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RESEARCH ARTICLE

The Influence of Blockchain Technology to Enhance Sustainable Supply Chain Performance in the Aviation Industry

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ABSTRACT

This study investigates the impact of blockchain technology on enhancing sustainable supply chain performance in the aviation industry. It examines the causal relationships among blockchain technology, supply chain integration, and competitive advantage in driving supply chain sustainability. Using a quantitative research approach, data was collected from business operators in the aviation industry supply chain through a structured questionnaire. The research model was tested using structural equation modeling (SEM), confirming the significant influence of blockchain technology on supply chain integration and competitive advantage. The findings indicate that blockchain technology improves supply chain transparency, operational efficiency, and trust among stakeholders, thereby enhancing supply chain sustainability. The study also highlights that supply chain integration strengthens competitive advantage and contributes to the overall sustainability of the aviation supply chain. Moreover, hypothesis testing results reveal that blockchain technology has a direct influence on sustainable supply chain performance (coef. = .503, p = .000), supply chain integration (coef. = .278, p = .013), and competitive advantage (coef. = .347, p = .000). Additionally, supply chain integration significantly impacts sustainable supply chain performance (coef. = .305, p = .004) and competitive advantage (coef. = .576, p = .000), while competitive advantage strongly influences sustainable supply chain performance (coef. = .687, p = .000). The total influence of blockchain technology on sustainable supply chain performance increases when mediated through supply chain integration and competitive advantage (total influence = .942). These insights provide a framework for adopting blockchain technology to develop a more efficient and resilient supply chain in the aviation industry.

INTRODUCTION

The continuous advancement of innovation and technology requires organizations to adapt and evolve to remain competitive in the global market. Rapid technological changes necessitate a proactive approach to staying ahead (Hillmann & Guenther, 2021). While internet usage was limited to agencies in the 1960s, it took over 30 years for the world to fully embrace the internet age, largely due to the development of the Transfer Control Protocol/Internetwork Protocol (TCP/IP) (Sánchez, 2022). This innovation enabled faster data exchange, broader accessibility, and reduced costs, driving transformative changes across various sectors, including publishing, manufacturing, and banking, while reshaping lifestyles worldwide. Preserve market relevance, organizations must invest in technology-driven systems for inter-business transactions, such as Electronic Data Interchange (EDI), the internet, Enterprise Resource Planning (ERP), and Electronic Procurement (E-Procurement) (Handfield, 2002). These systems standardize processes, enhance reliability, and automate operations, enabling businesses to respond swiftly to customer demands while ensuring transparency and auditability (Olawale et al., 2024).

However, one prominent supply chain impacted by blockchain technology implementation is the transportation industry, particularly within the airport sector (Di Vaio & Varriale, 2020). Over the past two decades, the airport industry has undergone significant transformation, heavily influenced by the emergence of blockchain technology. This necessitates a consideration of the key impacts stemming from the standardization of operational procedures within airport industries. This includes the development and implementation of new technologies, alongside other crucial service contexts such as enhanced passenger identity verification methods, aircraft maintenance data management, and frequent flyer program improvements (Pereira et al., 2022). These factors significantly influence service delivery. Furthermore, key performance indicators (KPIs) for airport planning, design, and management involve service levels and operational standards, encompassing factors such as queuing time, service processing time, and passenger space requirements (Bahas, 2023). The advent and proliferation of blockchain technology, however, bring renewed focus to the concept of service levels and operational standards in the airport industry. Key considerations include temporal and spatial constraints, which necessitate a focus on physical design and operational standards that impact passenger experience. Therefore, airports should refine operational standards based on passenger perception and needs to achieve improved service satisfaction (Chen et al., 2015).

Based on the aforementioned literature, this research aims to investigate the influential factors impacting the effects of blockchain technology on supply chain management. For instance, Di Vaio & Varriale highlighted several barriers to blockchain adoption in supply chains and discussed how this technology can affect supply chain sustainability at both local and global levels (Di Vaio & Varriale, 2020). We argue that two fundamental reasons underscore the importance of focusing on sustainability. First, the role of supply chains in achieving global economic sustainability has become increasingly prominent in recent years. Over 93% of the world's 250 largest companies report on sustainability, highlighting its necessity in supply chain operations (Kumar et al., 2012). Second, as blockchain technology gains traction, it is crucial to consider its role in areas such as fostering sustainability (Rajavat et al., 2024). This work therefore examines the influence of blockchain technology on the sustainability performance of supply chain management, offering a valuable framework for evaluating organizational performance in enhancing the sustainable efficiency of supply chains within the aviation industry. The implementation of blockchain not only enhances transparency and trust in various processes but also potentially reduces supply chain costs within the aviation sector significantly.

LITERATURE REVIEW

This study examines the impact of blockchain technology on enhancing the sustainable efficiency of the aviation industry's supply chain. It explores the causal model of blockchain technology, supply chain integration, and competitive advantage in influencing sustainable supply chain performance. The research aims to determine whether this model aligns with empirical data and identifies direct, indirect, and total influential variables affecting sustainability in aviation supply chains. Furthermore, it investigates the structural characteristics of the causal model, providing insights into how blockchain-driven integration and competitive advantage contribute to long-term operational sustainability in the industry.

Blockchain technology

Blockchain refers to a technology that stores and distributes data across a database shared among all stakeholders participating in the network. All participants can access detailed transaction data in real time (Muzammal et al., 2019). Traditionally, transaction data was stored in a centralized hub system and shared directly with transaction participants. However, blockchain technology enables people to share all information in a decentralized, secure, and intelligent manner (Haleem et al., 2021).

Kalyar et al. stated that all participants can access individual transaction details through a peer-to-peer network, ensuring decentralization (Kalyar et al., 2023). Furthermore, when transactions are conducted using digital signatures, security is significantly enhanced, ultimately ensuring transparency. Consequently, if any operational issues arise, they can be addressed collaboratively in real time. Additionally, once a transaction is recorded in the system with a verified digital signature assigned to a user, that signature remains unchanged. This characteristic is known as immutability

(Pointcheval & Stern, 2000). Given these attributes, blockchain technology is expected to bring substantial benefits to various industries. It has a profound impact on supply chains, where information sharing is a critical factor. Supply chain management encompasses the entire process of transportation, storage, and product delivery from raw material sourcing to production and ultimately to the final consumer (Tien et al., 2019).

Yousefi & Tosarkani predicted that blockchain technology would bring various advantages to supply chains, including enhanced efficiency and cost reduction, which are two primary objectives of supply chain management. Meanwhile, the body of literature on blockchain-based supply chains continues to expand (Yousefi & Tosarkani, 2023).

Supply chain integration

Supply chain integration is the strategic collaboration and management of supply chain activities across all stages, from demand planning and customer orders to production, procurement, transportation, and distribution (Power, 2005). Effective coordination among all stakeholders enhances operational efficiency and mutual benefits. It comprises three key aspects: internal integration (streamlining operations, reducing costs, meeting customer demands), supplier integration (fostering collaboration, reducing uncertainty, improving quality), and customer integration (understanding customer needs, minimizing design errors, optimizing resource utilization) (Basnet, 2013). Research suggests that organizations implementing comprehensive supply chain integration internally, with suppliers, and with customers achieve superior operational performance.

Competitive advantage

Market competition is becoming increasingly intense as digital technology empowers customers with more choices and greater influence (Pires et al., 2006). Advanced data-driven decision-making enables companies to conduct in-depth competitive research more efficiently. Competitive advantage plays a crucial role in an organization's sustainability, influencing how businesses address environmental, social, and economic challenges. Sustainability has become a source of innovation and differentiation, enabling companies to develop unique products, services, and business models that meet the needs of evolving customer and market demands (Schaltegger et al., 2016). Integrating sustainability principles into operational processes allows organizations to differentiate themselves from competitors and build a competitive advantage by demonstrating a commitment to environmental responsibility, social responsibility, and ethical practices. While simply adhering to sustainability and ethical standards doesn't always guarantee a competitive advantage, focusing on improving the quality, cost, and flexibility of processes using sustainability initiatives enhances competitiveness (Esty & Simmons, 2011). Furthermore, managing risks associated with Environmental, Social, and Governance (ESG) factors such as regulatory compliance, reputational damage, and supply chain disruptions allows companies to enhance resilience and long-term survival, maintaining a competitive edge in rapidly changing markets (Karwowski & Raulinajtys-Grzybek, 2021).

Sustainable supply chain performance

Sustainable supply chain performance encompasses the economic, social, and environmental dimensions of a supply chain's efficiency. It goes beyond timely and cost-effective delivery, incorporating environmental impact considerations, fair treatment of stakeholders throughout the chain, and adherence to good governance principles (Bag et al., 2020). Key performance indicators (KPIs) often include environmental metrics such as greenhouse gas emissions reduction, energy and water consumption, waste management, eco-friendly packaging, and natural resource conservation; social metrics such as human rights respect, fair labor practices, diversity and inclusion promotion, community support, and positive stakeholder relationships; and economic metrics such as cost efficiency, productivity improvements, supplier reliability, supply chain resilience, and innovation. Achieving sustainable supply chain performance provides a competitive advantage, builds customer trust, mitigates risks, and generates long-term value for both the business and society (Mefford, 2011).

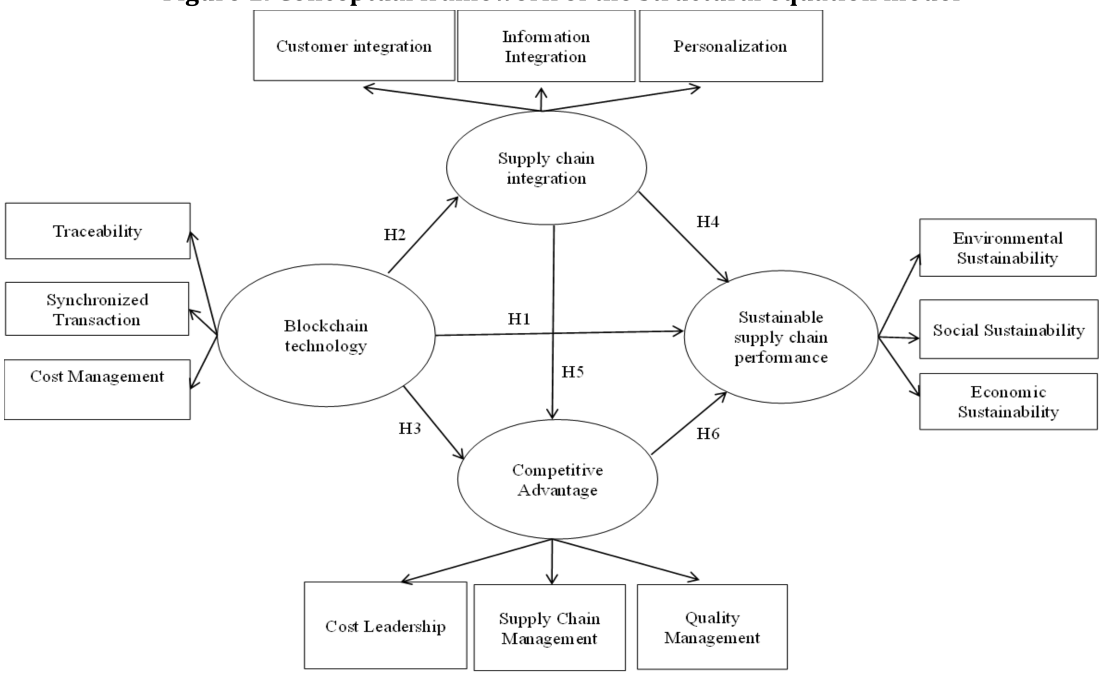
The meaning of technology acceptance

Technology adoption refers to the process by which an individual or organization adopts a technology. Once they are confident that the technology can be used effectively, the next step is to make a decision to invest in the technology, which leads to the acceptance and actual use of the technology in the activities or processes involved (Lee et al., 2009). The technology acceptance is a process that reflects the relationship between intention and behavior in using technology, which is influenced by people's attitudes in many aspects. It consists of main factors such as perceived usefulness, which indicates the belief that using technology will improve the results or efficiency, perceived ease of use, which refers to the convenience and simplicity of learning and using technology, and attitude toward using, which reflects opinions and feelings towards using technology (Davis, 1993). The understanding technology and deciding to adopt it and use it in everyday life involves many important factors. Starting with perceived usefulness of technology, which refers to analyzing how the use of technology will benefit the user and how it will improve work or life (Selwyn, 2003). Next is perceived ease of use, which involves assessing the convenience and ease of learning and using technology, especially in terms of how easy it is for the average user to adapt and use.

Hypothesis and conceptual framework

This research examines the relationship between blockchain technology and sustainable supply chain performance in the aviation industry by analyzing the influence of blockchain technology on supply chain integration and competitive advantage. The findings indicate that blockchain technology directly enhances supply chain efficiency through improved integration processes and strengthens an organization's competitive capability. Furthermore, the study reveals that supply chain integration plays a crucial role in improving sustainable supply chain performance and reinforcing competitive advantage. At the same time, competitive advantage contributes to the development and maintenance of supply chain sustainability. This research highlights the role of blockchain technology in enhancing the potential of the aviation industry, with a detailed overview of the studied variable relationships illustrated in Figure 1.

Figure 1: Conceptual framework of the structural equation model



RESEARCH METHODOLOGY

The researcher employed a quantitative research approach, beginning with the analysis of secondary data from textbooks, academic documents, and relevant research. The study's population comprised business operators within the aviation industry supply chain. A multi-stage sampling method was utilized, involving multiple steps: first, determining a sample size of 240 individuals (20 × 12 = 240) based on Hair et al. (2010) (Black et al., 2010); next, applying a cluster random sampling technique; and finally, conducting simple random sampling within the selected clusters.

The research instrument was developed using a 5-point Likert scale questionnaire (Likert, 1972). The questions were designed and adapted from existing academic scales, with modifications to ensure they aligned with the study's context. A review of related literature was conducted to refine the questionnaire structure for data collection. To ensure content validity, experts evaluated the questionnaire using the Index of Item-Objective Congruence (IOC) (Bollen, 1989), ensuring alignment with the study's objectives. Finally, the reliability of the questionnaire was tested using Cronbach's alpha coefficient (α) (Cronbach, 1990), which yielded a value of 0.957, indicating a high level of reliability. The statistics used to analyze the data in this quantitative research are as follows: descriptive statistics and structural equation modeling (SEM) analysis. The pattern analysis will consider the standardized factor loadings, which must be statistically significant for all factors ($|t| \geq 1.96$) or the C.R. (Critical Ratio) (Tenenhaus et al., 2005) and the goodness of fit between the measurement model and the empirical data (Goodness of Fit Measures) using accepted standard criteria (Jöreskog & Sörbom, 1990), Hair et al. (2010), (Eid et al., 2012).

SUMMARY OF RESEARCH RESULTS

The respondent demographics, as shown in Table 1 reveal that the majority are female (154 respondents, 64.17%), aged 30-40 (89 respondents, 37.08%), hold bachelor's degrees (135 respondents, 56.25%), have 6-10 years of work experience (107 respondents, 44.58%), and currently hold managerial positions (120 respondents, 50%).

Table 1: General data analysis

General status information		Frequency (n=240)	Percentage
Gender	Male	86	35.83
	Female	154	64.17
Age	Under 30 years old	9	3.75
	30-40 years old	89	37.08
	41-50 years old	56	23.33
	Over 50 years	86	35.83
Education level	Bachelor's Degree	135	56.25
	Master's Degree	98	40.83
	Above Master's Degree	7	2.92
Experience in Work	1-5 years	88	36.67
	6-10 years	107	44.58
	More than 10 years	45	18.75
Job Position Current	Head	67	27.92
	Manager	120	50.00
	Director	48	20.00
	Chairman	5	2.08

From Table 2, results of the analysis of the measurement model and the structural validity of the observed or empirical variables. When considering the Factor loadings values, the values obtained were more than 0.4 ($\lambda > 0.4$) with statistical significance. The analysis of variance extracted (Average

Variable Extracted: AVE) had values greater than 0.5 and the analysis of structural reliability (Composite Reliability: CR) had values greater than 0.7 (Fornell & Larcker, 1981, Hair et al., 2010).

Table 2: Factor loadings, CR, and AVE.

Latent variable	Observed variables	Factor loadings (λ>0.4)	CR	AVE
Blockchain technology (BT)	Traceability (BT1) Synchronized Transaction (BT2) Cost Management (BT3)	.809 .887 .863	.891	.732
Supply chain integration (SCI)	Customer integration (SCI1) Information Integration (SCI2) Personalization (SCI3)	.920 .823 .838	.898	.743
Competitive Advantage (CA)	Cost Leadership (CA1) Supply Chain Management (CA2) Quality Management (CA3)	.842 .896 .469	.794	.576
Sustainable supply chain performance (SSC)	Environmental Sustainability (SSC1) Social Sustainability (SSC2) Economic Sustainability (SSC3)	.837 .803 .891	.883	.715

Table 3 The results of the analysis of the Discriminant and correlation matrix found that the relationship between the latent variables in the model was found to be positive and not too high. The correlation coefficient between the latent variables in the research model was not greater than the square root of the AVE, indicating that the latent variables in the research model had discriminant validity, which was appropriate for further analysis of the structural model.

Table 3: Discriminant and correlation matrix.

	CR	AVE	BT	SCI	CA	SSC
BT	.891	.732	.855			
SCI	.898	.743	.348***	.861		
CA	.794	.576	.453***	.453***	.758	
SSC	.883	.715	.365***	.378***	.370***	.845

Structural equation model analysis results

The relationships between variables were examined based on standardized component weights, statistical significance (|t| ≥ 1.96) or Critical Ratio (C.R.), and an R^2 value of at least 0.2 (Lauro & Vinzi, 2004), as shown in Table 2. The findings revealed that Blockchain technology had standardized regression weights ranging from 0.801 to 0.873, with a variation rate (R^2 or Squared Multiple Correlation) between 0.751 and 0.788. Supply chain integration exhibited standardized regression weights between 0.565 and 0.883, with an R^2 value ranging from 0.427 to 0.791. Competitive Advantage had standardized regression weights between 0.782 and 0.879, with a variation rate (R^2) between 0.665 and 0.748. Finally, Sustainable supply chain performance showed standardized regression weights between 0.790 and 0.874, with an R^2 value ranging from 0.608 to 0.789 as shown in Table 4.

Table 4: Analysis of the relationship of structural equation model factors.

Relationship of variables			Factor loadings	S.E.	R^2	C.R.	p
Sustainable supply chain performance	<---	Blockchain technology	.503	.087	.676	9.646	***
Sustainable supply chain performance	<---	Supply chain integration	.305	.112		4.772	.004

Relationship of variables			Factor loadings	S.E.	R^2	C.R.	p
Sustainable supply chain performance	<---	Competitive Advantage	.687	.109		10.364	***
Competitive Advantage	<---	Blockchain technology	.347	.045	.775	7.637	***
Competitive Advantage	<---	Supply chain integration	.576	.147		8.814	***
Supply chain integration	<---	Blockchain technology	.278	.173	.597	3.955	.013
SSC1	<---	Sustainable supply chain performance	.874	-	.789	-	-
SSC2	<---	Sustainable supply chain performance	.790	.077	.761	17.207	***
SSC3	<---	Sustainable supply chain performance	.797	.067	.608	15.918	***
CA1	<---	Competitive Advantage	.847	.087	.748	17.504	***
CA2	<---	Competitive Advantage	.879	-	.708	-	-
CA3	<---	Competitive Advantage	.782	.089	.665	16.072	***
SCI1	<---	Supply chain integration	.783	.065	.667	17.661	***
SCI2	<---	Supply chain integration	.883	-	.791	-	-
SCI3	<---	Supply chain integration	.565	.045	.427	9.205	***
BT1	<---	Blockchain technology	.821	.089	.762	18.502	***
BT2	<---	Blockchain technology	.873	-	.788	-	-
BT3	<---	Blockchain technology	.801	.087	.751	16.523	***

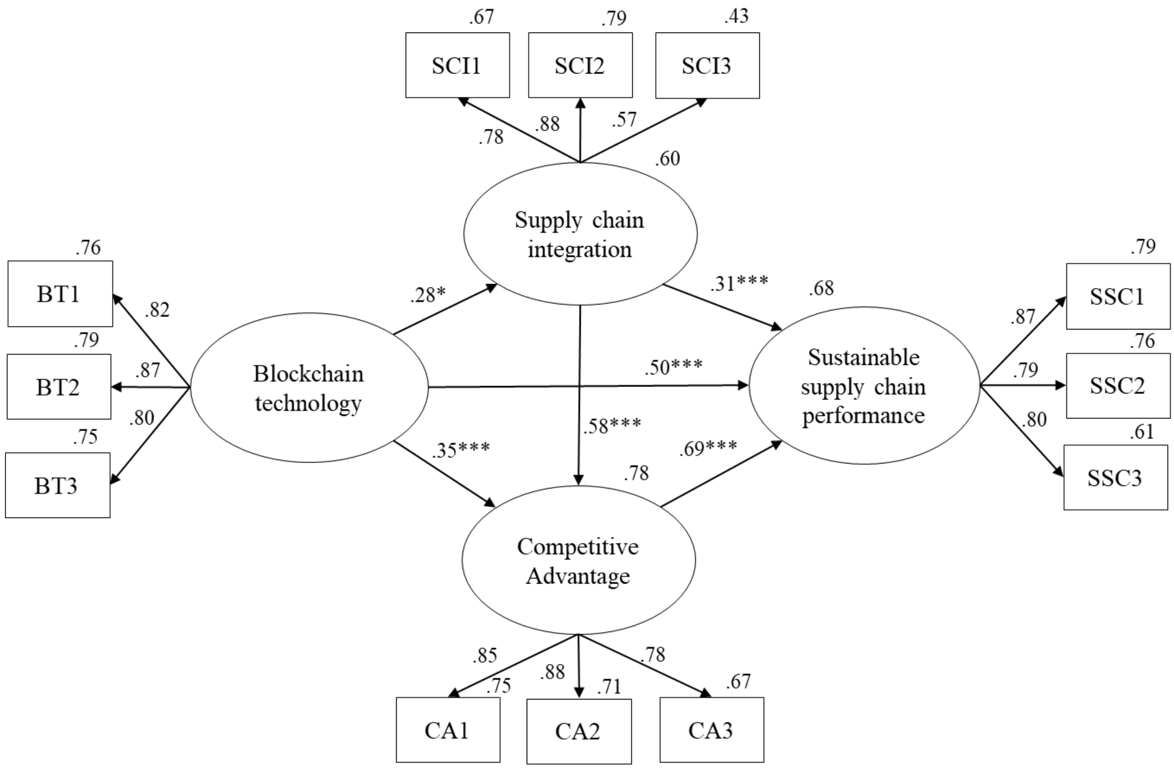
Note: Statistical significance level *** $p < .01$.

The results of the examination of the consistency between the measurement model and the empirical data (Goodness of Fit Measures) used the accepted standard criteria as shown in Table 5. The examination found that the structural equation model was consistent with the empirical data (Model Fit) with the following test values: Chi-square (χ^2) = 49.871, df = 38, p = .076, CMIN/DF (χ^2/df) = 1.210, GFI = .995, CFI = .995, NFI = .986, AGFI = .951, RMR = .015 and RMSEA = .023. The analysis results passed the standard criteria, so it can be concluded that the models of Blockchain technology, Supply chain integration, and Competitive Advantage have an influence on enhancing the sustainable efficiency of the supply chain in the aviation industry.

Table 5: Analysis of consistency and harmony

Related statistics	Symbol	criterion	After adjustment	Interpretation
Chi-square	χ^2	Ns)p>.05)	49.871 (p=.076)	Pass
Relative Chi-square	χ^2/df	< 2.000	1.210	Pass
Goodness of Fit Index	GFI	>.90	.975	Pass
Comparative Fit Index	CFI	>.95	.995	Pass
Normal Fit Index	NFI	>.90	.986	Pass
Adjusted Goodness of Fit Index	AGFI	>.90	.951	Pass
Standardized Root Mean Square Residual	Standardized RMR	<.05	.015	Pass
Root Mean Square Error of Approximation	RMSEA	<.05	.023	Pass

Sources: (Jöreskog & Sörbom, 1990), Hair et al. (2010), Lomax & Schumacker (2012).



Chi-square (χ^2) = 49.871, df = 38, p = .076, CMIN/DF (χ^2/df) = 1.210, GFI=.995, CFI=.995, NFI= .986, AGFI=.951, RMR=.015 and RMSEA= .023

Figure 2: Examination of the validity of the structural equation model of the influence of blockchain technology to enhance sustainable supply chain performance in the aviation industry.

The results of the analysis of the empirical data harmony as shown in Figure 2 (Final Model) found that the influence of blockchain technology in enhancing the sustainable performance of the supply chain in the aviation industry was positively affected by blockchain technology (coef. = 0.50) along with positively affected by supply chain integration (coef. = 0.31) and competitive advantage (coef. = 0.69) with statistical significance. The rate of variation of sustainable supply chain performance can be explained by 67.6 percent (R^2 = 0.676).

Hypothesis testing results

Hypothesis testing results and factor influence values will consider the t-test (C.R.) value, p-value and the assessment of the influence between predictive factors on the factors according to the results of enhancing the sustainable efficiency of the supply chain in the aviation industry. Hypothesis testing results and analysis of direct, indirect and combined influences of the factors that show the standardized regression coefficient (coef.) of each relationship path (Path Model) according to each research hypothesis. The analysis results found that all hypotheses, t-test values, have a significant level. Therefore, it can be concluded that all hypotheses are supported, as shown in Table 6.

Table 6: Hypothesis testing results.

Hypothesis	Coef.	T-test	Total influence	Direct influence	Indirect influence	Interpretation
Hypothesis 1: Blockchain technology influences Sustainable supply chain performance.	.503	13.646	.942	.503	.439	supported
Hypothesis 2: Blockchain technology influences Supply chain integration.	.278	3.995	.278	.278	-	supported
Hypothesis 3: Blockchain technology influences Competitive Advantage.	.347	7.637	.509	.347	.162	supported
Hypothesis 4: Supply chain integration influences sustainable supply chain performance.	.305	4.772	.705	.305	.400	supported
Hypothesis 5: Supply chain integration influences Competitive Advantage.	.576	8.814	.576	.576	-	supported
Hypothesis 6: Competitive Advantage influences Sustainable supply chain performance.	.687	10.364	.687	.687	-	supported

Hypothesis 1: Blockchain technology influences sustainable supply chain performance. Results of hypothesis testing revealed a significant positive relationship (coefficient = 0.503, $p < 0.001$), supporting the hypothesis.

Hypothesis 2: Blockchain technology influences supply chain integration. Hypothesis testing revealed a significant positive relationship (coefficient = 0.278, $p = 0.013$), supporting the hypothesis.

Hypothesis 3: Blockchain technology influences competitive advantage. Hypothesis testing revealed a significant positive relationship (coefficient = 0.347, $p < 0.001$), supporting the hypothesis.

Hypothesis 4: Supply chain integration influences sustainable supply chain performance. Results from hypothesis testing showed a significant positive relationship (coefficient = 0.305, $p = 0.004$), supporting the hypothesis.

Hypothesis 5: Supply chain integration influences competitive advantage. Hypothesis testing revealed a significant positive relationship (coefficient = 0.576, $p < 0.001$), supporting the hypothesis.

Hypothesis 6: Competitive advantage influences sustainable supply chain performance. Hypothesis testing revealed a significant positive relationship (coefficient = 0.687, $p < 0.001$), supporting the hypothesis.

However, the analysis results also show the direct, indirect and combined influence of Blockchain Technology to Enhance Sustainable Supply Chain Performance in the Aviation Industry. It was found that the influence of Blockchain Technology has an increase in the Sustainable supply chain performance when passing through Supply chain integration and Competitive Advantage (Total influence = .942). Therefore, operators in the aviation industry supply chain can adopt the best practices in implementing Blockchain technology to help operators and executives in the aviation industry to apply data to develop a more efficient and sustainable supply chain.

CONCLUSION

This study demonstrates the crucial role of blockchain technology in enhancing the efficiency and sustainability of aviation supply chain management. Findings confirm blockchain improves supply chain transparency, facilitates stakeholder integration, and strengthens competitive advantage, leading to enhanced sustainable supply chain performance. Supply chain integration is vital for both operational efficiency and long-term sustainability. Blockchain enables aviation operators to optimize logistics, reduce inefficiencies, and increase trust. Industry stakeholders should prioritize adopting blockchain-driven solutions to bolster supply chain resilience and sustainability. Future research should explore additional influencing factors, such as technological disruptions and workforce capabilities, on supply chain innovation and competitiveness. All six hypotheses were statistically significant ($p<.05$). Blockchain significantly impacts sustainable supply chain performance, mediated by supply chain integration and competitive advantage (total effect = .942). Therefore, aviation supply chain operators should adopt best practices in blockchain implementation to create a more efficient and sustainable supply chain.

SUGGESTIONS FOR FUTURE RESEARCH

The study of the influence of blockchain technology on enhancing the sustainable efficiency of the supply chain in the aviation industry, which was developed from a literature review and the creation of a research framework, including both quantitative and qualitative data collection and hypothesis testing, can be used to develop best practices for implementing blockchain technology in the aviation industry. The study will help to demonstrate the advantages and disadvantages of using this technology in practice, which can help practitioners and executives in the industry apply data to develop a more efficient and sustainable supply chain, as follows:

1. The application of efficient, reliable technology that takes into account business ethics. Entrepreneurs should increase their skills and knowledge in building on research results to develop the use of blockchain technology in the supply chain, which can be verified at every step, allowing stakeholders to verify the source of products and services accurately and transparently, resulting in increased trust from customers and business partners.
2. Current business operators should focus on driving marketing data by creating a customer database, such as purchasing behavior in various forms, including strategic collaboration and supply chain management at every step, from customer demand and order planning, production planning, procurement, transportation to distribution. All parties in the supply chain must coordinate and cooperate closely to increase operational efficiency. This integration will lead to mutual benefits for all parties in the supply chain.
3. Study other important causal factors affecting the performance of the aviation business, such as the nature of the business. The size of the business, the potential level of employees that affect the creation of the organization's innovation potential, including the integration of the concept of Technology Disruption to support future changes as a guideline for research development that can be useful for academics and entrepreneurs in creating organizational development strategies.

REFERENCES

Bag, S., Wood, L. C., Xu, L., Dhamija, P., & Kayikci, Y. (2020). Big data analytics as an operational excellence approach to enhance sustainable supply chain performance. Resources, conservation and recycling, 153, 104559.

Bahas, S. (2023). Airport performance and service quality: a complexity theory perspective Loughborough University].

Basnet, C. (2013). The measurement of internal supply chain integration. Management Research Review, 36(2), 153-172.

Black, W. C., Babin, B. J., & Anderson, R. E. (2010). Multivariate data analysis: A global perspective. Pearson.

Bollen, K. A. (1989). Structural Equations with Latent Variables. North Carolina: John Wiley & Sons, Inc.

Chen, J. K., Batchuluun, A., & Batnasan, J. (2015). Services innovation impact to customer satisfaction and customer value enhancement in airport. Technology in Society, 43, 219-230.

Cronbach, L. J. (1990). Essentials of Psychological Testing. New York: Harper & Brothers.

Davis, F. D. (1993). User acceptance of information technology: system characteristics, user perceptions and behavioral impacts. International journal of man-machine studies, 38(3), 475-487.

Di Vaio, A., & Varriale, L. (2020). Blockchain technology in supply chain management for sustainable performance: Evidence from the airport industry. International Journal of Information Management, 52, 102014.

Eid, M., Courvoisier, D. S., & Lischetzke, T. (2012). Structural equation modeling of ambulatory assessment data.

Esty, D. C., & Simmons, P. (2011). The green to gold business playbook: How to implement sustainability practices for bottom-line results in every business function. John Wiley & Sons.

Fornell, C., & Larcker, D. F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics.

Hair, J.F., Black, W.C., Babin, B.J. and Anderson, R.E. (2010) Multivariate Data Analysis. 7th Edition, Pearson, New York.

Haleem, A., Javaid, M., Singh, R. P., Suman, R., & Rab, S. (2021). Blockchain technology applications in healthcare: An overview. International Journal of Intelligent Networks, 2, 130-139.

Handfield, R. (2002). Supply chain redesign: Transforming supply chains into integrated value systems. Financial Times Prentice Hall.

Hillmann, J., & Guenther, E. (2021). Organizational resilience: a valuable construct for management research? International journal of management reviews, 23(1), 7-44.

Jöreskog, K. G., & Sörbom, D. (1990). Model search with TETRAD II and LISREL. Sociological Methods & Research, 19(1), 93-106.

Kalyar, M. N., Shafique, I., Saleem, S., & Humayun, S. (2023). Role of Leadership for Blockchain-Driven Supply Chain Management. In Blockchain Driven Supply Chain Management: A Multi-dimensional Perspective (pp. 87-100). Springer.

Karwowski, M., & Raulinajtys-Grzybek, M. (2021). The application of corporate social responsibility (CSR) actions for mitigation of environmental, social, corporate governance (ESG) and reputational risk in integrated reports. Corporate Social Responsibility and Environmental Management, 28(4), 1270-1284.

Kumar, S., Teichman, S., & Timpernagel, T. (2012). A green supply chain is a requirement for profitability. International Journal of Production Research, 50(5), 1278-1296.

Lauro, C., & Vinzi, V. E. (2004). Some contributions to PLS Path Modeling and a system for the European Customer Satisfaction. Dipartimento di Matematica e Statistica, Universita Federico II di Napoli, 3(2), 201-210.

Lee, D., Rhee, Y., & Dunham, R. B. (2009). The role of organizational and individual characteristics in technology acceptance. Intl. Journal of Human–Computer Interaction, 25(7), 623-646.

Likert, R. E. N. S. I. S. (1972). Likert technique for attitude measurement. Social Psychology: Experimentation, Theory, Research, Sahakian, WS (Ed.). Scranton USA: Intext Educational Publishers.

Mefford, R. N. (2011). The economic value of a sustainable supply chain. Business and Society Review, 116(1), 109-143.

Muzammal, M., Qu, Q., & Nasrulin, B. (2019). Renovating blockchain with distributed databases: An open source system. Future generation computer systems, 90, 105-117.

Olawale, O., Ajayi, F. A., Udeh, C. A., & Odejide, O. A. (2024). RegTech innovations streamlining compliance, reducing costs in the financial sector. GSC Advanced Research and Reviews, 19(1), 114-131.

Pereira, B. A., Lohmann, G., & Houghton, L. (2022). Technology trajectory in aviation: Innovations leading to value creation (2000–2019). International Journal of Innovation Studies, 6(3), 128-141.

Pires, G. D., Stanton, J., & Rita, P. (2006). The internet, consumer empowerment and marketing strategies. European journal of marketing, 40(9/10), 936-949.

Pointcheval, D., & Stern, J. (2000). Security arguments for digital signatures and blind signatures. Journal of cryptology, 13, 361-396.

Power, D. (2005). Supply chain management integration and implementation: a literature review. Supply chain management: an International journal, 10(4), 252-263.

Rajavat, A., Bhardwaj, V., Kaur, N., Rawat, R., Rawat, A., & Jadon, G. S. (2024). Sustainable Futures: Navigating Blockchain's Energy Dilemma. Online Social Networks in Business Frameworks, 85-112.

Sánchez, M. A. (2022). A multi-level perspective on financial technology transitions. Technological Forecasting and Social Change, 181, 121766.

Schaltegger, S., Lüdeke-Freund, F., & Hansen, E. G. (2016). Business models for sustainability: A co-evolutionary analysis of sustainable entrepreneurship, innovation, and transformation. Organization & environment, 29(3), 264-289.

Schumacker, R. E., & Lomax, R. G. (2010). A beginners guide to structural equation modeling. New York: Routledge.

Selwyn, N. (2003). Apart from technology: understanding people's non-use of information and communication technologies in everyday life. Technology in Society, 25(1), 99-116.

Tenenhaus, M., Vinzi, V. E., Chatelin, Y.-M., & Lauro, C. (2005). PLS path modeling. Computational statistics & data analysis, 48(1), 159-205.

Tien, N. H., Anh, D. B. H., & Thuc, T. D. (2019). Global supply chain and logistics management. In: Academic Publications, Dehli.

Yousefi, S., & Tosarkani, B. M. (2023). Exploring the role of blockchain technology in improving sustainable supply chain performance: a system-analysis-based approach. IEEE Transactions on Engineering Management, 71, 4389-4405.