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Blockchain Adoption in Green Supply Chains: Analyzing Key Drivers, Green Innovation, and Expected Benefits

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Abstract: This study aims to explore the impact of key drivers on the integration of blockchain technology implementation and green innovation practices within green supply chains. This study combines the TOE and TAM frameworks to identify six key driving factors that in the proposed model. A survey was conducted with Vietnamese enterprises, resulting in 328 valid responses from senior managers across various sectors. The PLS-SEM approach was conducted to analyze the relationships between the variables and to gain deeper insights into their interactions. The research findings highlight the significant potential of adopting blockchain and green innovation programs to enhance organizational performance. Six essential factors act as key drivers for implementing these initiatives, exerting a positive influence. Among them, Perceived Usefulness, Organizational Readiness, and Partnerships emerge as the three most influential variables within this research framework. Our research offers several valuable implications, both theoretical and practical. The structural framework model provides empirical evidence demonstrating the feasibility of achieving expected benefits for green supply chains, particularly in emerging economies such as Vietnam. Thus, these results serve as valuable references for senior managers and policy makers.

Keywords: blockchain adoption; green products; driving factors; green supply chains; expected benefits

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1. Introduction

Green supply chains (GSCs) necessitate the integration of environmentally responsible practices across all stages of the supply chain, encompassing activities from sourcing raw materials to delivering final goods to consumers [1,2]. Numerous initiatives have been proposed to encourage carbon emission reductions and prioritize the adoption of renewable resources [3,4]. Thus, accountability and collaboration among all stakeholders in the supply chain are essential to achieving transparency in adhering to environmental regulations and meeting green objectives [5]. Despite these efforts, fostering trust and transparency regarding materials and products among stakeholders remains a persistent challenge in traditional supply chains [6,7]. In response, blockchain technology has emerged as an effective tool for enhancing green supply chain management (GSCM) [6,8]. By providing an immutable ledger that records every transaction and piece of information, blockchain fosters trust and improves transparency, traceability, and efficiency across all supply chain stages [6,9]. Its adoption is particularly critical in addressing issues such as information fraud and the counterfeiting of product labels [10,11]. Additionally, blockchain technology

offers unique advantages for GSCM by enhancing the accountability of environmentally responsible practices and verifying the sustainability of raw materials [9,12,13].

Despite its potential and various benefits, blockchain technology adoption in green supply chains faces several challenges, including cultural differences among suppliers for collaboration [14], high implementation costs [15], and Technological Infrastructure gaps [16]. Additionally, Chavalala et al. (2024) emphasized that business leaders' strategic vision and leadership style are crucial factors driving blockchain adoption in cold supply chains [16]. In the context of developing countries, these challenges are further exacerbated by limited government support [17,18] and the lack of awareness about blockchain's benefits [19]. Therefore, Hartley et al. (2022) argue that identifying key factors is crucial to understanding why some businesses are willing to adopt blockchain technology, while others remain hesitant or refuse, despite recognizing its potential benefits [20]. Pinpointing the right drivers is particularly important for planning effective blueprints and strategies that help businesses overcome barriers. As such, understanding the key drivers of blockchain adoption is essential for its successful implementation and seamless integration into business operations [21,22]. To achieve sustainability goals, blockchain adoption serves as a strategic enabler to meet consumer demand for eco-friendly and ethically sourced products [23,24]. Studies have documented that identifying key factors not only influences the intention to adopt blockchain but also determines its practical application in enhancing transparency and promoting sustainability [5,13,25]. However, some scholars believe that a lack of consensus exists among scholars regarding the identification of influencing factors, primarily due to variations in research contexts and methodologies [22]. Moreover, as the emphasis on GSCM grows, organizations are placing greater importance on adopting green innovation initiatives. These initiatives aim to achieve sustainability, showcasing corporate efforts to advance eco-friendly practices through green products and business models [1,2]. Therefore, the decision to implement blockchain technology can act as a powerful catalyst for advancing green innovation. Currently, there is a noticeable gap in the existing literature, as few studies have simultaneously explored the integration of blockchain technology implementation and green innovation practices, particularly within the framework of structural model evaluation [26]. Integrating blockchain with green innovation practices provides a strong foundation for fostering greater trust among enterprises, encouraging the adoption of these concepts [27]. This combination not only strengthens the competitive advantage of companies but also contributes to more sustainable and efficient supply chain operations [28]. Furthermore, exploring this relationship offers valuable insights for enterprises and policy makers, enabling the development of effective strategies and practical solutions [27–29]. Thus, conducting a study to bridge these research gaps by identifying key drivers is essential for refining strategies, enhancing competitiveness, and ensuring that businesses align with sustainable development goals [13,25]. The research objectives are as follows:

RO1. Identify and evaluate the impact of key driving factors on Blockchain Adoption Intention and Green Innovation practices within supply chains.

RO2. Investigate the relationship between corporate Blockchain Adoption Intention and Green Innovation practices within supply chains.

RO3. Analyze how Blockchain Adoption Intention and Green Innovation practices influence the Expected Benefits for enterprises.

This study aims to focus on developing economies, the findings are expected to contribute to both theoretical advancements and practical applications in green supply chain management.

2. Hypotheses Development and the Research Model

Blockchain technology holds significant potential for enhancing green supply chains, particularly by improving transparency and traceability among suppliers within the chain [21,22]. Furthermore, enterprises pursuing innovations to enhance green efficiency are influenced by various factors [26,30]. Grounded in the TOE (Technology, Organization, Environment) theoretical framework, this study aims to identify and prioritize the key driving factors for blockchain adoption in GSCM [31,32]. Simultaneously, as suggested by Tasnim et al. (2023), this study incorporates insights from the TAM (Technology Adoption Model) framework to provide a more comprehensive understanding of critical considerations in this context [33]. Thus, our research focuses on nine constructs. Specifically, six key driving factors are identified: Perceived Usefulness (PU), Technological Infrastructure (TI), Investment Cost (IC), Organizational Readiness (OR), Government Support (GS), and Partnerships (PA). Additionally, three constructs, Blockchain Adoption Intention (BA), Green Innovation (GI) and Expected Benefits (EB), serve as predictive factors. Together, these constructs form the foundation of the research framework and guide the formulation of various hypotheses, as detailed below (see Figure 1).

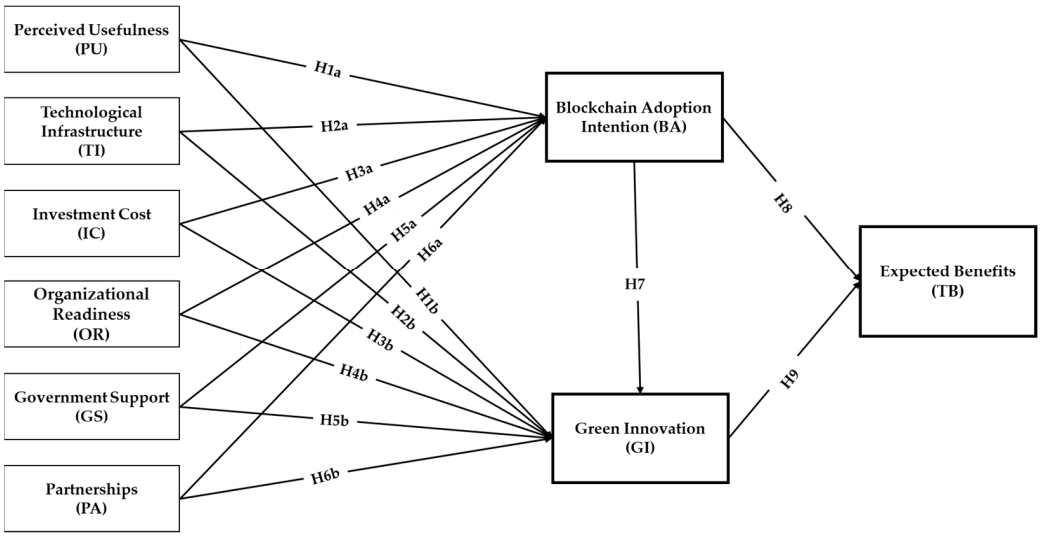


Figure 1. Proposed conceptual model.

Perceived Usefulness measures the benefits a business can achieve by adopting new technologies or implementing innovative ideas [18,34]. In the context of the supply chain, it serves as a critical factor in evaluating the impact on the intention to adopt new technologies or initiate new projects [33,35,36]. Hence, following the findings of relationships between Perceived Usefulness and Blockchain Adoption Intention and Green Innovation, the authors propose the following hypotheses:

H1a. *Perceived Usefulness positively affects Blockchain Adoption Intention.*

H1b. *Perceived Usefulness positively affects Green Innovation practices.*

Adaryani et al. (2024) reveals that modern infrastructure provides the necessary foundation for businesses to implement blockchain and adopt innovative green practices by enabling efficient data management and sustainable resource optimization, thereby fostering both BA and GI issues [37]. However, in some studies, this factor is identified as a technical barrier, presenting both a challenge and an opportunity for enterprises [16,38].

Thus, the authors proposes that Technological Infrastructure has correlated with Blockchain Adoption Intention and Green Innovation, as expressed through the following hypotheses:

H2a. *Technological Infrastructure positively affects Blockchain Adoption Intention.*

H2b. *Technological Infrastructure positively affects Green Innovation practices.*

High Investment Costs can hinder the intention to adopt modern technologies, particularly for small and medium enterprises (SMEs), as they often worry that the financial burden may outweigh the perceived benefits [39,40]. Do et al. (2024) highlights that financial cost is the most significant obstacle in the context of Vietnamese GSCM [2]. However, Shahzad et al. (2022) suggests that top managers should perceive these costs as a strategic investment for long-term benefits [36]. Additionally, securing financial support from external sources can encourage SMEs to explore and adopt innovative green practices [41]. Consequently, Investment Cost directly influences both the feasibility of blockchain adoption and the motivation to implement green innovative solutions, the authors propose the following hypotheses:

H3a. *Investment Cost positively affects Blockchain Adoption Intention.*

H3b. *Investment Cost positively affects Green Innovation practices.*

Organizational Readiness, which includes adequate financial resources, skilled personnel, top management support, and a clear strategic plan, enables businesses to adopt blockchain technology more effectively [34,42]. Furthermore, a high level of Organizational Readiness facilitates the development of innovative green practices by ensuring the seamless implementation of sustainable technologies [43]. Conversely, Abdelwahed et al. (2024) argue that a lack of readiness can pose significant barriers to both blockchain adoption and the pursuit of Green Innovation, thereby limiting an organization's ability to achieve long-term sustainability goals [44].

H4a. *Organizational Readiness positively affects Blockchain Adoption Intention.*

H4b. *Organizational Readiness positively affects Green Innovation practices.*

According to Yadlapalli et al. (2022), Government Support plays a crucial role in facilitating blockchain adoption within supply chains. Supportive policies can help businesses reduce Investment Costs and encourage greater investment in green technologies, promoting sustainability [30,45]. In the absence of adequate support, companies may struggle to adopt blockchain or pursue environmentally sustainable innovations, ultimately hindering their ability to achieve long-term competitive advantages [46]. Thus, the authors propose that Government Support serves as a key driving factor in relationships with Blockchain Adoption Intention and Green Innovation, as expressed through the following hypotheses:

H5a. *Government Support positively affects Blockchain Adoption Intention.*

H5b. *Government Support positively affects Green Innovation practices.*

Some studies found that collaboration with supply chain partners plays a pivotal role in driving businesses to adopt technological advancements and Green Innovation [46,47]. Partnerships with technology providers, research institutions, or key stakeholders offer businesses access to specialized expertise, shared resources, and innovative solutions [6,48].

In addition, Habib et al. (2022) document that these collaborations also accelerate Green Innovation by fostering collective efforts to implement sustainable practices across the supply chain, enhancing both efficiency and environmental responsibility [49]. Thus, the authors propose two hypotheses regarding the influence of Partnerships as below.

H6a. *Partnerships positively affect Blockchain Adoption Intention.*

H6b. *Partnerships positively affect Green Innovation practices.*

Considering the influence of blockchain technology integration, several scholars argue that blockchain adoption is positively associated with Green Innovation [26,50]. The implementation of blockchain within supply chains offers various advantages, enabling organizations to identify and adopt sustainable practices more effectively [51]. Furthermore, blockchain adoption fosters collaboration among supply chain stakeholders, facilitating the exchange of data and resources that drive innovative solutions for environmental sustainability [26,27]. Therefore, the authors hypothesize that businesses with a strong intention to adopt blockchain are more likely to engage in and advance Green Innovation practices.

H7. *Blockchain adoption has a positive relationship with Green Innovation practices.*

Building on the findings of prior studies, Expected Benefits refer to the anticipated positive outcomes that businesses achieve from adopting innovative initiatives [47,52]. In this study, the authors examine the Expected Benefits for enterprises integrating blockchain technology and Green Innovation within their supply chains. Sodhi et al. (2022) have shown that blockchain integration enhances supply chain transparency and operational efficiency, leading to significant business advantages [53]. Similarly, engaging in Green Innovation practices promotes sustainability and strengthens competitive advantages by aligning with environmental standards and meeting evolving consumer demands [26,54]. Therefore, the authors propose the following hypotheses

H8. *Blockchain adoption has a positive relationship with Expected Benefits.*

H9. *Green Innovation has a positive relationship with Expected Benefits.*

3. Methodology

3.1. Data Collection

This study surveyed the perspectives of managers at various levels across enterprises in diverse industries in Vietnam. The questionnaire was structured around the proposed research model, enabling respondents to evaluate the constructs effectively. Therefore, data collection relied primarily on online questionnaires and direct interviews. In detail, survey respondents included middle managers and business leaders directly involved in decision-making processes related to supply chains and technological innovation. Although some studies have demonstrated that the adoption of blockchain technology encounters varying challenges depending on the specific characteristics of each supply chain [14,15], its substantial benefits have driven its increasingly widespread adoption [16]. Consequently, a total of 328 valid responses were collected, ensuring representation and objectivity across diverse industries within the context of a transitional economy. These industries include agriculture, mining, manufacturing, food processing, trading, and services. Additionally, Table 1 presents the demographic background of the respondents, detailing information such as gender, age, education level, department, and the number of employees in their enterprises.

Table 1. Demographic background of respondents.

Information		Count	Percentage
Gender	Male	214	65.2%
	Female	114	34.8%
Age group	<30 years old	18	5.5%
	30–40 years old	46	14.0%
	40–50 years old	155	47.3%
	50–60 years old	95	29.0%
	over 60 years old	14	4.3%
Education	Bachelor's degree	242	73.8%
	Master's degree	70	21.3%
	PhD	16	4.9%
Department	Executive	24	7.3%
	R&D	49	14.9%
	Accounting	47	14.3%
	Logistics	21	6.4%
	Manufacturing	90	27.4%
	Sales	20	6.1%
	Operation	70	21.3%
	Complex	7	2.1%
Sectors	Agriculture	100	30.5%
	Mining	11	3.4%
	Manufacturer	63	19.2%
	Food processing	74	22.6%
	Trading	49	14.9%
	Service	31	9.5%
Number of employees	Less than 10 people	12	3.7%
	11–50 people	45	13.7%
	51–100 people	128	39.0%
	101–150 people	61	18.6%
	151–200 people	68	20.7%
	Over 200 people	14	4.3%

3.2. Measures

As suggested by some scholars about measurement scales of the construct, this work adopted a five-point Likert scale ranging from 1 (Strongly disagree) to 5 (Strongly agree) [55,56]. The data collected aim to identify the key factors influencing the acceptance and intention to adopt blockchain technology, as well as its impact on Green Innovation strategies within Vietnamese supply chains. This study examines six driving factors: Perceived Usefulness (PU) (4 items), Technological Infrastructure (TI) (3 items), Investment Cost (IC) (3 items), Organizational Readiness (OR) (4 items), Government Support (GS) (4 items), and Partnerships (PA) (4 items). In addition, the research focuses on two primary outcomes: Blockchain Adoption Intention (BA) (4 items) and Green Innovation (GI) (4 items). Finally, the authors assess Expected Benefits (EB) (4 items) as a prediction construct of this framework. Hence, aiming to examine hypotheses related to the driving factors influencing blockchain adoption and its impact on Green Innovation in supply chains, the Partial Least Squares Structural Equation Modeling (PLS-SEM) approach is employed in this study for understanding of the relationships between variables. Durdyev et al. (2018) and Do et al. (2020) believed that PLS-SEM is particularly suitable for exploratory research and analyzing complex models with multiple constructs and relationships [57,58]. More importantly, PLS-SEM does not require a strict assumption of data normality, and it is robust in handling smaller sample sizes; therefore, making it appropriate for the 328 valid

responses collected in transitional economies like Vietnam, where data characteristics may vary [40,59].

4. Data Analysis

This study aims to evaluate the influence of key driving factors on the acceptance and intention to adopt blockchain technology, as well as its impact on Green Innovation strategies within Vietnamese supply chains. To achieve these objectives, the Smart-PLS software version 4.0.9.5 was employed to analyze both the measurement model and the structural model. Some recent studies revealed that Smart-PLS tool enable assessing the reliability and validity of the constructs within the model and to test the proposed hypotheses effectively [37,40,60].

4.1. The Measurement Model

Based on the framework model, a total of nine constructs (PU, TI, IC, OR, GS, PA, BA, GI, and EB) have been assessed in the measurement model path; as a result, Figure 2 and Table 2 demonstrate the reliability and validity of these scales.

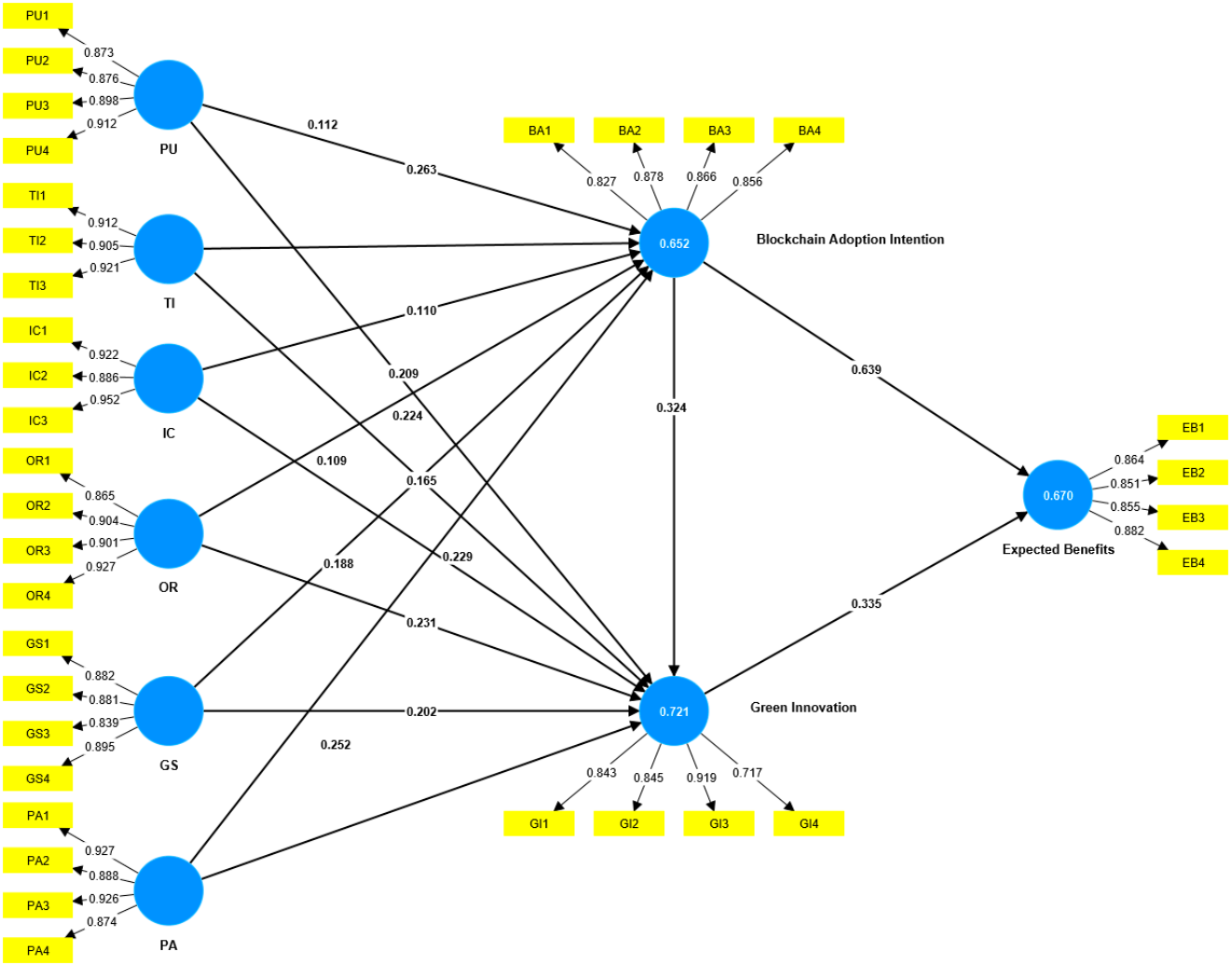


Figure 2. The measuring model's evaluation. Presented values: outer loadings; total effects; and R-square.

Firstly, the indicator reliability was assessed through the outer loading values of all 34 items, which exceeded the recommended threshold of 0.708, as suggested by [37,59].

Specifically, the outer loading ranges for each construct were as follows: Perceived Usefulness (0.873–0.912), Technological Infrastructure (0.905–0.921), Investment Cost (0.886–0.952), Organizational Readiness (0.865–0.927), Government Support (0.839–0.895), Partnerships (0.871–0.927), Blockchain Adoption Intention (0.827–0.878), Green Innovation (0.717–0.919), and Expected Benefits (0.851–0.882). These results demonstrate that the individual indicators reliably measure their respective constructs. Additionally, the maximum VIF value among all items is 4.509, which is below the threshold of 5.0 [40,59]. This indicates that there is no multicollinearity present in this case study.

Table 2. The measurement Model assessment.

Constructs	Indicator	Loading	VIF	Cronbach's Alpha	CR	AVE
PU	PU1	0.873	2.767	0.912	0.918	0.792
	PU2	0.876	2.778			
	PU3	0.898	3.055			
	PU4	0.912	3.354			
TI	TI1	0.912	2.652	0.901	0.915	0.833
	TI2	0.905	2.996			
	TI3	0.921	2.846			
IC	IC1	0.922	3.731	0.910	0.922	0.848
	IC2	0.886	2.430			
	IC3	0.952	4.482			
OR	OR1	0.865	2.365	0.921	0.921	0.809
	OR2	0.904	3.661			
	OR3	0.901	3.145			
	OR4	0.927	4.509			
GS	GS1	0.882	2.808	0.897	0.898	0.765
	GS2	0.881	3.489			
	GS3	0.839	2.169			
	GS4	0.895	3.970			
PA	PA1	0.927	4.328	0.925	0.926	0.817
	PA2	0.888	2.907			
	PA3	0.926	4.319			
	PA4	0.874	2.452			
Blockchain Adoption	BA1	0.827	2.159	0.879	0.882	0.735
	BA2	0.878	2.591			
	BA3	0.866	2.385			
	BA4	0.856	2.379			
Green Innovation	GI1	0.843	2.255	0.851	0.861	0.696
	GI2	0.845	2.178			
	GI3	0.919	3.343			
	GI4	0.717	1.524			
Expected Benefits	EB1	0.864	2.517	0.886	0.886	0.745
	EB2	0.851	2.193			
	EB3	0.855	2.172			
	EB4	0.882	2.730			

Secondly, the reliability and validity of the nine constructs were assessed using two key metrics: Cronbach's Alpha and Composite Reliability (CR). Following the guidelines of Hair et al. (2019), all values for the nine constructs (PU, TI, IC, OR, GS, PA, BA, GI, and EB) had a higher suggested cut-off of 0.7. These results confirm the internal consistency and reliability of the constructs within the proposed framework [59]. Finally, the AVE

values of these nine constructs range from 0.696 to 0.848, exceeding the threshold of 0.5. Combined with all HTMT values being less than 0.9 (see Table 3), these results align with the recommendations of [40,60] for assessing the convergent and discriminant validity of constructs.

Table 3. Discriminant validity (HTM-Matrix).

Constructs	BA	EB	GS	GI	IC	IN	PA	PU	TI
Blockchain Adoption Intention (BA)									
Expected Benefits (EB)	0.893								
Government Support (GS)	0.646	0.566							
Green Innovation (GI)	0.895	0.865	0.667						
Investment Cost (IC)	0.575	0.531	0.525	0.586					
Organizational Readiness (OR)	0.632	0.645	0.471	0.657	0.353				
Partnerships (PA)	0.639	0.525	0.336	0.672	0.360	0.398			
Perceived Usefulness (PU)	0.738	0.649	0.575	0.730	0.562	0.450	0.525		
Technological Infrastructure (TI)	0.515	0.461	0.325	0.576	0.343	0.354	0.419	0.411	

4.2. The Structural Model

Following the assessment of convergent and discriminant validity for all nine constructs (PU, TI, IC, OR, GS, PA, BA, GI, and EB), the structural model will be evaluated in the second stage to test the proposed hypotheses as suggested by [40,59]. Figure 3 illustrates the correlations among the constructs, while Table 4 presents the predictive accuracy of the structural model.

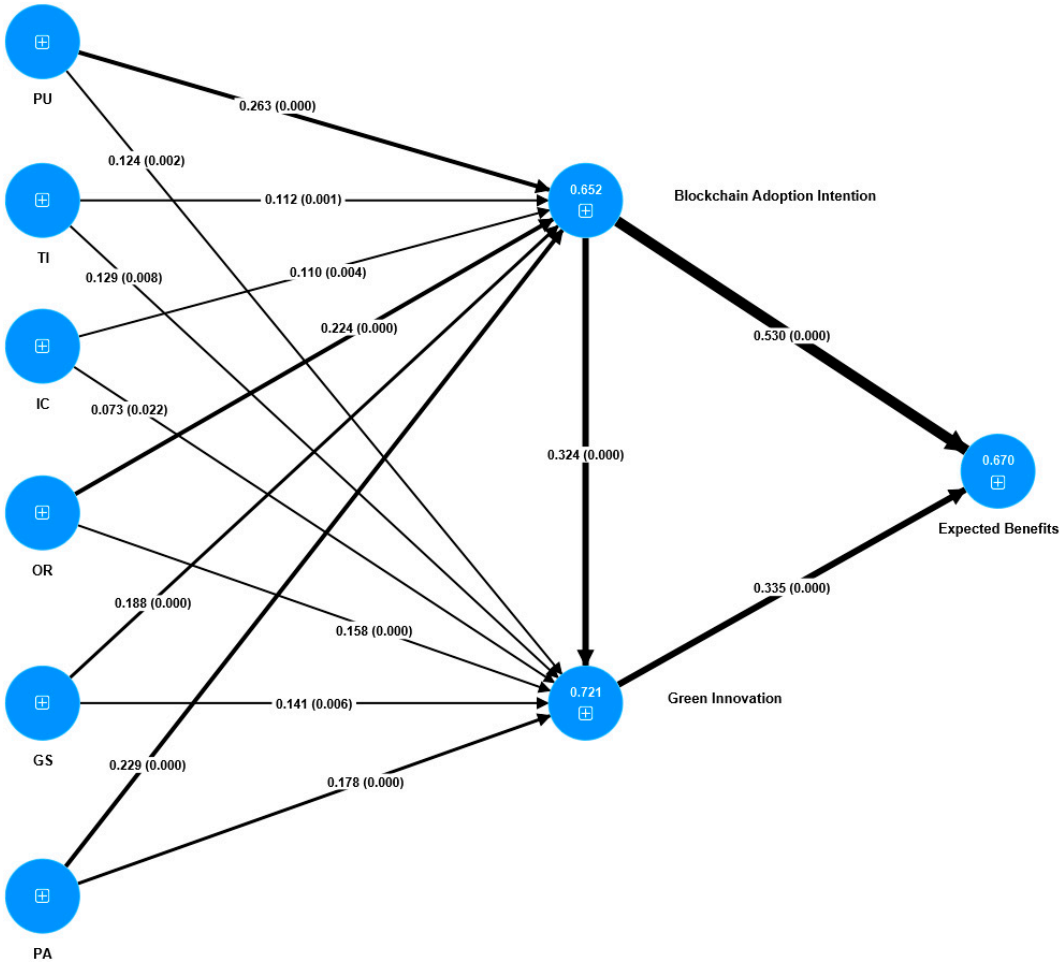


Figure 3. Evaluation of the structural model. Presented values: coefficient and *p*-values.

Table 4. The structural model.

	SSO	SSE	Q^2 (=1 − SSE/SSO)
Blockchain Adoption Intention	1312.000	696.100	0.469
Green Innovation	1312.000	666.073	0.492
Expected Benefits	1312.000	668.128	0.491

In terms of Q-squared (Q^2) values, which is obtained through the blindfolding procedure in Smart-PLS, serves as an indicator of the model's predictive accuracy. According to [59,60], the thresholds for Q^2 values are 0.25, 0.50, and 0.75, corresponding to weak, moderate, and strong predictive accuracy, respectively. The Q^2 values of three dependent constructs (BA, GI, and EB) presented in Table 4 indicate that the predictive accuracy of this model is moderate and can be accepted.

A bootstrapping procedure was performed using responses from 328 observations to assess the hypotheses. The path coefficients and *p*-values resulting from this analysis are presented in Table 5. Significance levels are indicated by (*), (**), and (***) corresponding to *p*-values of <0.05, <0.01, and <0.001, respectively. These levels help assess the reliability of the results, indicating a strongest relationship and the lowest likelihood of the results occurring by chance [54,57].

Table 5. Path coefficients and hypotheses conclusion.

Hypothesis	Paths	Coefficient	T Statistics	2.5%	97.5%	Conclusion
H1a	PU -> BA	0.263	6.411 ***	0.184	0.350	Accepted
H1b	PU -> GI	0.124	3.162 **	0.040	0.196	Accepted
H2a	TI -> BA	0.112	3.274 **	0.042	0.177	Accepted
H2b	TI -> GI	0.129	2.640 **	0.029	0.219	Accepted
H3a	IC -> BA	0.110	2.898 **	0.034	0.185	Accepted
H3b	IC -> GI	0.073	2.291 *	0.011	0.136	Accepted
H4a	OR -> BA	0.224	5.609 ***	0.144	0.301	Accepted
H4b	OR -> GI	0.158	4.256 ***	0.078	0.224	Accepted
H5a	GS -> BA	0.188	4.078 **	0.090	0.273	Accepted
H5b	GS -> GI	0.141	2.761 **	0.032	0.234	Accepted
H6a	PA -> BA	0.229	5.541 ***	0.147	0.311	Accepted
H6b	PA -> GI	0.178	4.168 ***	0.087	0.258	Accepted
H7	BA -> GI	0.324	4.091 ***	0.210	0.519	Accepted
H8	BA -> EB	0.530	6.575 ***	0.368	0.688	Accepted
H9	GI -> EB	0.335	4.588 ***	0.191	0.481	Accepted

Note: *: *p*-values < 0.05; **: *p*-values < 0.01; ***: *p*-values < 0.001.

As shown in Table 5, the relationships between the six key driving factors (PU, TI, IC, OR, GS, and PA) and Blockchain Adoption Intention (BA) in Vietnamese supply chains are positive, with coefficient values of 0.263, 0.112, 0.110, 0.224, 0.188, and 0.229, respectively. All *p*-values are below 0.05, confirming that the six proposed hypotheses (H1a, H2a, H3a, H4a, H5a, and H6a) are supported. Similarly, the results support the six proposed hypotheses (H1b, H2b, H3b, H4b, H5b, and H6b), indicating a significant correlation between the six key driving factors (PU, TI, IC, OR, GS, and PA) and Green Innovation practices (GI) in Vietnamese supply chains. Specifically, the corresponding coefficient values are 0.124, 0.129, 0.073, 0.158, 0.141, and 0.178, respectively, and all *p*-values are below 0.05. Furthermore, the relationships between Blockchain Adoption (BA), Green Innovation Practices (GI), and the predicted construct Expected Benefits (EB) were assessed through three hypotheses: H7, H8, and H9. The findings reveal that BA has a positive impact on both GI and EB, with coefficient values of 0.324 and 0.530, respectively, and *p*-values of 0.000. Additionally, GI

demonstrates a significant positive impact on EB, with a coefficient of 0.335 and a *p*-value less than 0.001.

Finally, using the bootstrapping procedure, various indirect relationships within the framework model were assessed and presented. Specifically, the complex pathways linking the six key driving factors (PU, TI, IC, OR, GS, and PA) to the final predictive factor Expected Benefits (EB) were analyzed, highlighting the mediating roles of Blockchain Adoption Intention (BA) and Green Innovation practices (GI), as demonstrated in Table 6.

Table 6. Result of indirect relationships.

No.	Relationships	Coefficient	T Statistics	2.5%	97.5%	Result
1	PU -> BA -> GI	0.085	3.714 ***	0.050	0.139	Supported
2	TI -> BA -> GI	0.036	2.435 *	0.012	0.071	Supported
3	IC -> BA -> GI	0.036	2.123 *	0.009	0.076	Supported
4	OR -> BA -> GI	0.072	2.812 **	0.035	0.136	Supported
5	GS -> BA -> GI	0.061	2.279 *	0.022	0.127	Supported
6	PA -> BA -> GI	0.074	2.638 **	0.035	0.145	Supported
7	PU -> BA -> EB	0.139	4.609 ***	0.084	0.203	Supported
8	TI -> BA -> EB	0.060	3.060 **	0.022	0.099	Supported
9	IC -> BA -> EB	0.059	2.507 *	0.017	0.108	Supported
10	OR -> BA -> EB	0.119	3.662 ***	0.062	0.188	Supported
11	GS -> BA -> EB	0.099	3.225 ***	0.042	0.163	Supported
12	PA -> BA -> EB	0.121	4.006 ***	0.069	0.188	Supported
13	PU -> GI -> EB	0.042	2.293 *	0.011	0.081	Supported
14	TI -> GI -> EB	0.043	2.221 *	0.008	0.083	Supported
15	IC -> GI -> EB	0.025	1.969 *	0.003	0.052	Supported
16	OR -> GI -> EB	0.053	2.608 **	0.018	0.098	Supported
17	GS -> GI -> EB	0.047	2.129 *	0.009	0.096	Supported
18	PA -> GI -> EB	0.060	2.951 **	0.022	0.101	Supported
19	BA -> GI -> EB	0.108	3.802 ***	0.064	0.176	Supported
20	PU -> BA -> GI -> EB	0.029	3.449 ***	0.015	0.047	Supported
21	TI -> BA -> GI -> EB	0.012	2.285 *	0.004	0.024	Supported
22	IC -> BA -> GI -> EB	0.012	2.255 *	0.003	0.024	Supported
23	OR -> BA -> GI -> EB	0.024	3.147 **	0.013	0.043	Supported
24	GS -> BA -> GI -> EB	0.020	2.340 *	0.008	0.041	Supported
25	PA -> BA -> GI -> EB	0.025	2.694 **	0.012	0.048	Supported

Note: *: *p*-values < 0.05; **: *p*-values < 0.01; ***: *p*-values < 0.001.

As a result, all relationships mediated by BA and GI were found to be statistically significant (*p*-values < 0.05) and supported. These results underscore the critical roles of BA and GI as mediating constructs, bridging the influence of the six driving factors on the Expected Benefits of Vietnamese enterprises. Hence, this highlights the importance of fostering both technological adoption and innovative practices to maximize the potential benefits within Vietnamese supply chains.

5. Discussion

Similar to several other studies on the implementation of blockchain technology and Green Innovation in supply chains, Adaryani et al. (2024) and Khan et al. (2023) emphasize significant research gaps that remain unaddressed, particularly within the context of emerging economies [37,61]. These regions possess substantial potential for adopting advanced technologies like blockchain but encounter numerous challenges related to infrastructure, policies, and resource limitations [61,62]. Furthermore, Do et al. (2024) reveals that supply chains in a transitional country like Vietnam are often characterized by high complexity, a

lack of transparency, and mounting sustainability pressures, underscoring the urgency of adopting innovative solutions such as blockchain [2].

Drawing on the TOE framework and referencing the TAM model in this study [31], the findings identify six key driving factors influencing Blockchain Adoption Intention and Green Innovation practices in supply chains [40,63,64]. Accordingly, the results provide empirical support for six hypotheses (H1 to H6) in the first stage of the research conducted within Vietnamese supply chains including Perceived Usefulness (H1a, H1b), Technological Infrastructure (H2a, H2b), Investment Cost (H3a, H3b), Organizational Readiness (H4a, H4b), Government Support (H5a, H5b), and Partnerships (H6a, H6b). Thus, the intention of Vietnamese enterprises to adopt blockchain technology and Green Innovation practices is predicted by the direct impact of the six proposed factors, all of which were found to be statistically significant. This indicates that suppliers within Vietnamese supply chains are willing to integrate blockchain into their SCM practices and Green Innovation strategies. In this study, our results reveal that Organizational Readiness, Partnerships, and Perceived Usefulness are the most significance driving factors affecting the Blockchain Adoption Intention and Green Innovation practices within Vietnamese supply chains. These results align with prior studies, such as those conducted in Bangladesh's SCM [33], Turkey's IT industries [34], and Italian innovative enterprises [40]; notably, Xie et al. (2023) highlighted the essential role of Organizational Readiness within Chinese family companies [43]. However, the influence of Technological Infrastructure and Organizational Readiness factors diverges from the findings of Adaryani et al. (2024), who reported that these factors had an nonsignificant impact on behavioral intention to adopt blockchain in Iran's poultry supply chain [37]. Consequently, the findings highlight significant potential for transforming SCM practices in Vietnam by enhancing transparency, efficiency, and sustainability through blockchain integration. This implementation not only helps companies in developing countries meet global market demands for greener supply chains but also strengthens their competitive advantage in an increasingly digitalized economy [52,54,65]. Furthermore, the willingness of Vietnamese enterprises to adopt blockchain underscores a promising future for fostering technological innovation across key sectors such as agriculture, manufacturing, and food processing.

In the second stage, our research examines the relationships among three constructs: Blockchain Adoption Intention (BA), Green Innovation practices (GI), and Expected Benefits (EB) within Vietnamese supply chains. Three hypotheses (H7, H8, and H9) were proposed, all of which were found to be statistically significant (see Table 5), hence these results address the second and third objectives of this study. The findings indicate that integrating blockchain technology can drive positive changes in Green Innovation practices, contributing to more sustainable and efficient supply chain management [26]. In the context of Vietnam, where supply chains face growing pressure to enhance transparency and sustainability [2], these results highlight the feasibility of blockchain and green initiatives to act as solutions for meeting the requirements of globally supply chain [51]. In the context of a developing country like Vietnam, Fang and Jiang (2024) reported that the number of green invention patents has increased, driven by the growing adoption of blockchain technology [50]. This aligns with the findings of our empirical study and the results of Al-Swidi et al. (2024) in India. However, our research highlights that the adoption of blockchain technology functions as an enabler, while Green Innovation practices serve as a mediating factor in the relationships among the three constructs. Our research conducted a comprehensive evaluation of both BA and GI as mediating constructs within the same framework. Unlike prior research, which often examines these constructs independently, our findings offer new and unique insights, distinguishing this study from others, such as those by [26,33,50].

6. Conclusions and Research Implications

In this study, the authors successfully identify six key driving factors based on the TOE-TAM framework that influence Blockchain Adoption Intention and Green Innovation practices within Vietnamese supply chains. By surveying Vietnamese enterprises across various sectors, the findings contribute valuable insights to the existing literature, particularly by integrating Blockchain Adoption Intention and Green Innovation practices as dual mediators. These mediators demonstrate how enterprises can achieve significant advantages in the future. According to the results analysis, all hypotheses were supported. Therefore, the proposed framework offers a practical reference for top managers to implement in real-world applications and serves as a valuable foundation for future scholarly research.

In terms of research implications, our research bridges the gap between technology adoption theories by considering the integration of mediators [31,40]. The findings contribute to the GSCM literature by integrating Blockchain Adoption Intention and Green Innovation practices as dual mediators within a single framework, which has been rarely assessed in previous studies. Specifically, this study emphasizes the combined mediating roles of BA and GI in linking the six driving factors to the Expected Benefits. This integrated approach provides valuable insights into how these two mediators interact synergistically to drive Expected Benefits, particularly in developing economies such as Vietnam. Furthermore, as suggested by Al-Swidi et al. (2024), our research contributes to theory through an empirical study that validates context-specific factors. Specifically, the results confirm the applicability of six key driving factors in influencing Blockchain Adoption Intention and Green Innovation practices within emerging markets. This provides a robust theoretical foundation for future comparative studies across regions and industries.

On the other hand, our research offers several managerial implications. Firstly, top managers should focus on the key driving factors, prioritizing issues related to Organizational Readiness, Partnerships, and Perceived Usefulness. These factors have the most significant direct and indirect impacts on all prediction factors in this model, making them critical areas for managerial attention. Secondly, the findings suggest that top managers and policy makers in supply chains should view blockchain not merely as a technological solution but as a catalyst for fostering green initiatives. By integrating these two dimensions, organizations can enhance operational efficiency and achieve Expected Benefits such as cost savings, improved transparency, and strengthened customer trust.

Although this study provides valuable theoretical and practical insights, certain limitations remain that warrant further consideration in future research. These limitations offer meaningful suggestions and open new opportunities for other scholars to explore to fulfill the SCM literature. Firstly, this study focuses on assessing six key driving factors: Perceived Usefulness, Technological Infrastructure, Investment Cost, Organizational Readiness, Government Support, and Partnerships within the context of Vietnamese supply chains. These constructs were selected based on prior studies and aligned with the TOE-TAM framework as recommended by other scholars, such as [31,33]. However, the authors suggest that future research should consider expanding and exploring additional factors to provide more comprehensive and realistic insights. Secondly, this study is limited to the context of Vietnamese supply chains within an emerging economy that is increasingly integrating into the global market. As a result, our findings may show similarities and differences compared to studies conducted in other contexts. Therefore, we recommend that our proposed model should be tested more broadly to provide more diverse and generalized perspectives.

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Abbreviations

The following abbreviations are used in this manuscript:

GSCs	Green supply chains
GSCM	Green supply chain management
TOE	Technology, Organization, Environment
TAM	Technology Adoption Model
BA	Blockchain Adoption Intention
GI	Green Innovation Practices

References

1. Singh, R.K. Exploring the Impact of Green Supply Chain Strategies and Sustainable Practices on Circular Supply Chains. *Benchmarking* 2024; *ahead-of-print*. [CrossRef]
2. Do, M.H.; Huang, Y.F.; Phan, V.D. Van Analyzing the Barriers to Green Supply Chain Management Implementation: A Case Study of the Vietnamese Agriculture Sector. *J. Enterp. Inf. Manag.* **2024**, *37*, 125–147. [CrossRef]
3. Do, Q.; Mishra, N.; Correia, F.; Eldridge, S. The Role of a Boundary Object in Legitimacy-Making Strategies for Food Waste Innovation: The Perspective of Emergent Circular Supply Chains. *Supply Chain Manag.* **2024**, *29*, 523–539. [CrossRef]
4. Yassin, A.M.M.; Hassan, M.A.; Elmesmary, H.M. Key Elements of Green Supply Chain Management Drivers and Barriers Empirical Study of Solar Energy Companies in South Egypt. *Int. J. Energy Sect. Manag.* **2022**, *16*, 564–584. [CrossRef]
5. Khan, S.A.; Mubarik, M.S.; Kusi-Sarpong, S.; Gupta, H.; Zaman, S.I.; Mubarik, M. Blockchain Technologies as Enablers of Supply Chain Mapping for Sustainable Supply Chains. *Bus. Strateg. Environ.* **2022**, *31*, 3742–3756. [CrossRef]
6. Pattanayak, S.; Ramkumar, M.; Goswami, M.; Rana, N.P. Blockchain Technology and Supply Chain Performance: The Role of Trust and Relational Capabilities. *Int. J. Prod. Econ.* **2024**, *271*, 109198. [CrossRef]
7. Rijanto, A. Blockchain Technology Roles to Overcome Accounting, Accountability and Assurance Barriers in Supply Chain Finance. *Asian Rev. Account.* **2024**, *32*, 728–758. [CrossRef]
8. Ghode, D.J.; Yadav, V.; Jain, R.; Soni, G. Exploring the Integration of Blockchain Technology into Supply Chain: Challenges and Performance. *Bus. Process Manag. J.* **2023**, *29*, 223–239. [CrossRef]
9. Mubarik, M.; Raja Mohd Rasi, R.Z.; Mubarak, M.F.; Ashraf, R. Impact of Blockchain Technology on Green Supply Chain Practices: Evidence from Emerging Economy. *Manag. Environ. Qual. An Int. J.* **2021**, *32*, 1023–1039. [CrossRef]

10. Centobelli, P.; Cerchione, R.; Del Vecchio, P.; Oropallo, E.; Secundo, G. Blockchain Technology for Bridging Trust, Traceability and Transparency in Circular Supply Chain. *Inf. Manag.* **2022**, *59*, 103508. [CrossRef]
11. Mohit; Kaur, S.; Singh, M. Design and Implementation of Blockchain-Based Supply Chain Framework with Improved Traceability, Privacy, and Ownership. *Cluster Comput.* **2023**, *27*, 2345–2363. [CrossRef]
12. Khan, S.A.R.; Godil, D.I.; Jabbour, C.J.C.; Shujaat, S.; Razzaq, A.; Yu, Z. Green Data Analytics, Blockchain Technology for Sustainable Development, and Sustainable Supply Chain Practices: Evidence from Small and Medium Enterprises. *Ann. Oper. Res.* **2021**, 1–25. [CrossRef]
13. Shah, A.; Soomro, M.A.; Zahid Piprani, A.; Yu, Z.; Tanveer, M. Sustainable Supply Chain Practices and Blockchain Technology in Garment Industry: An Empirical Study on Sustainability Aspect. *J. Strateg. Manag.* 2023; *ahead-of-print*. [CrossRef]
14. Bag, S.; Viktorovich, D.A.; Sahu, A.K.; Sahu, A.K. Barriers to Adoption of Blockchain Technology in Green Supply Chain Management. *J. Glob. Oper. Strateg. Sourc.* **2021**, *14*, 104–133. [CrossRef]
15. Boutkhoum, O.; Hanine, M.; Nabil, M.; Barakaz, F.E.L.; Lee, E.; Rustam, F.; Ashraf, I. Analysis and Evaluation of Barriers Influencing Blockchain Implementation in Moroccan Sustainable Supply Chain Management: An Integrated IFAHP-DEMATEL Framework. *Mathematics* **2021**, *9*, 1601. [CrossRef]
16. Chavalala, M.M.; Bag, S.; Pretorius, J.H.C.; Rahman, M.S. A Multi-Method Study on the Barriers of the Blockchain Technology Application in the Cold Supply Chains. *J. Enterp. Inf. Manag.* **2024**, *37*, 745–776. [CrossRef]
17. Shahzad, M.F.; Xu, S.; Baheer, R.; Ahmad, W. Unveiling the Role of Supply Chain Parameters Approved by Blockchain Technology towards Firm Performance through Trust: The Moderating Role of Government Support. *Heliyon* **2023**, *9*, e21831. [CrossRef] [PubMed]
18. Qiu, Z.; Wang, S.; Hou, Y.; Xu, S. What Drives Infrastructure Participants to Adopt Digital Technology: A Nexus of Internal and External Factors. *Sustainability* **2023**, *15*, 16229. [CrossRef]
19. Mathivathanan, D.; Mathiyazhagan, K.; Rana, N.P.; Khorana, S.; Dwivedi, Y.K. Barriers to the Adoption of Blockchain Technology in Business Supply Chains: A Total Interpretive Structural Modelling (TISM) Approach. *Int. J. Prod. Res.* **2021**, *59*, 3338–3359. [CrossRef]
20. Hartley, J.L.; Sawaya, W.; Dobrzykowski, D. Exploring Blockchain Adoption Intentions in the Supply Chain: Perspectives from Innovation Diffusion and Institutional Theory. *Int. J. Phys. Distrib. Logist. Manag.* **2022**, *52*, 190–211. [CrossRef]
21. Antsipava, D.; Strycharz, J.; van Reijmersdal, E.A.; van Noort, G. What Drives Blockchain Technology Adoption in the Online Advertising Ecosystem? An Interview Study into Stakeholders' Perspectives. *J. Bus. Res.* **2024**, *171*, 114381. [CrossRef]
22. Sargent, C.S.; Breese, J.L. Blockchain Barriers in Supply Chain: A Literature Review. *J. Comput. Inf. Syst.* **2024**, *64*, 124–135. [CrossRef]
23. Xu, W.; Yan, W.; Song, B.; He, J. Blockchain Adoption and Strategic Contracting in a Green Supply Chain Considering Market Segmentation. *Ind. Manag. Data Syst.* **2023**, *123*, 2704–2732. [CrossRef]
24. Singh, A.K.; Kumar, V.R.P.; Shoaib, M.; Adebayo, T.S.; Irfan, M. A Strategic Roadmap to Overcome Blockchain Technology Barriers for Sustainable Construction: A Deep Learning-Based Dual-Stage SEM-ANN Approach. *Technol. Forecast. Soc. Change* **2023**, *194*, 122716. [CrossRef]
25. Nayal, K.; Raut, R.D.; Narkhede, B.E.; Priyadarshinee, P.; Panchal, G.B.; Gedam, V.V. Antecedents for Blockchain Technology-Enabled Sustainable Agriculture Supply Chain. *Ann. Oper. Res.* **2023**, *327*, 293–337. [CrossRef] [PubMed]
26. Al-Swidi, A.K.; Al-Hakimi, M.A.; Alyahya, M.S. Green Innovation for Sustainable Development: Leveraging Green Knowledge Integration, Blockchain Technology and Green Supply Chain Integration. *J. Knowl. Manag.* **2024**, *28*, 1746–1770. [CrossRef]
27. Polas, M.R.H.; Kabir, A.I.; Sohel-Uz-zaman, A.S.M.; Karim, R.; Tabash, M.I. Blockchain Technology as a Game Changer for Green Innovation: Green Entrepreneurship as a Roadmap to Green Economic Sustainability in Peru. *J. Open Innov. Technol. Mark. Complex.* **2022**, *8*, 62. [CrossRef]
28. Singh, S.; Pratap, S.; Dwivedi, A.; Lakshay. An Empirical Study on Driving Blockchain Adoption in Maritime Freight: An Asian Business Perspective. *J. Bus. Ind. Mark.* **2024**, *39*, 2347–2363. [CrossRef]
29. Jellason, N.P.; Ambituuni, A.; Adu, D.A.; Jellason, J.A.; Qureshi, M.I.; Olarinde, A.; Manning, L. The Potential for Blockchain to Improve Small-Scale Agri-Food Business' Supply Chain Resilience: A Systematic Review. *Br. Food J.* **2024**, *126*, 2061–2083. [CrossRef]
30. Cao, H.; Chen, Z. The Driving Effect of Internal and External Environment on Green Innovation Strategy-The Moderating Role of Top Management's Environmental Awareness. *Nankai Bus. Rev. Int.* **2019**, *10*, 342–361. [CrossRef]
31. Henao-Ramírez, A.M.; López-Zapata, E. Analysis of the Factors Influencing Adoption of 3D Design Digital Technologies in Colombian Firms. *J. Enterp. Inf. Manag.* **2022**, *35*, 429–454. [CrossRef]
32. Kamble, S.; Gunasekaran, A.; Arha, H. Understanding the Blockchain Technology Adoption in Supply Chains-Indian Context. *Int. J. Prod. Res.* **2019**, *57*, 2009–2033. [CrossRef]

33. Tasnim, Z.; Shareef, M.A.; Baabdullah, A.M.; Hamid, A.B.A.; Dwivedi, Y.K. An Empirical Study on Factors Impacting the Adoption of Digital Technologies in Supply Chain Management and What Blockchain Technology Could Do for the Manufacturing Sector of Bangladesh. *Inf. Syst. Manag.* **2023**, *40*, 371–393. [CrossRef]
34. Turhan, C.; Akman, I. Exploring Sectoral Diversity in the Timing of Organizational Blockchain Adoption. *Inf. Technol. People* **2022**, *35*, 1912–1930. [CrossRef]
35. Chowdhury, S.; Rodriguez-Espindola, O.; Dey, P.; Budhwar, P. Blockchain Technology Adoption for Managing Risks in Operations and Supply Chain Management: Evidence from the UK. *Ann. Oper. Res.* **2023**, *327*, 539–574. [CrossRef] [PubMed]
36. Shahzad, M.; Qu, Y.; Rehman, S.U.; Zafar, A.U. Adoption of Green Innovation Technology to Accelerate Sustainable Development among Manufacturing Industry. *J. Innov. Knowl.* **2022**, *7*, 100231. [CrossRef]
37. Adaryani, R.L.; Palouj, M.; Karbasioun, M.; Asadi, A.; Gholami, H.; Kianirad, A.; Joodi Damirchi, M. Antecedents of Blockchain Adoption in the Poultry Supply Chain: An Extended UTAUT Model. *Technol. Forecast. Soc. Change* **2024**, *202*, 123309. [CrossRef]
38. Chien, F.; Kamran, H.W.; Nawaz, M.A.; Thach, N.N.; Long, P.D.; Baloch, Z.A. Assessing the Prioritization of Barriers toward Green Innovation: Small and Medium Enterprises Nexus. *Environ. Dev. Sustain.* **2022**, *24*, 1897–1927. [CrossRef]
39. Khan, S.; Kaushik, M.K.; Kumar, R.; Khan, W. Investigating the Barriers of Blockchain Technology Integrated Food Supply Chain: A BWM Approach. *Benchmarking* **2023**, *30*, 713–735. [CrossRef]
40. Sciarelli, M.; Prisco, A.; Gheith, M.H.; Muto, V. Factors Affecting the Adoption of Blockchain Technology in Innovative Italian Companies: An Extended TAM Approach. *J. Strateg. Manag.* **2022**, *15*, 495–507. [CrossRef]
41. Iranmanesh, M.; Maroufkhani, P.; Asadi, S.; Ghobakhloo, M.; Dwivedi, Y.K.; Tseng, M.L. Effects of Supply Chain Transparency, Alignment, Adaptability, and Agility on Blockchain Adoption in Supply Chain among SMEs. *Comput. Ind. Eng.* **2023**, *176*, 108931. [CrossRef]
42. Panghal, A.; Sindhu, S.; Dahiya, S.; Dahiya, B.; Mor, R.S. Benchmarking the Interactions among Challenges for Blockchain Technology Adoption: A Circular Economy Perspective. *Int. J. Math. Eng. Manag. Sci.* **2022**, *7*, 859–872. [CrossRef]
43. Xie, X.; Zhang, H.; Blanco, C. How Organizational Readiness for Digital Innovation Shapes Digital Business Model Innovation in Family Businesses. *Int. J. Entrep. Behav. Res.* **2023**, *29*, 49–79. [CrossRef]
44. Abdelwahed, N.A.A.; Al Doghan, M.A.; Saraih, U.N.; Soomro, B.A. The Predictive Robustness of Organizational and Technological Enablers towards Blockchain Technology Adoption and Financial Performance. *Kybernetes* 2024; *ahead-of-print*. [CrossRef]
45. Fahad, S.; Alnori, F.; Su, F.; Deng, J. Adoption of Green Innovation Practices in SMEs Sector: Evidence from an Emerging Economy. *Econ. Res. Istraz.* **2022**, *35*, 5486–5501. [CrossRef]
46. Yadlapalli, A.; Rahman, S.; Gopal, P. Blockchain Technology Implementation Challenges in Supply Chains—Evidence from the Case Studies of Multi-Stakeholders. *Int. J. Logist. Manag.* **2022**, *33*, 278–305. [CrossRef]
47. Wamba, S.F.; Queiroz, M.M. Blockchain in the Operations and Supply Chain Management: Benefits, Challenges and Future Research Opportunities. *Int. J. Inf. Manag.* **2020**, *52*, 102064. [CrossRef]
48. Patil, K.; Ojha, D.; Struckell, E.M.; Patel, P.C. Behavioral Drivers of Blockchain Assimilation in Supply Chains—A Social Network Theory Perspective. *Technol. Forecast. Soc. Change* **2023**, *192*, 122578. [CrossRef]
49. Habib, M.A.; Balasubramanian, S.; Shukla, V.; Chitakunye, D.; Chanchaichujit, J. Practices and Performance Outcomes of Green Supply Chain Management Initiatives in the Garment Industry. *Manag. Environ. Qual. An Int. J.* **2022**, *33*, 882–912. [CrossRef]
50. Fang, X.; Jiang, Y. Blockchain Applications: Promotion of Green Innovation. *Manag. Decis.* **2024**, *63*, 709–733. [CrossRef]
51. Wang, X.; Zhang, R.; Gong, Z.; Chen, X. Impact of Blockchain on the Green Innovation Performance of Enterprises under the Policy Uncertainty. *Ind. Manag. Data Syst.* **2023**, *123*, 2681–2703. [CrossRef]
52. Jaradat, Z.; Al-Hawamleh, A.; Al Shbail, M.O.; Hamdan, A. Does the Adoption of Blockchain Technology Add Intangible Benefits to the Industrial Sector? Evidence from Jordan. *J. Financ. Report. Account.* **2023**, *22*, 327–349. [CrossRef]
53. Sodhi, M.M.S.; Seyedghorban, Z.; Tahernejad, H.; Samson, D. Why Emerging Supply Chain Technologies Initially Disappoint: Blockchain, IoT, and AI. *Prod. Oper. Manag.* **2022**, *31*, 2517–2537. [CrossRef]
54. Jasrotia, S.S.; Rai, S.S.; Rai, S.; Giri, S. Stage-Wise Green Supply Chain Management and Environmental Performance: Impact of Blockchain Technology. *Int. J. Inf. Manag. Data Insights* **2024**, *4*, 100241. [CrossRef]
55. Al-Abdallah, G.M.; Al-Salim, M.I. Green Product Innovation and Competitive Advantage: An Empirical Study of Chemical Industrial Plants in Jordanian Qualified Industrial Zones. *Benchmarking* **2021**, *28*, 2542–2560. [CrossRef]
56. Huang, Y.; Phan, V.; Do, M. The Impacts of Supply Chain Capabilities, Visibility, Resilience on Supply Chain Performance and Firm Performance. *Adm. Sci.* **2023**, *13*, 225. [CrossRef]
57. Durdyev, S.; Ismail, S.; Ihtiyar, A.; Abu Bakar, N.F.S.; Darko, A. A Partial Least Squares Structural Equation Modeling (PLS-SEM) of Barriers to Sustainable Construction in Malaysia. *J. Clean. Prod.* **2018**, *204*, 564–572. [CrossRef]
58. Do, M.H.; Huang, Y.F.; Do, T.N. The Effect of Total Quality Management-Enabling Factors on Corporate Social Responsibility and Business Performance: Evidence from Vietnamese Coffee Firms. *Benchmarking* **2020**, *28*, 1296–1318. [CrossRef]
59. Hair, J.F.; Risher, J.J.; Sarstedt, M.; Ringle, C.M. When to Use and How to Report the Results of PLS-SEM. *Eur. Bus. Rev.* **2019**, *31*, 2–24. [CrossRef]

60. Phan, V.D.V.; Huang, Y.F.; Do, M.H. Exploring the Effect of Cognitive Factors and E-Social Interactions on the Green Purchase Intention: Evidence from a Transitional Economy. *Young Consum.* **2023**, *24*, 767–785. [CrossRef]
61. Khan, S.; Haleem, A.; Husain, Z.; Samson, D.; Pathak, R.D. Barriers to Blockchain Technology Adoption in Supply Chains: The Case of India. *Oper. Manag. Res.* **2023**, *16*, 668–683. [CrossRef]
62. Öztürk, C.; Yildizbaşi, A. Barriers to Implementation of Blockchain into Supply Chain Management Using an Integrated Multi-Criteria Decision-Making Method: A Numerical Example. *Soft Comput.* **2020**, *24*, 14771–14789. [CrossRef]
63. Quayson, M.; Bai, C.; Sarkis, J.; Hossin, M.A. Evaluating Barriers to Blockchain Technology for Sustainable Agricultural Supply Chain: A Fuzzy Hierarchical Group DEMATEL Approach. *Oper. Manag. Res.* **2024**, *17*, 728–753. [CrossRef]
64. Chen, S.; Liu, X.; Yan, J.; Hu, G.; Shi, Y. Processes, Benefits, and Challenges for Adoption of Blockchain Technologies in Food Supply Chains: A Thematic Analysis. *Inf. Syst. E-Bus. Manag.* **2021**, *19*, 909–935. [CrossRef]
65. Abu Afifa, M.M.; Nguyen, T.H.; Nguyen, L.T.L.; Tran, T.H.T.; Dao, N.T. Nexus among Blockchain Technology Adoption and Firm Performance: Perspective from Mediating and Moderating Effects. *Int. J. Organ. Anal.* 2024; *ahead-of-print*. [CrossRef]

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