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Usage of blockchain technology and working capital efficiency: Evidence from listed firms in India

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Abstract

Working capital management is central to a firm's operating liquidity, because inefficient handling of inventories, trade receivables and trade payables ties up financial resources in the operating cycle. Blockchain technology (BCT) may improve transaction transparency, traceability, information sharing and coordination among trading partners, yet firm level evidence on its link with working capital efficiency (WCE) is limited. This study examines whether usage of blockchain technology is associated with WCE among non-financial firms listed on India's National Stock Exchange (NSE) from 2016 to 2024. The sample contains 3,501 firm year observations and includes 389 firms using BCT. BCT usage is a binary, time varying indicator taken from the Compustat Global database and validated through textual analysis of annual reports. WCE is measured mainly by the cash conversion cycle (CCC). Days inventory outstanding (DIO), days sales outstanding (DSO) and days payable outstanding (DPO) are analysed separately to identify the channels involved. A two-step system Generalized Method of Moments estimator addresses the dynamic nature of WCE and the potential endogeneity in BCT usage. Findings suggests that usage of blockchain technology is associated with a shorter CCC (significant at the 10 percent level). This association is driven mainly by a reduction in DIO (significant at the 5 percent level). No significant association is found for DSO or DPO. The findings suggest that blockchain supports working capital mainly through better inventory visibility and coordination, not through changes in customer collection or supplier payment terms. The study extends the blockchain literature from financial reporting and firm performance to the operational and financial management of firms. It has practical implications for managers evaluating blockchain investments in inventory intensive supply chains.

***Keywords*:** Blockchain Technology, Working Capital Efficiency, Cash Conversion Cycle, Inventory Management, Accounts Receivable, Accounts Payable, National Stock Exchange of India, System GMM

JEL Classification: G31, G32, M41

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1. Introduction

Firms must continuously balance its liquidity requirements by efficiently utilizing the resources committed for day-to-day operations. Thus, working capital management is a fundamental component of corporate financial management. Inventory, trade receivables and trade payables constitute major components of this operating cycle, and inefficient management of these components can constrain liquidity and increase the amount of capital tied up in business operations (Badakhshan & Ivanov, 2025a). Prior studies demonstrate that inventory and receivables management are particularly relevant to corporate financial outcomes, highlighting the importance of reducing unnecessary delays in the operating cycle (Deloof, 2003). Deloof (2003), for example, uses accounts receivable, inventory and accounts payable periods together with the cash conversion cycle to examine working capital management and reports that reductions in inventory and receivables periods are associated with improved profitability. At the same time, firms are increasingly using digital technologies to improve the efficiency of business processes and interorganizational transactions. Among these technologies, blockchain has attracted considerable attention because of its ability to create shared, traceable and relatively tamper-resistant records of transactions among participating entities (Al-Okaily *et al.,* 2023; Pflueger *et al*., 2024). BCT is particularly relevant in this context as its architecture provides a shared and traceable record of transactions among authorized participants. Blockchain-enabled traceability can provide an immutable digital record, potentially improving the visibility of products and transactions across organizational boundaries (Ahmed & MacCarthy, 2023; Thakkar & Himanshu, 2026).

Working capital efficiency depends partly on how quickly and reliably firms can obtain information about inventory movements, deliveries, invoices, transactions and receivable obligations. Delays or inconsistencies in these processes may result in excess inventory, delayed receivables collection and inefficient payment processes. Blockchain may mitigate some of these frictions by providing a common transaction record that facilitates verification and coordination among transaction participants. The study uses the cash conversion cycle (CCC) as the primary measure of working capital efficiency (Badakhshan & Ivanov, 2025a). The cash conversion cycle captures the time required to convert resources invested in operations into cash. This helps to determine the effect of usage of BCT on WCE primarily through inventory management, receivables collection or payables management (Kumar et al., 2024).

Despite this growing literature, limited empirical research has been done to analyse the association between usage of BCT and the overall operating cash cycle of firms. Existing blockchain research has extensively examined supply-chain applications, traceability, financial processes and technological adoption, but the extent to which usage of blockchain technology translates into measurable improvements in firms' WCE remains insufficient (Tsai, 2023). The gap is particularly relevant because technological adoption does not necessarily produce financial benefits

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automatically, but the effect depends on how technology is incorporated into organizational and interorganizational processes (Bhardwaj et al., 2026a). The study addresses this gap by examining the association between usage of BCT and WCE among NSE-listed companies. India provides an appropriate institutional setting because listed firms operate within complex domestic and international supply chains and are increasingly exposed to digital transformation.

Methodologically, the study employs two-step System GMM. The dynamic specification is motivated by the persistence of working capital practices across time. Moreover, usage of blockchain technology may be endogenous because firms with superior managerial capabilities, greater financial resources or more advanced operational systems may be more likely to adopt blockchain. The System GMM approach provides a framework for addressing dynamic dependence and potential endogeneity using internal instruments, subject to the validity of the underlying moment conditions (Arellano & Bover, 1995; Blundell & Bond, 1998).

The study makes three contributions. First, it extends the blockchain literature by examining its implications for working capital efficiency, thereby connecting technological transformation with an important dimension of corporate financial management. Second, it provides a component-level analysis of CCC through DIO, DSO and DPO, allowing greater insight into the mechanisms underlying the overall relationship. Finally, the study provides evidence from Indian listed companies, thereby contributing to the relatively limited empirical literature on blockchain and corporate financial management in emerging markets.

2. Theoretical Foundation and Literature Review

Transaction Cost Economics (TCE) provides a critical theoretical foundation for the proposed relationship. Firms incur various costs such as searching for information, verification of transactions, monitoring the counterparties and resolving disputes. Fragmented information systems can increase these costs because different participants maintain separate records. Blockchain reduces these frictions by facilitating transaction traceability, shared information, verification, monitoring, reconciliation, and automated settlement. Therefore, usage of blockchain technology can lower transaction costs and improve information sharing and coordination among firms and supply-chain partners. These improvements can contribute to a more efficient operating cycle by facilitating faster and more accurate transactions, inventory management, and information flows, ultimately leading to better working capital efficiency.

2.1 Working Capital Efficiency

Working capital management concerns the management of short-term operating assets and liabilities, particularly inventories, trade receivables and trade payables (Badakhshan & Ivanov, 2025a). Effective management requires firms to maintain sufficient operating resources to support sales and production while avoiding unnecessary capital tied up in the operating cycle. The CCC provides an integrated measure of WCE because it incorporates the time associated with inventory

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conversion, receivables collection and supplier credit (Dewangan & Kannadhasan, 2025). A lower CCC generally indicates that a firm converts its operating investment into cash more quickly (Dewangan & Kannadhasan, 2025). However, efficient working capital management should not be interpreted as mechanically minimizing every component. For example, excessive reductions in inventory could increase stock-out risk, while excessively rapid supplier payments could reduce the benefits associated with trade credit. Accordingly, the objective is to achieve an efficient operating cycle, rather than simply minimizing individual working-capital components.

This distinction is particularly important when examining effect of BCT. Blockchain may not necessarily reduce every working-capital component in the same direction. Instead, it can improve the information and coordination underlying decisions concerning these components. Blockchain has attracted considerable attention as a technology for improving transparency and traceability. Its characteristics such as decentralization, transparency, immutability and traceability as potentially relevant to supply-chain management. These characteristics are potentially relevant to working capital because inventory and receivables decisions depend on the availability of reliable transaction information. BCT provides participating organizations with a shared and traceable record of transactions. This can reduce information fragmentation and improve visibility across multiple stages of a transaction. From a working-capital perspective, transaction transparency can be valuable because firms require timely information to determine: when inventory has been shipped, when goods have been received, whether an invoice corresponds to an actual transaction, whether customer obligations have been fulfilled, and when supplier payment obligations become due (Xue et al., 2025). Greater transparency can therefore reduce the need for repeated verification and reconciliation.

2.2 Blockchain and Inventory Management

Inventory is one of the major components of working capital. Inventory represents capital committed to goods that have not yet been converted into sales. Firms often maintain safety inventories because of uncertainty concerning supplier reliability, transportation, demand and inventory availability. Blockchain-enabled traceability can provide greater visibility into the movement of products across supply-chain stages. The resulting information may enable firms to coordinate procurement and inventory decisions more effectively (Ahmed & MacCarthy, 2023; Rani et al., 2026). The theoretical mechanism can therefore be expressed as follows. Blockchain-enabled tracking improves visibility across the order–shipment–delivery–inventory cycle. Greater supply-chain visibility reduces information uncertainty and enables firms to coordinate procurement and inventory decisions more efficiently. Accordingly, usage of blockchain technology can enhance supply-chain visibility, reduce information uncertainty, and improve inventory management, ultimately reducing the days inventory outstanding (DIO). Consistent with this theoretical argument, the study hypothesizes that:

H1: Usage of blockchain technology is negatively associated with days inventory outstanding.

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2.3 Blockchain and Accounts Receivable

Accounts receivable represents sales for which cash has not yet been collected. Delayed collection can arise from credit terms, transaction verification, invoice discrepancies, reconciliation problems and disputes concerning delivery or product quantities. Blockchain may improve the traceability of transactions and facilitate information sharing among supply-chain participants. Recent research on blockchain-driven accounts-receivables suggests that blockchain can influence trade-credit management, repayment risk and supply-chain efficiency. Similarly, Zhan et al. (2026) examine blockchain-enabled accounts-receivable supply-chain financing and show how blockchain can affect coordination and payment transfers within a multi-tier supply chain. In a conventional transaction process, an order is followed by delivery, invoicing, verification, dispute resolution, and finally payment. Blockchain makes this process more transparent and traceable by providing a verifiable record of delivery and transactions, thereby facilitating faster verification and settlement. This enhanced traceability can reduce information delays and transaction frictions, improve coordination among trading partners, and contribute to a more efficient operating cycle. This does not imply that blockchain automatically causes customers to pay earlier. Rather, the proposed mechanism is that improved transaction verification and information sharing may reduce avoidable administrative delays and disputes. Consequently, blockchain can improve transaction verification, reduce disputes, and facilitate faster payment collection, thereby potentially reducing the days sales outstanding (DSO).

H2: Usage of blockchain technology is negatively associated with days sales outstanding.

2.4 Blockchain and Accounts Payable

Blockchain may also influence accounts payable by improving the verification and traceability of procurement transactions. Accounts payable represents short-term obligations to vendors. Blockchain can improve the traceability of procurement transactions and potentially facilitate automated verification and settlement. Smart-contract functionality may automate selected steps when predefined contractual conditions are satisfied. However, the direction of the effect on DPO is theoretically ambiguous. Blockchain could facilitate faster payment, which would reduce DPO, but it could also improve the firm's ability to optimize payment timing. The study hypotheses:

H3: Usage of blockchain technology is significantly associated with days payable outstanding.

2.5 Blockchain and Cash Conversion Cycle

Cash Conversion Cycle shows the combined effects on inventory, receivables and payables to determine the overall effect on working capital efficiency. If blockchain reduces unnecessary inventory holdings and facilitates more efficient receivables collection without an offsetting deterioration in payable management, the firm's CCC should decline. Deloof (2003), using a large sample of Belgian firms, employed days of accounts receivable, inventory and accounts payable together with CCC to examine working capital management and corporate profitability. His

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findings highlight the relevance of inventory and receivables management for corporate outcomes. Deloof (2003) uses the cash conversion cycle as a comprehensive measure of working capital management and demonstrates the importance of managing inventory and receivables efficiently.

H4: Usage blockchain technology is negatively associated with the cash conversion cycle.

3. Research Methodology

3.1 Sample

The study population consists of all companies listed on the National Stock Exchange (NSE) of India for the year 2016-2024. There were 2,439 companies listed on the NSE; however, 495 companies in the financial sector were excluded due to their distinct operating structures and working capital concepts compared to non-financial firms (Himanshu & Baker, 2025). Additionally, 645 companies with missing data were removed from the final sample. Out of remaining 1,299 non-financial firms, 389 firms were identified as firms using blockchain technology. The resultant sample comprises 3,501 firm-year observations for the empirical analysis. Financial information was sourced from the appropriate Refinitiv database, while details on usage of blockchain technology were retrieved from the Compustat Global database. The classifications regarding blockchain were subsequently cross-validated using the companies' annual reports.

3.2 Measurement of variables

3.2.1 Dependent variable: Working Capital Efficiency

The primary dependent variable is working capital efficiency (WCE) that is measured with the cash conversion cycle (CCC). Examining the components separately allows the study to determine whether any observed association between usage of blockchain technology and CCC is concentrated in inventory management, receivables collection, or payment timing.

$$CCC_{it} = DIO_{it} + DSO_{it} - DPO_{it}$$

where:

$$DIO_{it} = \frac{Average\ Inventory_{it}}{COGS_{it}} \times 365$$

$$DSO_{it} = \frac{Average\ Receivables_{it}}{Sales_{it}} \times 365$$

$$DPO_{it} = \frac{Average\ Payables_{it}}{COGS_{it}} \times 365$$

The use of CCC as an integrated measure follows the established working-capital literature (Deloof, 2003).

3.2.2 Independent variable: Usage of blockchain technology

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Usage of blockchain technology is the independent variable in this study. Data on usage of BCT was sourced from the Compustat Global database (Autore et al., 2024), which offers firm-level details regarding usage of blockchain technology. To improve the credibility and accuracy of the information regarding usage derived from the database, the information was subsequently confirmed through a systematic textual analysis of the firms' annual reports.

For each firm recognized as using BCT in Compustat Global, the corresponding annual reports were scrutinized to validate the occurrence and timing of usage. The textual analysis involved searching through annual reports for mentions of usage of blockchain technology and its associated terminologies. The usage was confirmed when the annual report provided evidence of the firm's implementation, deployment, utilization, or integration of blockchain technology into its operations. The first year in which usage of blockchain technology is identified in the Compustat Global data and supported by the firm's corporate disclosure is treated as the usage year. Based on this procedure, 389 NSE-listed companies were identified as firms using BCT.

The usage of blockchain technology variable ($\boldsymbol{BCT_{it}}$) is constructed as a binary, time-varying variable:

$$\boldsymbol{BCT_{it}} = \begin{cases} \mathbf{0} & \text{if firm } \boldsymbol{i} \text{ has not adopted blockchain by year } \boldsymbol{t} \\ \mathbf{1} & \text{if firm } \boldsymbol{i} \text{ has adopted blockchain by year } \boldsymbol{t} \end{cases}$$

Thus, when a company uses blockchain, BCT is assigned a value of one starting from the year of usage and to all following years. All the years before usage receive a value of zero. This coding reflects the shift from the period before usage to the period after for firms that have used BCT and allows the analysis of whether there are changes in firms' WCE following usage of blockchain technology.

3.2.3 Control Variables

To control the firm specific variables affecting CCC, the study uses firm size (SIZE), leverage (LEV), research and development intensity (RD), cash and cash equivalents (CASH), selling and administrative expenses (ADMIN), number of employees (EMP), and firm age (AGE) and return on assets (ROA) as controls (Pramahender et al., 2021). Their descriptions are shown in table I.

Table 1. Description of the variables

Variables	Symbol	Measurements
Dependent variables		
Cash conversion cycle	CCC	DIO+DSO-DPO
Days inventory outstanding	DIO	$DIO_{it} = \frac{Average\ Inventory_{it}}{COGS_{it}} \times 365$

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Days sales outstanding	DSO	$DSO_{it} = \frac{Average\ Receivables_{it}}{Sales_{it}} \times 365$
Days payables outstanding	DPO	$DPO_{it} = \frac{Average\ Payables_{it}}{COGS_{it}} \times 365$
Independent variable		
Usage of Blockchain Technology	BLOCKCHAIN	Compustat global database
Control variables		
Research and development expenses	RD	R&D expenditure / total assets
Leverage	LEV	Ratio of total debt to total assets
Firm age	AGE	Log of the company's age after Incorporation
Cash and cash equivalents	CASH	Cash & cash equivalents / total assets
Size	SIZE	Log of total revenue
Sales and administrative expenses	ADMIN	Taken from Refinitiv database
Number of employees	EMP	Taken from Refinitiv database
Return on assets	ROA	Taken from Refinitiv database

4. Empirical Model

The dynamic model is:

$$CCC_{it} = \alpha CCC_{i,t-1} + \beta_1 BCT_{it} + \beta_2 Controls + \epsilon_{it} \quad (1)$$

Where, CCC= *DIO+DSO-DPO.* Their measurements are given in Table I

Component analysis

The same dynamic specification is estimated using DIO, DSO and DPO as dependent variables:

$$DIO_{it} = \alpha DIO_{i,t-1} + \beta_1 BCT_{it} + \gamma Controls_{it} + \epsilon_{it} \quad (2)$$
$$DSO_{it} = \alpha DSO_{i,t-1} + \beta_1 BCT_{it} + \gamma Controls_{it} + \epsilon_{it} \quad (3)$$
$$DPO_{it} = \alpha DPO_{i,t-1} + \beta_1 BCT_{it} + \gamma Controls_{it} + \epsilon_{it} \quad (4)$$

This decomposition is important because it identifies where the blockchain effect originates.

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Method: System GMM Estimation

The study employs two-step System GMM, following the dynamic-panel framework developed by Arellano and Bover (1995). It demonstrates that including the lagged dependent variable can improve the performance of GMM estimators when the dependent variable is persistent and the time dimension is relatively limited (Pandey et al., 2026). Working-capital efficiency is likely to exhibit persistence. Firms generally maintain relatively stable operating policies concerning inventory, credit terms and supplier relationships. Furthermore, usage of blockchain technology can be endogenous. Firms with stronger financial resources, technological capabilities or superior management may be more likely to use blockchain. Hence, using system GMM is appropriate.

5. Results and Discussion

5.1 Blockchain and CCC

The results show a negative and statistically significant coefficient of BCT (β= -5.681, p<0.10) on the cash conversion cycle (CCC) in column 1 of Table 2. The finding indicates that usage of blockchain technology results in reduction in the number of days required for firms to convert resources committed to their operations into cash. A reduction in CCC reflects more efficient management of operating working capital, and thus improved working capital efficiency, supporting H4. The result provides novel evidence by showing that the benefits of BCT extend beyond accounting information and financial reporting to the day-to-day management of resources tied up in the business operations (Himanshu & Singh, 2022). WCE depends on the speed and reliability with which firms obtain information about inventories, sales, deliveries, customer transactions and supplier obligations. BCT provide a shared and traceable record of transactions, potentially reducing the need for repeated verification and reconciliation across organizational boundaries. The finding is also consistent with the broader evidence that usage of blockchain technology improves operational processes and the operating cycle. Culot et al. (2024), using a sample of 130 North American adopters, reported significant improvements in operating-cycle performance following usage of blockchain technology. Azevedo et al. (2023) emphasized the importance of blockchain-enabled traceability in complex supply chains, while Li (2023) showed how blockchain can facilitate common platforms, end-to-end information sharing, real-time updates, asset transfer and contract automation.

Working capital is not managed independently within a firm. Inventory decisions depend on information received from suppliers, production units, logistics providers and customers. Delays or inconsistencies in this information can cause firms to hold additional inventory as a precaution. Similarly, uncertainty concerning deliveries and transactions can require firms to maintain buffers in their operating processes. BCT reduces the information asymmetry among the participants by creating a decentralised and distributed record that is accessible to all authorized participants. The finding is also consistent with Huang and Zhou (2024), who provided firm-level evidence from Chinese listed companies that blockchain investment is associated with improvements in business

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operations and supply-chain management. Their analysis also reported better inventory management among firms with greater blockchain investment.

5.2 Component-level Results

The component-level results provide further insight into this overall finding. The coefficient of BCT is negative and statistically significant for days inventory outstanding (DIO) (β= -13.25, $p<0.05$) shown in table 2 (column 2), supporting H1. In contrast, the coefficients of BCT for days sales outstanding (DSO) and days payable outstanding (DPO) are statistically insignificant, thus H2 and H3 is not supported. Thus, the component regressions indicate that the statistically significant association between usage of blockchain technology and working-capital outcomes is concentrated in DIO. This distinction in results provides novel evidence that BCT does not affect every component of working capital in the same manner.

5.2.1 Blockchain and DIO

Instead, the results demonstrate that inventory management is the primary and most important channel through which usage of blockchain technology is associated with a shorter cash conversion cycle. The findings are consistent with the argument that blockchain improves the visibility of inventory and supply-chain transactions. Traditional supply chains often involve several independent information systems. A supplier, manufacturer, logistics provider and customer may each maintain their own records, which create delays in obtaining a consistent picture of inventory movement. Blockchain provide a shared transaction history that records supply-chain events and makes them easier to trace. Li (2023) specifically showed that blockchain supported end-to-end information sharing and traceability, real-time updates and more efficient asset transfers. These characteristics are directly relevant for inventory decisions because firms can obtain more timely information about the movement and availability of goods. Moreover, Vu et al. (2025) reported that usage of blockchain technology in the food supply chain reduced inventory levels by improving the timeliness and accuracy of information available to supply-chain participants. The study explains that better information about downstream demand and inventory conditions allows firms to align production and sourcing more closely with actual requirements. Further, Zhu et al. (2024) similarly show that blockchain can reduce ordering quantities and excessive inventory when it improves the information available about demand volatility. Their findings suggest that blockchain can reduce the need for precautionary inventory under appropriate conditions. The empirical evidence of Huang and Zhou (2024) is particularly close to the present finding. Using panel data for Chinese listed companies, they found that blockchain investment is associated with better inventory management and lower supply-chain risk. They also reported that the effect becomes stronger as blockchain implementation becomes more mature. Therefore, better information about inventory movements and supply-chain activities with BCT reduces uncertainty and allows firms to operate with less inventory tied up for long periods. A lower DIO does not mean that firms simply reduce inventory regardless of operational requirements. Excessive

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inventory reduction can increase stock-out risk. Recent evidence also cautions that reducing inventory buffers too aggressively may adversely affect service levels, particularly when demand is volatile (Vu et al., 2025; Srivastava et al., 2026). The finding should therefore be interpreted as evidence of more efficient inventory management, rather than as evidence that firms should always minimize inventory.

5.2.2 Blockchain and DSO

The insignificant coefficient of BCT on DSO is an important finding because it indicates that the effect of usage of blockchain technology on working capital does not extend uniformly to customer receivables. DSO measures the time required to collect cash from customers. Although blockchain can improve the traceability and verification of transactions, the actual timing of customer payment depends on several factors that remain outside the firm's direct control (Bhardwaj et al., 2026b). These include contractual credit terms, customer bargaining power, customer liquidity, payment policies and industry-specific practices. The distinction between transaction verification and payment behaviour is important. BCT facilitates real-time traceability that a product was shipped, delivered or invoiced, but this does not automatically alter the contractual payment period agreed between the buyer and seller. Recent research on blockchain and accounts receivable also points to this complexity. Li et al. (2024) examined customers' usage of blockchain technology and suppliers' provision of trade credit and frame the relationship in terms of information transparency, profitability and information-related risks. Their study illustrates that blockchain can affect the financing relationship surrounding receivables, but the direction and magnitude of the effect depend on the economic conditions surrounding the transaction. Similarly, Zhan et al. (2026) examined blockchain in accounts-receivable supply-chain financing and show that blockchain can improve coordination and streamline payment transfers under particular conditions. Their findings suggested that blockchain can influence receivables-related processes, but these effects depend on information-sharing conditions and the design of the contractual arrangement. The insignificant DSO result in the present study can therefore be interpreted as evidence that the operational benefits of blockchain are stronger for inventory visibility than for the actual speed of customer collections.

5.2.3 Blockchain and DPO

The coefficient of BCT on DPO is also statistically insignificant. This suggests that usage of blockchain technology does not produce a systematic change in the number of days firms take to pay their suppliers. Supplier-payment periods are often determined by contractual arrangements and bargaining relationships rather than solely by the efficiency of transaction processing. Even if blockchain makes invoice verification faster, the contractual payment date may remain unchanged. Firms may deliberately maintain their existing payment policies after using BCT. Blockchain can improve the accuracy and visibility of information without necessarily changing the firm's

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preferred financing strategy. Moreover, changes in DPO may involve a trade-off. Faster verification and automated processing could make earlier settlement easier, but firms may still choose to retain supplier credit because accounts payable provide a source of short-term operating finance. Thus, improved technological efficiency does not necessarily imply a shorter payment period. The existing literature supports treating this relationship cautiously. Blockchain research shows that transparency can alter supply-chain incentives and information-sharing arrangements, but the effects depend on the design of the blockchain system and the relationships among supply-chain participants. Cui et al. (2023) showed that the economic consequences of blockchain-enabled transparency depend on what information is made visible and to whom. Blockchain does not have a universally positive effect on every supply-chain outcome. The absence of a significant DPO effect in the present study is therefore economically credible. Blockchain may make supplier transactions easier to verify and process, while leaving the firm's negotiated payment period largely unchanged.

Table 2. GMM Results for Working Capital Efficiency

	(1)	(2)	(3)	(4)
VARIABLES	**CCC**	**DIO**	**DSO**	**DPO**
L.CCC	0.791***			
	(0.0884)			
L.DIO		0.376*		
		(0.202)		
L.DSO			0.746***	
			(0.193)	
L.DPO				0.391***
				(0.124)
BLOCKCHAIN	-5.681*	-13.25**	-5.464	0.293
	(3.444)	(5.751)	(13.45)	(13.91)
SIZE	-8.122	-0.0274	13.48	13.76
	(6.177)	(7.448)	(10.32)	(13.76)
EMPLOYEE	0.000574	-8.39e-05	-0.000618	-0.000428
	(0.000912)	(0.000107)	(0.000406)	(0.000315)

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LEV	-10.40	5.359	-102.2	-100.4
	(25.09)	(48.18)	(132.9)	(121.3)
RD	-1,666	1,457	1,145	578.5
	(16,739)	(934.2)	(2,438)	(2,180)
CASH	-518.0	22.46	100.9	240.2
	(336.6)	(298.6)	(93.04)	(174.5)
ADMIN	-107.3*	-28.46	906.6***	375.3
	(55.55)	(25.46)	(39.08)	(299.4)
AGE	1.271	11.50	25.39	-19.28
	(4.597)	(9.844)	(23.23)	(36.18)
ROA	-95.88	-102.8	-70.15	-215.7
	(59.42)	(98.01)	(132.1)	(313.3)
Constant	216.0	37.53	-538.8**	-213.9
	(133.4)	(148.9)	(211.7)	(299.6)
AR1	-4.3138	-0.8015	-1.3454	-1.4429
	(0.0000)	(0.4228)	(0.1785)	(0.1491)
AR2	-1.5054	0.4001	-1.8443	1.2976
	(0.1322)	(0.6891)	(0.0651)	(0.1944)
Hansen J	12.6964	81.1498	95.8799	54.6238
	(0.6257)	(0.5058)	(0.1768)	(0.7920)

Note: Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

5.3 Theoretical implications

The results provide support for the TCE theory applied in the study. BCT reduces the cost of obtaining, verifying and sharing information, the effect is particularly visible in activities where information delays create operational inefficiencies. Inventory management fits this condition because firms need timely information about orders, shipments, production and demand to determine appropriate inventory levels. The significant reduction in DIO is therefore consistent with the view that blockchain can reduce information and coordination frictions within supply

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chains. The insignificant effects on DSO and DPO, however, suggest that reducing transaction-related information frictions is not sufficient to change every working-capital decision. Customer credit terms and supplier payment arrangements are influenced by contractual and strategic considerations that may remain largely unchanged after usage of technology. This distinction makes the findings theoretically useful. Blockchain appears to affect working capital most clearly where better information can directly improve operating decisions, rather than where outcomes depend primarily on negotiated financial relationships.

5.4 Managerial implications

The findings have several implications for managers considering usage of blockchain technology. First, the results suggest that the business case for blockchain may be particularly relevant to inventory-intensive operations and supply chains. Managers should therefore evaluate blockchain not only as a technology for record keeping but also as a potential tool for improving inventory visibility and coordination. Second, the findings indicate that managers should not assume that usage of blockchain technology will automatically reduce receivables or payables periods. If the objective is to reduce DSO, firms may still need to modify credit policies, collection procedures and customer agreements. Similarly, reducing DPO may require renegotiation of supplier contracts rather than technological investment alone. Finally, the results suggest that usage of blockchain technology should be accompanied by appropriate integration with existing supply-chain and accounting systems. Blockchain creates value when relevant participants actually use and share reliable information through the system. The technology by itself does not guarantee better operating decisions.

6. Conclusion

The study examines the association between usage of blockchain technology and working capital efficiency using CCC as proxy for its measurement. It also analyses the component level effects on DIO, DSO and DPO after usage of blockchain technology. By employing system GMM estimation, the study found empirical evidence that usage of blockchain technology is associated with improved working capital efficiency among the NSE-listed blockchain firms, as reflected in a significant reduction in the cash conversion cycle. More importantly, the component analysis shows that this improvement is driven primarily by a significant reduction in days inventory outstanding. No statistically significant effect is observed for DSO and DPO. The findings therefore suggest that blockchain's contribution to working capital management operates mainly through inventory-related operational improvements rather than through changes in receivables or payables.

The study has certain limitations. It relies on secondary data and a binary measure of usage of blockchain technology, which may not fully capture the intensity, maturity, or specific applications of blockchain within firms. Further, the sample is limited to NSE-listed firms, which may restrict the generalizability of the findings. Although System GMM addresses dynamic effects and

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potential endogeneity, other unobserved factors may still influence the results. Future research can use more detailed measures of usage of blockchain technology and examine the specific mechanisms through which blockchain affects working capital efficiency, such as supply-chain visibility, information sharing, inventory management, and transaction costs. Future studies may also compare industries and countries and employ alternative causal research designs to provide further evidence.

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