ENHANCING SUPPLY CHAIN EFFICIENCY: EXPLORING THE MEDIATING ROLE OF PERCEIVED USEFULNESS IN BLOCKCHAIN-ENABLED COLLABORATION

**Ikramuddin Junejo[1*], Muhammad Sufyan Ramish[2],
Muhammad Ahsan[3], and Jalil Ahmed Thebo[4]**

ABSTRACT

This study aims to examine the mediating role perceived usefulness between supply chain collaboration and the intention to use blockchain in the textile industry of Pakistan. The cross-sectional method is conducted, and data is gathered with the help of the adopted questionnaire from previous studies. The HR department of the concerned firm is requested to circulate the printed questionnaire among middle-level employees of the firm. A total of 240 cases are considered in this study. Five Likert scales, from strongly disagree to agree strongly, are considered to test the suggested hypotheses based on previous studies. The findings of this study confirmed the direct effect of supply chain collaboration on the intention to use the blockchain and the partial mediation effect of perceived usefulness is revealed. There are few studies on supply chain collaboration, blockchain use, and perceived usefulness in developing countries like Pakistan's textile industry, especially among middle-level employees. Existing scholarship ignores emerging countries' textile sectors and extends results to other industries. The insights also help managers create blockchain-integrated supply chain strategies. Blockchain technology may be maximized via technology providers and industry-wide cooperation. These practical consequences may improve developing nations' textile supply chains' efficiency, transparency, and competitiveness. The insights also help managers create blockchain-integrated supply chain strategies. Blockchain technology may be maximized via technology providers and industry-wide cooperation.

Keywords: Supply Chain Collaboration; Intention to Use Blockchain; Perceived Usefulness; Textile Industry.

[1] Department of Management Sciences, SZABIST Hyderabad, Pakistan. Email: ikramuddin8022@yahoo.com
[2] College of Management Sciences, Karachi Institute of Economics & Technology (KIET), Karachi, Pakistan. Email: sufyan.ramish@kiet.edu.pk
[3] Program Manager MPM, SZABIST Larkana Campus, Larkana, Pakistan. Email: m.ahsan@lrk.szabist.edu.pk
[4] Department of Management Sciences, SZABIST Larkana Campus, Larkana, Pakistan. Email: jalilthebo@lrk.szabist.edu.pk
*Corresponding Author

INTRODUCTION

Today's competitive economy demands supply chain coordination (Min et al., 2019). Supply chain partners' collaboration improves market and customer response. Sharing real-time data helps companies adjust to changes, estimate demand, optimize inventories, and simplify operations—customer satisfaction and competitiveness increase (Fernando et al., 2020). Collaboration also reduces waste, redundancy, and supply chain synchronization. It helps partners optimize transportation routes, inventory replenishment, and resource use. By recognizing possible disruptions, formulating contingency plans, and executing risk mitigation techniques, teamwork reduces risks (Ivanov & Dolgui, 2019). Organizations may mitigate supply chain disruptions by exchanging information. Partner skills and resources boost innovation and new product development. Collaboration may boost creativity, product quality, and competitiveness. Supply chain cooperation allows companies to track inventories, transportation, and manufacturing using real-time data (Park & Li, 2021). Visibility identifies bottlenecks, optimizes processes, and informs choices. Collaboration builds trust, transparency, and long-term supply chain relationships. These ties provide supply chain stability. Supply chain cooperation improves operational efficiency, customer happiness, risk management, innovation, and competitiveness in today's competitive market (Munir et al., 2020; Hastig & Sodhi, 2020). Supply chain cooperation and blockchain adoption in developing nations are linked in numerous ways. Blockchain in supply chains improves stakeholder cooperation. Blockchain offers a decentralized, transparent ledger for safe, immutable transaction recording (Rajasekaran et al., 2020).

This openness fosters confidence and cooperation among supply chain partners, particularly in developing nations with trust challenges and information asymmetries (Prakash et al., 2022). Using blockchain technology, participants may securely exchange product origins, certificates, and transaction histories. Information-sharing lowers intermediaries and improves supply chain efficiency, encouraging cooperation (Chen et al., 2022). Blockchain technology may also improve supply chain transparency in developing countries (Kumar et al., 2022). This visibility addresses counterfeiting, product quality, and regulatory compliance. Supply chain stakeholders may track and verify commodities using a transparent and auditable blockchain system, encouraging cooperation to maintain supply chain integrity. Developing countries' textile industries need supply chain coordination and blockchain technology (Hader et al., 2022; Pal, 2020). They eliminate supply chain risks, maintain ethical and sustainability compliance, promote transparency, traceability, and accountability, and simplify supply chain

management. Collaboration and blockchain may boost emerging nations' competitiveness, promote global partnerships, and maintain textile sector development (Khan et al., 2023). Supply chain cooperation improves textile sector transparency and traceability (Garcia-Torres et al., 2022). Developing states may guarantee supply chain transparency by working closely with suppliers, manufacturers, and other stakeholders. Blockchain technology's decentralized, immutable ledger increases transparency. Blockchain can securely trace the textile supply chain from raw ingredients to manufacture and distribution. Visibility increases accountability, inhibits counterfeiting and fraud, and guarantees ethical and environmental standards (Rogerson & Parry, 2020).

There are few studies on supply chain collaboration, blockchain use, and perceived usefulness in developing countries like Pakistan's textile industry, especially among middle-level employees. Existing scholarship ignores emerging countries' textile sectors and extends results to other industries. Most studies focus on top-level management or IT specialists, ignoring middle-level personnel vital to supply chain operations. Thus, research on supply chain collaboration, blockchain adoption, and perceived usefulness in developing countries' textile industries, focusing on middle-level employees, is needed. This research gap will reveal middle-level workers' roles and views in the textile industry's blockchain technology adoption and implementation.

THEORETICAL FRAMEWORK AND HYPOTHESIS DEVELOPMENT

TAM supports the perceived usefulness variable (Abdullah et al., 2016). Established by Fred Davis in (1989), TAM has been widely used to study technology adoption and acceptance. TAM claims that perceived usefulness influences consumers' technology adoption (Aldammagh et al., 2021). It suggests that people will accept technology if they think it will help them succeed. According to the hypothesis, people are more likely to utilize a technology if they think it will improve their work performance, efficiency, or other advantages. Easy use, subjective standards, and social influence affect usefulness. TAM has been used to study technology adoption, including blockchain, in numerous businesses and scenarios (Taherdoost, 2022; Sciarelli et al., 2022). TAM examined how perceived usefulness mediates supply chain cooperation and blockchain technology adoption (Chowdhury et al., 2022; Kamble et al., 2019). By using TAM as the theoretical framework in your research on the mediating role of perceived usefulness in the textile industry in developing countries like Pakistan, you can build on existing knowledge and contribute to the literature by examining the specific factors that

influence perceived usefulness and its impact on the intention to use blockchain technology in the textile supply chain.

LITERATURE REVIEW

Supply Chain Collaboration

Blockchain technology may increase supply chain cooperation and performance; hence, it is linked to supply chain collaboration (Nand et al., 2020). Supply chain cooperation includes stakeholders working together to improve efficiency, cost, and customer satisfaction (Baah et al., 2022). Blockchain technology allows safe, transparent, decentralized data exchange across supply chain actors, improving decision-making and coordination (Kramer et al., 2021). Understanding what affects blockchain technology adoption is crucial. According to studies, supply chain cooperation increases blockchain adoption (Liu et al., 2023; Gökalp et al., 2022; Sunmola et al., 2021). Effective collaboration makes stakeholders more likely to consider blockchain as a tool to help them accomplish their objectives. Blockchain technology also boosts supply chain openness, accountability, and trust (Adow et al., 2022). Blockchain technology prevents data tampering, reducing supply chain fraud and mistakes. This may boost supply chain stakeholder confidence, which is essential for cooperation. Cooperation improves the ambition to utilize blockchain technology, whereas blockchain technology improves supply chain cooperation (Ekman et al., 2021). Therefore, the following hypothesis is suggested:

H1: Supply chain collaboration positively relates to the Intention to use Blockchain.

The Mediating Role of Perceived Usefulness

Perceived usefulness mediates supply chain collaboration and blockchain technology adoption according to the Technology Acceptance Model (Cai et al., 2023; Shrestha et al., 2021). TAM states that an individual's perception of a technology's usefulness determines their desire to utilize it (Vahdat et al., 2021; Song et al., 2021). Perceived usefulness illustrates how supply chain cooperation affects blockchain technology adoption. Perceived usefulness helps people evaluate how blockchain technology might enhance work performance, productivity, and supply chain effectiveness (Grover et al., 2019). Supply chain cooperation improves information sharing, coordination, and decision-making among stakeholders, increasing the perceived value of blockchain technology and the desire to use it (Lohmer et al., 2020). Researchers can better understand how supply chain cooperation affects blockchain technology adoption by using perceived usefulness as a mediating variable. This theoretical viewpoint coincides with TAM's focus on perceived usefulness in technology adoption. It offers a

foundation for studying supply chain cooperation and blockchain development in poor countries like Pakistan's textile sector. Therefore, the following hypothesis is suggested:

H2: *Perceived usefulness mediates between supply chain collaboration and intention to use blockchain.*

RESEARCH METHODOLOGY

Data Collection and Procedure

This cross-sectional study examined supply chain collaboration, blockchain adoption, and perceived benefit in the textile industry of developing countries. Cross-sectional data collection provides a snapshot of critical variables at a certain period (Wang & Cheng, 2020). This study required original data. The researchers based their questions on analogous structural studies. Supply chain collaboration, blockchain adoption, and technological usefulness were surveyed. Questionnaires were distributed among textile business human resources departments. A survey was based on middle-level supply chain personnel to ensure a representative sample. A total of 240 cases are considered in this study. This study concentrated on developing countries' Pakistan's medium-level textile industry players. The questionnaire did not list textile companies to ensure privacy. The respondents provided clear instructions to ensure they understand the study's purpose and how to complete the questionnaire. A total of 240 cases are considered in the present study. Surveys were gathered in sealed envelopes to protect respondents' identities. The questionnaire assessed supply chain collaboration, blockchain adoption, and usefulness using a five-point Likert scale from "strongly disagree" to "strongly agree". The scale assessed respondents' agreement or disagreement with construction-related comments.

Measurements

The independent variable supply chain collaboration is taken from the study of (Dubey et al., 2020; Huges et al., 2019). Items are "Helps in storing supply-chain information on a real-time basis and sharing it among participants, allows only authorized participants to write and read supply chain operation, assists in verifying supply-chain transactions without the need for a trusted third party and Assists participants in easily writing and reading supply-chain operations."

The mediating variable is adapted from the research of Kamble et al. (2019). Research items are "Using BT will help minimize my transaction delays, Using BT would improve SC performance, Using BT would improve SC productivity and Using BT would improve SC

effectiveness." The dependent variable is taken from the study of Kamble et al. (2019). Items are "I predict that our firm will use BT regularly in the future, our firm will use BT in the future, I expect that our firm will use BT or a similar type of system for SC transactions and I intend to use blockchain for managing activities."

Statical Tools

The current research uses structural equation modeling to test the hypothesis. Using numerical data, SEM can verify the correctness of previously proposed ideas (Nasution et al., 2020). As a result, structural equation modeling (SEM) is used to verify the link between latent variables and their associated components (Rashid, 2020). In addition, a subsample consisting of 5,000 bootstrap samples was used in this study. When dealing with complicated models such as mediation or moderation, it is vital to consider Smart-PLS (Mustafa et al., 2023).

RESULTS

Reliability and Validity (Instrument)

Research requires reliable and trustworthy measurements and findings (Stern et al., 2019). Consistent results from a dependable but incorrect measurement may not be helpful or accurate (Sürücü & MASLAKÇI, 2020). Thus, the measurement may be correct and unreliable. A valid but incorrect measure may provide accurate results but may not be reliable. Cronbach's alpha and composite reliability determine an instrument or questionnaire's internal consistency and reliability (Shrestha, 2021). EFA and CFA employ these measures. Researchers aim for high Cronbach's alpha and composite reliability scores to ensure a scale or questionnaire's internal consistency and reliability (Barati et al., 2021). The study's topic and the construct's attributes must be considered while analyzing this data. Table 1 and Figure 1 demonstrate Cronbach alpha and composite reliability values that exceed the criteria. These findings show that a hypothesis may be investigated, and the investigation is reliable and valid.

Table 1. Reliability and Validity

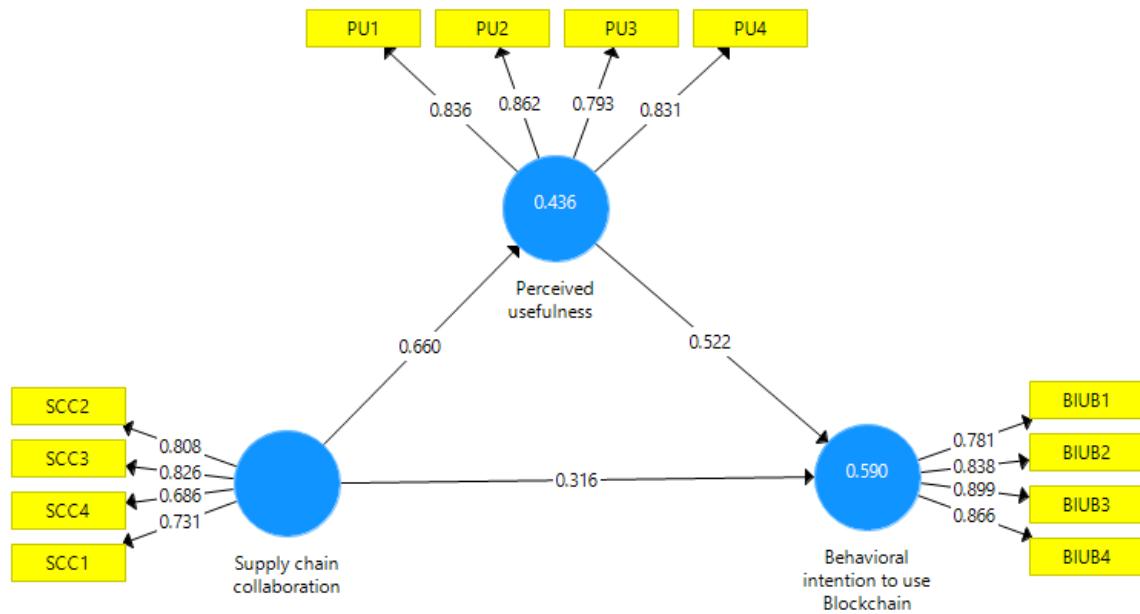| Factors	Item SPSS Coding	Factor Loading	Cronbach Alpha Value	Composite Reliability
Supply chain collaboration	SCC1	0.808	0.762	0.849
	SCC2	0.826		
	SCC3	0.686		
	SCC4	0.731		
Perceived useful ness	PU1	0.836	0.850	0.899
	PU2	0.862		
	PU3	0.793		
	PU4	0.831		
Behavioral Intention to Use Blockchain	BIUB1	0.781	0.868	0.910
	BIUB2	0.838		
	BIUB3	0.899		
	BIUB4	0.866		

Source: *Author's estimations*

Figure 1*. Model Fitness*

Hypotheses Testing

The previously suggested hypothesis was examined in this investigation, and the findings are shown in Table 2 and Figure 2, respectively. In order to test the hypothesis that is given about the bootstrapping approach, 5,000 bootstrap sub-samples were employed. In addition, the confidence intervals in the current research were 95%, as broad as possible. This research aimed to investigate the effect of having perceived usefulness, which serves as a mediator between supply chain collaboration and intention to use blockchain. In this scenario, Nitzl et al. (2016) and Preacher and Hayes (2008) used multiple analyses and the proposed investigative technique to get direct and indirect impacts. The data shown in Table 2 support both stated hypotheses, H1 and H2, which include direct correlations between the variables. In addition, the findings of the present inquiry on the mediating effect are provided in Table 2.

Table 2. Path Analysis Coefficient and T-Value

Proposed Hypothesis	Path	Path Coefficient	t	Remarks
H1	SCC-> BIUB	0.522	8.317	Accepted
H2	SCC-> PU-> BIUB	0.345	7.418	Accepted

Note(s): SCC=Supply chain collaboration, PU=Perceived usefulness, BIUB Behavioral intention to use blockchain
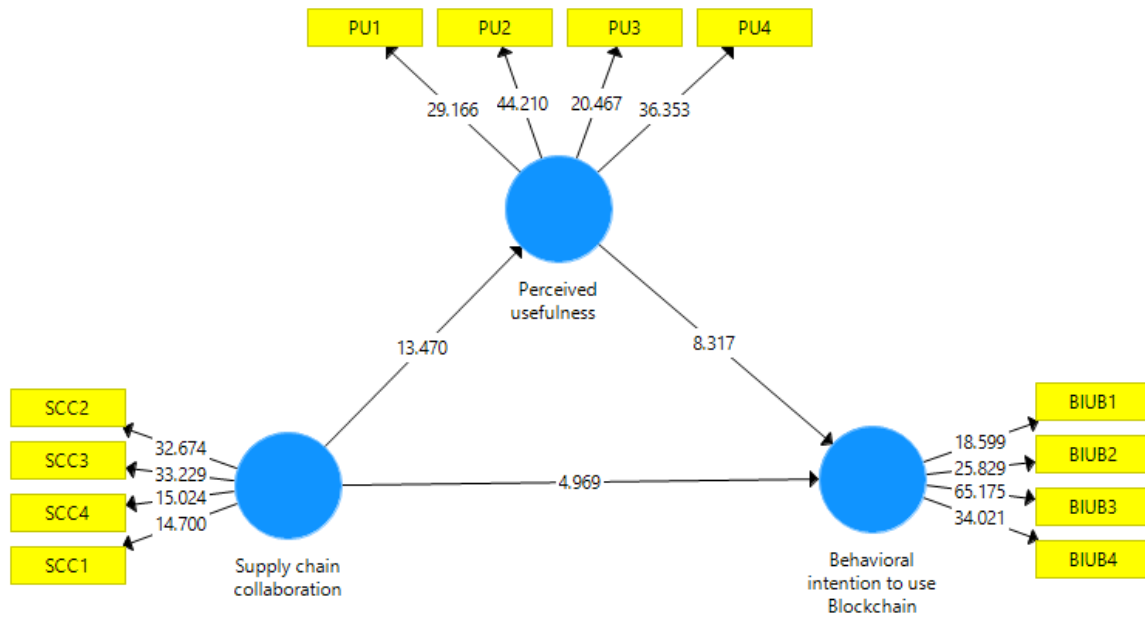
Figure 2. *Structural Equation Model*

DISCUSSION

The findings of this research shed significant light on the connection between supply chain cooperation, the desire to employ blockchain technology, and the role that perceived usefulness plays as a mediator in this connection. The study's findings indicate a significant positive association between cooperation throughout the supply chain collaboration and a desire of intention to use blockchain. This study highlights the necessity of coordinated efforts among supply chain stakeholders to cultivate an environment favorable for implementing blockchain technology. Employees who see the potential benefits of blockchain technology and strong desire to implement its implementation are more likely to work for companies that place a premium on cooperation (Philsoophian et al., 2022; Härting et al., 2020). Second, the findings support the idea that perceived usefulness plays a role in mediating the relationship between the two variables. According to the study's findings, the perceived usefulness partially mediates the connection between supply chain cooperation and the intention to use blockchain. This suggests that the workers' impression of the utility of this technology is a contributing factor to the influence of supply chain cooperation on the intention to use blockchain (Selimović et al., 2021). When workers see blockchain as a valuable tool that can help them do a better job, simplify operations, and increase supply chain efficiency, they are more likely to accept and use blockchain technology (Teodorescu & Korchagina, 2021). These results are consistent with earlier research that has reinforced how important it is for people to believe that technology

would be valuable to them before using it (Vahdat et al., 2021; Hite & McDonald, 2020). This study contributes to the current body of research by investigating the function that perceived usefulness plays as a mediator between supply chain cooperation and the adoption of blockchain technology. It sheds insight into the cognitive processes at play when workers' perceptions of the efficacy of blockchain are used as a mediator to determine whether employees want to adopt blockchain technology.

CONCLUSION

The findings of this research emphasized finding the connection between supply chain cooperation, the desire to employ blockchain technology, and the role that perceived usefulness plays as a mediator in this connection. To begin, the study's findings indicate a significant positive association between cooperation throughout the supply chain collaboration and a desire of Intention to use blockchain. This study highlights the necessity of coordinated efforts among supply chain stakeholders in the process of cultivating an environment that is favorable for the implementation of blockchain technology.

This research has significant ramifications for developing-country textile companies. To promote blockchain technology adoption, it emphasizes supply chain cooperation. Organizations may promote blockchain adoption by improving communication, sharing, and trust. Second, the research emphasizes perceived usefulness as a mediator. Training workers on blockchain technology's advantages may boost their perceived usefulness and inclination to adopt it. The insights may also help managers create blockchain-integrated supply chain strategies. Blockchain technology may be maximized via technology providers and industry-wide cooperation. These practical consequences may improve developing nations' textile supply chains' efficiency, transparency, and competitiveness.

This work has numerous critical theoretical consequences. Applying the Technology Acceptance Model (TAM) to supply chain cooperation and blockchain technology utilization validates it. The research uses perceived usefulness as a mediating variable to understand how perceptions affect blockchain adoption and intention. This validation reinforces TAM's theoretical basis and widens its supply chain blockchain application. Second, the research sheds light on perceived usefulness as a technology adoption mediator. The results support the theory that perceived usefulness mediates supply chain cooperation and blockchain adoption. Third, supply chain cooperation drives blockchain adoption, according to the report. Collaboration is crucial to supply chain blockchain arrangement. Finally, by concentrating on the textile sector

in underdeveloped countries like Pakistan, the research contextualizes blockchain implementation in particular socio-economic situations, revealing the obstacles and prospects of technology acceptance in these contexts. Theoretical implications help us comprehend blockchain adoption and supply chain integration.

FUTURE RESEARCH DIRECTIONS

The research on the perceived effectiveness of bridging supply chain cooperation and blockchain technology adoption has significant drawbacks. First, the study is cross-sectional, capturing data at specific points in time. This design limits causality. Longitudinal research might better demonstrate mediating effects and intention to adopt blockchain. Second, the research uses questionnaire data. Self-reporting bias and respondents' subjective views may affect this method's colossal sample size. Future studies might combine surveys with interviews or case studies to further understand contextual elements that impact perceived usefulness. The research also focuses on Pakistan's textile sector, limiting its applicability to other industries or countries. To further understand supply chain cooperation, perceived usefulness, and blockchain adoption, future research might examine diverse industries and countries.

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