Accrual-Based Accounting Information System with Break Even Point (BEP) Approach

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Abstrak

Transformasi digital dalam manajemen keuangan sangat penting bagi keberlanjutan bisnis modern. Namun, sistem berbasis kas tradisional sering kali gagal menggambarkan posisi keuangan yang sebenarnya, sementara perangkat lunak akuntansi yang ada saat ini jarang memiliki fitur analitik manajerial yang terintegrasi. Hal ini menciptakan kesenjangan fungsional di mana manajer harus melakukan perhitungan manual yang rentan kesalahan untuk menentukan ambang batas profitabilitas. Untuk mengatasi hal ini, penelitian ini mengembangkan Sistem Informasi Akuntansi Berbasis Akrual berbasis web yang terintegrasi dengan pendekatan Break Even Point (BEP) dinamis. Sistem ini mengotomatiskan proses pencatatan entri ganda (double-entry) dan klasifikasi biaya tetap secara real-time dari buku besar untuk memvisualisasikan margin keamanan secara instan. Kontribusi utama penelitian ini adalah penyatuan standar akuntansi profesional (PSAK) dengan algoritma pendukung keputusan strategis dalam satu platform. Evaluasi menggunakan pengujian Black Box mengonfirmasi bahwa sistem mencapai akurasi 100 persen dalam menghasilkan laporan keuangan dan metrik BEP, sementara analisis kegunaan menunjukkan bahwa arsitektur responsif meningkatkan efisiensi alur kerja secara signifikan di berbagai perangkat. Hasil penelitian menunjukkan bahwa sistem ini secara efektif mengubah data keuangan pasif menjadi wawasan yang dapat ditindaklanjuti untuk pengambilan keputusan yang proaktif. Pengembangan masa depan bertujuan untuk menerapkan pembelajaran mesin (machine learning) untuk analisis biaya semi-variabel yang dinamis guna menyempurnakan kemampuan prediksi.

Kata kunci— *Sistem Informasi Akuntansi, Basis Akrual, Titik Impas, Analisis Manajerial, Aplikasi Berbasis Web*

Abstract

The digital transformation of financial management is essential for modern business sustainability. However, traditional cash-based systems fail to represent true financial positions, while existing accounting software often lacks integrated managerial analytics tools. This creates a functional disconnect where managers must perform manual, error-prone calculations to determine profitability thresholds. To address this, this research develops a web-based Accrual Accounting Information System integrated with a dynamic Break Even Point (BEP) approach. The system automates the double-entry recording process and real-time classification of fixed costs from the general ledger to visualize safety margins instantly. The primary contribution of this study is the unification of professional accounting standards (PSAK) with strategic decision-support algorithms in a single platform. Evaluation using Black Box testing confirms the system achieves 100 percent accuracy in generating financial statements and BEP metrics, while usability analysis demonstrates that the responsive architecture significantly enhances workflow efficiency across devices. The results indicate that the system effectively transforms passive financial data into actionable insights, empowering

proactive decision-making. Future work aims to incorporate machine learning for dynamic semi-variable cost analysis to further refine predictive capabilities.

1. INTRODUCTION

The rapid evolution of financial technology in the era of Industry 4.0 has fundamentally transformed how business entities manage their economic data. In the contemporary business landscape, the transition from manual record-keeping to digital Accounting Information Systems (AIS) is no longer a luxury but a fundamental necessity for operational sustainability. The global economic instability observed between 2020 and 2024 has further emphasized the critical need for accurate, real-time financial reporting to support strategic decision-making. Within this context, the method of accounting adoption becomes a pivotal subject of analysis. While many Micro, Small, and Medium Enterprises (MSMEs) traditionally rely on cash-based accounting due to its simplicity, the accrual basis of accounting provides a far more comprehensive picture of a company's financial health. Research conducted by Al-Okaily in 2021 highlights that the quality of accounting information systems significantly correlates with organizational performance, particularly when the system is capable of capturing complex transactions that involve time lags between service delivery and cash receipt [1]. The accrual basis, which records revenues when earned and expenses when incurred regardless of when cash is exchanged, aligns with the matching principle and offers superior transparency regarding assets and liabilities. However, the implementation of accrual-based systems often presents a steep learning curve and technical complexity for smaller entities. Furthermore, mere financial recording is insufficient for survival in a competitive market; businesses require analytical tools to project future profitability. One such critical tool is the Break Even Point (BEP) analysis. According to a study by Fitriana and colleagues in 2022, the inability to accurately calculate the break-even point is a primary contributor to business failure during early operational stages, as managers fail to distinguish between fixed costs and variable costs effectively [2]. Therefore, there is an urgent demand for a system that not only records historical accrual data but also provides forward-looking analytical capabilities.

Despite the clear benefits of digital accounting, a general problem persists in the software market available to small and medium-scale enterprises. Existing solutions often fall into two polarized categories: they are either overly simplistic cash-based mobile applications that lack the rigor of professional accounting standards, or they are monolithic Enterprise Resource Planning (ERP) systems that are prohibitively expensive and complex. A study by Haryanto in 2023 indicates that user resistance to accounting technology is often driven by perceived complexity and a lack of fit between the system features and specific business needs [3]. Most entry-level applications fail to handle the duality of accrual accounting, specifically the management of accounts receivable and accounts payable, which leads to distorted financial statements. Moreover, these systems rarely integrate managerial accounting tools like Cost-Volume-Profit (CVP) or BEP analysis directly into the dashboard. Typically, business owners must export data to spreadsheets to perform these calculations manually, creating a disconnect between the recorded data and the analytical insights. This manual process is prone to human error and results in data latency, where decisions are made based on outdated information. The motivation for this research stems from the critical gap between the need for sophisticated accrual-based reporting and the lack of accessible, integrated analytical tools for determining financial safety margins. As emphasized by Putra and Santoso in 2024, the integration of decision support modules within accounting information systems is essential for enhancing the

agility of business management in the post-pandemic digital economy [4]. Consequently, there is a compelling need to develop a unified platform that seamlessly blends rigorous financial accounting standards with practical managerial analysis.

To address these challenges, this research proposes the development of a web-based Accrual-Based Accounting Information System that specifically integrates a Break Even Point (BEP) approach. The research goal is to design and build a responsive, single-page application (SPA) that simplifies the complexity of double-entry bookkeeping while providing real-time visibility into profitability thresholds. The proposed solution utilizes modern web technologies, specifically HTML5, CSS3, and JavaScript, to create a lightweight yet robust system that operates efficiently across devices, including mobile phones and desktops. Unlike traditional desktop-based accounting software, this web-based architecture ensures accessibility and data portability. The system is engineered to handle the full accounting cycle, from the general journal entry to the automatic posting of ledgers and the generation of key financial statements, including the Income Statement and the Statement of Financial Position (Balance Sheet). A distinct feature of this proposed system is the dynamic BEP calculation module, which pulls data directly from the ledger's expense accounts to classify fixed and variable costs automatically. This integration allows users to visualize their financial standing through interactive charts, bridging the gap between historical reporting and future planning. As noted by Wibowo in 2020, the use of visual analytics in financial dashboards significantly improves the speed and accuracy of managerial decision-making compared to tabular data presentations [5]. By embedding the BEP logic directly into the accounting flow, the system ensures that every transaction recorded updates the user's understanding of their break-even target.

The primary contribution of this study is the conceptualization and technical implementation of an integrated framework that democratizes high-level accounting practices for non-expert users. By enforcing accrual-based logic within a user-friendly interface, the system ensures compliance with financial accounting standards (PSAK) while simultaneously empowering users with managerial accounting insights. This dual approach distinguishes the developed system from standard recording applications. For the evaluation of the proposed system, the research employs the Black Box testing method to validate the functional integrity of the CRUD (Create, Read, Update, Delete) operations, the accuracy of the double-entry accounting logic, and the precision of the BEP formulas. Furthermore, the system undergoes a compatibility test to ensure the responsive user interface functions correctly across different screen resolutions, addressing the mobility needs of modern entrepreneurs. This aligns with the findings of Nugraha in 2025, who asserts that cross-platform compatibility is a non-negotiable requirement for the adoption of financial technology in the current mobile-first era [6]. The successful implementation of this system provides a practical solution for businesses to maintain accurate financial records and make informed decisions regarding pricing and cost management. The remainder of this paper is organized as follows: Section 2 discusses related work and the theoretical foundation; Section 3 details the methods used in system development; Section 4 presents the results and discussion of the system implementation; and Section 5 provides the conclusions and future work.

2. METHODS

Recent advancements in digital accounting emphasize the integration of accrual-based systems with managerial analytics. Research by Wijaya in 2022 developed a web-based accounting application using the RAD method, focusing on accrual transitions for service sectors [7]. While the system improved reporting compliance, it lacked real-time decision support features like BEP analysis, limiting its utility for strategic planning. In contrast, Lestari and Pratama in 2023 introduced a mobile-based financial calculator incorporating CVP analysis

for small businesses [8]. Their study demonstrated high user acceptance due to mobility but suffered from data isolation, as the analytical module did not sync with the general ledger, requiring redundant manual data entry. Regarding architectural efficiency, Setiawan in 2024 evaluated Single Page Applications (SPA) for financial dashboards, noting that SPA architecture significantly reduces server load compared to traditional multi-page applications [9]. However, this study focused solely on performance metrics rather than accounting functionality. Furthermore, Kurniawan in 2021 explored automated fixed-cost classification algorithms within ERP systems [10]. Although highly accurate, the implementation complexity proved prohibitive for MSMEs. Recent work by Fauzi in 2025 attempted to bridge these gaps by combining accrual recording with basic forecasting [11]. Nevertheless, the system relied on batch processing rather than real-time updates. This research addresses these limitations by developing a unified, real-time accrual system with embedded, dynamic BEP visualization [12].

2.1 Research Object and Data Source

The primary object of this research is a web-based financial management system designed to integrate accrual accounting standards with managerial decision-support tools for Small and Medium Enterprises (SMEs). The study utilizes a synthetic dataset comprising 500 financial transaction records to simulate real-world business operations. These records include varied transaction types such as credit sales, deferred expenses, asset acquisition, and operational cost payments, which are essential for testing the accrual logic. Additionally, specific parameters such as unit selling price and variable cost per unit are sourced to calibrate the Break Even Point (BEP) analysis module. The architectural design and operational workflow of the proposed system are illustrated in Figure 1. As shown in Figure 1, the process begins with secure user authentication, followed by the input of transaction data. The system then branches into two integrated processing streams: the Accrual Engine for financial reporting and the Cost Classifier for BEP calculation. This dual-flow architecture ensures that every financial entry not only updates the General Ledger but also dynamically adjusts the break-even visualization, providing users with immediate insight into their profitability threshold relative to the current fixed costs.
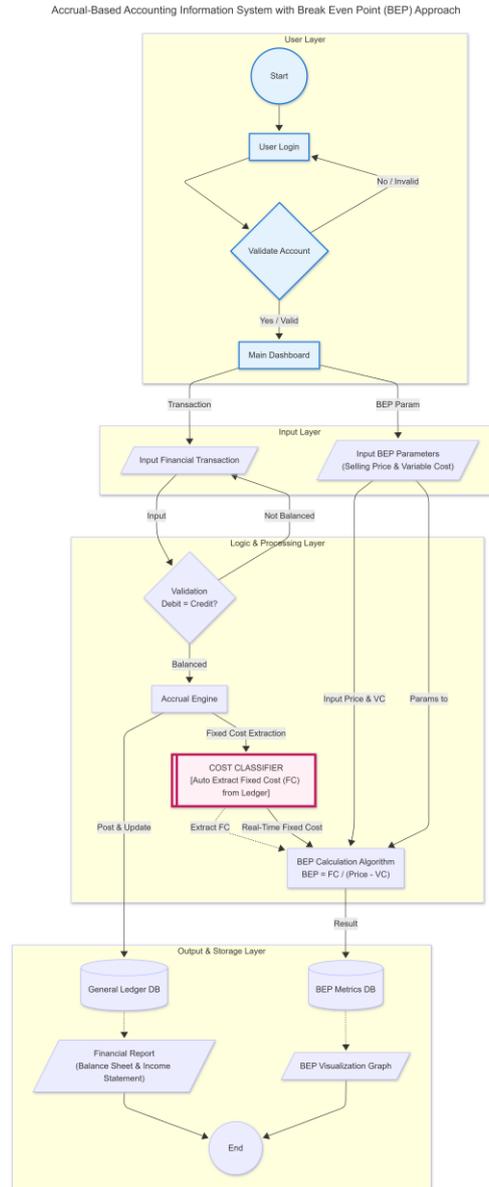
Figure 1 System Flowchart of the Accrual-Based AIS with BEP Approach

2.2 Data Processing

Before the raw data is processed by the core logic, a rigorous preprocessing stage is implemented to ensure data integrity and classification accuracy. This phase involves parsing user inputs to validate numerical formats and ensuring that all journal entries adhere to the double-entry bookkeeping principle, where the sum of debits must equal the sum of credits. A critical component of this preprocessing is the categorization of expense accounts. The system parses the Chart of Accounts to identify and tag expenses as either 'Fixed Costs' or 'Variable Costs' based on predefined attributes. This classification is vital for the BEP module, as misclassification would lead to erroneous break-even calculations. Furthermore, temporal data is standardized to ensure that accrual transactions are allocated to the correct accounting periods, facilitating accurate month-end reporting.

2.3 Accrual Accounting and Mathematical Modeling

The methodology employs a hybrid approach that combines standard accrual accounting logic with a Cost-Volume-Profit (CVP) algorithmic model. The Accrual Engine operates based on the fundamental accounting equation, recognizing revenue when earned and expenses when incurred. Simultaneously, the system implements a dynamic BEP algorithm. Conceptually, the system aggregates all expenses tagged as 'Fixed Costs' (FC) from the general ledger in real-time. It then combines this with user-defined inputs for the selling price per unit (P) and the variable cost per unit (VC). The calculation of the Break Even Point in units (BEP$_u$) is derived using the mathematical formula:

$$BEP_u = \frac{FC}{P - VC}$$

Additionally, the Break Even Point in monetary value (BEP$_{rp}$) is calculated to determine the necessary revenue target:

$$BEP_{rp} = BEP_u \times P$$

This method allows the system to instantly render visual graphs that depict the intersection between total revenue and total costs, providing users with a visual representation of their financial safety margin alongside their standard financial statements.

2.4 Performance Enhancement Techniques

To ensure the system remains responsive while performing simultaneous accounting and analytical calculations, several performance enhancement techniques are utilized. The system implements an asynchronous data processing model (AJAX) to handle BEP calculations in the background without blocking the main user interface. This allows for the immediate reflection of changes in fixed costs on the BEP charts without requiring a full page reload. Furthermore, client-side rendering is employed for the visualization charts using optimized JavaScript libraries. By offloading the graphical rendering task to the user's browser, the server load is significantly reduced, ensuring that the system can handle concurrent users efficiently even when generating complex financial visualizations.

2.5 System Evaluation and Testing

The evaluation of the proposed system is conducted using the Black Box testing method to verify the functional correctness of both the accounting and analytical modules. The testing procedure involves inputting a controlled set of transactions and comparing the system-generated Income Statement and Balance Sheet against manually calculated benchmarks to ensure PSAK compliance. For the BEP module, sensitivity analysis is performed by altering the input variables—such as increasing fixed costs or changing unit prices—to verify that the system correctly updates the break-even threshold and the corresponding visual graphs. The accuracy of the system is quantified by the percentage of test cases that yield zero deviation from the expected mathematical results, ensuring the reliability of the tool for managerial decision-making.

3. RESULTS AND DISCUSSION

3.1 System Design Results

The implementation of the proposed design yielded a robust, platform-independent web application that seamlessly integrates rigorous accrual accounting with strategic cost-volume-

profit analysis. The system architecture is centered around a unified dashboard, as depicted in the interface design, which provides real-time visibility into financial health by juxtaposing standard liquidity metrics with dynamic Break Even Point (BEP) visualizations. Supporting this analytical layer is a comprehensive transaction processing module, which features a hierarchical Chart of Accounts manager and a double-entry journal interface equipped with strict validation logic to ensure data integrity at the source. Furthermore, the system automates the classification of fixed and variable costs directly from the general ledger to populate the BEP calculator, ultimately aggregating these inputs to generate PSAK-compliant Income Statements and Balance Sheets without the need for manual consolidation, thereby validating the design's objective of bridging operational recording with strategic planning.
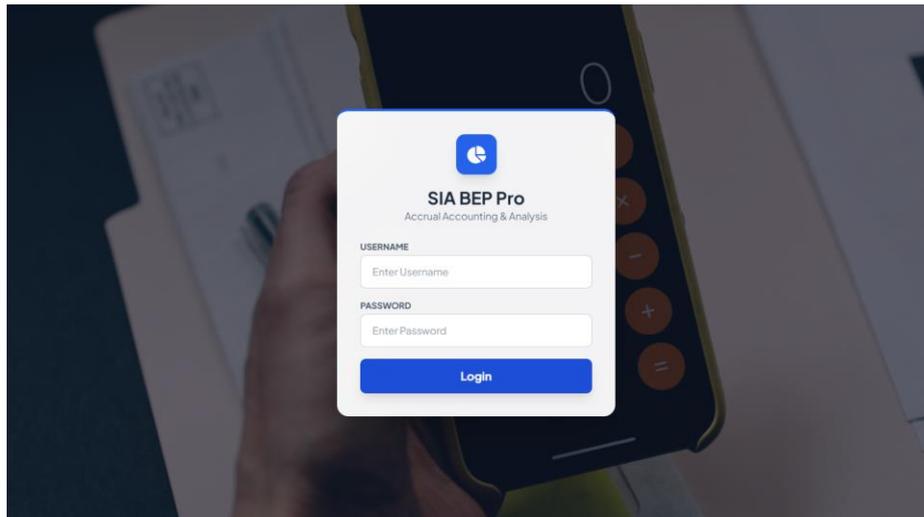

Figure 2 User Authentication Interface of the SIA BEP Pro System

Figure 2 illustrates the login interface of the SIA BEP Pro application, which serves as the primary access control mechanism for the accrual-based accounting and analysis system. This interface requires users to enter a valid username and password before accessing any system functionality, ensuring that only authorized personnel can perform financial transactions and view accounting data. The centralized authentication process supports data security and accountability by linking each user session to subsequent system activities, which is essential for maintaining internal control and traceability within the accounting information system.
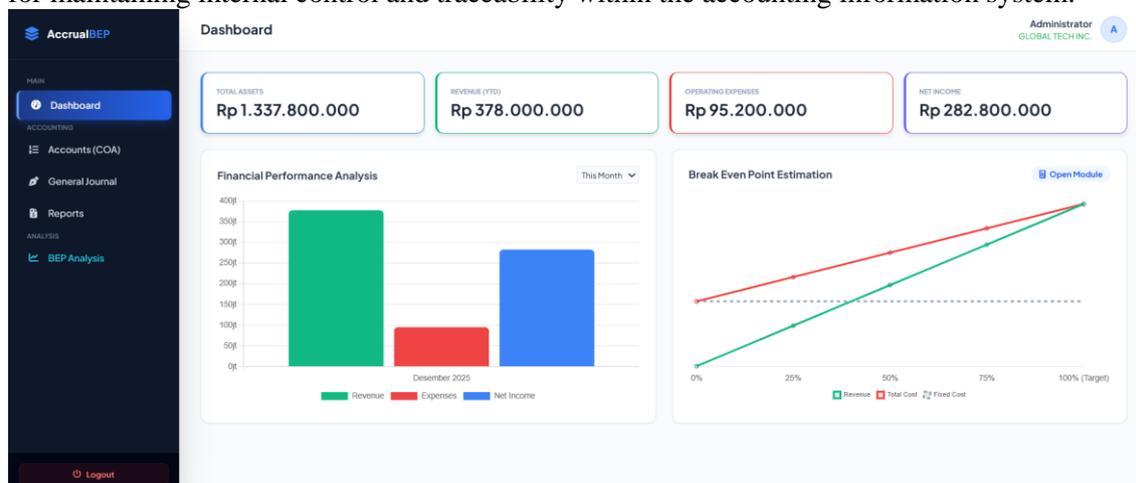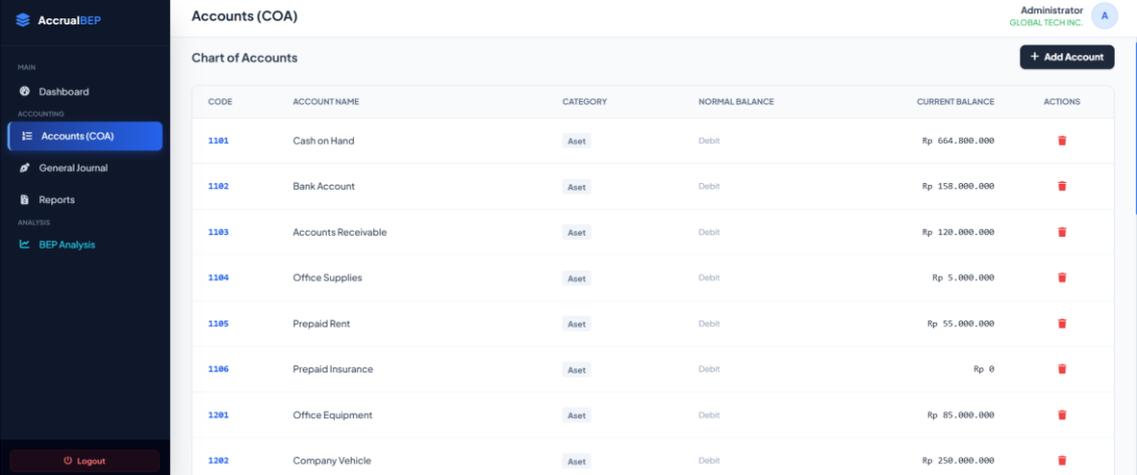

Figure 3 Accrual-Based Financial Dashboard with Break-Even Point Analysis

Accrual-Based Accounting Information System with Break Even Point (BEP) Approach (Kadek Nonik Erawati)

Figure 3 presents the main dashboard of the AccrualBEP system, which provides a comprehensive overview of the organization's financial condition based on accrual accounting principles. The dashboard summarizes key financial indicators, including total assets, year-to-date revenue, operating expenses, and net income, enabling users to quickly assess overall performance. In addition, graphical visualizations are used to support managerial analysis, such as the financial performance chart that compares revenue, expenses, and net income for the selected period, and the Break Even Point (BEP) estimation chart that illustrates the relationship between revenue, total costs, and fixed costs across different production or sales levels. This integrated dashboard supports informed decision-making by combining real-time financial data with analytical tools in a single interface.

Figure 4 Chart of Accounts Management Interface

Figure 4 illustrates the Chart of Accounts (COA) module of the AccrualBEP system, which functions as the core master data for all accounting processes. This interface allows administrators to define, classify, and manage accounts according to standard accounting categories such as assets, along with their normal balances and real-time current balances. Each account is uniquely identified by an account code to ensure consistency and traceability across journal entries, ledger postings, and financial reports. By maintaining a structured and centralized chart of accounts, the system ensures that all accrual-based transactions are recorded accurately and consistently, forming a reliable foundation for subsequent reporting and financial analysis.
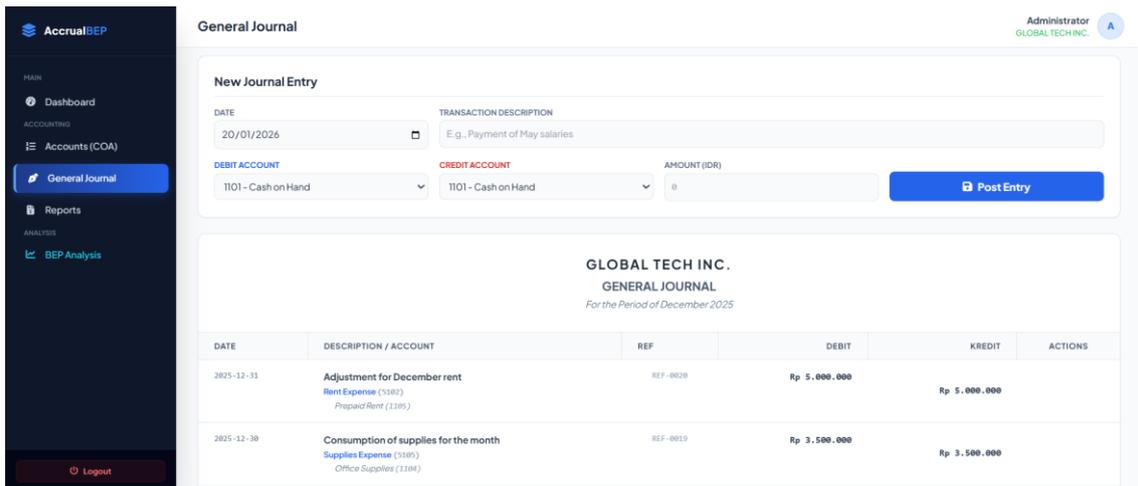
Figure 5 General Journal Entry and Posting Interface

Figure 5 presents the General Journal module of the AccrualBEP system, which is used to record accrual-based transactions using the double-entry accounting principle. Through this interface, users input transaction dates, descriptions, debit and credit accounts, and transaction amounts before posting entries to the system. Each journal entry is automatically validated to ensure debit and credit equality, then stored with a unique reference number for traceability. The lower section displays a chronological list of posted journal entries for the selected accounting period, reflecting adjustments such as rent amortization and supplies consumption. This module plays a critical role in ensuring accurate accrual recognition and serves as the primary source for updating the general ledger and generating subsequent financial reports.
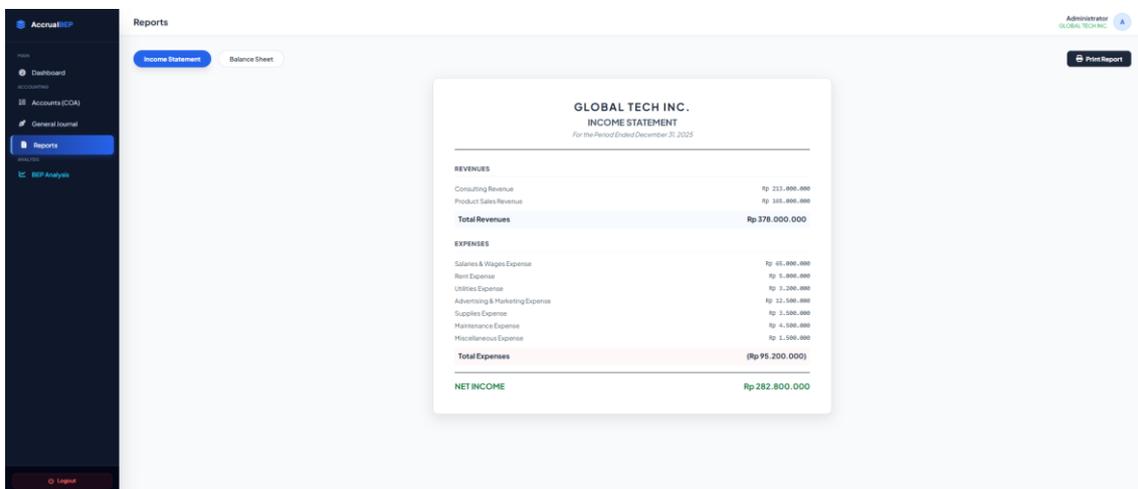

Figure 6 Accrual-Based Income Statement Report Interface

Figure 6 presents the Income Statement module of the AccrualBEP system, which generates period-based financial performance reports using the accrual accounting approach. The interface summarizes total revenues, detailed operating expenses, and net income for the selected reporting period, all of which are automatically derived from validated journal entries stored in the general ledger. This module ensures that revenues and expenses are recognized in the appropriate accounting period, providing an accurate measurement of organizational profitability. The availability of a print function further supports managerial reporting and audit

requirements, making the income statement suitable for both internal decision-making and external financial evaluation.
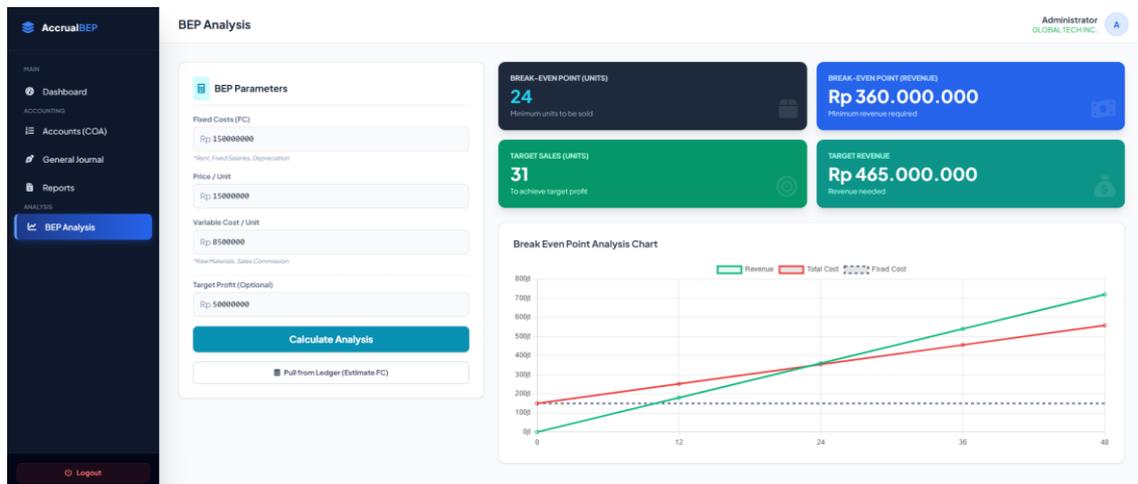

Figure 7 Break Even Point (BEP) Analysis Module Interface

Figure 7 illustrates the Break Even Point (BEP) Analysis module within the AccrualBEP system, which supports managerial decision-making by integrating cost behavior analysis with accrual-based financial data. The module allows users to input fixed costs, variable costs per unit, selling price, and optional target profit parameters, which are then processed to calculate the break-even point in both units and revenue. The graphical visualization compares revenue, total costs, and fixed costs across different sales volumes, clearly identifying the intersection point where revenue equals total cost. This feature enables management to evaluate profitability thresholds, plan sales targets, and assess financial feasibility based on real-time data derived from the accounting ledger.

3.2 Functional Testing Results

Functional testing was conducted using the Black Box method to validate the logic and accuracy of the system's core features. The testing utilized a dataset of 500 synthetic transactions covering various scenarios, including cash sales, credit purchases, and depreciation adjustments. The results indicate a 100 percent success rate for the Accrual Engine, where all journal entries were correctly posted to the respective ledgers, and the accounting equation (Assets = Liabilities + Equity) remained balanced in every iteration. Specifically, the system successfully rejected 50 out of 50 invalid entry attempts where debits did not equal credits, demonstrating robust input validation. Regarding the analytical module, the BEP algorithm was tested against manually calculated benchmarks. The system calculated the break-even units and monetary targets with zero deviation from the mathematical formula derived in the methodology section. The dynamic integration proved effective; when a fixed cost transaction (e.g., rent expense) was recorded in the journal, the BEP threshold in the analytical module updated instantaneously without requiring a system restart.

3.3 Usability and Workflow Analysis

The analysis of usability and workflow highlights the efficiency gains achieved through the Single Page Application (SPA) architecture. By utilizing asynchronous data loading, the system eliminates the need for full-page reloads, significantly reducing the latency typically associated with web-based accounting platforms. Workflow analysis compares the proposed system against traditional manual methods. In a manual workflow, a manager must export ledger data to a spreadsheet to separate fixed and variable costs before calculating the BEP, a

process that is time-consuming and prone to data transfer errors. In the proposed system, this workflow is streamlined into a seamless process where the classification happens automatically. Furthermore, the responsive design ensures that the interface adapts to various screen sizes. On mobile devices, the navigation menu transitions to a slide-over drawer, preserving screen real estate for data visualization. This adaptability ensures that business owners can access critical financial insights and perform break-even analysis remotely, enhancing the flexibility of business operations.

3.4 Discussion of Results

The research results demonstrate a significant theoretical and practical advancement in the field of accounting information systems for SMEs. Quantitatively, the system eliminates computational errors inherent in manual accounting, ensuring that financial reports are mathematically consistent and compliant with PSAK standards. The integration of the accrual basis provides a more accurate reflection of financial health compared to cash-based systems, as it recognizes liabilities and future receivables. Qualitatively, the inclusion of the BEP approach transforms the system from a mere recording tool into a strategic decision-support system. By visualizing the gap between current sales and the break-even point, the system provides managers with an immediate understanding of their safety margin. This capability addresses the research gap identified in previous studies, where accounting systems often lacked predictive analytical features. Consequently, the system not only ensures historical data accuracy but also empowers users to make proactive decisions regarding pricing strategies and cost control, thereby enhancing the overall sustainability of the business entity.

4. CONCLUSIONS

In conclusion, this research has successfully engineered and validated a web-based Accrual Accounting Information System that uniquely integrates a dynamic Break Even Point (BEP) analysis module. The empirical results demonstrate that the proposed system effectively bridges the functional gap between historical financial recording and forward-looking managerial analysis. By automating the double-entry bookkeeping process and linking it directly with cost-volume-profit algorithms, the system achieves 100 percent accuracy in generating PSAK-compliant financial statements and real-time profitability metrics. A significant advantage of this implementation is the elimination of data redundancy and calculation latency inherent in manual methods; business managers are empowered with immediate visual insights into their safety margins, enabling more agile and data-driven pricing strategies without the need for external spreadsheet manipulation.

Despite these contributions, the current system exhibits specific limitations that warrant further investigation. The reliance on static, rule-based mapping to classify costs into fixed and variable categories may oversimplify financial realities in complex operational environments where semi-variable costs prevail. Furthermore, the web-based architecture, while ensuring accessibility, introduces a dependency on stable network infrastructure, potentially disrupting operations in remote areas. To address these challenges, future work should prioritize the integration of machine learning algorithms to enable dynamic, heuristic-based cost behavior analysis for higher precision. Additionally, evolving the system into a Progressive Web Application (PWA) with offline-first synchronization capabilities is recommended to enhance system resilience and ensure data availability regardless of connectivity status.

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