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Research Paper

Mapping blockchain adoption motivations: A micro-level analysis of supply chain decision-making

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Abstract: This research advances supply chain management scholarship by exploring the individual-level cognitive drivers influencing blockchain adoption among upstream and downstream supply chain actors. Leveraging the Three Arenas Model and integrating Institutional Isomorphism with the mental model theory, we conducted 34 in-depth, semi-structured interviews complemented by Fuzzy Cognitive Mapping (FCM) to capture detailed perceptual frameworks. Using thematic analysis via Atlas.ti, our findings indicate clear motivational distinctions: upstream actors (e.g., producers) predominantly seek enhanced transparency and traceability to optimize operational efficiency, while downstream actors (e.g., end users) emphasize trust and reputational capital to strengthen market confidence. Our study highlights that these contrasting cognitive schemas require differentiated strategic approaches for successful blockchain integration. By linking micro-level cognitive processes with institutional pressures, this research enriches theoretical perspectives on technology adoption within supply chain contexts and provides actionable insights for practitioners and policymakers to customize adoption strategies, regulatory frameworks, and stakeholder engagement practices for maximum effectiveness.

Keywords: Blockchain technology, supply chain management, mental models, fuzzy cognitive maps, isomorphism theory.

1. Introduction

Blockchain technology offers transformative potential for supply-chain management (SCM) by enhancing transparency, traceability, and trust (Tapscott & Tapscott, 2016). However, real-world adoption remains inconsistent; while some firms swiftly integrate blockchain to optimize operational workflows, others hesitate or implement only limited pilot projects (Biswas & Gupta, 2019). This uneven adoption highlights a crucial insight: fully understanding technology adoption requires examining not only technical and organizational factors but also cognitive barriers faced by decision-makers. This study investigates individual mental model's cognitive frameworks shaped by experiences, beliefs, biases, perceptions of risk, value, and authority (Johnson-Laird, 1983) and how these influence blockchain adoption decisions within supply chains.

Traditional technology adoption frameworks, such as the Technology Acceptance Model (TAM) (Davis, 1989) and Diffusion of Innovations Theory (DIT) (Rogers, 2003), emphasize perceived usefulness and ease of use. However, they often overlook nuanced cognitive factors such as resistance due to entrenched practices or status quo biases common in SCM, where established workflows can strongly resist change. For instance, TAM might underestimate how resistance from deeply ingrained operational knowledge hampers blockchain integration.

To bridge this theoretical gap, this research integrates Fuzzy Cognitive Mapping (FCM), a qualitative modelling approach simplifying complex cognitive relationships and beliefs (Kosko, 1986), with the 3 Arenas Model: individual motivations (Micro), organizational strategies (Meso 1), institutional power dynamics (Meso 2) (see Gharehdaghi & Kamann, 2024a). FCM was selected over alternative modelling techniques due to its ability to visually represent complex belief structures clearly and systematically. This combination explicitly connects micro-level institutional influences, such as coercive, mimetic, and normative

Citation:
Gharehdaghi, M. and Kamann, D-J. F. (in press). Mapping blockchain adoption motivations: A micro-level analysis of supply chain decision-making. *Prosperitas*. Budapest University of Economics and Business. https://doi.org/10.31570/prosp_2025_0146

History:
Received: 18 Mar 2025
Revised: 4 May 2025
9 Jul 2025
Accepted: 18 Aug 2025
Published: 9 Sep 2025

pressures described by Institutional Isomorphism theory, with individual-level cognitive processes. Institutional isomorphic pressures, particularly present at the systemic levels (Arena 2, 3), indirectly shape individual mental models by influencing perceptions of legitimacy, norms, and acceptable behaviours within supply chains.

There are two research questions for this study. Firstly, what cognitive and motivational factors influence individual actors' adoption of blockchain technology? Secondly, how do these motivations differ between upstream and downstream actors in supply networks? By addressing these questions through 34 semi-structured interviews and Fuzzy Cognitive Mapping, this study advances SCM literature by integrating mental models with institutional isomorphism. It offers a robust, multilevel framework to overcome adoption barriers and support supply-chain transformation.

Understanding these cognitive drivers is critical for aligning blockchain strategies with stakeholder needs, especially in industries such as food and fashion where visibility and ethical operations drive adoption (Saberi et al., 2018). The insights of this study enable managers to design targeted interventions such as role-specific training, incentive mechanisms and regulatory guidance that resonate with underlying motivations. For policymakers, clarifying how mental models interact with coercive, mimetic and normative pressures offers a roadmap to craft regulatory frameworks that accelerate effective blockchain integration across diverse supply networks.

2. Literature Review

2.1. Mental models in supply-chain context

Mental models refer to the internal cognitive frameworks individuals use to interpret complex situations, which encompass perceptions of risk, value judgments, authority structures, and procedural knowledge (Johnson-Laird, 1983). Within supply chains, these models include beliefs regarding lead-time reliability, quality standards, cost-benefit analyses, and stakeholder expectations. Importantly, entrenched operational practices such as legacy ERP workflows or traditional paper-based auditing can create significant inertia. Overcoming this inertia requires a deliberate process of unlearning, defined as consciously discarding outdated routines and assumptions. This process is frequently met with resistance, as it threatens established expertise and challenges individuals' sense of control (Taki et al., 2016).

Traditional adoption frameworks, notably the Technology Acceptance Model (TAM) (Davis, 1989) and Diffusion of Innovations Theory (DIT) (Rogers, 2003), prioritize factors like perceived usefulness, ease of use, and social influence. However, these models often fail to adequately address cognitive biases. For example, TAM assumes high adoption rates when users perceive technology as beneficial but does not sufficiently consider status quo bias where managers resist transitioning from familiar legacy systems despite clear efficiency improvements. Similarly, while DIT emphasizes the role of peer influence, it underestimates barriers such as loss aversion, where fear of reputational damage from initial failures discourages firms from fully committing to new technologies. By employing a mental-models perspective, we can better understand how these cognitive biases influence blockchain adoption.

Fuzzy Cognitive Mapping (FCM) is a qualitative technique used to visually represent how individuals perceive causal relationships among various factors (Kosko, 1986). Simply put, FCM involves participants in identifying key concepts (e.g., "transparency," "implementation cost") and drawing weighted connections to illustrate the strength and direction of influence among these concepts. Unlike purely quantitative methods such as structural equation modelling or basic qualitative coding, FCM captures both the specific content and intensity of these causal beliefs (Priniski et al., 2023). This capability makes FCM uniquely suited for comparing cognitive structures among different stakeholder groups, and for clearly identifying the adoption of bottleneck areas marked by weak or negative causal relationships that hinder technological integration. In this study, FCM provides valuable, stakeholder-specific insights into cognitive barriers to blockchain adoption.

Institutional isomorphism describes the process by which organizations adapt and conform to external pressures categorized as coercive (regulatory mandates), mimetic (benchmarking against peers), and normative (professional standards and norms) (DiMaggio

& Powell, 1983). This process significantly influences individual mental models (Arena 1) indirectly by altering actors' perceptions of legitimacy and necessity. For example, regulatory frameworks such as the European Sustainability Reporting Standards (ESRS) create coercive pressures that prompt firms to initiate blockchain pilots, subsequently reshaping practitioners' beliefs regarding blockchain's utility and reliability. By comparing FCM outcomes before and after exposure to institutional stimuli, this study tracks the evolution of individual mental models, uncovering specific cognitive barriers or bottlenecks. These bottlenecks commonly include exaggerated perceptions of implementation costs or underestimated benefits related to interoperability. Recognizing these cognitive obstacles allows supply-chain managers to design targeted interventions such as specialized training workshops to correct misconceptions. Furthermore, policymakers can leverage these insights to develop targeted regulatory measures that bridge the gap between perceived and actual technology benefits, thereby facilitating smoother and more effective blockchain integration.

2.1. Theoretical framework

This study employs a multi-level theoretical framework, the Three Arenas Model (Gharehdaghi & Kamann, 2024a), to analyse blockchain adoption. This model posits three interconnected levels influencing adoption decisions. Arena 1 (Micro) focuses on individual mental models, examining the motivations and perceptions that shape an individual's view of a blockchain's value. Arena 2 (Meso 1) shifts to the organizational level and investigates how internal hierarchies and social dynamics influence strategic technology adoption (Gharehdaghi & Kamann, 2025). Finally, Arena 3 (Meso 2) encompasses the network level, and explores the power dynamics among external stakeholders that impact adoption (Gharehdaghi & Kamann, 2024b).

To further elucidate the external forces influencing blockchain adoption, this study integrates Isomorphism Theory (DiMaggio & Powell, 1983). This theory explains how external pressures, industry norms, and institutional behaviours drive organizational change. Specifically, we examine three forms of isomorphic pressure: mimetic isomorphism, where organizations emulate successful peers amidst uncertainty (Widmier et al., 2023); coercive isomorphism, arising from regulatory and legal mandates (Armitage & Pinter, 2021); and normative isomorphism, driven by professional standards and industry best practices (Fany, 2022). These isomorphic forces interact with internal decision-making processes and interdepartmental dynamics, collectively shaping the extent and direction of blockchain adoption within organizations (Haugset, 2023). This research focuses on Arena 1 to understand individual-level motivations (see orange part of Figure 1).

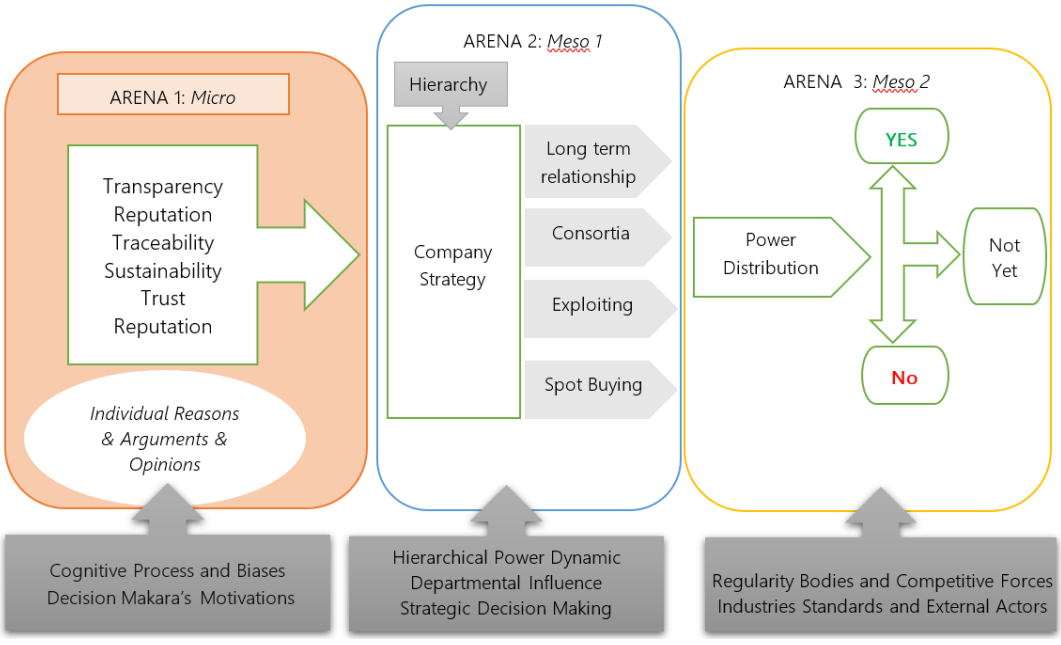

Figure 1: The 3 Arenas Model. *Source: adapted from Gharehdaghi & Kamann, 2024a, 2024b, 2025*

3. Research Methodology

3.1 Research design

This study focuses on individual-level blockchain adoption in supply networks, targeting Arena 1 (Micro-level) of the Three Arenas Model, which centres on individual mental models and motivations. Using a mixed-methods approach, it investigates how supply-chain actors perceive blockchain, their cognitive transformations, and evolving decision-making processes. Qualitative semi-structured interviews, analysed with Atlas.ti, explore perceptions. Fuzzy Cognitive Mapping (FCM) visually maps relationships among factors like trust and transparency.

3.2 Data collection

Data was collected through semi-structured interviews (N=34) with stakeholders from the food, fashion, and technology sectors. Participants were categorized into two main groups based on their positions in the supply chain: upstream actors (n=23; including producers, manufacturers, and suppliers) and downstream actors (n=11; end-users). The upstream participants were further segmented into three distinct sets. Set 1 was made up of sustainable supply chain specialists. Set 2 is comprised of blockchain experts and set 4 of organizational leaders. The downstream participants that formed set 3 were end-users. Interviews continued until data saturation was achieved when new insights ceased emerging after which four additional interviews confirmed saturation. Open-ended interview questions specifically targeted motivations, barriers, and perceived blockchain benefits, such as transparency and trust. All interviews were audio-recorded, transcribed verbatim, and anonymized.

3.3 Data analysis

Qualitative Analysis: Interview transcripts underwent thematic coding using Atlas.ti software, with two independent coders initially achieving high intercoder reliability (Cohen's kappa = 0.85). Discrepancies were systematically resolved through consensus discussions. Thematic analysis revealed prominent themes including transparency, traceability, trust, and sustainability. Following an initial open-coding phase that established a comprehensive codebook, coders applied deductive codes consistently across all transcripts. Each theme was assigned an intensity score on a 5-point scale: 1. Very Low (theme referenced in ≤10% of segments); 2. Low (11%–20%); 3. Moderate (21%–40%); 4. High (41%–60%); 5. Very High (> 60%). Scores were normalized on a 0–1 scale for comparability. Intercoder reliability was reconfirmed (Cohen's $\kappa = 0.85$), with less than 5% of discrepancies resolved through further consensus discussions.

Fuzzy Cognitive Mapping: To analyse the interconnected factors associated with blockchain adoption, Fuzzy Cognitive Mapping (FCM) was employed (Hu et al., 2023). Using the software tool Mental Modeler, the FCM model graphically illustrates the relationships between drivers and interdependencies, shaping the nature of adoption decisions (Xu et al., 2023). Mental Modeler is intuitive software designed for creating Fuzzy Cognitive Maps (Apostolopoulos & Groumpos, 2023). It allows users to represent concepts as nodes and their relationships as weighted arrows, making it easy to visualize and analyse complex systems. It provides functionality to simulate "what-if" scenarios, helping to understand how changes in one factor might ripple through a system.

4. Results

The following section is divided into the results concerning the thematic analysis and Fuzzy Cognitive Mapping (FCM) insights. The following tables provides an overview of the participants of the study, based upon the four sets.

Table 1. Demographics of the sample, by set. *Source: Author's own*

	Set			
	1	2	3	4
Gender	F/M	F/M	F/M	M
Group Description	Sustainable Supply Chain Experts	Blockchain Experts	End Users	Organizational Experts
No. of Participants	9	10	11	4
Sector(s)	Food, Fashion	Technology	Food, Fashion, Technology	Food, Fashion
Position(s)	Sustainable SC Expert, Supply Chain Manager, Procurement Specialist, Sustainability Consultant Researcher	IT/Blockchain Expert, Software Developer, Data Analyst	End-user, Customer Service Representative	Organizational Expert, Operations Manager, Logistics Coordinator, Quality Assurance Specialist
Activity	Producer Manufacturer Supplier	Technology Developer	End-user	Producer, Manufacturer
Upstream/ Downstream	Upstream	Upstream	Downstream	Upstream

4.1 Thematic analysis

Thematic analysis via Atlas.ti revealed distinct blockchain adoption motivations between upstream and downstream actors, reflecting role-specific priorities. Five key themes emerged from coded interviews (N=34). Transparency (T1) refers to how upstream actors prioritize blockchain for enhancing supply chain visibility and operational efficiency. Traceability (T2) is seen as essential for compliance, fraud prevention, and maintaining supply chain integrity. Trust (U) emerged as a theme as downstream actors value blockchain to validate product authenticity and reinforce brand credibility. Reputation (R) was referred to in the context of for end users, brand image holds more power than the underlying technology. Sustainability (S) was a common concern across all stakeholder groups, reflecting industry trends towards responsible sourcing. Blockchain (BC) advantages / disadvantages (B1 and B2) also emerged as a theme. All 4 sets prioritize blockchain advantages (B1) over disadvantages (B2), with blockchain experts (set 2) particularly emphasizing the positive effects of the technology. They focus on benefits such as enhanced transparency and traceability while viewing disadvantages like high energy consumption as manageable through solutions like solar-powered systems. The results of the thematic analysis, by set, can be seen in Table 2. This table indicates the thematic frequencies of each set.

Table 2. Results of thematic analysis. *Source: Author's own*

Code	Key Words	Set 1: SSC Experts	Set 2: BC Experts	Set 3: End Users	Set 4: Org Experts
T1	Transparency	20.2%	21.5%	2.8%	36.5%
T2	Traceability	14.8%	26.6%	3.6%	17%
B1	BC Advantages	9.6%	12.4%	3.2%	9.2%
B2	BC Disadvantages	4.3%	5.3%	2.4%	2.8%
S	Sustainability	21.4%	9.8%	14.8%	10%
U	Trust	9.7%	2.8%	34.9%	5.8%
O	Other technologies	12.6%	18.2%	12.5%	10.7%
R	Reputation	7.4%	3.4%	25.8%	8%
	Total	*100*	*100*	*100*	*100*

Thematic frequencies highlight notable differences in emphasis (See Appendix 1 for a visualization of the thematic analysis). For instance, set 1 and set 4 placed a strong emphasis on transparency (20.2% and 36.5%, respectively), while trust (34.9%) and reputation (25.8%) were most pronounced among set 3 (End-Users). Sustainability (S) also emerged as a significant shared concern, especially among SSC Experts (21.4%) and End-Users (14.8%).

4.2 Selected participant perspectives

To provide deeper insight into the thematic analysis, this section presents direct quotes from participants, highlighting key perspectives from each group. These quotes reflect the qualitative findings and align with the themes identified in Table.

Sustainable Supply Chain Experts (set 1, food, procurement specialist): "We don't use blockchain technology to attract end-users as a marketing tool. Instead, we leverage it internally as a strategic tool to enhance transparency and streamline operations." This reflects the emphasis on transparency (T1, 20.2%) within supply chain management.

Blockchain Experts (set 2, technology, data analyst): "A key disadvantage in blockchain adoption is the shortage of skilled experts. Companies must invest significantly in the initial design and programming of platforms tailored to their market size, product type, and specific requirements." This highlights challenges in blockchain implementation (B2, 5.3%).

End Users (set 3, fashion): "We trust the technologies because it makes shopping faster, especially when companies offer incentives for using their apps." This underscores the role of trust (U, 34.9%) in end-user adoption.

Organizational Expert (set 4, fashion, logistics coordinator): "In our logistics processes, transparency is essential for seamless operations. As coordinators, we align producers and manufacturers to ensure every step is traceable (solving timing issues too)." This emphasizes the importance of transparency (T1, 36.5%) in upstream organizational processes.

4.3 Fuzzy Cognitive Mapping (FCM) insights

Fuzzy Cognitive Mapping (FCM) revealed distinct motivational structures among supply chain actors (Figure 2).

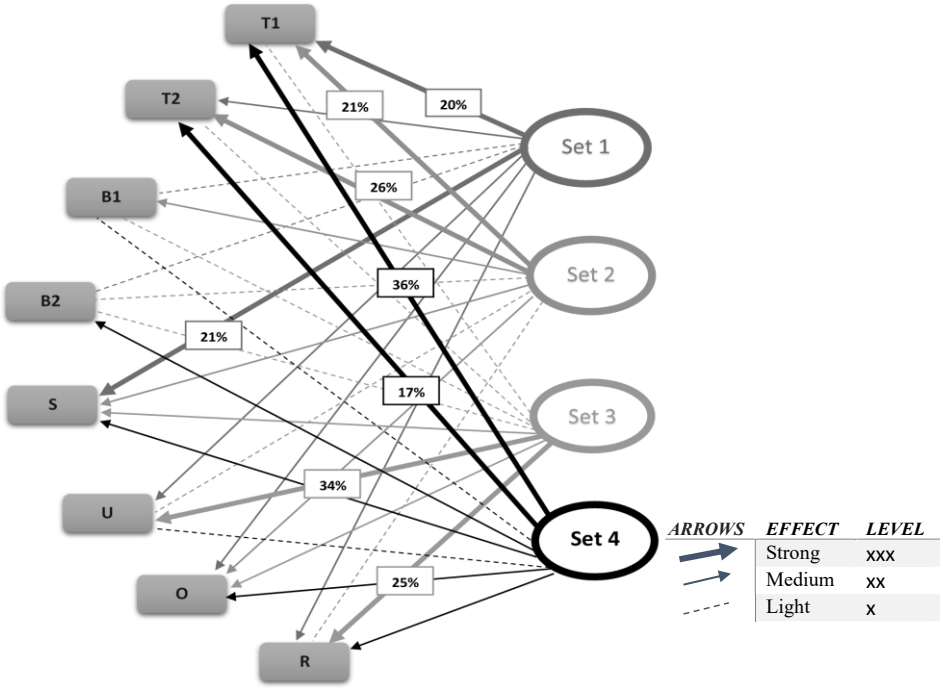

Figure 2. Fuzzy Cognitive Mapping of motivational structures among supply chain actors. *Source: Authors' own*

The mental models of upstream actors exhibited strong interconnections between transparency, traceability, and sustainability, highlighting their focus on operational optimization. In contrast, downstream actors emphasized trust and reputation, associating blockchain more with consumer-facing values than internal efficiencies (Strong Arrows). Upstream participants tended to frame blockchain as a strategic tool for enhancing process optimization, ensuring regulatory compliance, and improving supply chain visibility. Conversely, downstream actors viewed blockchain primarily as a mechanism to enhance credibility and build consumer trust, rather than a means to streamline operations. These findings emphasize the need for differentiated blockchain implementation strategies, tailored to the specific motivations and expectations of upstream and downstream stakeholders within the supply chain.

5. Discussion

This study substantiates the applicability of Arena 1 in the Three Arenas Model (Gharehdaghi & Kamann, 2024a), demonstrating how blockchain adoption is shaped by heterogeneous institutional logics across supply chain actors. Upstream stakeholders (sets 1, 2, and 4) predominantly respond to coercive pressures, particularly regulatory requirements, which is reflected in the prominence of transparency (T1; e.g., 36.5% in set 4) and traceability (T2; e.g., 26.6% in set 2). These themes operationalize compliance-driven visibility and efficiency, aligning with prior evidence on regulation-led adoption (Armitage & Pinter, 2021) and coercive isomorphism (Haugset, 2023). Crucially, the findings refine this perspective by revealing how institutional demands reshape individual mental models (Johnson-Laird, 1983), prioritizing optimization of operations over relational considerations.

In contrast, downstream actors (set 3) are more strongly influenced by mimetic and normative pressures, with trust (U; 34.9%) and reputation (R; 25.8%) dominating their cognitive schemas. This reflects consumer-driven expectations for authenticity and legitimacy, consistent with prior work (Widmier et al., 2023; Saberi et al., 2018). Sustainability (S) emerges as a transversal concern across actor sets (e.g., 21.4% in set 1), underscoring institutionalized ethical norms. Importantly, FCM visualizations show upstream clusters of T1, T2, and S, highlighting role-specific cognitive structures that challenge the explanatory sufficiency of universal adoption models such as TAM (Davis, 1989) and DIT (Rogers, 2003).

A further contribution lies in documenting cognitive evolution. Upstream actors reframed blockchain from an abstract concept into a practical tool through experiential learning (Stylios & Groumpos, 2004; Apostolopoulos & Groumpos, 2023), mitigating biases such as status quo inertia (Taki et al., 2016). The systematic prioritization of advantages (B1) over disadvantages (B2) especially among experts in set 2, who emphasized transparency benefits while countering energy-related concerns through renewable solutions contradicts barrier-centric perspectives (Biswas & Gupta, 2019; Tapscott & Tapscott, 2016). This indicates that expertise serves as a moderator of perception, fostering more balanced evaluations of blockchain's utility.

Overall, the study advances supply chain management research by integrating micro-cognitive processes with institutional pressures, addressing persistent gaps in multilevel frameworks (Gharehdaghi & Kamann, 2024b, 2025; Hu et al., 2023; Xu et al., 2023). By foregrounding dynamic mental mapping, the findings not only illuminate bottlenecks in adoption trajectories but also provide a nuanced theoretical basis for designing differentiated, context-sensitive strategies for blockchain integration.

6. Implications

The results of the thematic analysis and FCM generate substantive theoretical and practical implications for blockchain adoption, grounded in Institutional Isomorphism (DiMaggio & Powell, 1983) and mental model theory (Johnson-Laird, 1983) within Arena 1 of the Three Arenas Model (Gharehdaghi & Kamann, 2024a).

The divergence in actor motivations is central. Upstream groups emphasize transparency (T1) and traceability (T2) with set 4 highlighting compliance-driven visibility and set 2 stressing supply chain integrity while downstream actors prioritize trust (U) and reputation (R), as in set 3's emphasis on consumer authentication. These distinctions extend isomorphism theory by demonstrating how coercive, mimetic, and normative pressures are internalized at the cognitive level, addressing limitations of macro-oriented frameworks such as TAM (Davis, 1989) and DIT (Rogers, 2003). FCM analyses further illustrate the structural salience of T1, T2, and sustainability (S) among upstream actors, while downstream mappings privilege relational legitimacy, thereby enriching prior FCM applications (Kosko, 1986; Stylios & Groumpos, 2004). Moreover, the consistent preference for advantages (B1) over disadvantages (B2), particularly among expert actors (set 2), challenges barrier-centric literature (Biswas & Gupta, 2019) and underscores the moderating role of expertise in attenuating cognitive inertia (Taki et al., 2016). These insights offer a fine-grained, micro-cognitive complement to multilevel adoption models (Saberi et al., 2018; Widmier et al., 2023).

The results provide actionable guidance for stakeholders. For upstream actors (sets 1, 2, and 4), where transparency and traceability dominate, blockchain-integrated ERP systems should be deployed to automate compliance and enable real-time monitoring for example, food safety audits (organic certification verification) or ethical sourcing in fashion supply chains. Such applications simultaneously address coercive pressures and enhance efficiency (Armitage & Pinter, 2021). For downstream actors (set 3), where trust and reputation prevail, consumer-facing applications such as QR code–enabled verification of product histories can bolster authenticity and brand value, responding to mimetic competition (Widmier et al., 2023).

Sustainability (S), consistently salient across actor groups, demands shared platforms that enable verifiable reporting of environmental and social practices, such as blockchain-based carbon tracking, in line with normative expectations (Fany, 2022). Cognitive barriers should be addressed through targeted training programs for sets 1 and 4, reframing disadvantage-related concerns (B2) by demonstrating mitigation strategies (e.g., renewable-powered blockchain nodes), leveraging learning effects documented in FCM (Apostolopoulos & Groumpos, 2023). Policymakers should pursue sector-specific frameworks: coercive regulation for food (safety-driven traceability), normative certification schemes for fashion (sustainability-linked standards), and mimetic incentives for technology sectors (trust-focused data security), thereby reducing adoption barriers (Haugset, 2023). Technology developers, in turn, should prioritize intuitive design, such as FCM-enabled dashboards simulating adoption scenarios, to bridge cognitive gaps between expert (sets 1,2,4) and non-expert (set 3) stakeholders, thereby accelerating integration across supply networks.

7. Conclusions and future research directions

This study reveals that blockchain adoption is not driven by uniform incentives but rather by divergent motivations shaped by stakeholder roles. Upstream actors emphasize transparency and traceability as tools for compliance and operational efficiency, while downstream actors value trust and reputation to enhance consumer confidence. These distinctions were validated through both Fuzzy Cognitive Mapping, underscoring the presence of differentiated mental models, and institutional influences.

The implications of this study are twofold: first, implementation strategies must align with stakeholder-specific priorities, and second, sector-based regulatory and design frameworks are essential for fostering adoption. Ultimately, blockchain's transformative potential lies not merely in its technical features, but in its ability to embed ethical, transparent, and accountable practices into global supply chains.

This study is subject to several limitations. First, while it spans multiple industries, the motivations for blockchain adoption may differ by sectoral priorities e.g., food focuses on safety and traceability, fashion on ethics and reputation, and technology on data integrity. Second, the cross-sectional design captures stakeholder perceptions at a single time point. Although cognitive shifts were noted, these observations would benefit from a longitudinal approach to systematically trace mental model evolution. Future studies should also explore how sector-specific institutional pressures evolve and affect blockchain adoption trajectories over time.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

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Appendices

Appendix 1. Visual representation of thematic analysis of blockchain adoption motivations. *Source: Author's own*