

The Impact of Accounting Digitalization on Financial Efficiency at PT Bukit Asam Tbk

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ABSTRACT

Keywords

*Digital
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This research aims to analyze the influence of accounting digitalization on financial efficiency at PT Bukit Asam Tbk. Using a descriptive quantitative and associative approach, the data analyzed consists of quarterly operating profit reports from 2019–2024, before and after the implementation of digital systems such as ERP, e-Invoice, and the CISEA application. The analysis technique used is the Wilcoxon Signed-Rank Test, as the data is not normally distributed. The results show that there is a significant difference between profits before and after digitalization, with a significance value right at the threshold ($p = 0.05$). This indicates that accounting digitalization contributes positively to the improvement of the company's financial efficiency, although its impact needs to be studied further in the long term. Factors supporting the effectiveness of digitalization include technology infrastructure, management commitment, and human resources readiness; while its obstacles consist of internal resistance and a lack of system evaluation. This study provides empirical contributions in the context of digital transformation of mining companies in Indonesia and enriches the literature on efficiency based on accounting information systems.

1. Introduction

In today's era of accelerated information technology development, industries across various sectors are increasingly compelled to integrate digital systems as a means to boost operational efficiency and maintain competitive advantage. Embracing digital transformation is no longer merely a prevailing trend—it has evolved into a critical strategy, particularly in the domains of financial reporting and information management. The digitalization movement has significantly altered how businesses operate, especially within accounting practices, where the need for timely, precise, and dependable data has pushed firms to adopt advanced technological tools. Consequently, the shift towards digital accounting systems has emerged as a key focus for organizations striving to ensure optimal performance and streamlined operations. This study seeks to examine how the adoption of digital technologies contributes to enhancing financial efficiency within large-scale enterprises in Indonesia.

1.1 Background

In the wake of the Fourth Industrial Revolution, digitalization has emerged as a crucial element in corporate transformation, particularly within the accounting sector. The digitalization of accounting refers to the integration of information technology to automate activities such as data entry, financial processing, and report generation. This approach is intended to enhance the accuracy and speed of financial reporting while maintaining a focus on optimizing corporate financial efficiency.

As one of Indonesia's major coal mining enterprises, PT Bukit Asam Tbk has encountered considerable challenges in managing administrative tasks, particularly due to the demand for transparency from stakeholders given the vast scale of its operations. To address these challenges, strategic efforts must be implemented to minimize operational expenses, expedite information processing, and improve the dependability of financial data in pursuit of greater financial efficiency.

Nevertheless, the link between digitalization and financial efficiency in corporations is not universally straightforward. Its effectiveness hinges on several factors, including the robustness of the technological infrastructure, the competency of human resources, and the overall operational systems in place. In light of this, the present study aims to deepen the understanding of how digital tools influence the financial efficiency of PT Bukit Asam Tbk.

This research intends to shed light on the connection between accounting digitalization and corporate financial performance, offering valuable insights for companies with similar profiles that are planning to pursue digital approaches in their financial operations..

1.2 Problem Statement

Does the digitization of accounting significantly affect the financial efficiency of companies?
And What factors support or hinder the effectiveness of financial digitization in companies?

1.3 Objectives and Scope

To determine whether accounting digitalization has a significant effect on the financial efficiency of the company and to identify the factors that support or hinder the effectiveness of the company's financial digitalization.

2. Literature Review

Accounting digitization is the process of transforming the recording and reporting systems of financial data from manual methods to technology-based digital systems. According (Nugroho et al., 2024), digitization allows for the automation of routine processes such as transaction recording and financial report preparation, which impacts operational efficiency and increases transparency.

2.1 Related Work

According to Loang (2023), the integration of digital technology plays a pivotal role in enhancing the quality of financial reporting and analytical processes. While this aligns closely with the central theme of the present research, Loang's study did not specifically examine profitability efficiency. In a different context, Ajape and Adelowotan (2025) explored the impact of cloud-based accounting on return on assets (ROA) within the Nigerian banking sector. Although their research contributes to the discussion on efficiency, it differs both in terms of industry focus and the metrics employed for assessing profit. Al-Hattami (2025), conducting research in the Middle East, identified a positive correlation between the implementation of digital accounting systems and increased return on investment (ROI). This finding supports the intended outcomes of the current study, although Al-Hattami did not utilize a longitudinal quarterly-based framework in the analysis.

Meanwhile, Hamdan (2024) investigated the quality of accounting information systems (AIS) and their influence on data efficiency using a PLS-SEM approach. Though methodologically distinct, Hamdan's emphasis on system efficiency shares common ground with this study. Supporting the argument that digitalization enhances operational performance, Gnatiuk et al. (2023) found that digital systems significantly reduce reporting errors and improve timeliness. However, their research was conducted at a broader, macroeconomic, and cross-national scale, contrasting with the firm-specific focus adopted here. Iversen and Sangrigoli (2024) noted that digitalization may initially suppress short-term

profitability before fostering long-term innovation, highlighting transitional impacts rather than steady-state efficiency—an angle that diverges from the current study's objectives.

Adebola (2023) examined how digital initiatives promote financial accountability in the manufacturing sector. While this adds valuable perspective, Adebola's emphasis lies more in governance and transparency, in contrast to the current emphasis on profit-based efficiency. Likewise, Mosteanu and Faccia (2020) underlined the transformative role of blockchain and fintech in advancing accounting infrastructure. Their insights reinforce the technological foundation of digital transformation but focus primarily on the underlying system architecture rather than performance outcomes.

Additionally, MELANI et al. (2024) underscored the significance of human capital in determining the success of financial digitalization, particularly within institutions in Bali. Their findings suggest that human resource capabilities can either support or impede the realization of digital benefits. Finally, Iversen and Sangrigoli (2024) also highlighted that the outcomes of digital transformation are often contingent upon an organization's internal readiness. This perspective contrasts with the current study's paired quantitative design, which seeks to measure outcomes with greater precision and consistency.

2.2 Research Gap

This study seeks to address several critical gaps that have remained largely overlooked in prior research. To begin with, while earlier studies have predominantly concentrated on sectors such as banking, manufacturing, or regional financial services, the mining industry—particularly state-owned enterprises like PT Bukit Asam Tbk—has not received sufficient scholarly attention in the area of accounting digitalization. Secondly, the methodological framework employed in this research distinguishes itself by utilizing a comparative quantitative approach that analyzes quarterly profit figures from periods before and after the digital transition. This differs significantly from conventional studies, which often rely on cross-sectional analyses or inter-firm regression models. Thirdly, this study measures financial efficiency directly using profit outcomes as an indicator of operational performance, providing a more tangible and specific assessment compared to the use of general financial ratios like ROA or ROI. Additionally, this research offers a valuable contribution within the Indonesian context—a geographic setting that remains underrepresented in global academic discussions on digital accounting transformation. Finally, the study addresses a rarely explored analytical gap by explicitly linking the adoption of digital tools such as ERP systems, e-Invoicing, and CISEA platforms to observable changes in financial efficiency through a longitudinal lens.

3. Methodology

The study adopts a quantitative research framework combining descriptive and associative approaches to analyze how accounting digitalization influences financial efficiency at PT Bukit Asam Tbk. This methodological choice enables a structured representation of shifts in profit trends while allowing for an objective examination of the relationships between key variables. The data utilized in this research were obtained through document analysis, specifically drawn from the company's quarterly financial statements spanning the period from 2019 to 2024. A saturated sampling technique was applied, encompassing the full range of profit data from both the pre- and post-digitalization phases to ensure comprehensive coverage and analytical depth.

3.1 Data Collection

This study utilizes secondary data sourced from PT Bukit Asam Tbk's officially released quarterly financial statements spanning the years 2019 to 2024. The dataset comprises figures on operating profit, which are employed to assess and compare the company's financial efficiency prior to and following the digital transformation of its accounting system. A saturation sampling method is applied, meaning that all available quarterly profit data within the specified period are included in the analysis without exclusion. The research adopts a non-experimental design, using a comparative paired-period approach—such as comparing Q1 of 2019 with Q1 of 2022—to enable an objective assessment of the influence of digitalization on financial performance, grounded in historical data.

3.2 Analysis Techniques

The analytical method employed in this research is the Wilcoxon Signed-Rank Test, a non-parametric statistical tool designed to evaluate differences between two related samples—in this context, the operating profits recorded before and after the implementation of accounting digitalization. This test was selected due to the non-normal distribution of the data, as identified through preliminary assessments using the Shapiro-Wilk and Kolmogorov-Smirnov normality tests. Data analysis is conducted using statistical applications such as SPSS or Microsoft Excel, applying a paired comparison of matching quarterly periods to maintain objectivity and ensure the validity of the results. The chosen technique is well-suited to the research objective, which aims to provide empirical insight into the effect of digitalization on corporate financial efficiency.

3.3 Validation

To ensure the validity and reliability of the data, this research uses the official financial reports of PT Bukit Asam Tbk as a source of audited and verifiable data. Normality tests were performed using Shapiro-Wilk and Kolmogorov-Smirnov to determine the data distribution, and the results justified the use of the Wilcoxon Signed-Rank test as an appropriate method. Comparisons of profits between periods are arranged in pairs (for example Q1 2019 with Q1 2022) to control for seasonal factors, thereby enhancing internal validity. Measurements of variables were conducted consistently and based on quantitative data, reinforcing the reliability of the analytical results.

4. Results and Discussion

Tabel 4.1

Laba Oprasional Triwulan 2019-2024 PT Bukit Asam Tbk

Sebelum		Sesudah	
2019Q1	2,039,973	2022Q1	2,864,991
2019Q2	2,592,775	2022Q2	7,191,794
2019Q3	4,081,898	2022Q3	12,065,844
2019Q4	5,014,355	2022Q4	15,145,421
2020Q1	1,080,094	2023Q1	1,319,458
2020Q2	1,384,118	2023Q2	3,015,918

2020Q3	1,826,890	2023Q3	4,302,359
2020Q4	2,520,425	2023Q4	7,202,709
2021Q1	514,539	2024Q1	948,187
2021Q2	2,324,858	2024Q2	2,517,385
2021Q3	6,316,186	2024Q3	3,919,848
2021Q4	9,959,025	2024Q4	5,652,418

All pairs of data show differences, most of which are significant improvements, especially in the early post-digitalization phase.

Tabel 4.2

Uji Normalitas (Kolmogorov-Smirnov dan Shapiro-Wilk)

	Kolmogorov-Smirnov ^a			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
selisih	.524	12	.000	.335	12	.000

a. Lilliefors Significance Correction

p-value < 0.05 = data is not normally distributed. The data of the differences between 'before' and 'after' (i.e., the differences of quartiles) is not normally distributed, so you should not use the paired t-test because it violates the assumptions of parametric tests. An alternative test is the Wilcoxon test.

Tabel 4.3

Uji Wilcoxon Signed-Rank

Test Statistics^a

	sesudah - sebelum
Z	-1.961 ^b
Asymp. Sig. (2-tailed)	.050

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

Based on the results of the Wilcoxon Signed-Rank test on the effectiveness data of the information system before and after digitization, a p-value of 0.05 was obtained. This value is exactly at the commonly used significance threshold ($\alpha = 0.05$), thus it can be concluded that there is a statistically significant difference between the two conditions.

4.1 Key Findings

Based on the analysis conducted, it can be inferred that the digitalization of the accounting system at PT Bukit Asam Tbk has had a notable impact on enhancing the company's financial efficiency. This is evidenced by statistically significant differences in quarterly profit figures when comparing the pre- and post-digitalization periods, with the Wilcoxon Signed-Rank Test producing a p-value at the critical threshold ($p = 0.05$). These results suggest that the adoption

of digital tools such as ERP systems, electronic invoicing (e-Invoice), and the CISEA platform has contributed to greater accuracy and effectiveness in financial reporting and management processes. Nevertheless, the observed fluctuations in profit—particularly the declines recorded in some quarters of 2024—highlight that the success of digital transformation is also dependent on external economic conditions and the internal preparedness of the organization. In general, digitalization presents a promising avenue for improving efficiency, though its long-term impact requires continuous monitoring and adaptive management to ensure sustained benefits.

4.2 Interpretation of Results

Addressing the first research objective—whether accounting digitalization significantly influences the company's financial efficiency—the results of the Wilcoxon Signed-Rank Test suggest that the implementation of a digital accounting information system at PTBA does indeed have a meaningful effect on enhancing financial efficiency. This improvement is evidenced by notable differences in efficiency scores observed before and after the digital transformation. However, as the statistical significance value sits precisely at the threshold level ($p = 0.05$), these findings warrant further validation, potentially through expanded datasets or the application of time-series analysis to assess long-term trends.

The second objective concerns identifying the factors that either facilitate or hinder the success of financial digitalization. Although these factors are not explicitly captured through the statistical data, they can be inferred through qualitative methods such as field studies or observational research. Key enablers of effective digitalization may include: (1) the presence of robust technological infrastructure, (2) strong commitment from management to support digital initiatives, and (3) sufficient training and preparedness of personnel. On the other hand, several challenges that may obstruct the process include: (1) employee resistance to organizational change, (2) continued reliance on legacy manual systems, and (3) the absence of routine evaluation and maintenance of digital tools.

5. Discussion

The results of this study demonstrate that the digitalization of accounting processes has had a significant positive effect on enhancing financial efficiency at PT Bukit Asam Tbk, particularly during the initial stages of implementation. These findings are consistent with previous research by Al-Hattami (2025) and Gnatiuk et al. (2023), who concluded that digital technologies can improve organizational performance and reduce inefficiencies. Nevertheless, the observed decline in profits over several recent quarters suggests that the benefits of digital transformation may not always follow a linear or sustained trajectory, echoing the conclusions drawn by Iversen and Sangrigoli (2024). This study is constrained by several limitations, including its focus on a single company, the relatively short duration of the data analyzed, and the exclusion of external variables such as market dynamics or fluctuations in production costs, which could also influence financial outcomes. As such, future research should consider adopting a more extended time series analysis and incorporating qualitative dimensions to more comprehensively understand the multifaceted effects of accounting digitalization.

5.1 Comparison with Prior Research

The results of this study generally align with numerous prior findings that highlight the positive influence of accounting digitalization on organizational efficiency and financial outcomes. Specifically, the findings support the conclusions of Al-Hattami (2025) and

Gnatiuk et al. (2023), who emphasized that the adoption of digital systems can enhance operational effectiveness and improve decision-making processes. The rise in quarterly profits at PT Bukit Asam following the deployment of ERP systems and the CISEA platform serves as empirical confirmation of these claims. However, the outcomes also reveal a non-linear pattern, consistent with the observations of Iversen and Sangrigoli (2024), who noted that digitalization might initially suppress profitability before yielding long-term gains. This trend is evident in the profit declines observed in 2024, which were lower compared to the earlier post-digitalization periods—suggesting that both internal preparedness and external variables may influence the stability and effectiveness of digital initiatives.

In contrast to studies such as those by Adebola (2023) and MELANI et al. (2024), which primarily concentrate on accountability or reporting perceptions, this research expands the discussion by offering a concrete and longitudinal assessment of how digitalization impacts actual profit performance. As such, the study not only reinforces existing academic discourse but also contributes novel insights by employing a paired-period methodology and directing attention to the mining industry in Indonesia—a sector that has remained relatively underexplored in this context.

5.2 Limitations

This study acknowledges several limitations that are important to consider when interpreting the results. Firstly, the scope of the research is confined to a single entity—PT Bukit Asam Tbk—meaning the conclusions drawn cannot be readily generalized to the broader mining industry or other sectors. Secondly, the analysis covers a relatively short time frame of six years (2019–2024), which, while adequate for identifying short-term patterns, does not capture the potential long-term effects of digitalization. Thirdly, the research relies solely on a quantitative methodology using secondary data, without incorporating qualitative insights or direct field observations. As a result, critical elements such as organizational dynamics, digital adaptability, and workforce preparedness are not thoroughly explored. Lastly, the application of the Wilcoxon Signed-Rank Test focuses only on identifying differences in profit across time periods and does not examine underlying causal mechanisms or the presence of intervening variables. Given these constraints, the findings should be interpreted with caution. Nonetheless, this study provides a valuable foundation for future research that could adopt a more expansive timeframe, involve multiple companies, and integrate both quantitative and qualitative dimensions to produce a more comprehensive understanding of digitalization's impact.

5.3 Future Research

For future researchers, it is recommended to use more complex time series approaches such as Interrupted Time Series Analysis (ITSA) or ARIMA models with intervention variables, in order to analyze the impact of digitalization more accurately while considering time factors and seasonal trends. In addition, future research could incorporate qualitative aspects, such as in-depth interviews with information system users (employees and managers), to gain a more comprehensive understanding of perceptions regarding changes in financial effectiveness.

6. Conclusion

Research shows that the digitization of the accounting information system at PT Bukit Asam (PTBA) has a significant impact on financial efficiency, as evidenced by the Wilcoxon Signed-Rank test results with a significance value of 0.05. Although significant, these results are marginal and require further verification through long-term analysis such as time series.

The success of digitalization does not only depend on technology, but also on the readiness of the organization, such as adequate infrastructure, managerial support, as well as the competence and training of human resources. Conversely, challenges such as employee resistance, dependence on legacy systems, and lack of regular evaluation can hinder the effectiveness of digitalization.

Overall, digitization has great potential in improving financial efficiency, but it requires a comprehensive, strategic, and sustainable approach for its impact to be optimal.

7. Recommendation

This study explores the impact of accounting system digitalization on financial efficiency within PT Bukit Asam Tbk, a state-owned enterprise in the mining sector currently undergoing a digital transformation through the integration of ERP systems, electronic invoicing (e-Invoice), and the CISEA platform. A descriptive and associative quantitative method was employed, utilizing documentation of quarterly financial reports from 2019 to 2024. The analysis was conducted using non-parametric statistics, specifically the Wilcoxon Signed-Rank Test, with data collected through a saturated sampling technique. All data points were paired to compare performance before and after the digital implementation.

The core findings reveal that digital accounting systems significantly enhance financial efficiency, as demonstrated by changes in operating profit between the two periods. Although the statistical significance is at the marginal level ($p = 0.05$), the results strengthen existing empirical evidence suggesting that digital tools contribute to faster reporting, fewer errors, and more effective financial management. Implicit in these findings is the understanding that successful digital transformation relies not only on technological infrastructure but also on the organization's internal readiness and external environmental factors.

This research contributes meaningfully to the academic discourse by introducing a relatively unexplored sector—the Indonesian mining industry—into the context of accounting digitalization. Furthermore, its use of paired quarterly data introduces a novel, longitudinal approach to measuring efficiency, offering an alternative methodological perspective for future studies in this field.

Appendix

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b. Based on negative ranks.

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