

Article

Blockchain-Enabled Information Quality and Sustainable Food Purchase Decision-Making: The Mediating Role of Perceived Credibility and the Moderating Role of Consumer Trust

Sultan Ayed ALGhamdi 

Management Information Systems, University of Jeddah, Jeddah 23218, Saudi Arabia; salghamdi1@uj.edu.sa

Abstract

Information asymmetry in the unobservable sustainability attributes of food products, together with widespread consumer scepticism toward unverifiable green claims, continues to constrain the translation of pro-environmental attitudes into actual purchases. Blockchain technology has been positioned as a structural response to this asymmetry because its tamper-evident and independently verifiable records lower the cost of substantiating credence claims. However, the bulk of the consumer-facing evidence has examined blockchain as an object of adoption rather than as a conduit of information whose quality determines its persuasive force. Drawing on Signalling Theory within a Stimulus–Organism–Response framework, this study advances and tests a model in which blockchain-enabled information quality (stimulus) influences sustainable purchase decision-making (response) through perceived credibility (organism), with consumer trust serving as a boundary condition on the stimulus-to-organism path. A cross-sectional survey of 412 agri-food consumers was analysed using partial least squares structural equation modelling to test direct, mediated, moderated, and conditional indirect effects. The contributions are threefold: blockchain is re-specified as an information signal whose quality, rather than the technology itself, drives downstream sustainability behaviour; perceived credibility is empirically isolated as the psychological mechanism that carries that effect; and message-level credibility is analytically separated from dispositional trust, addressing a recurring conflation in the digital transparency literature.

Keywords: blockchain; information quality; sustainable consumption; perceived credibility; consumer trust; signalling theory; food traceability; ethical consumption; greenwashing



Academic Editor: Francesco Bimbo

Received: 5 June 2026

Revised: 16 July 2026

Accepted: 16 July 2026

Published: 22 July 2026

Copyright: © 2026 by the author.

Licensee MDPI, Basel, Switzerland.

This article is an open access article distributed under the terms and

conditions of the [Creative Commons Attribution \(CC BY\)](https://creativecommons.org/licenses/by/4.0/) license.

1. Introduction

The transition toward sustainable consumption hinges not only on whether consumers hold pro-environmental attitudes but on whether they are able to act on those attitudes with confidence. A recurring obstacle has been the difficulty of verifying credence attributes—ethical sourcing, fair-trade compliance, certified-organic provenance, and the environmental footprint of the supply chain—since they are not detectable through inspection or experience [1–3]. Moreover, the proliferation of unsubstantiated and at times misleading environmental claims has, in turn, given rise to consumer scepticism, which weakens the influence of sustainability information on choice and broadens the well-documented attitude–behaviour gap in green consumption [4–7].

Blockchain technology has been advanced as a structural response to this problem. Because records on a distributed ledger are tamper-evident and independently verifiable,

blockchain has the potential to convert previously self-declared claims into auditable evidence that consumers and intermediaries can scrutinise [2,8–10]. In agri-food contexts in particular, blockchain-enabled traceability has been studied as a means of substantiating origin, certification, and sustainability claims that consumers would otherwise have to take on faith [1,11–14]. Recent empirical work has confirmed that consumer-facing blockchain implementations can elevate trust and purchase intention across product categories such as organic food [15–17], premium wine [18,19], fresh produce [20], denim and apparel [21–25], luxury beauty [26], and even hospitality donations [27].

However, despite this growing evidence base, much of the consumer-facing scholarship has framed blockchain as an object of adoption, applying acceptance-style models that centre on perceived usefulness, ease of use, and intention to use the technology itself [12,19,28,29]. This framing answers a meaningful question but leaves a more consequential one largely unaddressed: When blockchain delivers information about a product's sustainability profile, does the quality of that information drive sustainable purchase behaviour, and through what psychological mechanism? Treiblmaier and Garaus [2] moved the field forward by treating blockchain as a quality signal in the food supply chain, and recent S-O-R applications in fresh e-commerce and wine markets have confirmed the value of signal-based framings [9,18,20]. What remains under-theorised is the layered architecture in which information quality acts as the stimulus, perceived credibility functions as the mediating organism state, and dispositional consumer trust conditions the strength of the stimulus-to-organism path. This omission is consequential because trust and credibility are frequently conflated in the literature, even though prior work has shown that they operate at different levels of consumer cognition and can interact in non-obvious ways [15,17,30,31].

The present study addresses this gap by re-specifying blockchain not as an adoption target but as an information signal whose quality determines its persuasive force. We integrate Signalling Theory [32,33] with the Stimulus–Organism–Response framework [34] to develop and test a model in which blockchain-enabled information quality, captured through dimensions such as accuracy, completeness, verifiability, and timeliness [35], acts as the stimulus; perceived credibility serves as the organism; sustainable purchase decision-making is the response; and consumer trust moderates the stimulus-to-organism link. Three contributions follow: First, the study shifts the analytical lens from blockchain-as-technology to blockchain-as-a-signal, isolating information quality as the active variable in line with the signalling perspective recently extended to agri-food blockchain [2,20]. Second, by specifying perceived credibility as the mediator, the model articulates the psychological pathway through which information quality translates into a sustainable choice, going beyond the input–output associations that pervade prior adoption-centric work [12,28,29,36]. Third, by distinguishing message-level credibility from dispositional consumer trust and testing the latter as a moderator, the study addresses a recurring source of conceptual blurring in the digital transparency literature [15,17,31]. In summary, this study aims to examine how blockchain-enabled information quality influences sustainable purchase decision-making through perceived credibility and whether consumer trust conditions this mechanism. Specifically, the study investigates the direct, mediating, moderating, and conditional indirect relationships among these constructs.

The remainder of the paper is organised as follows: Section 2 reviews the relevant literature on sustainable consumption, blockchain transparency, and the theoretical anchors of the study. Section 3 develops the conceptual model and hypotheses. Section 4 presents the methodology. Section 5 reports the results. Section 6 discusses the theoretical and managerial implications, and Section 7 concludes with limitations and future research directions.

2. Theoretical Background and Literature Review

2.1. Information Asymmetry and the Scepticism Problem in Sustainable Consumption

Sustainability attributes have a peculiar epistemic status. Origin, ethical sourcing, and environmental performance are credence attributes that consumers cannot verify even after consumption, which creates a structural information asymmetry between producers and buyers [1–3]. Where such asymmetry is severe and the cost of verification high, sustainability claims function as cheap talk that consumers learn to discount. The practical manifestation is greenwashing, and its consequence is a generalised green scepticism that depresses the willingness to act on sustainability information [4–7]. A growing body of work has documented this attitude–behaviour gap and identifies perceived information credibility and trust as central transmitting constraints [5,26,30].

Recent reviews of consumer responses to digital transparency converge on a similar conclusion across product categories: increasing the volume of sustainability disclosure does not necessarily improve outcomes; what changes behaviour is the perception that the information can be trusted [7,37,38]. The implication is that interventions that only expand the quantity of disclosure, without altering its underlying credibility, may achieve little. This sets the stage for technological mechanisms, blockchain among them, that promise to change not the quantity but the verifiability of sustainability information [5,6,9].

2.2. Blockchain in Consumer Markets: From Adoption Object to Information Signal

Blockchain's relevance to the asymmetry problem rests on its technical properties. As a distributed, append-only ledger, it provides immutability and decentralised verification such that records of provenance and handling are resistant to unilateral alteration and can be independently audited [2,6,8]. In supply chain and agri-food contexts, these properties have been positioned as a means of substantiating sustainability claims that consumers would otherwise have to accept on faith [1,11–14]. Similarly, in an early multimethod study, Sander, Semeijn, and Mahr [28] reported that exposure to blockchain-backed information shifted consumer evaluations of credence claims. Subsequent work corroborated and extended these findings across categories including organic rice [22], ancient wheat products [29], olive oil [11], tomato purée [1], organic pasta [39], and consumer food purchase intentions more generally [40], as well as the broader fair-trade ecosystem [4]. Outside the agri-food domain, blockchain–consumer research has extended to areas such as peer-to-peer trading on blockchain-based smart grids [41], blockchain-powered last-mile drone deliveries [42], cultural consumption on blockchain-driven NFT platforms [43], and broader machine learning-enabled circular supply chains [44], underlining the cross-sector reach of the underlying transparency mechanism.

However, despite this expanding evidence base, the dominant analytical posture in the consumer literature has been adoption-centric. For instance, a substantial stream has applied acceptance models, including technology acceptance, planned behaviour, and trust transfer variants, to model intention to use blockchain applications, with perceived usefulness, ease of use, and the consumer's prior trust as core antecedents [12,19,28,29,36]. While valuable, this framing treats blockchain as the terminal object of the decision rather than as a conduit of information for a different decision: the purchase itself. The construct of information quality, distinct from attitudes toward the technology, has therefore not been adequately theorised as the operative variable for downstream sustainable purchase behaviour [2,35]. The signalling re-framing offered by Treiblmaier and Garaus [2], and the S-O-R extensions that followed in fresh e-commerce [20], wine [18], and environmental information disclosure [9], suggest that an alternative framing, i.e., blockchain as a quality signal whose strength depends on the properties of the conveyed information, is both timely and underdeveloped.

2.3. Signalling Theory as the Mechanism

Signalling Theory provides the substantive mechanism for understanding why information quality should matter. Originally formulated to address information asymmetry in labour markets [32], and subsequently elaborated as a general account of how parties communicate unobservable qualities across organisational and consumer settings [33], the theory holds that a signal is informative only insofar as it is costly or difficult to falsify for senders who do not possess the underlying quality. The credibility of the signal is therefore endogenous to its falsification cost: hard-to-fake signals shift receiver beliefs, while cheap talk does not [33].

This logic closely aligns with blockchain-enabled sustainability information. In this area, producers (senders) seek to convey unobservable credence attributes to consumers (receivers); however, since conventional self-declarative claims and unverified labels are inexpensive to issue regardless of the underlying truth, their signalling value is weakened. Blockchain-recorded information, by contrast, is comparatively costly to falsify because alteration is detectable and provenance is independently auditable, which, in signalling terms, positions it as a stronger signal [2,6,9,20]. The interesting variable is therefore not the presence of blockchain but the quality of the signal it produces: a record that is accurate, complete, verifiable, and timely constitutes a strong signal, whereas a sparse or opaque one does not [35]. On these grounds, Signalling Theory predicts that higher blockchain-enabled information quality should raise the credibility consumers assign to the sustainability claim.

2.4. The Stimulus–Organism–Response Framework as the Organising Structure

While Signalling Theory specifies why information quality should influence credibility, the Stimulus–Organism–Response framework [34] organises the full sequence from environmental cue to behavioural response. Within this paradigm, an external stimulus shapes an individual's internal cognitive and affective states, which, in turn, drive an approach or avoidance response. The framework has been used productively in consumer studies of digital transparency stimuli in fresh e-commerce [20], wine traceability [18], environmental information disclosure [9], and social media advertising of beauty brands employing blockchain authentication [26], consistently treating the technology-mediated cue as the stimulus and a perceptual evaluation as the organism.

In the present model, blockchain-enabled information quality operates as the stimulus, an external informational cue encountered at or before the point of decision. Perceived credibility, i.e., the consumer's evaluation that the sustainability information is believable, serves as the organism, that is, the internal state through which the stimulus is processed. Sustainable purchase decision-making constitutes the response. Integrating Signalling Theory with S-O-R in this way is theoretically productive because S-O-R provides the structural scaffolding for stimulus-driven studies. At the same time, Signalling Theory supplies the substantive reason for the stimulus-to-organism link [2,9,20]. This combination pre-empts the common critique that S-O-R applications are atheoretical boxes and arrows.

2.5. Distinguishing Perceived Credibility from Consumer Trust

At the operational level, prior blockchain studies have sometimes used trust measures that capture beliefs that information or claims are reliable, believable, or trustworthy [6,12,15,17,31] and thereby overlap with conventional credibility measures. Such operational proximity obscures whether consumers are evaluating the focal information or expressing a broader propensity to trust the technology or system. The present study addresses this overlap by measuring perceived credibility as an evaluation of the specific sustainability information, while consumer trust captures confidence in blockchain-based verification systems more generally. A central conceptual requirement of the study is to

keep perceived credibility and consumer trust analytically distinct, because the two are often conflated in the digital transparency literature, with the result that empirical models double-count overlapping content [6,12,15,31]. Following the source and information evaluation tradition, perceived credibility is treated here as a message- or signal-level judgement: the extent to which the specific sustainability information presented is believed to be accurate and trustworthy in the immediate evaluative context [2,13,26]. Consumer trust is treated, by contrast, as a more general dispositional or system-level orientation: a standing propensity to trust sustainability claims, the verification technology, or commercial actors in this category [6,17,30,31,45].

This distinction is consequential. Credibility is the proximal state that information quality acts upon and that, in turn, drives the response; it is therefore positioned as a mediator [13,26]. Trust is a prior orientation the consumer brings to the encounter; it does not transmit the effect of information quality so much as condition how strongly that effect operates [15–17,31]. Moderated mediation studies in the blockchain–organic food domain have already demonstrated the analytical traction of this separation, modelling trust as a moderator on signal effects while leaving the mediating role to a more proximal perceptual variable [15–17]. The same logic underpins the present model and is reflected in the measurement strategy specified in Section 4.

3. Conceptual Model and Hypothesis Development

Building on the foregoing, this study’s conceptual model positions blockchain-enabled information quality as the antecedent stimulus, perceived credibility as the mediating organism state, sustainable purchase decision-making as the response, and consumer trust as a moderator of the stimulus-to-organism path. The model is depicted in Figure 1, and the hypotheses are developed below.

Signaling Theory—Stimulus-Organism-Response (S-O-R) Framework

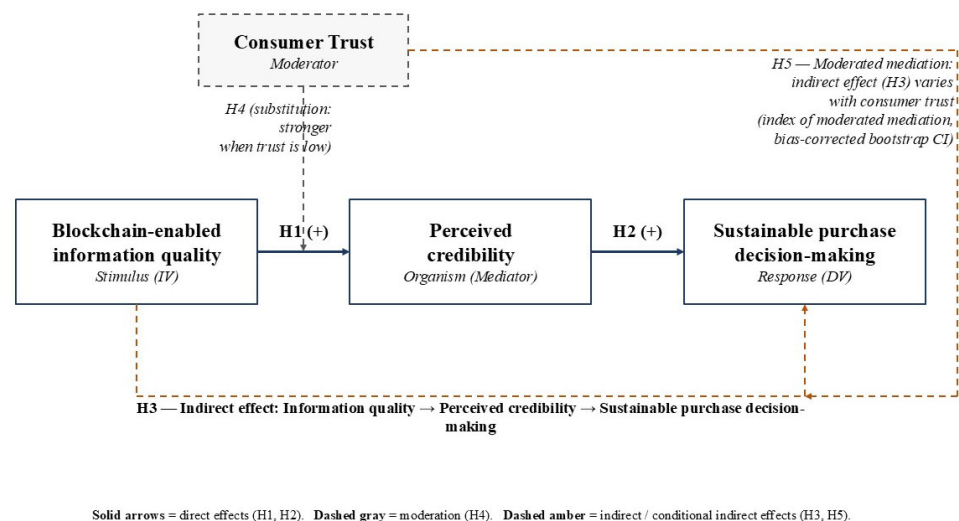


Figure 1. Proposed conceptual model illustrating the direct (H1–H2), indirect (H3), moderation (H4), and conditional indirect (H5) relationships among blockchain-enabled information quality, perceived credibility, consumer trust, and sustainable purchase decision-making.

3.1. Blockchain-Enabled Information Quality and Perceived Credibility

Information quality has long been conceptualised as the degree to which information is accurate, complete, verifiable, and timely [35]. Signalling Theory holds that a signal influences receiver beliefs in proportion to how difficult it is to falsify [32,33], and blockchain’s immutability and verifiability raise the falsification cost of the recorded sustainability infor-

mation; thus, high-quality blockchain-enabled information functions as a comparatively strong signal: when the information is accurate, complete, and independently checkable, the consumer has a sound basis for judging the underlying claim to be believable [2,6,9]. Conversely, sparse, opaque, or untimely information offers little signalling value and should produce limited credibility [1,20]. Recent studies of credence in code, signal quality framings in fresh produce and wine, and blockchain authentication in advertising have converged on the same prediction in their respective domains [1,2,18,20,26].

H1. *Blockchain-enabled information quality is positively associated with the perceived credibility of the sustainability claim.*

3.2. Perceived Credibility and Sustainable Purchase Decision-Making

Within the S-O-R logic, the organism's state drives the response [34]. Perceived credibility reduces the perceived risk that a sustainability claim is misleading (the very risk that greenwashing concerns amplify) [5–7]. When consumers judge the information to be credible, the cognitive and affective barrier to acting on it diminishes, and the likelihood that sustainability considerations are weighted in the purchase decision rises [16,22,30]. Recent work in food traceability has shown that credibility-adjacent perceptions exert sizable effects on premium willingness to pay, affective brand commitment, and online green grocery patronage [9,13,46,47], and studies in luxury, fashion, and beauty have reported analogous patterns under blockchain verification [23–26].

H2. *Perceived credibility is positively associated with sustainable purchase decision-making.*

3.3. The Mediating Role of Perceived Credibility

Hypotheses H1 and H2 jointly imply an indirect pathway. Consistent with S-O-R [34] and with signal-based accounts of consumer information processing [2,33], information quality should not influence purchase behaviour directly so much as through the credibility judgement it produces. High-quality blockchain information is consequential precisely because it is believed; without that belief, even rich information would exert little behavioural pull [13,20,26]. Specifying credibility as a mediator distinguishes the present model from input–output formulations and aligns with prior moderated mediation work in the blockchain–organic food domain, which used proximal perceptual variables rather than dispositional trust as the transmitting state [15–17].

H3. *Perceived credibility mediates the relationship between blockchain-enabled information quality and sustainable purchase decision-making.*

3.4. The Moderating Role of Consumer Trust

Consumer trust governs how much work a signal must do. In this regard, two competing predictions are theoretically defensible: An amplification account holds that high-trust consumers are more receptive to quality signals, and so the effect of information quality on credibility is stronger when trust is high [6,31]. A substitution account, conversely, holds that high-trust consumers already extend credibility to sustainability claims on the basis of disposition, leaving relatively little room for information quality to add credibility; low-trust consumers, who withhold credibility by default, can be moved only by strong, verifiable information, and so the information quality effect is stronger when trust is low [12,30,45].

In this study, the substitution prediction is advanced as the primary hypothesis. It is theoretically the more interesting and managerially the more consequential proposition, because it implies that blockchain-enabled information quality matters most for the sceptical consumers sustainability communication most needs to reach, making it a counterintuitive boundary condition with clear practical value. It is also the more defensible position against the credibility–trust overlap concern, because it requires articulating trust as a prior disposition governing how much the signal must accomplish, rather than as a near-synonym of credibility [15,17,31]. Amplification is nonetheless retained as a rival prediction to be adjudicated empirically.

H4. *Consumer trust moderates the relationship between blockchain-enabled information quality and perceived credibility such that the relationship is stronger when consumer trust is lower (substitution) rather than when consumer trust is higher (amplification).*

3.5. The Conditional Indirect Effect (Moderated Mediation)

Hypotheses H3 and H4 jointly imply a conditional indirect effect. Furthermore, if perceived credibility transmits the effect of information quality onto sustainable purchase decision-making (H3), and if consumer trust governs the strength of the information-quality-to-credibility path (H4), the magnitude of the indirect effect must itself depend on the level of consumer trust. This is the logic of moderated mediation: the mediated pathway is not fixed but conditional on the moderator. Establishing it requires showing that the indirect effect differs across levels of trust, formally assessed using the index of moderated mediation and its bootstrap confidence interval. Prior moderated mediation work on blockchain and organic food consumption [15–17] operationalised related contingencies, and the present formulation builds on that template while specifying credibility, rather than dispositional trust, as the mediator. Under the substitution account, the indirect effect is expected to be stronger at lower levels of consumer trust.

H5. *Consumer trust moderates the indirect effect of blockchain-enabled information quality on sustainable purchase decision-making via perceived credibility (moderated mediation) such that the indirect effect is stronger at lower levels of consumer trust.*

4. Materials and Methods

4.1. Research Context and Design

The study employed a cross-sectional survey design within the agri-food product context, offering a strong empirical setting for three reasons: First, sustainability attributes in food, organic provenance, fair-trade compliance, and cold-chain integrity are paradigmatic credence attributes for which blockchain-based verification is most theoretically relevant [1,2,9]. Second, consumer-facing blockchain traceability has been actively studied across food categories ranging from organic rice and pasta to olive oil, wine, tomato purée, and beef [1,9,11,14,18,22,39], such that respondents can be presented with a realistic, concrete scenario rather than an abstract technology. Third, the agri-food context aligns closely with the ethical consumption and traceability themes that are central to current sustainability scholarship [7,9,47,48].

4.2. Stimulus and Scenario Design

The survey comprised four sections: screening and demographic questions, the blockchain-enabled food traceability scenario, measurement items for the study constructs, and attention-check items. All construct items were measured using seven-point Likert scales. To anchor the constructs in a concrete and replicable decision, each respondent was

presented with a standardised purchase scenario describing a routine grocery purchase of a food product carrying a sustainability claim, such as organic certification or fair-trade sourcing, accompanied by a blockchain-verified traceability record accessible via a QR code on the packaging. Comparable scenario-based stimuli have been used in prior studies of blockchain effects on wine and food purchase decisions [12,18,19]. In this study, respondents were shown a brief, neutral description and, where feasible, a mock product visual, explaining that the blockchain record documents the product's origin and handling and that the record cannot be altered after entry and can be independently verified. Information quality was then assessed with reference to this record.

Prior to the main survey, the instrument and scenario (full scenario text and stimulus images) were pilot-tested with 30 respondents to assess clarity, comprehension, and scenario realism. Feedback indicated that the scenario was readily understood and perceived as realistic; minor wording refinements were made before the main survey. The complete scenario and stimulus materials are reproduced in Appendix A.

4.3. Sample and Data Collection

The study was conducted in Saudi Arabia, and the respondents were adult grocery consumers residing in the country. The target population comprised adult grocery consumers aged 18–45 years residing in Saudi Arabia who held or shared responsibility for household food purchasing. This age range reflects the characteristics of the respondents recruited for the present study and should not be interpreted as representative of the entire adult grocery consumer population. Data were collected through a consumer panel or online survey platform, with purposive screening for purchase responsibility followed by quota controls on age and gender to approximate the underlying population distribution. Additionally, attention-check items and response-time screening were used to ensure data quality, in line with current practice in PLS-SEM-based consumer research [31,49]. Data were collected between January and April 2026 using a structured online questionnaire administered through Google Forms. Respondents were recruited using purposive sampling and were eligible if they were aged 18 years or above and were responsible for, or shared responsibility for, household grocery purchasing. A total of 560 responses were received. After excluding 148 responses because of incompleteness, failed attention checks, or unusually short completion times, the final sample comprised 412 usable responses. Respondents were recruited through purposive sampling and were eligible if they were aged 18 years or above and held or shared responsibility for household grocery purchases. A total of 560 responses were received, of which 148 were excluded because of incomplete responses, failed attention checks, or unusually short completion times—the final sample comprised 412 usable responses. The final sample comprised 412 respondents, of whom 45% were male and 55% were female, all aged between 18 and 45 years. Consequently, the findings should be interpreted in the context of this consumer segment rather than as representative of all adult grocery consumers.

Sample size adequacy is established on two grounds: First, following the inverse-square-root and gamma-exponential procedures for PLS-SEM power [50], a minimum sample size is computed for the model's maximum number of arrows pointing at any single construct, targeting a power of 0.80 at the anticipated minimum path coefficient. Second, the sample is sized to exceed conventional rules of thumb comfortably and to support the moderation and mediation tests with adequate precision. The final sample of 412 respondents exceeded these requirements and provided adequate statistical power for the proposed analyses [12,15,16,31].

4.4. Measurement

All constructs were measured with multi-item reflective scales adapted from validated published instruments and rated on seven-point Likert scales. Items were contextualised to the blockchain food traceability setting without altering construct meaning, in line with adaptation practice in prior blockchain–consumer studies [2,15–17]. Information quality dimensions were operationalised in line with the information quality construct in the DeLone and McLean tradition [35] and recent blockchain information quality applications [2,20]. Perceived credibility was adapted from message and signal credibility instruments used in blockchain authentication and traceability studies [2,26]. Consumer trust was operationalised at the dispositional/system level following recent blockchain trust work [6,17,30,31,45]. Sustainable purchase decision-making was adapted from recent measures of green and organic purchase intention and behaviour [15,16,22,30,31].

4.5. Control Variables

To reduce the risk of spurious inference, the model includes theoretically justified controls on the dependent variable: environmental concern (a known driver of sustainable purchasing that could confound the credibility–behaviour link) [5,7,30], prior blockchain familiarity (to separate the information quality effect from mere technology awareness) [2,28,36], and demographic covariates including age, gender, income, and education [15,16,47]. Cultural context has been shown to shape blockchain traceability effects on organic food consumption and may be reported as a robustness consideration [51,52].

4.6. Measurement Model Specification and Common Method Considerations

Blockchain-enabled information quality is specified reflectively in the baseline model, treating accuracy, completeness, verifiability, and timeliness as manifestations of a common underlying perception of information quality, consistent with the dominant practice for perceptual information quality constructs [2,35]. Moreover, a formative or higher-order specification was examined as a robustness alternative. Procedural remedies against common method bias include the separation of predictor and criterion items, assurance of respondent anonymity, and balanced item wording. Here, our statistical assessment included a full-collinearity (VIF) check and, where appropriate, a marker-variable approach, in line with recent practice in blockchain–consumer PLS-SEM studies [15–17,31].

4.7. Analytical Approach

The PLS-SEM analysis was conducted using [Smart-PLS, Version 4]. Missing values were negligible and handled through listwise deletion. Statistical significance was assessed using 5000 bootstrap resamples and bias-corrected and accelerated (BCa) 95% confidence intervals. The structural model assessment included VIF, R^2 , adjusted R^2 , f^2 , Q^2 , and PLSpredict. Age, gender, income, education, environmental concern, and prior blockchain familiarity were included as control variables. Path coefficient significance, mediation, moderation, and conditional indirect effects were assessed using a bootstrapping procedure with 5000 resamples, following the method of Hair et al. [53]. The hypotheses were tested using partial least squares structural equation modelling (PLS-SEM), which is appropriate given the study’s prediction and theory development orientation, the inclusion of a moderation term, and the composite-based treatment of the constructs, an approach widely adopted in comparable blockchain–consumer studies [15–17,31,54]. The analysis proceeded in two stages: The measurement model was first assessed for indicator reliability, internal consistency (composite reliability, ρ_A), convergent validity (average variance extracted), and discriminant validity (the Fornell–Larcker criterion and the HTMT ratio), with the HTMT assessment carrying particular weight in establishing the separation of credibility

and trust. The structural model was then assessed for collinearity, path coefficient significance via bootstrapping, effect sizes (f-squared), explanatory power (R-squared), and predictive relevance (Q-squared via blindfolding and PLSpredict). Mediation (H3) was tested via the bootstrapped indirect-effect procedure, classifying the mediation type from the joint significance of direct and indirect effects. Moderation (H4) was tested using a two-stage approach: in the first stage, standardised latent variable scores for information quality and consumer trust were estimated; in the second stage, their product term was used to estimate the interaction effect. Collinearity among the predictor, moderator, and interaction term was separately assessed using VIF values and remained below the recommended threshold of 3.3 [15–17]. The conditional indirect effect (H5) was assessed by estimating the index of moderated mediation and the indirect effect at low, mean, and high levels of consumer trust, each with bias-corrected bootstrap confidence intervals. A separate CFA using CB-SEM was not conducted, as the study adopts PLS-SEM as its primary and exclusive analytical framework. Accordingly, construct validity was assessed using PLS-SEM-specific measurement criteria, including indicator reliability, internal consistency, AVE, the Fornell–Larcker criterion, and HTMT, rather than CB-SEM global fit indices such as CFI, TLI, and RMSEA.

5. Results

This section presents the empirical findings obtained from the PLS-SEM analysis. The results are reported sequentially, beginning with sample characteristics and measurement model assessment and ending with structural model evaluation, mediation analysis, moderation analysis, and robustness checks.

5.1. Sample Profile and Descriptive Statistics

A total of 412 usable responses were retained for analysis after screening for completeness, attention-check compliance, and response quality. Table 1 presents the demographic profile of the respondents. The sample comprised 55.1% female and 44.9% male respondents. The largest age group was 25–34 years (41.5%), followed by 35–45 years (29.9%) and 18–24 years (28.6%). Overall, the sample represents adult grocery consumers aged 18–45 years who participated in the study. Missing values were negligible and were addressed through listwise deletion because the proportion of missing data remained well below conventional thresholds. Table 2 presents the contribution of the current study.

Table 1. Demographic profile of respondents (n = 412).

Characteristic	Category	Frequency (n)	Percentage (%)
Gender	Male	185	44.9
	Female	227	55.1
Age Group (years)	18–24	118	28.6
	25–34	171	41.5
	35–45	123	29.9

Descriptive statistics indicated moderate-to-high levels of perceived blockchain-enabled information quality, perceived credibility, consumer trust, and sustainable purchase decision-making. Inter-construct correlations were positive and statistically significant, providing preliminary support for the theorised relationships. Examination of skewness and kurtosis values suggested no substantial deviations from normality. Although PLS-SEM does not require multivariate normality, these findings further support the suitability of the dataset for subsequent bootstrapping procedures [15–17,31]. Table 3 summarises the constructs, working definitions, and source instruments.

Table 2. Positioning of the present contribution relative to prior work.

Dimension	Dominant Prior Approach	This Study
Role of blockchain	Object of adoption/acceptance [12,28,29]	Information signal whose quality drives credibility [2,20]
Primary theory	TAM/UTAUT-style acceptance [19,28,29]; trust transfer [31,54]	Signalling Theory [32,33] nested in the S-O-R framework [9,18,20,26,34]
Active variable	Attitudes toward/acceptance of the technology [29,36]	Quality of conveyed information [2,35]
Mediating mechanism	Often unspecified or limited to trust [6,12]	Perceived credibility, distinct from trust [13,26]
Boundary condition	Trust is frequently treated as a mediator; conflation is common [15,17]	Consumer trust as a moderator distinct from credibility (moderated mediation)
Outcome	Adoption/use intention [28,29,36]	Sustainable purchase decision-making [15–17,22,30]

Source: Authors' own interpretation.

Table 3. Constructs, working definitions, and source scales are adapted from the prior literature.

Construct (Role)	Working Definition	Source Instruments Adapted from
Blockchain-enabled information quality (IV/stimulus)	Accuracy, completeness, verifiability, and timeliness of the sustainability information conveyed via blockchain	DeLone and McLean information-quality tradition [35]; blockchain signal quality measures [2,20]
Perceived credibility (mediator/organism)	The degree to which the specific sustainability claim is judged believable and trustworthy in the focal encounter	Signal and message credibility instruments adapted from [2,13,26]
Consumer trust (moderator)	Dispositional or system-level propensity to trust sustainability claims and the verification technology	Blockchain and system trust instruments adapted from [6,17,30,31,45]
Sustainable purchase decision-making (DV/response)	Weighting of sustainability and corresponding action in the focal purchase decision	Green and organic purchase instruments adapted from [15,16,22,30,31]

Source: Authors' own interpretation.

5.2. Measurement Model Assessment

The measurement model was evaluated through indicator reliability, internal consistency reliability, convergent validity, and discriminant validity. As shown in Table 4, all standardised factor loadings exceeded the recommended threshold of 0.70, ranging from 0.816 to 0.891, thereby demonstrating satisfactory indicator reliability [17]. Internal consistency reliability was established through Cronbach's alpha, rho_A, and composite reliability values. All constructs exceeded the recommended threshold of 0.70 while remaining below the upper boundary of 0.95, indicating adequate reliability without evidence of redundancy among indicators [53]. Composite reliability values ranged from 0.916 to 0.932, while rho_A values ranged from 0.882 to 0.907. Convergent validity was supported by average variance extracted (AVE) values exceeding the recommended threshold of 0.50 for all constructs. Specifically, AVE values ranged from 0.732 for consumer trust to 0.774 for perceived credibility, indicating that each construct explained more than half of the variance in its indicators [53].

Table 4. Measurement items, factor loadings, reliability, and convergent validity.

Construct	Item Code	Measurement Item	Loading	Source	Cronbach's α	rho_A	Composite Reliability (CR)	AVE
Blockchain-Enabled Information Quality (BIQ)	BIQ1	The blockchain-based sustainability information is accurate.	0.842	[2,35]	0.887	0.889	0.917	0.734
	BIQ2	The blockchain-based sustainability information is complete.	0.871	[2,35]				
	BIQ3	The blockchain-based sustainability information is verifiable.	0.888	[2,35]				
	BIQ4	The blockchain-based sustainability information is up-to-date.	0.824	[2,35]				
Perceived Credibility (PC)	PC1	The sustainability information presented is believable.	0.863	[2,26]	0.893	0.895	0.926	0.757
	PC2	The sustainability information presented is trustworthy.	0.891	[2,26]				
	PC3	The sustainability information presented is reliable.	0.847	[2,26]				
	PC4	The sustainability information presented is credible.	0.878	[2,26]				
Consumer Trust (CT)	CT1	I trust blockchain-based verification systems.	0.816	[15,17]	0.869	0.882	0.916	0.732
	CT2	Blockchain technology is dependable.	0.852	[15,17]				
	CT3	Blockchain verification systems are trustworthy.	0.883	[15,17]				
	CT4	I feel confident relying on blockchain-based sustainability information.	0.839	[15,17]				
Sustainable Purchase Decision-Making (SPDM)	SPDM1	I would choose this product because of its sustainability attributes.	0.845	[15–17,22]	0.889	0.907	0.923	0.750
	SPDM2	Sustainability information would positively influence my purchase decision.	0.882	[15–17,22]				
	SPDM3	I prefer this product over less sustainable alternatives.	0.861	[15–17,22]				
	SPDM4	I intend to purchase this product because it is sustainably produced.	0.875	[15–17,22]				

Source: Authors' own compilation.

Discriminant validity was assessed using both the Fornell–Larcker criterion and the heterotrait–monotrait ratio (HTMT). As reported in Table 5, the square root of the AVE for each construct exceeded its correlations with all other constructs, satisfying the Fornell–Larcker criterion [55], and all HTMT values remained below the conservative threshold of 0.85, providing additional evidence of discriminant validity. Notably, perceived credibility and consumer trust exhibited adequate empirical separation, supporting the conceptual distinction proposed in the theoretical framework.

Table 5. Discriminant validity (Fornell–Larcker criterion and HTMT ratio).

Construct	BIQ	PC	CT	SPDM
Fornell–Larcker Criterion				
BIQ	0.867			
PC	0.603	0.880		
CT	0.514	0.572	0.856	
SPDM	0.487	0.668	0.503	0.876
HTMT Ratio				
BIQ	-			
PC	0.712	-		
CT	0.598	0.674	-	
SPDM	0.551	0.781	0.587	-

5.3. Structural Model and Hypothesis Tests

Before assessing the structural relationships, collinearity diagnostics were examined. All variance inflation factor (VIF) values remained below the recommended threshold of 3.3, indicating that multicollinearity was not a concern. The structural model results are presented in Table 6. Consistent with H1, blockchain-enabled information quality exerted a positive and significant effect on perceived credibility ($\beta = 0.548$, $t = 11.874$, $p < 0.001$), supporting the signalling-theoretic proposition that high-quality blockchain-enabled information serves as a credible signal capable of reducing information asymmetry and strengthening consumers' evaluations of sustainability claims [2,32,33]. Supporting H2, perceived credibility positively influenced sustainable purchase decision-making ($\beta = 0.517$, $t = 9.623$, $p < 0.001$), a result consistent with the Stimulus–Organism–Response framework, wherein internal evaluative states translate external informational stimuli into behavioural responses [34]. Consumers who perceived sustainability information as credible were more likely to incorporate sustainability considerations into their purchase decisions. However, these findings should be interpreted as reflecting perceived sustainable purchase decision-making within the hypothetical scenario rather than verified actual purchasing behaviour. The model explained 45.1% of the variance in perceived credibility and 39.2% of the variance in sustainable purchase decision-making, with adjusted R^2 values.

Table 6. Structural paths, effect sizes, and hypothesis decisions.

Hypothesis	Path	β	t -Value	p -Value	95% BCa CI	f^2	SE	Decision
H1	BIQ $\rightarrow$ PC	0.548	11.874	<0.001	[0.458, 0.633]	0.412	0.046	Supported
H2	PC $\rightarrow$ SPDM	0.517	9.623	<0.001	[0.408, 0.612]	0.364	0.054	Supported
H3	BIQ $\rightarrow$ PC $\rightarrow$ SPDM	0.283	7.194	<0.001	[0.205, 0.372]	-	0.039	Supported
H4	BIQ $\times$ CT $\rightarrow$ PC	−0.142	3.087	0.002	[−0.231, −0.054]	0.041	0.046	Supported
H5	Index of Moderated Mediation	−0.073	2.644	0.008	[−0.127, −0.021]	-	0.028	Supported

The negative interaction coefficient ($\beta = -0.142$, $p = 0.002$) indicates a substitution effect: as consumer trust increases, the positive effect of information quality on perceived credibility weakens. Thus, low-trust consumers rely more strongly on the quality of blockchain-enabled information when evaluating credibility. The indirect effect of blockchain-enabled information quality on sustainable purchase decision-making through perceived credibility was positive and statistically significant ($\beta = 0.283$, $t = 7.194$, $p < 0.001$), thereby supporting H3. This finding indicates that perceived credibility functions as a meaningful psychological mechanism through which information quality influences consumer behaviour. The result extends previous blockchain traceability research by identifying

credibility as a distinct mediating process rather than treating trust as the sole explanatory pathway [2,15,26].

Regarding H4, the interaction between blockchain-enabled information quality and consumer trust was negative and significant ($\beta = -0.142$, $t = 3.087$, $p = 0.002$). The simple-slopes analysis presented in Figure 2 reveals that the positive influence of information quality on perceived credibility was stronger among consumers exhibiting lower levels of trust. Thus, the results support the substitution perspective rather than the competing amplification perspective, with high-trust consumers appearing to grant credibility more readily and low-trust consumers relying more heavily on objective information quality cues before assigning credibility. As shown in Figure 2a, the simple-slopes analysis indicates that the positive relationship between blockchain-enabled information quality and perceived credibility is stronger among consumers with lower levels of trust. Figure 2b further demonstrates that the conditional indirect effect of blockchain-enabled information quality on sustainable purchase decision-making via perceived credibility progressively weakens as consumer trust increases, supporting the moderated mediation hypothesis (H5).

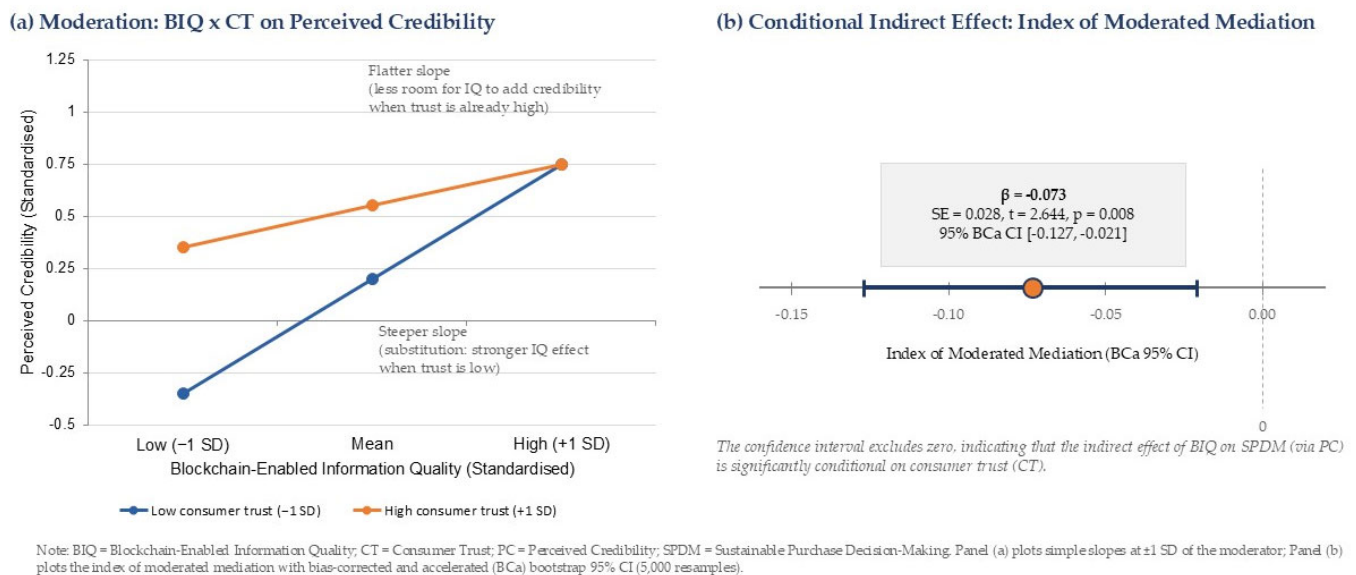


Figure 2. Results of the moderation and moderated mediation analyses. Panel (a) presents the simple-slopes analysis illustrating the moderating effect of consumer trust on the relationship between blockchain-enabled information quality and perceived credibility. Panel (b) presents the conditional indirect effect of blockchain-enabled information quality on sustainable purchase decision-making through perceived credibility across low, mean, and high levels of consumer trust.

Finally, H5 predicted moderated mediation. In reality, the index of moderated mediation was significant ($\beta = -0.073$, $p = 0.008$), indicating that the indirect effect of blockchain-enabled information quality on sustainable purchase decision-making via perceived credibility varied across levels of consumer trust. Conditional indirect-effect analysis demonstrated that the mediated relationship was strongest at low levels of trust and progressively weakened as trust increased. These findings provide evidence that blockchain-enabled information quality is particularly influential among sceptical consumers, thereby highlighting the practical importance of verifiable sustainability information. The model explained 45.1% of the variance in perceived credibility and 39.2% of the variance in sustainable purchase decision-making. In addition, positive Q^2 values indicated the satisfactory predictive relevance of the model.

5.4. Robustness Checks

Several robustness checks were conducted to assess the stability of the findings: First, full-collinearity VIF values ranged from 1.34 to 2.48, remaining below the conservative threshold of 3.30, indicating that common method bias is unlikely to threaten the validity of the findings [56]. Second, alternative model specifications produced substantively similar findings, indicating that the observed relationships were robust to reasonable variations in model structure. Third, the moderation effect remained significant across alternative estimation procedures and bootstrap resamples, confirming the stability of the substitution effect. Collectively, these robustness checks strengthen confidence in the validity of the proposed model and the reliability of the substantive conclusions [15–17,31].

6. Discussion

This study examined how blockchain-enabled information quality influences sustainable purchase decision-making through perceived credibility and under varying levels of consumer trust. Drawing upon Signalling Theory [32,33] and the Stimulus–Organism–Response (S-O-R) framework [34], the findings demonstrate that consumers respond not merely to the presence of blockchain technology but to the quality of the sustainability information that blockchain enables and communicates. Collectively, the results suggest that blockchain's value in sustainable consumption lies less in technological novelty and more in its capacity to enhance the credibility of sustainability-related information. The positive relationship between blockchain-enabled information quality and perceived credibility supports the central prediction of Signalling Theory [32,33]. Sustainability attributes often function as credence attributes that consumers cannot directly verify, creating persistent information asymmetries between firms and consumers [1–3]. The findings indicate that, when sustainability information is perceived as accurate, complete, verifiable, and timely, consumers are more likely to regard such information as credible. This result extends prior blockchain research, which primarily examined technology adoption and acceptance [12,28,29,36] by demonstrating that the behavioural influence of blockchain originates from the quality of the information signal rather than from the technology itself. The findings are consistent with recent studies emphasising blockchain-enabled transparency and traceability as mechanisms for strengthening consumer evaluations of sustainability claims [2,9,20].

The positive effect of perceived credibility on sustainable purchase decision-making further supports the S-O-R framework [34]. Consistent with prior sustainability and traceability research [13,22,26,30], credibility appears to operate as a critical psychological mechanism that reduces uncertainty surrounding sustainability claims and facilitates behavioural responses. Consumers are increasingly exposed to environmental and ethical claims in the marketplace, yet concerns regarding greenwashing often undermine their willingness to act upon such information [4,5,7]. The present findings suggest that consumers are more willing to incorporate sustainability considerations into their purchase decisions when they perceive the supporting information to be credible. A particularly important contribution of the study concerns the mediating role of perceived credibility. The significant indirect effect demonstrates that blockchain-enabled information quality influences sustainable purchase decision-making primarily through consumers' evaluations of claim credibility. While prior studies have frequently reported positive associations between blockchain implementation and consumer outcomes [2,12,15], the psychological process underlying these relationships has remained underdeveloped. By identifying perceived credibility as the mediating organismic state, the study advances a more nuanced understanding of how blockchain-enabled transparency generates behavioural consequences. In

doing so, it shifts the discussion from whether blockchain matters to why it matters from a consumer perspective.

The findings also contribute to the growing literature on digital transparency and sustainability communication. Although transparency has become a central objective of many sustainability initiatives, transparency alone may not necessarily influence consumer behaviour [1,5,6]; rather, the effectiveness of transparency depends on the perceived quality of the disclosed information. The present results indicate that consumers reward information that is verifiable and reliable by assigning greater credibility to sustainability claims. Consequently, organisations may derive greater benefits from improving the quality of sustainability disclosures than from merely increasing the volume of information provided. Another noteworthy contribution concerns the moderating role of consumer trust. The negative interaction effect supports the substitution hypothesis and indicates that blockchain-enabled information quality exerts a stronger influence on perceived credibility among consumers with lower levels of trust, suggesting that high-quality information can partially compensate for the absence of pre-existing trust. Naturally sceptical consumers appear to rely more heavily on objective informational cues when evaluating sustainability claims, whereas highly trusting consumers may grant credibility more readily regardless of information quality [15,17,30,31]. This result contributes to the ongoing effort to distinguish credibility from the trust conceptually and empirically, addressing a recurring source of ambiguity within the blockchain and sustainability literature.

The moderated mediation results reinforce this interpretation. Specifically, the indirect effect of blockchain-enabled information quality on sustainable purchase decision-making through perceived credibility was strongest among low-trust consumers. This finding is theoretically important because it suggests that blockchain-enabled transparency mechanisms may be particularly effective among sceptical consumers who are typically more resistant to sustainability communications. That is, rather than merely strengthening relationships with consumers who already possess high trust, blockchain-enabled information quality appears to be capable of reducing scepticism and increasing confidence among more difficult-to-persuade market segments. Overall, the study advances sustainable consumption research by reconceptualising blockchain as an information-signalling infrastructure rather than simply an object of technological adoption [2,20]. By integrating Signalling Theory with the S-O-R framework, the study provides a theoretically grounded explanation of how blockchain-enabled information quality, perceived credibility, and consumer trust jointly shape sustainable purchase decision-making. The findings further contribute to ongoing discussions surrounding greenwashing and sustainability communication by demonstrating that transparency initiatives are most effective when accompanied by high-quality and independently verifiable information [1,4–6]. Collectively, the results highlight the importance of information quality as a foundational mechanism through which blockchain technologies can support more informed and sustainable consumer choices.

6.1. Theoretical Implications

Beyond consumer behaviour, the findings position information quality as a central mechanism through which blockchain may create value in digital transparency and sustainability governance. This perspective is relevant to wider debates on traceability, accountability, stakeholder trust, and ESG disclosure, where the value of digital infrastructure depends not merely on technological adoption but on the accuracy, verifiability, completeness, and timeliness of the information it communicates. First, the study extends Signalling Theory [32,33] into the digital transparency domain by showing that the falsifiability properties of blockchain operate through the quality of the signal rather than through the technology itself, thereby differentiating the present account from the adoption-centric stream that

has dominated consumer-facing blockchain research [12,28,29,36] and complementing the recent signal-based extensions in food and fresh produce contexts [2,20]. Second, by specifying perceived credibility as the mediator (H3) and modelling its conditional dependence on trust (H5), the study advances the S-O-R tradition [9,18,26,34] by supplying an explanatory mechanism where prior work has frequently stopped at associations. Third, by separating message-level credibility from dispositional trust, the model addresses a recurring conflation in the literature [15,17,31] and provides an analytical template for future work that needs to keep these constructs distinct.

6.2. Managerial and Policy Implications

If the substitution prediction holds, the headline implication is that investment in high-quality, verifiable blockchain information yields the greatest credibility returns among low-trust, sceptical consumers [5,30], reframing blockchain traceability not as a loyalty reinforcement for already trusting customers but as a tool for converting sceptics. However, practically, design choices that maximise perceived information quality, accuracy, completeness, verifiability, and timeliness are likely to be more consequential than the mere presence of blockchain [1,2,20]. For firms operating in food categories where credence claims, such as those surrounding organic produce, ethical sourcing, fair trade, and regional origin, are central, the findings can inform how traceability information is structured, presented, and communicated [1,11,12,14,18,39].

The policy relevance is also concrete and current. Verifiable substantiation of environmental claims has moved to the centre of consumer protection regulation, and recent reviews of marketing strategies through sustainability emphasise the need for credible disclosure mechanisms within the circular economy loop [7,57]. In this context, blockchain-based verification offers firms a credible mechanism for meeting substantiation expectations, and the present findings clarify where that mechanism delivers the most value [6,9].

7. Limitations, Future Research, and Conclusions

One limitation of this study is that the sample comprised Saudi Arabian grocery consumers aged 18–45 years. Consequently, the findings may not fully generalise to older consumer groups or to the broader adult grocery consumer population. In addition, the single-country context may limit the cross-cultural generalisability of the findings, as consumer familiarity with blockchain-enabled food traceability and responses to sustainability information may vary across different markets and institutional settings. Thus, future research should further examine the proposed information quality mechanism across industries, institutional settings, stakeholder groups, and national contexts to assess its applicability beyond consumer-facing agri-food traceability. Furthermore, the cross-sectional and scenario-based design of this study precludes strong causal inference, and the measured outcome reflects perceived purchase decision-making rather than verified actual purchasing behaviour. Therefore, future research should test the proposed relationships using experimental, longitudinal, or actual purchase data. Several extensions follow naturally: First, as the measured outcome is decision-making rather than verified behaviour, future work should link the model to actual purchase or to incentive-compatible choice [9,47]. Second, green scepticism may be a theoretically tighter alternative or complement to dispositional trust as a boundary condition and merits dedicated testing [4,5]. Third, a serial mediation structure of information quality → credibility → perceived authenticity/brand trust → behaviour could be examined, provided the constructs are kept discriminant [3,13]. Fourth, replication across product categories such as apparel, beauty, second-hand luxury, and tourism [23–27,38,58] and across cultural contexts, including India, China, Vietnam, and the Gulf [15,16,31,47,51], would test the model's robustness, as would longitudinal or

experimental designs that manipulate information quality directly to strengthen causal inference. This study reconceptualises blockchain in sustainable consumption from an object of adoption to a signal of information quality and tests a credibility-mediated, trust-contingent pathway from that signal to sustainable purchase decision-making. By integrating Signalling Theory [32,33] with the Stimulus–Organism–Response framework [34], it offers a theoretically grounded and empirically tractable account of how, and for whom, blockchain-enabled transparency shapes ethical consumption. In doing so, it responds to the practical urgency of combating greenwashing with verifiable information [5–7] and clarifies a conceptual boundary between message credibility and dispositional trust that has remained blurred in much of the prior digital transparency literature [15,17,31].

Funding: This research received no external funding.

Institutional Review Board Statement: Ethical review and approval were waived for this study by Institution Committee as per the Implementing Regulations of the Law of Ethics of Research on Living Creatures issued by the National Committee of Bioethics (NCBE), Kingdom of Saudi Arabia. This type of minimal-risk, anonymous survey research does not require formal ethical review board approval. Therefore, the study was conducted in accordance with the relevant ethical principles and regulatory requirements without the need for prior ethics committee review.

Informed Consent Statement: Informed consent was obtained from all subjects involved in the study.

Data Availability Statement: The data presented in this study are available on request from the corresponding author.

Acknowledgments: During the preparation of this manuscript, the author used Anthropic’s Claude (Claude Opus 4.7) for language refinement. The author reviewed and edited the output and takes full responsibility for the content of the publication.

Conflicts of Interest: The author declares no conflicts of interest.

Appendix A. Survey Scenario and Stimulus

Imagine that you are purchasing a food product during your regular grocery shopping. The product carries a sustainability claim and included a QR code providing access to a blockchain-based traceability record. The record provides information regarding the product’s origin, sustainability certification, and supply-chain handling. The information recorded on the blockchain cannot be altered after entry and can be independently verified. The measurement items were adapted from previously validated scales and contextualized to the blockchain-enabled food traceability setting while preserving their original conceptual meaning.

Measurement Instruments:

Unless otherwise stated, all items were measured using a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree).

Blockchain-Enabled Information Quality (adapted from DeLone et al. [35] and Treiblmaier et al. [2])

- IQ1. The blockchain-based sustainability information is accurate.
- IQ2. The blockchain-based sustainability information is complete.
- IQ3. The blockchain-based sustainability information is verifiable.
- IQ4. The blockchain-based sustainability information is up to date.

Perceived Credibility (adapted from Treiblmaier et al. [2] and Sun et al. [9])

- PC1. The sustainability information presented is believable.
- PC2. The sustainability information presented is trustworthy.
- PC3. The sustainability information presented is reliable.
- PC4. The sustainability information presented is credible.

Consumer Trust (adapted from Hina et al. [5], Duan & Zhu [6], and Koroma et al. [8])

- CT1. I trust blockchain-based verification systems.
- CT2. Blockchain technology is dependable.
- CT3. Blockchain verification systems are trustworthy.
- CT4. I feel confident relying on blockchain-based sustainability information.

Sustainable Purchase Decision-Making (adapted from Hina et al. [5], Sun et al. [9], and Treiblmaier et al. [2])

- SPDM1. I would choose this product because of its sustainability attributes.
- SPDM2. Sustainability information would positively influence my purchase decision.
- SPDM3. I prefer this product over less sustainable alternatives.
- SPDM4. I intend to purchase this product because it is sustainably produced.

References

1. Tria, E.; Di Cosola, F.; Petrantino, A.; Frem, M.; Bozzo, F. Credence in code: Consumer engagement and responses to blockchain-enabled sustainability in tomato Purée. *Clean. Responsible Consum.* **2025**, *19*, 100339. [\[CrossRef\]](#)
2. Treiblmaier, H.; Garaus, M. Using blockchain to signal quality in the food supply chain: The impact on consumer purchase intentions and the moderating effect of brand familiarity. *Int. J. Inf. Manag.* **2023**, *68*, 102514. [\[CrossRef\]](#)
3. Lukas, S.; Olivier, S. The Impact of Block Chain-Enabled Traceability on Perceived Product Authenticity and Willingness to Pay in the Canadian Biotechnology Industry. *J. Commer. Biotechnol.* **2023**, *28*, 351–363.
4. Toufaily, E.; Daghfous, A.; Belkhamza, Z. Perceptions of blockchain readiness for fairtrade programmes. *Technol. Forecast. Soc. Change* **2022**, *184*, 122031. [\[CrossRef\]](#)
5. Hina, M.; Islam, N.; Dhir, A. Blockchain for sustainable consumption: An affordance and consumer value-based view. *Internet Res.* **2024**, *34*, 215–250. [\[CrossRef\]](#)
6. Duan, Y.; Zhu, Q. Blockchain empowerment: Enhancing consumer trust and outreach through supply chain transparency. *Int. J. Prod. Res.* **2025**, *63*, 5358–5382. [\[CrossRef\]](#)
7. Vrontis, D.; Christofi, M.; Battisti, E.; Graziano, E.A. Redefining marketing strategies through sustainability: Influencing consumer behavior in the circular economy: A systematic literature review and bibliometric analysis. *Clean. Responsible Consum.* **2025**, *18*, 100302. [\[CrossRef\]](#)
8. Koroma, J.; Zhou, R.; Muhideen, S.; Akintunde, T.Y.; Amosun, T.S.; Dauda, S.J.; Sawaneh, I.A. Assessing citizens' behavior towards blockchain cryptocurrency adoption in the Mano River Union States: Mediation, moderation role of trust and ethical issues. *Technol. Soc.* **2022**, *68*, 101885. [\[CrossRef\]](#)
9. Sun, S.; Wang, M.; Tran, P.T.K. The impact of environmental information disclosure of origin using blockchain technology on online consumer behaviour: A perspective of S-O-R theory. *J. Clean. Prod.* **2023**, *425*, 138827. [\[CrossRef\]](#)
10. Kumar, N.; Jain, G.; Shrivastawa, A. Blockchain for customer transparency in e-commerce—A survival of fittest not fastest. *Int. J. Public Sect. Perform. Manag.* **2023**, *12*, 46–66. [\[CrossRef\]](#)
11. De Boni, A.; Pavone, S.; Acciani, C.; Roma, R. Enhancing olive oil communication through blockchain agri-food traceability. *New Medit* **2025**, *24*, 35–52. [\[CrossRef\]](#)
12. Mazzù, M.F.; Baccelloni, A.; Lavini, L. Injecting trust in consumer purchase intention through blockchain: Evidences from the food supply chain. *Ital. J. Mark.* **2022**, *2022*, 459–482. [\[CrossRef\]](#)
13. Doanh, D.C.; Tram, T.B.; Vu, P.Q.; Linh, L.T.N.; Huong, N.T.T. Blockchain-Based Food Traceability System and Green Brand Image: Enhancing Product Trust and Purchase Intentions for Online Agricultural Products. *Clean. Responsible Consum.* **2026**, *20*, 100368. [\[CrossRef\]](#)
14. Cordero-Gutiérrez, R.; Lahuerta-Otero, E.; Zapatero-González, A. Leveraging blockchain for ecosystem service transparency: Enhancing consumer value and sustainability in the beef industry. *Agric. Food Econ.* **2025**, *13*, 45. [\[CrossRef\]](#)
15. Duong, C.D.; Nguyen, T.H.; Ngo, T.V.N.; Dao, T.T.; Tran, N.M. Blockchain technology and consumers' organic food consumption: A moderated mediation model of blockchain-based trust and trust in organic food chain. *J. Asia Bus. Stud.* **2025**, *19*, 54–78. [\[CrossRef\]](#)
16. Duong, C.D.; Tran, T.V.H.; Nguyen, T.H.; Ngo, T.V.N.; Vu, T.N. Blockchain-based food traceability system and pro-environmental consumption: A moderated mediation model of technology anxiety and trust in organic food product. *Digit. Bus.* **2024**, *4*, 100095. [\[CrossRef\]](#)
17. Duong, C.D.; Vu, T.N.; Ngo, T.V.N.; Nguyen, M.H. Blockchain-enabled food traceability system and consumers' organic food consumption: A moderated mediation model of blockchain knowledge and trust in the organic food chain. *Sustain. Futur.* **2024**, *8*, 100316. [\[CrossRef\]](#)

18. Spinelli, R.; Aiello, G.; Bonanno, A.; Crescimanno, M.; Galati, A. Consumer intentions to purchase wines with Blockchain and quick-response code tracking: Insights from an extended stimulus-organism-response framework. *J. Innov. Knowl.* **2026**, *11*, 100766. [\[CrossRef\]](#)
19. Adamashvili, N.; Spada, A.; Fiore, M.; Tricase, C. What about QR codes on wine bottles? A statistical analysis of technology's influence on purchase decisions among Italian consumers. *Socio-Econ. Plan. Sci.* **2024**, *96*, 102088. [\[CrossRef\]](#)
20. Zhang, J.; Wei, X. From technological signal to behavioral response: Unraveling the influence of blockchain traceability labels in fresh e-commerce within the framework of S-O-R theory. *J. Retail. Consum. Serv.* **2026**, *86*, 104488. [\[CrossRef\]](#)
21. Lou, X.; Xu, Y. Consumption of Sustainable Denim Products: The Contribution of Blockchain Certified Eco-Labels. *J. Theor. Appl. Electron. Commer. Res.* **2024**, *19*, 396–411. [\[CrossRef\]](#)
22. Yang, F.; Yan, X.; Niu, B.; Mu, Y. Green Attributes, Blockchain-Enabled Traceability Systems, and Purchase Intention towards Organic Rice in China: A Moderated Mediation Model. *Int. J. Oper. Quant. Manag.* **2025**, *31*, 256–283.
23. Youn, S.; Hwang, J.; Ju, N. Blockchain transparency in reducing second-hand luxury shopping uncertainty and the role of price consciousness. *Fash. Text.* **2025**, *12*, 10. [\[CrossRef\]](#)
24. Wang, S.; Esperança, J.P. Reshaping electronic word-of-mouth and commitment to second-hand high-end fashion with blockchain-enabled sustainability information. *J. Retail. Consum. Serv.* **2026**, *86*, 104465. [\[CrossRef\]](#)
25. Castaldo, S.; Penco, L.; Profumo, G. How would you like to pay? Consumers' reaction to crypto-based vs. traditional e-payment methods for luxury vs. mass-market fashion products. *J. Fash. Mark. Manag.* **2026**, *29*, 1085–1108. [\[CrossRef\]](#)
26. Sangal, S.; Nigam, A.; Behl, A.; Gupta, S.; Magliocca, P. Role of blockchain in shaping trust and purchase intentions for beauty brands advertised on social media: A SOR perspective. *Int. J. Advert.* **2025**, *44*, 1458–1482. [\[CrossRef\]](#)
27. Guo, Y.; Chon, K. Exploring the Potential of Blockchain-Based Donation Platforms in the Hospitality Industry: Examining Their Impact on Customers' Intention to Donate. *J. Hosp. Mark. Manag.* **2026**, *35*, 73–95. [\[CrossRef\]](#)
28. Wang, H.; Zhang, M.; Ying, H.; Zhao, X. The impact of blockchain technology on consumer behavior: A multimethod study. *J. Manag. Anal.* **2021**, *8*, 371–390. [\[CrossRef\]](#)
29. Bettiga, D.; Bianchi, A.M.; Lamberti, L.; Noci, G. Blockchain and consumer behaviour: Results of a Technology Acceptance Model in the ancient wheat sector. *Clean. Logist. Supply Chain* **2023**, *7*, 100109. [\[CrossRef\]](#)
30. Huang, B.; Dai, J.; Lim, J.J. Blockchain technology as a driver for sustainability? A consumer purchase intention perspective. *Int. J. Oper. Prod. Manag.* **2025**, *45*, 1402–1425. [\[CrossRef\]](#)
31. Duong, C.D. Blockchain technology and organic food consumption: A polynomial regression-based approach to explore the role of trust in retailers and producers. *Technol. Forecast. Soc. Change* **2026**, *228*, 124672. [\[CrossRef\]](#)
32. Spence, M. Job Market Signaling. *Q. J. Econ.* **1973**, *87*, 355–374. [\[CrossRef\]](#)
33. Connelly, B.L.; Certo, S.T.; Ireland, R.D.; Reutzel, C.R. Signaling Theory: A Review and Assessment. *J. Manag.* **2011**, *37*, 39–67. [\[CrossRef\]](#)
34. Mehrabian, A.; Russell, J.A. *An Approach to Environmental Psychology*; MIT Press: Cambridge, MA, USA, 1974.
35. DeLone, W.H.; McLean, E.R. The DeLone and McLean Model of Information Systems Success: A Ten-Year Update. *J. Manag. Inf. Syst.* **2003**, *19*, 9–30. [\[CrossRef\]](#)
36. Sepe, F. Blockchain technology adoption in food label systems: The impact on consumer purchase intentions. *Sinergie* **2024**, *42*, 241–264. [\[CrossRef\]](#)
37. Rodriguez-Vasquez, J.G.; D'Ancona, F.C.; Bolanos-Burgos, F.; Sanchez-Riofrio, A.M. Mapping trends in digital business research: From bit transformation to sustainable data-centric enterprises. *Humanit. Soc. Sci. Commun.* **2025**, *12*, 1005. [\[CrossRef\]](#)
38. Zhang, Y.; Papp-Váry, Á.; Szabó, Z. Global influences of digital transformation on behavioral factors in tourism: A systematic literature review. *Cogent Bus. Manag.* **2025**, *12*, 2536101. [\[CrossRef\]](#)
39. Maesano, G.; Sadrmousavigargari, S.; Castellini, A. Consumer intentions to purchase organic pasta with blockchain-based traceability. *Bio-Based Appl. Econ.* **2025**, *14*, 85–99. [\[CrossRef\]](#)
40. Martinelli, E.; De Canio, F. Are consumers' food purchase intentions impacted by blockchain technology? *Sinergie* **2024**, *42*, 17–36. [\[CrossRef\]](#)
41. Pinheiro, P.G.; Lopes, J.M.; Azevedo, J. A peer-to-peer trading model to enhance resilience: A blockchain-based smart grid with machine learning analysis towards sustainable development goals. *J. Clean. Prod.* **2024**, *467*, 142939. [\[CrossRef\]](#)
42. Hassan, N.A.; Hossain, M.S.; Rahman, M.S.; Quoquab, F. Blockchain-powered drone deliveries: Embedded governance mechanisms for reducing uncertainty and enhancing consumer behavior. *Technol. Forecast. Soc. Change* **2025**, *218*, 124195. [\[CrossRef\]](#)
43. Liu, X.; Cheng, P.; OuYang, Z.; Wang, P. Trend of owning the intangible: The mediating role of psychological ownership in cultural consumption within blockchain-driven NFTs platforms. *Humanit. Soc. Sci. Commun.* **2025**, *12*, 851. [\[CrossRef\]](#)
44. Aldoseri, A.; Al-Khalifa, K.N.; Hamouda, A.M. Leveraging Machine Learning for Advancing Circular Supply Chains: A Systematic Literature Review. *Logistics* **2024**, *8*, 108. [\[CrossRef\]](#)
45. Uchikoshi, L.; Frank, B. Restoring consumer trust in e-commerce: The role of blockchain technology and its behavioral implications. *Technol. Forecast. Soc. Change* **2026**, *224*, 124495. [\[CrossRef\]](#)

46. Wang, S.; Yuan, C.; Liu, Y.; Moon, H. The impact of blockchain food traceability system on consumers' affective brand commitment and premium price motivation. *Asia Pac. J. Mark. Logist.* **2023**, *36*, 1520–1537. [[CrossRef](#)]
47. Liu, X.; He, F.; Liu, Y. Hasingness to Pay for Traceability in the Post-Fukushima Nuclear-Contaminated Water Era: Chinese Consumers' Attitudes and Behaviors Towards Japanese Aquatic Products. *Agribusiness* **2026**, *42*, 327–349. [[CrossRef](#)]
48. Lim, X.J.; Cheah, J.-H.; Ngo, L.V.; Chan, K.; Ting, H. Consumers' concerns and the role of blockchain technology in mobile food delivery applications. *J. Destin. Mark. Manag.* **2024**, *33*, 100916. [[CrossRef](#)]
49. Shahzad, K.; Zafar, A.U.; Shahzad, M.F.; Husnain, M.; Hayat, K. The Role of Blockchain Technology in Enhancing Consumers' Impulsive Buying Behavior. *Int. J. Consum. Stud.* **2024**, *48*, e13092. [[CrossRef](#)]
50. Kock, N.; Hadaya, P. Minimum Sample Size Estimation in PLS-SEM: The Inverse Square Root and Gamma-Exponential Methods. *Inf. Syst. J.* **2018**, *28*, 227–261. [[CrossRef](#)]
51. Duong, D. Exploring the role of cultural values on consumers' organic food consumption: Does blockchain-enabled traceability matter? *Oecon. Copernic.* **2024**, *15*, 1509–1546. [[CrossRef](#)]
52. Setyaningsih, S.; Kelle, P. Discovering Islamic marketing potential in shaping blockchain-based halal logistic services: A bibliometric analysis. *J. Islam. Mark.* **2025**, *16*, 2849–2876. [[CrossRef](#)]
53. Hair, J.F.; Hult, G.T.M.; Ringle, C.M.; Sarstedt, M.; Danks, N.P.; Ray, S. *Partial Least Squares Structural Equation Modeling (PLS-SEM) Using R: A Workbook*; Springer: Cham, Switzerland, 2022. [[CrossRef](#)]
54. Tran, N.T.; Vu, A.T.; Doan, P.A.T.; Le, T.X.; Le, H.T. Blockchain Technology in the Organic Food Supply Chain: Insights from an Integrated Model of Trust Transfer Theory and Theory of Reasoned Action. *J. Glob. Mark.* **2025**, *38*, 273–294. [[CrossRef](#)]
55. Henseler, J.; Ringle, C.M.; Sarstedt, M. A New Criterion for Assessing Discriminant Validity in Variance-Based Structural Equation Modeling. *J. Acad. Mark. Sci.* **2015**, *43*, 115–135. [[CrossRef](#)]
56. Fornell, C.; Larcker, D.F. Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *J. Mark. Res.* **1981**, *18*, 39–50. [[CrossRef](#)]
57. Vasylyshyna, L.; Yahelska, K.; Aldankova, H.; Liashuk, K. Development of marketing research technologies as the basis of a socially responsible marketing strategy. *East.-Eur. J. Enterp. Technol.* **2024**, *5*, 76–85. [[CrossRef](#)]
58. Pop, R.-A.; Sabou, S.; Pop, L.-N.; Berbecaru, A.; Marincean, S.M.; Dabija, D.-C. Sustainable Choices in Fashion: Insights into Gen Z's Purchasing Behaviour. *J. Logist. Inform. Serv. Sci.* **2025**, *12*, 19–38. [[CrossRef](#)]

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.