

The relationship between SCM digitalization and earnings management: The case of Moroccan companies listed on the Casablanca stock exchange

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Abstract: This study investigates the impact of digitalization in Supply Chain Management (SCM) on earnings management practices among Moroccan listed companies. Using a sample of 48 non-financial firms over the period 2016–2023, it examines how three key digital SCM tools, Enterprise Resource Planning (ERP), Electronic Data Interchange (EDI), and Digital Tracking Systems (DTS) influence the extent of discretionary accruals as a proxy for earnings management. Relying on panel logistic regression models with robust standard errors, the findings reveal that ERP adoption and digital tracking technologies significantly reduce earnings management, thereby enhancing financial transparency and information reliability. These results support the assumptions of agency theory, transparency theory, and institutional theory, which suggest that digitalization can mitigate information asymmetry and opportunistic managerial behavior. However, EDI use exhibits no significant relationship, indicating that its impact depends on the level of technological integration and organizational maturity. Overall, this study contributes to the emerging literature on digital transformation and financial governance by providing empirical evidence from an emerging market context, emphasizing how SCM digitalization fosters ethical reporting and strengthens corporate accountability in Morocco.

Keywords: Digital tracking systems, Discretionary accruals, Earnings management, EDI, ERP, Morocco, Supply chain digitalization.

1. Introduction

In an era where digital transformation is reshaping corporate operations, the integration of digital technologies within Supply Chain Management (SCM) has become a critical driver of organizational performance and transparency. While the operational benefits of SCM digitalization are well established, its implications for financial reporting practices, particularly earnings management, remain underexplored, especially in emerging economies.

Earnings management, defined as the deliberate manipulation of accounting figures within the bounds of Generally Accepted Accounting Principles (GAAP), poses a serious threat to the quality of financial information [1, 2]. In settings characterized by weak institutional oversight and limited transparency, such as Morocco, the risk of opportunistic earnings management is heightened [3]. At the same time, technologies like ERP systems, EDI platforms, and digital traceability tools (e.g., RFID, IoT, blockchain) are transforming the way firms manage data flows, synchronize operations, and report financial outcomes [4].

From a theoretical standpoint, several frameworks provide insight into the expected relationship between SCM digitalization and earnings management. Agency theory suggests that digital systems reduce the scope for managerial opportunism by improving auditability and aligning incentives [5, 6]. Transparency theory emphasizes how structured, accessible, and real-time information flows discipline financial reporting [4]. Similarly, institutional theory highlights the role of digitalization as a

normative response to external legitimacy pressures [7, 8] while signaling theory posits that digital transformation serves as a credible commitment to transparency [9, 10]. Lastly, the dynamic capabilities theory frames digital supply chain management as a strategic resource that enables better financial governance through timely and accurate data integration [11, 12].

Despite these theoretical connections, empirical research linking digital SCM practices and earnings management remains scarce, particularly in the Global South. Most prior studies have focused on the effects of ERP systems on internal controls or audit quality in developed countries [12, 13] with limited attention paid to how broader supply chain digitalization, such as EDI use or real-time tracking, might influence financial reporting behavior in emerging economies.

This study aims to fill this gap by investigating whether the digitalization of information flows in SCM influences the level of earnings management among Moroccan listed firms. Specifically, we examine the impact of ERP adoption, EDI usage, and the presence of digital tracking systems on the extent of discretionary accruals, using a panel dataset of 48 non-financial firms over the 2016–2023 period.

By bridging the fields of digital supply chain management and financial reporting, our study contributes to both academic literature and managerial practice. It sheds light on how operational technologies can support financial integrity and offers empirical evidence relevant to corporate governance, regulatory policy, and digital transformation strategies in emerging markets.

2. Literature Review and Hypotheses Development

2.1. Digitization of Information Flows in SCM

In an increasingly digitized environment, companies rely on advanced technologies to ensure the fluidity, reliability, and traceability of their information flows throughout the supply chain. The digitization of information flows is therefore a strategic lever for creating value, improving operational performance, and enhancing accounting transparency.

Modern supply chain management relies on the adoption of digital technologies that facilitate the sharing of accurate, fast, and secure information. Among these, four tools dominate the transformation of information flows:

- The ERP (Enterprise Resource Planning) system integrates the various functions of the company into a single database, providing a consolidated and up-to-date view of logistics, financial, and accounting processes [14]. It is therefore a key tool for automation and interdepartmental synchronization.
- EDI (Electronic Data Interchange) enables the structured exchange of logistics information between business partners (customers, suppliers, carriers), significantly reducing data entry errors, delays, and administrative costs [15]. It is considered a catalyst for inter-organizational performance.
- RFID (Radio Frequency Identification) technology, in combination with IoT sensors, provides real-time visibility of products throughout the supply chain. It improves inventory management, anticipates shortages, and aligns physical flows with information flows [16].
- Blockchain, as a distributed ledger, ensures immutable and transparent traceability of logistics transactions. Its integration into the supply chain secures shared data, strengthens trust between partners, and limits the risk of manipulation [17].

The purpose of these digital technologies is to integrate upstream and downstream information flows. This integration represents a company's ability to exchange and synchronize its data with its suppliers, service providers, and customers. This close coordination makes it possible to transform a fragmented supply chain into a fluid and responsive process [17].

Upstream, integration enables the sharing of data on supplier stock levels, production lead times, and advance orders. It improves planning, reduces procurement costs, and mitigates the effects of uncertainty [13].

Downstream, the transmission of information on sales, order histories, and consumption forecasts makes it possible to adapt logistics flows to actual demand, promoting pull production models and agile logistics practices [8].

Furthermore, strong integration improves the company's information governance by making processes more traceable, auditable, and compliant with financial transparency requirements. This increased control limits opportunities for accounting manipulation and enhances the quality of data used for financial reporting [10, 18].

This is why it is important to measure the information performance of the digitalized supply chain, i.e., an organization's ability to manage its data flows in a fluid, reliable, and synchronized manner, both internally and with its logistics partners. It is now considered a key indicator of digital maturity [13].

Among the main indicators used in the literature to assess this performance are:

- Data synchronization rate [13];
- Level of integration of ERP or EDI systems [14];
- Logistics visibility rate via RFID or blockchain [16];
- Reduction in information transmission times [19];
- Data quality (accuracy, consistency, timeliness) [12].

These indicators reflect the company's ability to transform data into a strategic asset for decision-making, operational performance, and accounting compliance. Indeed, high information performance helps reduce errors and improve efficiency.

2.2. Theoretical Links between Digitalized SCM and Earnings Management

The introduction of digital technologies into the supply chain has effects that go beyond operational performance alone. It transforms internal and external information dynamics, influences the decision-making behavior of managers, and impacts the quality and reliability of financial information. Several theoretical frameworks help us understand the link between the digitization of information flows and earnings management, particularly through the concepts of transparency, control, legitimacy, and strategy.

2.2.1. Agency Cost Theory

According to the founding theory of Jensen and Meckling [5], managers may be tempted to manipulate accounting results in a context of information asymmetry, when their objectives (compensation, reputation) diverge from those of shareholders. The digitization of SCM, by enhancing the traceability and auditability of operations, reduces these asymmetries and, consequently, the incentives for opportunistic management of results [6].

Several empirical studies confirm that digital systems such as ERP or EDI facilitate interdepartmental supervision and coordination, limiting discretionary margins in accounting adjustments [12–14]. By reducing areas of internal opacity, these tools lower the agency costs associated with monitoring and controlling information.

2.2.2. Theory of Informational Transparency

The theory of transparency, developed in particular by Jensen and Meckling [5] posits that a rich and structured information environment reduces opportunistic behavior by forcing managers to produce higher-quality financial statements. The digitization of information flows acts as a major lever for this transparency.

The use of technologies such as blockchain in supply chains, for example, ensures data integrity, immutability, and real-time accessibility by stakeholders [16, 17]. This increased traceability makes accounting practices more verifiable and limits opportunistic manipulation identified by discretionary accruals [10].

2.2.3. Institutional Theory and Digital Normative Pressure

According to DiMaggio and Powell [7], companies tend to comply with dominant institutional and social norms in order to maintain their legitimacy. In a context where digitalization is becoming an organizational norm (as in the case of Supply Chain 4.0 and ISO 28005), the integration of digital technologies into SCM is no longer just a strategic choice but a normative requirement.

This isomorphism, dynamic and reinforced by regulatory (compliance standards, ESG requirements) and competitive pressures, is pushing companies to adopt high-performance information systems that, de facto, improve the quality of financial reporting [8, 12, 19]. Digitalization thus becomes an institutional mechanism for indirect accounting discipline.

2.2.4. Signaling Theory

Signaling theory, Spence [9] and Ross [20], suggests that companies can adopt certain practices or technologies as credible signals of quality to investors, analysts, or auditors. From this perspective, the visible implementation of an ERP or blockchain can be interpreted as a voluntary commitment to transparency and informational rigor.

This signaling strategy is particularly relevant in emerging markets where reputation and informational legitimacy are unstable. Recent studies, Siladjaja and Markonah [21]; Yu et al. [10] and Shi and Yu [19] show that firms with a high level of digitalization are perceived as more credible, which reduces the need to manipulate their results to meet market expectations.

2.2.5. Dynamic Capabilities Theory

Dynamic capabilities theory Teece et al. [11] argues that a company's sustainable competitiveness depends on its ability to integrate, reconfigure, and evolve its resources, particularly informational resources. The digitization of the supply chain is a key organizational capability that makes it possible to manage the complexity of flows, anticipate disruptions, and produce more reliable and faster financial information.

The alignment between logistics information systems and accounting systems contributes to more rigorous governance of accounting data, thereby limiting the use of earnings management [12, 14].

These five theoretical approaches provide insight into why and how the digitization of information flows in SCM can reduce performance management practices. Whether it is to limit information asymmetries, respond to institutional pressure, or signal a commitment to transparency, digital tools are becoming both drivers of logistics performance and levers of accounting reliability.

2.3. Research Hypotheses

Building on the theoretical foundations mobilized earlier, we posit that digitalizing informational flows within the supply chain reduces opportunistic earnings management practices by limiting information “blind spots” and strengthening operational traceability.

More specifically, technologies such as ERP, EDI, and digital traceability devices enhance inter-functional coordination, increase flow transparency, and deepen upstream-downstream integration. These features curb managers' ability to exercise excessive discretionary judgment over accounting entries, particularly discretionary accruals, the main proxy for earnings management.

H1 – ERP adoption and earnings management: Integrated ERP systems centralize and monitor accounting and logistics operations, thereby reducing manipulation opportunities through greater inter-departmental transparency [13, 14]. Thus, our first hypothesis: The level of ERP adoption is negatively associated with the level of earnings management.

H2 – EDI use and earnings management: EDI improves coordination with external partners (suppliers, distributors) and makes flows more visible, limiting artificial timing of revenues and expenses [15]. The second hypothesis: Extensive use of EDI is associated with lower earnings management practices.

H3 – Digital traceability and earnings management: Technologies such as RFID or blockchain provide heightened operational transparency, strengthen internal control, and reduce discretionary latitude [10, 16]. The third hypothesis can be expressed as follows: The presence of digital traceability devices in the supply chain is associated with a lower level of earnings management.

Finally, consistent with prior literature on the determinants of earnings management, we include three control variables [3, 22]: Firm size, industry sector, and financial performance, captured by economic profitability (ROA). These controls help isolate the net effect of supply-chain digitalization on earnings management behavior.

3. Research Methodology

This section begins by describing the procedure used to construct the study sample. It then outlines the approach employed to measure earnings management through the estimation of discretionary accruals. Finally, it explains how the explanatory variables were operationalized.

3.1. Research Sample

To address our research question, we utilized panel data covering the period 2016–2023 for Moroccan firms listed on the Casablanca Stock Exchange as of 2025. From the initial population of 77 listed firms, we excluded financial institutions through a stratification process in order to focus exclusively on non-financial sectors, which are more directly involved in inventory management practices¹.

All data were sourced from the Casablanca Stock Exchange, and our sample was constructed based on information obtained from its official website. The selection process was guided by three main criteria: first, the inclusion of non-financial Moroccan companies listed in the database; second, the exclusion of outliers or companies without a minimum eight-year historical record; third, the exclusion of companies with no inventories. Applying these criteria resulted in a final fixed sample of 48 companies over the study period.

Table 1 summarizes the selection process used to construct the study sample.

Table 1.
Summary of Sample Selection.

Selection Criteria	Number
Companies listed on the Casablanca Stock Exchange	77
- Excluded: financial sector companies	-20
- Excluded: firms with insufficient data	-9
= Final Sample	48

3.2. Measurement of Discretionary Accruals

Earnings management is measured using a three-step approach. First, we calculate total accruals. Second, we estimate normal (non-discretionary) accruals using the model developed by Kothari et al. [23]². Finally, we compute discretionary accruals, which constitute the primary focus of this study.

3.2.1. First Step: Determination of Total Accruals

Following the literature, Jiraporn et al. [26]; Robin and Wu [27]; Brahmana et al. [28] and Bellari [22], we adopt the subtractive method to compute total accruals as follows:

$$\text{Total Accruals} = \text{Net Income} - \text{Operating Cash Flows}$$

¹ We had to exclude these companies to ensure consistency in accounting and financial indicators across all sectors. Indeed, their financial statements are prepared using a distinct analytical framework, marked by unique classification methods and specific performance indicators, in accordance with their proprietary chart of accounts.

² This model integrates the adjustments suggested by previous models [24], [25] while making a key contribution by introducing a variable that reflects the firm's economic performance, the profitability of its economic assets.

Although net income is readily disclosed in financial statements, the estimation of operating cash flows is more challenging. In Morocco, the General Accounting Standardization Code (CGNC) does not mandate the publication of a cash flow statement. Only companies that report under IFRS are obligated to provide this information, in compliance with IAS 7.

Operating cash flows are estimated by calculating the difference between the firm's self-financing capacity and the variation in its working capital requirement (WCR). In theory, the WCR should exclude cash flows related to investment and financing activities to reflect only the operational component. However, accurately distinguishing these components is difficult, as such granularity is only available through access to the general ledger, which is not publicly disclosed.

In light of these constraints, we follow the approach of Brahmana et al. [28], who define operating cash flows as the net difference between self-financing capacity and the total working capital requirement.

3.2.2. Second Step: Estimation of Normal Accruals

We use the Kothari et al. [23] model to estimate normal accruals through the following regression equation:

$$NA_{it} / ASSET_{it-1} = \alpha (1 / ASSET_{it-1}) + \beta_1 (\Delta REV_{it} - \Delta AR_{it} / ASSET_{it-1}) + \beta_2 (FIXASSET_{it} / ASSET_{it-1}) + \beta_3 ROA_{it} + \varepsilon_{it}$$

Where:

- NA_{it} : Normal accruals
- $ASSET_{it-1}$: Total assets at the beginning of the period
- $\Delta REV_{it} - \Delta AR_{it}$: Difference between the change in revenue and the change in accounts receivable
- $FIXASSET_{it}$: Total gross fixed assets for the period
- ROA_{it} : Return on assets
- $\alpha; \beta_1; \beta_2; \beta_3$: Coefficients to be estimated
- ε_{it} : Error term

The strength of the Kothari et al. [23] model lies in its inclusion of firm performance, specifically ROA, to control for economic factors that might influence accrual behavior independently of earnings management motives.

3.2.3. Third Step: Estimation of Discretionary Accruals

Discretionary accruals are obtained by subtracting the normal accruals (estimated via the Kothari model) from total accruals, as shown below:

$$AVDA_{it} / ASSET_{it-1} = TA_{it} / ASSET_{it-1} - [\alpha (1 / ASSET_{it-1}) + \beta_1 (\Delta REV_{it} - \Delta AR_{it} / ASSET_{it-1}) + \beta_2 (FIXASSET_{it} / ASSET_{it-1}) + \beta_3 (ROA_{it} + \varepsilon_{it})]$$

Where:

- $AVDA_{it}$: Absolute value of discretionary accruals
- TA_{it} : Total accruals
- α, β_1, β_2 , and β_3 : Coefficients to be estimated

In this study, we use the absolute value of discretionary accruals to capture both upward and downward earnings management. As argued by Bellari [22], the choice between signed and absolute values should depend on the research objective. Since our focus is on the extent, not the direction of earnings management, the absolute value approach is most appropriate.

This methodological choice aligns with prior empirical studies, Barth et al. [29]; Chen et al. [30]; Wilson [31] and Bellari [22] and enables us to assess whether companies that effectively implement digitalization within their supply chain management (SCM) processes are less likely to engage in

earnings management, regardless of its direction. We aim to capture the extent to which digital transformation of SCM through enhanced data integration, automation, and real-time monitoring contributes to improved transparency and reduced manipulation of financial results.

3.3. Presentation of the Different Variables

Table 2 summarizes all the variables comprising our regression model for examining the relationship between CSR and earnings management:

Table 2.

Operationalization of study variables.

Variables	Attribute	Indicator	Measure
Dependent	Discretionary Accruals	AVDA	Absolute value of discretionary accruals normalized by total assets.
Explanatory	ERP adoption	ERPA	0 = No ERP 1 = ERP planned / partial 2 = Partially operational ERP 3 = Fully integrated ERP
	EDI usage	EDIU	0 = None 1 = 1–2 partners 2 = 3–5 partners 3 = Extensive EDI (more than 5 partners)
	Digital Tracking System	DTS	1 = At least one active tool (RFID, blockchain, IoT) 0 = No device
Control	Firm Size	SIZE	Natural logarithm of total assets.
	Industry Sector	SECT	Polychotomous variable taking values from 1 to 13, representing the various industry sectors of the companies in the sample.
	Return on Assets	ROA	Ratio of operating income to total assets.

This study explores the relationship between the digitalization of Supply Chain Management processes and earnings management among Moroccan companies listed on the Casablanca Stock Exchange. Specifically, we assess whether the integration of digital technologies within SCM influences the likelihood of engaging in earnings management. To conduct this analysis, we employ a panel logistic regression model specified as follows:

$$AVDA_{it} = \alpha + \beta_1 SIZE_{it} + \beta_2 SECT_{it} + \beta_3 ROA_{it} + \beta_4 ERPA_{it} + \beta_5 EDIU_{it} + \beta_6 DTS_{it} + \varepsilon_{it}$$

4. Results

First, we present the descriptive statistics and the correlation coefficients for the research variables, followed by the outcomes of various specification tests.

4.1. Descriptive Statistics

Table 3 displays the descriptive statistics for the study variables. The dependent variable, AVDA (absolute value of discretionary accruals), has a mean of 18.5% and a median of 10%, suggesting that earnings management is generally moderate across the sample. However, the standard deviation of 0.21, combined with a positive skewness of 2.46 and kurtosis of 11.55, reflects a highly asymmetric and leptokurtic distribution. This indicates the presence of a few firms with extreme levels of discretionary accruals, suggesting significant heterogeneity in earnings management behavior.

Concerning firm-specific control variables, SIZE (firm size) shows a mean and median of approximately 21.01, a standard deviation of 1.59, and minimal skewness (0.08), indicating a fairly normal distribution of company sizes, with no extreme outliers. Similarly, the SECT variable (industry sector) has a mean of 5.77 and a median of 5.50, suggesting an even distribution across sectors, albeit

with a slight concentration in the lower-numbered ones. The moderate dispersion ($SD = 3.25$) and low skewness (0.29) support this observation.

ROA (return on assets) reveals an average of 5.4% and a median of 6%, implying relatively consistent profitability among firms. However, its strong negative skewness (-6.94) and extremely high kurtosis (97.97) indicate the presence of outliers, with certain companies reporting very poor financial performance (minimum ROA = -1.24).

Focusing on SCM digitalization variables, we find that:

- ERPA (ERP adoption) has a mean of 1.21 and a median of 1.00, indicating that most firms have adopted ERP systems, though a few exhibit higher levels of integration. The skewness of 0.28 and kurtosis of 1.48 suggest a moderately right-skewed but relatively concentrated distribution.
- EDIU (EDI use) presents a mean of 1.31 and a median of 2.00, with a standard deviation of 1.19, reflecting some variation in EDI adoption across firms. The nearly symmetrical distribution (skewness = 0.10) and moderate kurtosis (1.45) indicate that firms differ slightly in their usage of electronic data interchange technologies.
- DTS (Digital Tracking System) shows a mean of 0.67 and a median of 1.00, suggesting that a majority of firms have implemented such systems. The negative skewness (-0.73) and relatively low standard deviation (0.47) reveal limited dispersion, with most firms concentrated around the adoption threshold.

Table 3.
Descriptive Statistics.

Variable	Min.	Median	Mean	Max.	SD	Skewness	Kurtosis
AVDA	0.0	0.1	0.1847	1.55	0.2145	2.4632	11.5482
SIZE	17.58	21.01	21.0095	24.81	1.5949	0.0805	2.2067
SECT	1.0	5.5	5.7734	13.0	3.2507	0.2939	2.2588
ROA	-1.24	0.06	0.0542	0.35	0.0934	-6.9372	97.9661
ERPA	0.0	1.0	1.2083	3.0	1.1998	0.2754	1.4807
EDIU	0.0	2.0	1.3073	3.0	1.1871	0.102	1.448
DTS	0.0	1.0	0.6719	1.0	0.4701	-0.7321	1.536

In summary, while earnings management (AVDA) is characterized by strong asymmetry and outlier behavior, the adoption of digital SCM tools such as ERP systems, EDI, and digital tracking exhibits more homogeneous patterns, albeit with varying levels of diffusion. These findings underscore the potential influence of digital transformation on accounting practices and financial transparency across Moroccan listed firms.

4.2. Correlation

Table 4 presents the Pearson correlation matrix, which reveals several significant relationships among the study variables. The dependent variable, AVDA, exhibits a strong and significant negative correlation with ERP adoption (ERPA) ($r = -0.5403$, $p < 0.001$) and EDI use (EDIU) ($r = -0.5123$, $p < 0.001$). These results suggest that firms adopting more advanced digital supply chain tools tend to engage less in earnings management.

In addition, a moderate negative correlation is observed between firm size (SIZE) and earnings management ($r = -0.4456$, $p < 0.001$), indicating that larger firms are less likely to manipulate earnings. This finding aligns with the literature suggesting that firm visibility and regulatory scrutiny discourage aggressive accounting practices.

Conversely, the industry sector (SECT) shows no significant correlation with AVDA ($r = 0.0689$, $p = 0.178$), suggesting that earnings management practices are not systematically driven by sectoral affiliation.

Regarding ROA (return on assets), the correlation with AVDA is positive but weak and only marginally significant ($r = 0.1132$, $p = 0.0265$), indicating that profitability may play a limited role in explaining earnings management in this context.

When examining inter-variable relationships, we find that ERP adoption (ERPA) and EDI use (EDIU) are highly and positively correlated ($r = 0.7414$, $p < 0.001$), reflecting the complementary nature of these digital tools in integrated SCM strategies. Both variables also show strong positive correlations with firm size ($r = 0.4833$ and $r = 0.5858$, respectively; $p < 0.001$), suggesting that larger firms are more likely to invest in digital SCM technologies.

The Digital Tracking System (DTS) variable is negatively correlated with AVDA ($r = -0.3156$, $p < 0.001$), indicating that real-time tracking capabilities may contribute to greater transparency and reduced earnings manipulation.

Table 4.
Correlations.

	AVDA	SIZE	SECT	ROA	ERPA	EDIU	DTS
AVDA	1						
SIZE	-0.4456***	1					
SECT	0.0689	-0.0889	1				
ROA	0.1132*	-0.0667	0.1069*	1			
ERPA	-0.5403***	0.4833***	-0.0468	-0.0615	1		
EDIU	-0.5123***	0.5858***	0.0499	-0.0285	0.7414***	1	
DTS	-0.3156***	0.0877	0.0161	0.1377**	0.2465***	0.2560***	1

Note: (***, ** and * denote significance levels at $p < 0.001$, $p < 0.01$, and $p < 0.05$, respectively.)

In summary, the correlation results provide preliminary support for the hypothesis that SCM digitalization through the adoption of ERP systems, EDI technologies, and digital tracking is associated with lower levels of earnings management. These findings also highlight the role of firm size as a structural factor contributing to more conservative financial reporting practices.

4.3. Specification Tests

To validate the robustness of our regression model, we conducted several specification tests and corrections.

We began by estimating both fixed and random effects models using panel data for 48 Moroccan listed companies over eight years. The Fisher test for individual effects yielded an F-statistic of 1.8674 with a p-value of 0.00094, indicating that individual (firm-level) effects are statistically significant. This result supports the presence of heterogeneity across firms and justifies the use of a fixed effects model over a pooled OLS approach.

To further determine the appropriate panel specification, we performed the Hausman test, which compares the consistency of the fixed and random effects models. The test returned a Chi-squared value of 63.366 with 6 degrees of freedom and a p-value of $9.296e-12$, leading us to reject the null hypothesis that the random effects model is consistent. These results strongly support the use of a fixed effects model for our analysis.

The fixed effects model explains approximately 51.7% of the variance in the dependent variable, with an overall F-statistic of 39.39 ($p < 0.001$), indicating strong model significance. The results show that firm size (SIZE), ERP adoption (ERPA), and digital tracking systems (DTS) have a significant negative impact on earnings management. These findings support the hypothesis that digital SCM tools and larger firm structures are associated with more conservative accounting practices.

To test for multicollinearity, we calculated the Variance Inflation Factor (VIF) and Tolerance values. As shown in Table 5, all VIFs are below the commonly accepted threshold of 10, and tolerance values exceed 0.1, indicating no significant multicollinearity among the independent variables.

Table 5.
Summary of VIF and Tolerance Results.

Variable	VIF	Tolerance
SIZE	1.577	0.634
SECT	1.047	0.955
ROA	1.041	0.961
ERPA	2.296	0.435
EDIU	2.739	0.365
DTS	1.113	0.899

However, the Breusch-Pagan test for heteroscedasticity yielded a p-value of 4.26e-06, indicating that the residuals are not homoscedastic. Similarly, the Breusch-Godfrey test revealed serial correlation in the residuals with an LM statistic of 57.29 ($p < 0.001$), suggesting the presence of first-order autocorrelation.

To address these issues, we applied Driscoll and Kraay [32] Standard Errors to the fixed effects model. The robust estimates reaffirm the statistical significance of key variables.

Table 6.
Summary of Driscoll–Kraay’s Test (Correction for Standard Errors).

Variable	Estimate	Standard Error	T value	Pr(> t)
SIZE	-0.1448367	0.0522146	-2.7739	0.0058545 **
SECT	-0.0211335	0.0233179	-0.9063	0.3654263
ROA	0.1534979	0.1008579	1.5219	0.1289860
ERPA	-0.0736116	0.0089857	-8.1921	5.711e-15 ***
EDIU	-0.0018865	0.0186912	-0.1009	0.9196670
DTS	-0.2420679	0.0697406	-3.4710	0.0005875 ***

Note: (***, **, and * denote significance levels at $p < 0.001$, $p < 0.01$, and $p < 0.05$, respectively.)

The EDI use (EDIU), SECT, and ROA coefficients remain statistically insignificant after correction, while ERP adoption and digital tracking retain their robust significance.

Accordingly, the results corrected for heteroscedasticity and autocorrelation largely reinforce the initial findings obtained before adjusting the standard errors. The next step is to interpret and contextualize these results in relation to the existing literature.

5. Discussion

The empirical results of our study confirm that the digitalization of information flows within Supply Chain Management (SCM) significantly influences earnings management practices among Moroccan listed companies. In particular, the adoption of ERP systems and digital tracking technologies appears to have a statistically significant and negative effect on the extent of discretionary accruals, even after correcting for heteroscedasticity and autocorrelation. This observation aligns with several theoretical frameworks previously mobilized.

5.1. ERP Adoption and Reduced Earnings Management

The negative and highly significant coefficient of the ERP variable confirms Hypothesis H1 and corroborates the agency theory perspective [5, 6]. By integrating logistics, accounting, and operational data into a single system, ERP software reduces informational asymmetries and limits managers’ ability to manipulate financial statements. This result is consistent with previous findings from Kumar et al. [14] and Alnoukari et al. [12], which underline the internal control and coordination benefits of ERP systems in constraining earnings management.

From a signaling theory perspective, ERP adoption may also serve as a credible signal of financial discipline and transparency, especially in emerging markets where external trust mechanisms are limited [9, 21]. The observed negative association confirms that firms leveraging ERP systems not only improve operational performance but also reinforce the credibility of their financial reporting.

5.2. Digital Tracking Systems and Accounting Transparency

The significant negative coefficient associated with DTS validates Hypothesis H3. Technologies such as RFID, IoT, or blockchain introduce traceability and real-time monitoring capabilities into logistics operations, making it more difficult for managers to justify artificial adjustments to revenues or expenses. These findings echo the transparency theory [4] and institutional theory [7] both of which suggest that greater operational visibility and normative pressure toward digital transformation improve the verifiability of accounting practices.

Digital tracking tools act as internal deterrents to earnings manipulation, particularly when SCM and accounting systems are integrated, as highlighted by Yu et al. [10] and Wang et al. [16]. In this sense, SCM digitalization fosters not only logistical agility but also accounting discipline.

5.3. EDI Use: No Significant Effect

Contrary to Hypothesis H2, the EDI variable did not exhibit a statistically significant relationship with earnings management after correction for heteroscedasticity. While bivariate correlations suggested a negative association, this effect disappears in the multivariate model. One possible explanation is that EDI use varies widely in scope and sophistication, and partial implementation (e.g., with only a few suppliers) may not be sufficient to constrain earnings management behavior.

Alternatively, EDI's primary benefits may reside more in external operational efficiency than in internal financial governance. These mixed results reflect those of Galal and Abdel Moneim [15] who emphasize that EDI's performance depends on its degree of integration and the quality of inter-organizational relationships.

5.4. Control Variables and Structural Effects

Firm size (SIZE) shows a consistently significant and negative relationship with discretionary accruals, in line with prior studies [3]. This confirms that larger firms, due to greater public scrutiny and regulatory oversight, are less likely to manipulate earnings. The industry sector (SECT) variable, while significant in the robust model, shows a weak effect, suggesting that sectoral affiliation plays a limited role in shaping earnings management behavior. ROA, as a proxy for financial performance, is not significant, implying that profitability alone is not a sufficient deterrent against earnings manipulation in this context.

6. Conclusion

This study provides empirical evidence that the digitalization of supply chain information flows plays a significant role in shaping earnings management behavior in Moroccan listed firms. By focusing on three key technologies: ERP systems, EDI platforms, and digital tracking devices, we demonstrate that digital tools designed to improve operational efficiency can also enhance accounting discipline and reduce the scope for discretionary financial reporting.

Our results confirm that ERP adoption and digital traceability are significantly and negatively associated with the level of discretionary accruals, suggesting that these technologies contribute to more transparent and reliable financial reporting. Conversely, EDI use shows no significant effect, possibly due to partial or inconsistent implementation across firms.

These findings have several implications. For practitioners, they underscore the importance of integrating digital SCM tools not only for logistical optimization but also for governance and compliance purposes. For regulators and policymakers, our study highlights the potential of digitalization policies to reinforce financial transparency in emerging markets.

However, this study is not without limitations. First, the analysis is restricted to non-financial firms listed on the Casablanca Stock Exchange, which may limit the generalizability of the findings to other sectors or private firms. Second, the digitalization variables are based on categorical proxies, which may not fully capture the depth, functionality, or quality of technological integration. Third, although the study uses panel data and robust estimation techniques, it remains correlational and cannot fully

establish causality. Lastly, the measurement of earnings management through discretionary accruals, while widely accepted, may not capture other forms of manipulation, such as real earnings management.

Future research could address these limitations by employing richer, possibly survey-based measures of digital maturity, expanding the geographic scope to include comparative emerging markets, and exploring longitudinal or experimental designs to better assess causality. Additionally, the role of organizational culture, digital literacy, or board-level digital expertise could be investigated as mediating variables in the relationship between digital SCM and financial reporting practices.

Transparency:

The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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