-2001	Penjualan ke PT Serat Kalam Media	0	2.000.000	-2.000.000

Figure 8. Appearance Book Big

This page displays the General Ledger in the Finance module, which displays transaction details for each account chronologically, along with debit, credit, and current balance information. Using the account code search feature, users can easily monitor the company's financial movements and balances accurately.

Click to go back, hold to see history

Keuangan

Jurnal Umum

Buku Besar

Laporan Laba Rugi

Neraca

Aset Tetap

Manajemen Akun

Halaman Utama

Data Aset Tetap

+ Add Aset Export

ID Aset	Nama Aset	Tanggal Pembelian	Qty	Harga Satuan	Penyusutan	Nilai Akhir	Status	Aksi
4	Pc Acer	2025-07-29	5	Rp 2.500.000	Rp 500.000	Rp 12.000.000	Baik	Edit Hapus
5	printer lenovo	2025-07-29	5	Rp 5.000.000	Rp 0	Rp 25.000.000	Baik	Edit Hapus

1

ERP System © 2025 | ProjectWork4w

Figure 9. Appearance Asset Still

The image above shows the interface of the Fixed Asset Data module in an Enterprise Resource Planning (ERP) system, which presents structured company asset information, including asset name, purchase date, quantity, unit price, depreciation amount, and final value. Furthermore, the system is equipped with an accounting navigation menu and data management features to support systematic asset recording and control.

(3) HR Module Page



Figure 10. *HR Module*

The image above shows the Human Resources (HR) Module interface in an Enterprise Resource Planning (ERP) system, which serves as the central hub for personnel administration. This module provides key features such as employee data management, payslip recording and printing, and integrated certificate creation to support efficient HR management.

(4) SCM Module Page

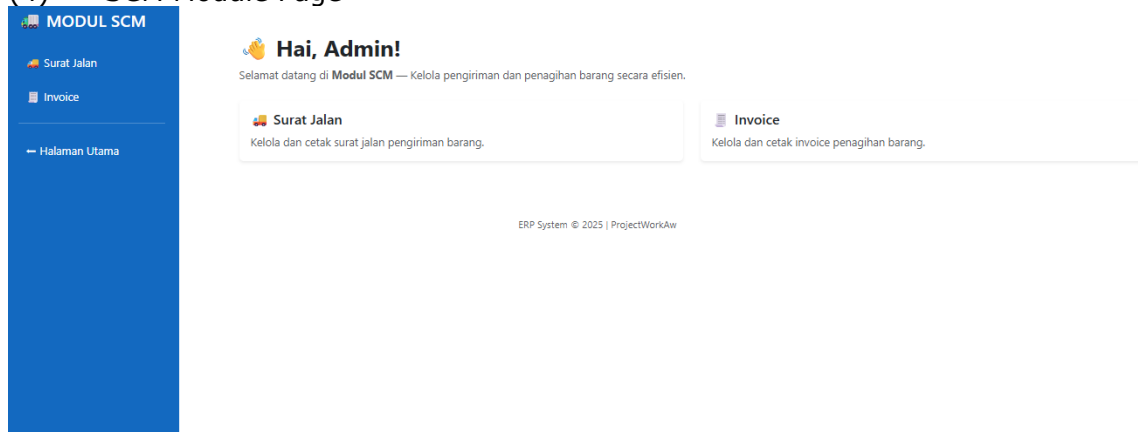


Figure 11. *SCM Module*

The image above shows the Supply Chain Management (SCM) module interface in an Enterprise Resource Planning (ERP) system, designed to support integrated distribution and billing processes. This module provides key features such as managing delivery notes and creating and printing invoices to improve the efficiency and orderliness of supply chain administration.

(5) WMS Module Page



The image above shows the Warehouse Management System (WMS) module interface in the Stock Data feature, which is used to monitor and manage inventory in an integrated manner, including product ID information, item name, stock quantity, update date, warehouse location, and storage rack. This module is equipped with search, filter, stock update, and data export functions to PDF and Excel formats to improve inventory management accuracy and support warehouse operational efficiency.

PT BUTIRHAKKAN

Business Intelligence Dashboard

PTB Jenis Filter

Sekarang

PTB Jenis Filter

Harapan

Mingguan

Bulanan

Laba Bersih

Rp 0

Detail Keuangan

Total Gaji

Rp 0

Detail Gaji

Invoice & SJ

Invoice 0

Surat Jalan 0

Detail SJ

Dokumen

0 Dokumen

Detail Dokumen

Barang & Stok

Barang Keluar 0

Stok 4950

Detail Stok

PT BUTIRHAKKAN

Business Intelligence Dashboard

Bulanan

July 2025

Sekarang

Export PDF

Ringkasan

Grafik

Insight

Laba & Gaji

Dokumen

Barang & Stok

20.0

1.8

1.6

1.4

1.2

1.0

0.8

0.6

0.4

0.2

0

Jumlah Dokumen

Business Intelligence Dashboard

PTB Jenis Filter

Sekarang

Export PDF

Ringkasan

Grafik

Insight

Laba & Gaji

Dokumen

Barang & Stok

-10,000,000

-8,000,000

-6,000,000

-4,000,000

-2,000,000

0

10,000,000

Laba Bersih

10,000,000

8,000,000

6,000,000

4,000,000

2,000,000

0

Tasarif Gaji

PT BUTIRHAKKAN

Business Intelligence Dashboard

Bulanan

July 2025

Sekarang

Export PDF

Ringkasan

Grafik

Insight

Laba & Gaji

Dokumen

Barang & Stok

1,000

800

600

400

200

0

Stok per Produk

Business Intelligence Dashboard

PTB Jenis Filter

Sekarang

Export PDF

Ringkasan

Grafik

Insight

Laba & Gaji

Dokumen

Barang & Stok

100%

90%

80%

70%

60%

50%

40%

30%

20%

10%

0%

Donat Chart

Figure 14. *Appearance All BI Modules*

The image above shows the Business Intelligence (BI) Module Page, which provides an integrated analytical dashboard for visualizing sales, document, and inventory data in the

form of graphs and key performance indicators. This BI module supports managerial analysis and decision-making by presenting concise, interactive, and easy-to-understand information over a specific time period.

3.8. Testing

Testing done use black-box testing method that focuses on testing functionality every module *ButuhLakban.com* ERP system. Testing This involving three role users: Admin, Warehouse Admin, and User, with scenario testing based on right available access and modules For each role. Five aspects of usability testing that are tested includes: Convenience learning, efficiency use, Ease remember, error rate users, and satisfaction users, The success rate was calculated using the following equation:

$$\text{Success Rate} = \frac{\text{Total Test Cases}}{\text{Number of Successful Tests}} \times 100\%$$

Following is results testing based on each roles and modules accessed:

Table 2 Admin Test Results

Participant	Finance	HR	SCM	CRM	WMS	Documents
Admin 1	✓	✓	✓	✓	✓	✓
Admin 2	✓	✓	✓	✓	✓	✓
Admin 3	✓	✓	✓	✓	✓	✓

In Table 2, there were 18 total test scenarios from three admin participants across six modules. A total of 18 tests were successful.

$$\text{Success Rate} = \frac{18}{18} \times 100\% = 100\%$$

Table 3 Warehouse Admin Test Results

Participant	WMS Access	View Stock	Outgoing Goods	Incoming Goods	Export Excel	Description
Warehouse1	✓	✓	✓	✓	✓	Functions operated normally
Warehouse2	✓	✓	✓	✓	✓	No issues were found
Warehouse3	✓	✓	✓	✓	✓	Responsive and stable UI

Table 3 shows that all warehouse administration features were successfully executed by the three warehouse participants. There were 15 successful tests out of 15 total test cases..

$$\text{Success Rate} = \frac{15}{15} \times 100\% = 100\%$$

Table 4 User Testing Results

Participant	View Customer	Access Documents	View Dashboard	Download Document	Feedback
User 1	✓	✓	✓	✓	The interface easy to use
User 2	✓	✓	✓	✓	Navigastion is clear and fast
User 3	✓	✓	✓	✓	No error were found

Based on Table 4, all user participants successfully accessed and utilized the available features. The system completed 12 successful tests out of 12 total test cases.

$$\text{Success Rate} = \frac{12}{12} \times 100\% = 100\%$$

Overall, the testing results demonstrate that the developed system performs effectively across different user roles. All modules achieved perfect performance with a 100% success rate. These findings indicate that the system is reliable, functional, and suitable for implementation in operational environments.

Test results show that developed ERP system has fulfil criteria functionality and usability for all over modules and all role users. All feature important can accessed and used in accordance his role without happen failure system, making system This worthy used in environment operational CV Triraksa Jaya Mandiri.

4. CONCLUSION

Implementation of a web-based ERP system at ButuhLakban.com for CV Triraksa Jaya Mandiri has proven capable of increasing efficiency and integration of cross-divisional data management. With the implementation of seven main modules: Finance, HR, SCM, CRM, WMS, Documents, and Business Intelligence systems, this provides an integrated solution to record, monitor, and analyze company operational activities in real-time. Every user receives appropriate role-based access: Admin has full access to all modules, Warehouse Admin only has access to the WMS module, and Users are limited to CRM, Documents, and BI modules. This supports data security and work efficiency.

The system testing results using the black-box testing approach showed that the Admin module achieved a success rate of 100%, the Warehouse Admin module achieved 100%, and the User module also achieved 100%, indicating that all system features operated successfully according to the designed scenarios.

A responsive interface and stable data integration support smooth business activities in the company's adhesive tape distribution operations. The existence of the BI dashboard also strengthens decision-making capabilities through the visualization of financial, inventory, and performance data. Overall, this study shows that the development of a web-based ERP system can become an appropriate solution for MSMEs that require automation and integration in their business processes.

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