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From Micro to Meso-Level Blockchain Adoption: Redefining Supply Network Dynamics and Collaboration

Thesis Summery

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1. Introduction

In recent years, blockchain technology has gained widespread attention for its transformative potential across various industries. Within the domain of supply chain management, blockchain presents an unparalleled opportunity to revolutionize traditional practices by addressing critical issues such as lack of transparency, limited traceability, and inefficiencies in data sharing. By leveraging blockchain's decentralized and immutable ledger, supply chains can increase trust among stakeholders, reduce the risk of fraud, and optimize operations across complex networks. These features are particularly relevant in industries where accountability and real-time data are paramount, such as food safety, pharmaceuticals, and automotive manufacturing.

Its evident promise, the adoption of blockchain technology in supply chains is neither uniform nor straightforward. Organizations face a diverse array of challenges and considerations when deciding whether to implement blockchain-based solutions. These decisions are influenced by a combination of factors, including individual perceptions of utility, organizational readiness, regulatory environments, and sector-specific demands. The intricate nature of these factors often leads to significant variations in adoption rates across industries and geographic regions.

This research seeks to unravel the complexities underlying blockchain adoption in supply chains, providing a nuanced understanding of the motivations, barriers, and decision-making processes involved. It aims to investigate how individual actors, organizational entities, and sectoral dynamics converge to shape blockchain implementation. By adopting a mixed-methods approach, the study will explore the interplay between *micro-level* motivations of individual actors, *meso 1-level* organizational strategies, and *meso 2-level* power dynamics at a broader institutional level. Through this comprehensive examination, the research aspires to generate actionable insights and theoretical frameworks that advance both academic and practical understanding of blockchain adoption.

The scope of the study extends beyond a singular lens, exploring blockchain adoption from multiple perspectives to provide a holistic view. At the individual level, the research delves into personal attitudes, perceptions, and behavioral drivers that influence decisions regarding blockchain. At the organizational level, it examines how internal policies, resource availability, and strategic priorities affect the decision-making process. At the sectoral level, the study investigates external pressures such as

market trends, regulatory frameworks, and competitive dynamics that drive or hinder adoption.

The results of this study will contribute to the academic conversation on blockchain technology in supply chains while providing actionable insights for businesses facing the hurdles of digital transformation. By identifying the critical factors that influence blockchain adoption and understanding their interdependencies, the study will provide organizations with a clearer roadmap for implementation. The development of a comprehensive adoption framework applicable across diverse industries will contribute to bridging the gap between theory and practice, enabling more informed decision-making in the era of supply chain digitization.

1.1. Research Plan

This study adopts a rigorous, multi-dimensional research design to examine blockchain adoption within sustainable supply chains across multiple industries. Framed by a three-arena model Micro (individual), Meso1 (organizational), and Meso2 (sectoral) the research investigates how adoption decisions are shaped at each level and how these layers interact. Distinct from adaptation, which modifies technology, adoption here refers to the acceptance and implementation of blockchain solutions (Greenhalgh et al., 2017).

The research emphasizes four core dimensions to guarantee depth, breadth, and contextual sensitivity: (1) Stakeholder inclusivity, engaging a wide range of actors such as farmers, designers, IT professionals, and regulators; (2) Cross-level feedback loops, integrating insights across individual, organizational, and sectoral layers to refine adoption strategies; (3) Industry adaptability, tailoring the analytic model to context-specific needs of sectors like food, fashion, automotive, and pharmaceuticals; and (4) Multi-method validation, employing both qualitative (interviews, focus groups) and quantitative (Surveys, Analytic Hierarchy Process) techniques to strengthen robustness.

In addressing the intricate dynamics of blockchain implementation, the study critically evaluates trade-offs between innovation and sustainability, particularly the energy demands of different consensus mechanisms (e.g., Proof of Work vs. Proof of Stake). This combined, mixed-methods approach guarantees that the conceptual model created is both empirically supported and adaptable across various industries, providing both theoretical progress and practical insights for driving sustainable supply chain change.

1.1.1. Research Objectives

The primary objectives of this research are to develop a comprehensive, multi-level understanding of blockchain adoption in sustainable supply chains. The study investigates the diverse drivers, barriers, and impacts of blockchain implementation across major sectors including food, fashion, and automotive, while analyzing how adoption unfolds at the micro (individual), meso1 (organizational), and meso2 (sectoral) levels.

At the micro level, the research examines how trust, perceived costs, and technological literacy influence individual decision-making, with a particular focus on food and fashion contexts. Organizational dynamics are explored through the lens of strategic alignment, regulatory compliance, and resource availability, using surveys and the Analytic Hierarchy Process (AHP) to quantitatively assess adoption enablers and inhibitors. At the sectoral level, focus groups are employed to uncover broader influences such as power asymmetries, market pressures, and legal frameworks.

The study critically assesses the sustainability implications of blockchain, contrasting the environmental footprints of different consensus mechanisms (e.g., Proof of Work vs. Proof of Stake) to evaluate their alignment with circular economy principles and low-carbon goals. It evaluates the technological maturity and operational viability of blockchain applications across various industries to inform best practices.

This research culminates in the development of an integrated, multi-sectoral adoption framework that provides practical guidance for policymakers and practitioners seeking to embed blockchain into sustainable supply chain strategies.

1.1.2. Research Methodology

To address the research objectives, this study is structured around a three-level analytic framework: micro-level (individual actors), meso 1-level (organizational dynamics), and meso2-level (sectoral influences). A mixed-methods approach, combining both qualitative and quantitative techniques, is used to provide a thorough understanding of blockchain adoption and support empirical generalizability.

Phase 1: Micro-Level Analysis (Individual Actors)

Data Collection: Qualitative - Interviews (FCM)

This study employs a qualitative grounded theory methodology to explore the personal attitudes, perceptions, and behavioral factors influencing blockchain adoption within

supply chain management across industries such as food, fashion, and tech. Through semi-structured interviews with stakeholder's supply chain managers, IT professionals, and end users the research identifies themes like perceived benefits, trust, transparency, and technological challenges. Data analysis is conducted using Atlas.ti, applying a rigorous iterative coding process (open, axial, and selective coding) to uncover significant themes and relationships. Additionally, research hypothesis testing is incorporated to quantify and validate key findings, while a Fuzzy Cognitive Map (FCM) is introduced to model the complex interdependencies between factors such as trust, transparency, and reputation, offering a comprehensive understanding of the micro-level drivers of blockchain adoption in supply chains.

Phase 2: Meso 1-Level Analysis (Organizational Dynamics)

Data Collection: Quantitative - Surveys Questioners (AHP)

The objective is to quantitatively assess the organizational factors influencing blockchain adoption and analyze the decision-making frameworks used by companies. Data will be collected through a large-scale survey targeting organizations across Europe, the USA, Canada, Turkey, and Dubai, representing diverse sectors for comparative analysis. The survey design will be informed by insights from Phase 1, ensuring that key organizational dynamics are captured. A 3-point scale will be used to rate factors, facilitating straightforward comparisons while minimizing emotional biases. The Analytic Hierarchy Process (AHP) will be employed to conduct structured pairwise comparisons of organizational factors, minimizing socially desirable response biases by focusing on the relative importance of each factor.

Phase 3: Meso 2-Level Analysis (Sectoral Power Influences)

Data Collection: Qualitative - Focus Groups Discussions (Triangulation)

Employs a qualitative, to explore how sector-specific power dynamics impact blockchain adoption across industries. This phase focuses on understanding the influence of regulatory challenges, market pressures, and hierarchical structures particularly between MNCs and SMEs on technology adoption. Data is collected through semi-structured interviews and focus group discussions (FGDs) with decision-makers from various sectors, ensuring a broad and diverse range of perspectives. Five focus groups, each with 4–6 participants, provide in-depth insights into the external and internal forces shaping adoption. The analysis uses Atlas.ti for thematic coding and

interpretation, allowing for the identification of key patterns and relationships. By applying a triangulation strategy, the study integrates qualitative findings from interviews, FGDs, and Arena 2 survey data to cross-validate results and enhance interpretive reliability. This combination of Atlas.ti analysis and triangulation create a robust framework for understanding blockchain adoption dynamics, while also enabling a nuanced exploration of how sectoral, geographical, and gender-related factors influence individual and organizational adoption decisions.

2. Research Background

2.1. Blockchain Technology Role in Sustainable Supply Chains

Blockchain technology is playing an increasingly transformative role in supporting sustainable, transparent, and ethical supply chains, particularly in the food and fashion sectors. Its decentralized ledger and immutable data structures directly address pressing challenges such as food fraud, textile waste, and counterfeiting issues that result in billions of dollars in annual losses (Cui et al., 2023; Aslam et al., 2023). In the food industry, blockchain improves traceability and reduces waste, as demonstrated by implementations like Carrefour's inventory tracking and Walmart's IBM Food Trust platform. (Li et al., 2022). In the fashion sector, blockchain supports ethical sourcing and transparency, as seen in initiatives by Stella McCartney and Provenance, which authenticate supply chain origins (Ding et al., 2023; Bhatia & Albarrak, 2023). The integration of smart contracts, digital certificates, and real-time data improves operational efficiency and strengthens consumer trust (Christidis & Devetsikiotis, 2016).

Blockchain adoption is restricted by high implementation costs, technical complexity, and fragmented regulations, obstacles that are particularly challenging for small and medium-sized enterprises (SMEs) and in widely spread supply chains (Chandan et al., 2023). Sustainability benefits are evident, particularly through consensus mechanisms like Proof of Stake (PoS), which significantly reduce energy consumption compared to Proof of Work (PoW) .PoW requires significant energy and infrastructure, making it unsustainable for many applications, while PoS supports scalable, low-energy models that better align with traceability and environmental goal (Wang et al., 2023; Zheng et al., 2017).

The path to adoption requires carefully managing the balance between transparency and data privacy. Blockchain platforms such as IBM Food Trust and VeChain address these concerns by employing permissioned access models and zero-knowledge proofs,

which protect sensitive information *even as* they maintain traceability (Brown & Taylor, 2016). Behavioral and organizational barriers including resistance to change and perceived technological complexity continue to hinder adoption, particularly among smaller firms. These challenges are gradually being mitigated through institutional support, targeted training, and the development of user-centric systems (Shahzad et al., 2023; Latha et al., 2023).

The success of blockchain in supporting sustainable supply chains will depend on technological innovation and the creation of inclusive governance structures and cross-sector collaboration (Zheng et al., 2018).

2.2. Challenges and Opportunities in Technology Integration

Digital technologies such as blockchain, IoT, AI, and cloud computing are reshaping modern supply chains in the food and fashion industries, enhancing transparency, efficiency, and sustainability (Adebayo & Kırıkkaleli, 2021; Adomako & Nguyen, 2023). Companies like Walmart, De Beers, and LVMH have used blockchain to combat fraud, improve traceability, and tackle ethical and environmental issues (Cui et al., 2023; Lindner et al., 2023; Musamih et al., 2023).Widespread integration remains challenged by cybersecurity risks, a lack of standards, limited technical skills, and resistance to change particularly among SMEs (Huang & Zhao, 2022; Rogers & Srivastava, 2021).

In food, contamination and waste persist; in fashion, concerns around labor practices and emissions dominate. Circular models and digital solutions, such as Patagonia's *Worn Wear* and *IBM Food Trust*, are emerging to address these issues (Geissdoerfer et al., 2017; Seif et al., 2023). As Gen Z and millennial consumers demand greater transparency, brands increasingly rely on certifications, QR codes, and predictive analytics to build trust (Jain et al., 2023; Shahzad et al., 2023). Yet adoption hurdles remain, including interoperability issues, data reliability, and high costs calling for collaborative standards, strong governance, and targeted training (Cacciamani et al., 2021; Chandan et al., 2023).

These barriers, digital transformation offers a clear path toward more resilient and ethically aligned supply chains that meet both market and regulatory expectations (Martínez-Peláez et al., 2023; Hagiu & Wright, 2023).

2.3. Individual vs. Organizational Adoption Factors

Blockchain adoption in sustainable supply chains (SSCs) is driven by trust, stakeholder perceptions, and institutional pressures. SSCs aim to balance environmental, social, and economic goals across interconnected actors (Khan et al., 2022). Blockchain builds trust through transparent, tamper-proof records that improve traceability and reduce fraud (Buterin, 2015; Liao & Vaughan, 2023). This trust operates at both interpersonal and organizational levels shaped by relationships, certifications, and shared standards.

Stakeholders have varying perspectives: IT managers typically emphasize automation, supply chain leaders prioritize traceability, while smaller suppliers may oppose due to costs or established habits (Schilling & Seuring, 2023; Schwenteck et al., 2023). Organizations adopt blockchain to meet goals like resilience and CSR, responding to regulatory pressure and consumer demand (Saberi et al., 2018; Liu et al., 2023). Individuals might hold back because of complexity or immediate concerns (Lee, 2023).

Legacy systems and cultural inertia the "shadow of the past" can hinder progress (Musamih et al., 2023), although future-oriented pressures, such as transparency and regulation, can spur adoption (Muldoon et al., 2023). Leadership and power dynamics play a crucial role, underscoring the need for inclusive strategies to fully realize blockchain's potential in ethical supply chains (Ramasami et al., 2023; Sharma et al., 2023).

3. Problem statement

Blockchain can improve transparency, traceability, and efficiency in sustainable supply chains (SSCs). Its adoption remains inconsistent, limited by fragmented research and real-world challenges. Industries like food, fashion, and automotive have shown clear benefits, from Walmart's traceable produce to Gucci's anti-counterfeit efforts (Ramasami et al., 2023; Sharma et al., 2023) implementation is often slowed by technical, organizational, and contextual challenges.

Most existing studies focus on isolated factors whether micro-level trust, meso-level organizational readiness, or macro-level regulation without fully exploring how these elements interact (Khan et al., 2022; Brown & Taylor, 2024). Five significant gaps remain: the lack of integrated multi-level models; limited sector-specific insights; minimal analysis of cross-level dynamics; underexplored non-technical drivers like trust and policy (Zheng et al., 2018; Saberi et al., 2018); and a shortage of practical frameworks for adoption (Ryu & Sueyoshi, 2021).

This thesis addresses these gaps by developing a holistic model that links stakeholder perspectives, contextual variables, and adoption drivers across individual, organizational, and industry levels offering both theoretical contributions and actionable guidance for more ethical, transparent, and resilient supply chains.

4.Theorical framework

Isomorphism Theory

Institutional isomorphism provides a valuable lens to understand how external pressures shape organizational behavior in supply chain management. Organizations are influenced by three interrelated arenas technological, regulatory, and professional each exerting distinct forces that often lead to convergence in practices across industries (Phin, Zámborský, & Kruesi, 2023).

1. The Technological Arena: Innovation Through Mimetic Isomorphism

In uncertain environments, firms often adopt new technologies by imitating industry leaders, a process known as mimetic isomorphism. This is particularly evident in the adoption of emerging tools like blockchain, AI, and automation, where companies follow peers rather than relying solely on independent evaluation (Zheng et al., 2017). This imitation lowers perceived risk and allows firms to stay competitive, creating a bandwagon effect (Gaol & Wahyudi, 2023).

2. The Regulatory Arena: Compliance Through Coercive Isomorphism

Coercive isomorphism arises from legal, governmental, and institutional requirements. Unlike mimetic pressures, these are not optional organizations must comply with regulations to maintain legitimacy and operational continuity (Chughtai et al., 2021). In supply chains, this includes adapting to evolving sustainability mandates, labor laws, and environmental standards (Roxani et al., 2023).

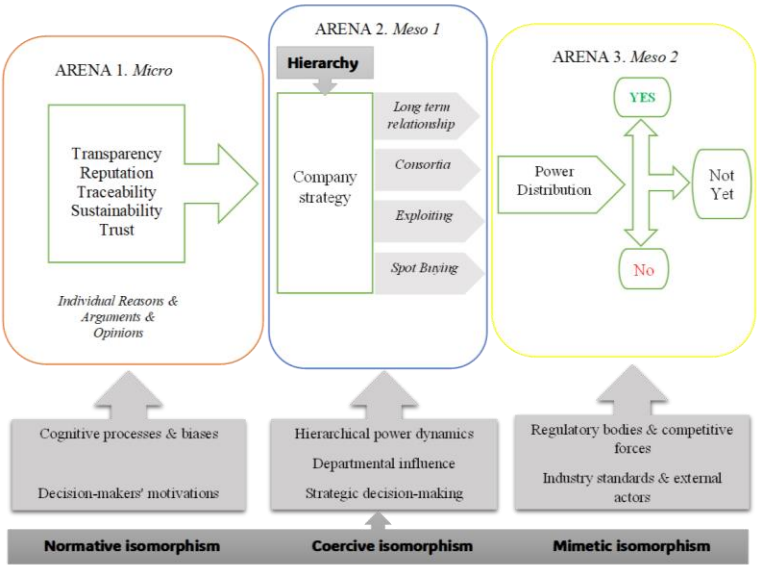
3. The Professional Arena: Ethical Legitimacy Through Normative Isomorphism

Normative isomorphism is shaped by shared professional values, industry norms, and institutional education. These pressures push companies to adopt sustainability and CSR initiatives not from competition or regulation, but to uphold ethical standards and align with the expectations of their professional networks (Kashem & Haque, 2014; Javaid et al., 2022). This form of influence enhances legitimacy and reinforces a firm's reputation in its sector.

5.Research Questions

RQ1:	**Given the blockchain capabilities, what is the motivation for actors to adopt the technology within supply networks?**
RQ1a:	What motivates upstream actors to adopt blockchain technology?
RQ1b:	What motivates downstream actors to adopt blockchain technology?
RQ1c:	How do differences in supply chain roles and responsibilities influence the adoption of blockchain technology?
RQ1d:	What external pressures (e.g., regulations, market competition) drive blockchain adoption in upstream and downstream supply chain actors?
RQ2:	**What goes on in the mind of the individual decision maker?**
RQ2a:	What factors (external / internal) affect the individual decision-maker's choice to adopt blockchain?
RQ2b:	What are the key arguments for and against adopting blockchain technology in the supply chain?
RQ3:	**Which factors are persuasive for participants to insert the required strategic information?**
RQ3a	How do economic and reputational factors influence the sharing of strategic information?
RQ3b	How does competitive pressure affect the willingness to share information?
RQ4:	**How does blockchain adoption contribute to sustainability goals in supply chains?**
RQ4a:	How does blockchain improve transparency and traceability of sustainable practices in supply chains?
RQ4b:	To what extent do stakeholders view blockchain as a tool for meeting sustainability requirements, such as ethical sourcing and energy consumption reduction?

Table 1. Research Questions



Model 01: The 3 Arenas Model

(Gharehdaghi & Kamann 2024)

6.Empirical research

This chapter presents the empirical findings of the study, based on a mixed-methods approach designed to uncover the main factors influencing blockchain adoption in supply chains. The research was conducted in three phases: a qualitative phase involving interviews with blockchain and supply chain experts to identify critical adoption factors; a quantitative phase where a survey validated and quantified these findings across a broader sample; and focus group discussions to triangulate and further explore the dynamics shaping blockchain adoption. The study follows *Model 01*, with three arenas: Arena 1 (Micro-level), focusing on individual actors' perceptions and decision-making; Arena 2 (Meso-level), examining organizational interactions and structures; and Arena 3 (Meso-level), investigating higher-level strategic decision-makers and external market forces. This layered design provides a comprehensive view of blockchain adoption across individual, organizational, and sectoral levels

(Gharehdaghi & Kamann 2024a). The inherent challenges in data collection and integration, the mixed-methods approach strengthens the study's depth, reliability, and relevance. By combining statistical analysis with rich qualitative insight, the research provides a nuanced understanding that informs both theory and practice in the evolving field of blockchain-enabled supply chains.

6.1 Arena 1: Micro Level (Individual actors)

The Genesis of Decision Makers' Mental Maps: Human decision-making is shaped by subjective mental maps, influenced by personal experiences and social conditioning. These mental maps prioritize information based on its relevance, with each individual's worldview guided by a unique reference model shaped by their social environment or "habitus" (Bourdieu, 1972). The habits, a "structured structuring structure" (Bourdieu, 1977), determines how individuals approach familiar problems and how they address new, complex challenges. The behaviors and decisions made by individuals are rooted in these structured experiences, which can be influenced by educational institutions, organizational cultures, and broader societal norms (Bakker & Kamann, 2007).

Methodology: This study employed a qualitative research design to deeply explore the human dimensions of blockchain adoption across industries, focusing on stakeholder perceptions, experiences, and concerns. Data was collected through semi-structured and peer-to-peer interviews with 34 diverse participants from sectors like food and fashion, including both upstream and downstream actors, as well as experts in blockchain and sustainable supply chains. Using Atlas.ti, the analysis followed an iterative coding process open, axial, and selective to identify and refine key themes such as transparency and data privacy. These themes highlighted differing stakeholder priorities, offering critical insights into the complex dynamics shaping blockchain integration.

Results (Data Analysis and Key Themes): The interviews highlighted crucial factors for blockchain adoption, with analysis conducted using Atlas.ti to identify recurring patterns. Major themes emerged around transparency, traceability, and sustainability for managers; technical challenges and advantages for IT managers; and trust and reputation for consumers. Four distinct sets of perspectives were identified: sustainability experts emphasized ecological and social sustainability; blockchain experts highlighted transparency, traceability, and technological integration; end-users prioritized trust and reputation; and organizational experts considered operational efficiency and cost-effectiveness.

Fuzzy Cognitive Mapping: Fuzzy Cognitive Mapping (FCM) was used to visualize relationships and interdependence among adoption factors. Using the Mental Modeler software, the FCM model revealed that upstream actors prioritize transparency and traceability, whereas downstream actors focus on trust and reputation. It illustrated the "push-and-pull dynamics" in blockchain adoption, showing that technological benefits such as transparency attract upstream stakeholders, whereas ethical practices, sustainability, and reputation drive downstream adoption.

Analysis of Main Motivations

Different sets of actors emphasized different factors:

Set 1 (Sustainable Supply Chain Experts): Transparency (20.2%), traceability (14.8%), and sustainability (21.4%) were primary drivers.

Set 2 (Blockchain Experts): Transparency (21.5%) and traceability (26.6%) were central, with a focus on technological capabilities and future sustainability.

Set 3 (End-user Customers): Trust (34.9%) and reputation (25.8%) were top priorities, followed by a lesser emphasis on transparency (2.8%) and traceability (3.6%).

Set 4 (Organizational Experts): Transparency (36.5%) and traceability (14.8%) were significant, alongside operational efficiency and cost-effectiveness.

Main Conclusions from the FCM Model

The FCM model confirmed that upstream actors are primarily driven by transparency, whereas downstream actors are motivated by trust and reputation. The "push-and-pull" dynamics identified in the model show how the emphasis on transparency in upstream actor’s contrasts with the downstream focus on ethical practices and brand reliability.

	Hypotheses
	Hypotheses Related to Upstream Actors:
H1:	Upstream actors prioritize transparency and traceability as key drivers for blockchain adoption.
	Hypotheses Related to Downstream Actors:
H2:	Downstream actors prioritize trust and reputation in blockchain adoption.
H3:	Downstream actors' decision-making regarding blockchain adoption are significantly influenced by perceived reputation of the platform's providers.
H4:	Downstream actors are more likely to adopt blockchain technology when trust and reputation are effectively communicated and reinforced.
	Hypotheses Related to the Fuzzy Cognitive Map (FCM):
H5:	The FCM will demonstrate significant differences in the hierarchical importance of factors influencing decision-making between upstream and downstream actors.

Table 2. Research Hypotheses

Validation of the Research Hypotheses: The FCM model visually reinforced the research hypotheses, highlighting the distinct motivations of upstream and downstream actors (*Table 2*). Upstream actors prioritize technical advantages like transparency, whereas downstream actors focus on consumer trust and reputation highlighting the need for blockchain strategies that align with stakeholder expectations.

Linear Structural Equation Modeling: LISREL was used to complement the FCM model and further analyze complex relationships between observed and latent variables. This method helped refine the theoretical framework by offering a quantitative perspective on how crucial factors interact and influence blockchain adoption, balancing the qualitative depth with statistical rigor.

Discussion of Significance and Practical Implications: The findings underscore the importance of trust, transparency, and sustainability in blockchain adoption, aligning with existing research. The study outlines the need for blockchain strategies that accommodate the diverse priorities of upstream and downstream actors, emphasizing

the role of consumer trust in driving adoption. The research suggests that addressing these varied motivations is critical for successful blockchain implementation.

Micro-Level Revolution: This research reveals the "Micro-level revolution" behind blockchain adoption, focusing on the motivations, perceptions, and cognitive shifts of individual decision-makers. The FCM model and hypotheses validation provide insights into how personal mental maps and social conditioning shape blockchain adopt at the Micro-level within supply chains, offering a deeper understanding of the human aspects involved**.**

6.2 Arena 2: Meso-1, Organizational Level

The Battle of the Egos: Hierarchy in decision-making: The adoption of technologies, such as blockchain, within companies is influenced by power structures across different functions like Finance, Marketing, HRM, Purchasing, and Production. These power dynamics are shaped by organizational hierarchy, where Finance and Marketing tend to hold the most influence, whereas Purchasing is often seen as the least influential.

Methodology: This study aimed to investigate the perceived influence of five organizational departments Finance, Marketing, Purchasing, Production, and Human Resource Management (HRM) on decision-making processes across 10 organizational scenarios. The perceived influence was defined as the extent to which respondents believed each department contributed to shaping decisions in different contexts. Survey participants from diverse sectors evaluated departmental influence for each scenario, selecting the department they perceived as having the greatest impact. The percentage values for each department's perceived influence were calculated and analyzed using Microsoft Excel, which served as the primary tool for data processing throughout the study.

Data Collection and Analysis: In conclusion, the application of a tailored Analytic Hierarchy Process (AHP) in this study provided a robust framework for evaluating the perceived influence of five organizational departments Finance, Marketing, Production, Human Resource Management (HRM), and Purchasing across diverse decision-making scenarios. By streamlining the AHP with a simplified three-point scale and processing 156 participant responses through systematic pairwise comparisons, the study effectively quantified departmental influence, with Finance emerging as the most

influential (29.03%), followed by Marketing (22.24%), Production (19.13%), HRM (16.68%), and Purchasing (12.90%). The use of Microsoft Excel for data analysis ensured precision in calculating normalized scores and percentage influences, culminating in a clear hierarchical model that enhances understanding of departmental roles in strategic decision-making. This methodology not only offers transparency and reproducibility but also provides valuable insights for organizations seeking to optimize decision-making processes by leveraging departmental strengths.

Discussion of Significance and Practical Implications: Strategic decision-making, Finance and Marketing's influence on technology adoption decisions reinforces the need for strategic arguments that resonate with these departments. The low influence of HRM and Purchasing suggests that their ideas may require the backing of more powerful departments, like Finance, to be successful.

Conclusion: The "Battle of the Egos": The study emphasizes the importance of understanding internal power dynamics when adopting new technologies like blockchain. A more inclusive decision-making process that considers underrepresented functions can promote a more balanced and effective implementation strategy (Gharehdaghi & Kamann 2025).

6.3 Arena 3: Meso-2, the Network Level

Typology of Networks: Once a company establishes its external strategies (procurement, marketing, operations), it becomes part of a larger network. Companies often interact with different types of networks simultaneously, including:

Long-term relational networks: Stable, trust-based partnerships.

Consortia with short-term relations: Temporary alliances for specific projects.

Exploitative networks: One-sided relationships for unilateral gain.

Volatile spot-buying networks: Short-term transactions driven by immediate needs.

These varied relationships create a complex web that influences how blockchain adoption is approached within supply chains.

Power and Uniqueness: Power dynamics play a significant role in blockchain adoption. Factors such as company size, market share, product uniqueness, and strategic positioning determine a company's ability to influence decisions within a network. Larger companies often push for blockchain adoption, while smaller players may face resistance or limited ability to drive change.

Methodology: This study employed a qualitative, two-phase methodology to explore network-level dynamics influencing blockchain adoption in supply chains, emphasizing depth, validity, and triangulation. Data were collected through five focus group discussions (N = 5 FGDs, P = 21) with diverse participants selected across sectors, regions (Netherlands, Hungary, Germany, Turkey), company sizes, and gender. Atlas.ti was used for data analysis, with an inter-coder agreement of 85% ensuring reliability. Findings were triangulated with prior Arena 1 and Arena 2 analyses and existing literature, enabling robust, context-rich insights into how various organizational and cultural factors shape blockchain adoption. FGD transcripts were analyzed using Atlas.ti through inductive coding (open, axial, and selective), and patterns were quantified using frequency and co-occurrence metrics. These coded themes were then converted into binary variables to build a multivariable logistic regression model.

Focus Group Findings

Companies often feel pressured to accept unfavorable terms because of financial dependency or imbalances in market power, which strains relationships and trust.

Manifestations of Arrogance: Unilateral decision-making or unrealistic demands by powerful actors can damage relationships.

Power Dynamics: Power imbalances can increase efficiency but may also result in resentment and disengagement from less influential participants.

Key Findings on Blockchain Adoption

Power Asymmetry: Larger corporations tend to avoid blockchain for the sake of stability, while smaller firms are more adaptable but lack negotiation power.

Company Size: Larger firms have resources for blockchain but may resist, while smaller firms struggle with resources and negotiating power.

Strategic Network Positions: Main players, such as suppliers or distributors, can drive adoption, whereas weaker players face significant barriers.

Individual Characteristics: Leadership traits like risk tolerance and openness to innovation influence blockchain adoption.

Relevance for Blockchain Adoption: The study emphasizes that the success of blockchain adoption relies heavily on managing power dynamics and promoting clear, symmetrical communication. The power of larger players can either facilitate or obstruct adoption, and a deeper understanding of network dynamics is crucial for overcoming barriers.

Practical Implications: The study suggests that blockchain adoption requires collaborative frameworks to address power imbalances. By promoting mutual respect, transparent communication, and aligning leadership priorities with broader network goals, companies can improve blockchain adoption and overcome systemic challenges.

Conclusion: The study emphasizes the importance of understanding organizational, cultural, and individual factors in network dynamics. Power asymmetries can either accelerate or hinder blockchain adoption, so fostering collaboration and equitable partnerships is critical. The findings contribute valuable insights into overcoming barriers to blockchain implementation and provide actionable recommendations for firms to leverage blockchain's transformative potential across interconnected supply chains (Gharehdaghi & Kamann 2024b).

7.Research findings

This study explores the adoption of blockchain technology in supply chains using a mixed methods approach, guided by a holistic model that integrates three distinct arenas of focus (*Model 01*). Drawing on institutional isomorphism, the research examines how external pressures influence firms' strategies, with particular emphasis on how past practices and future expectations shape adoption decisions.

The first arena of focus (*Qualitative*) involves in-depth interviews and case studies, shedding light on factors such as industry norms and competitive pressures (mimetic isomorphism) that drive blockchain adoption. The second arena (*Quantitative*) utilizes statistical analysis across different sectors to measure the impact of various isomorphic pressures coercive, mimetic, and normative on blockchain adoption. This analysis reveals sector-specific influences, with finance and marketing sectors being more strongly influenced by coercive and mimetic pressures, whereas human resources management (HRM) and purchasing are more shaped by normative isomorphism (Gharehdaghi & Kamann 2025).

The third arena (*Qualitative*) further investigates power dynamics within supply chain hierarchies through focus groups, illustrating how influential actors impact adoption decisions. By triangulating findings across these three arenas within the context of the holistic model, this research offers a comprehensive understanding of blockchain adoption in supply chains. It provides valuable insights for both theoretical development and practical implementation, highlighting the diverse factors that drive and challenge blockchain integration across diverse supply chain contexts (Gharehdaghi & Kamann 2024b).

7.1. Novelty of the Research Summary:

This research makes several innovative contributions to the study of blockchain adoption in supply chains. First, it integrates institutional isomorphism with a temporal framework that incorporates both the "shadow of the past" (such as legacy systems and organizational culture) and the "shadow of the future" (including competitive pressures and anticipated benefits), providing a dynamic perspective on the adoption process. Second, it uses a mixed-methods approach to conduct a multi-sector comparative analysis, broadening the generalizability of the findings across various industries and countries.

Additionally, the study addresses the role of power dynamics within the supply chain hierarchy, exploring how important stakeholders influence adoption decisions, an aspect that has been largely underexplored in previous research. The study further refines the measurement of isomorphic pressures, adapting it to the unique context of blockchain adoption in supply chains. Lastly, by adopting a cross-national data

collection approach, the study deepens the analysis by accounting for how different national and cultural contexts shape blockchain adoption patterns.

Together, these innovations contribute to theoretical development in this field and offer valuable practical insights for businesses and policymakers.

7.2. Limitations and Challenges Summary:

Research is innovative, it faces several challenges. *Methodologically*, integrating qualitative and quantitative data from diverse contexts is complex, requiring careful interpretation to avoid inconsistencies. Data collection across multiple countries introduces challenges related to language, culture, and regulatory differences, which may impact comparability and bias. Measuring isomorphism accurately is challenging, as it demands valid and dependable proxies for abstract concepts such as industry standards and competitive forces. The study's focus on power dynamics requires careful handling of potential biases in data collection and analysis. Data limitations, such as access to reliable blockchain adoption statistics, sampling bias, and ensuring the quality of qualitative data across different cultural settings, pose additional challenges. The complexity of *applying institutional theory* to blockchain adoption in a dynamic context also requires careful consideration of its limitations. *Practical challenges* include resources and time constraints, ethical considerations when conducting research in diverse cultural settings. These challenges, addressing them through robust research design and careful data analysis will strengthen the research's credibility and contribution to the field.

8.Future of study

I. Extending the Theoretical Framework:

Resource Dependence Theory: Integrating this theory could provide insights into how reliance on specific technologies or suppliers influences blockchain adoption.

Institutional Logics: Future studies could explore how different institutional logics (e.g., market, regulatory, social responsibility) interact in shaping adoption decisions.

Institutional Entrepreneurship: Investigating the role of significant actors promoting blockchain adoption could broaden understanding of the diffusion process.

Dynamic Model of Isomorphism: Developing a dynamic model that incorporates feedback loops and the evolution of institutional pressures over time would better capture adoption processes.

II. Deepening the Empirical Investigation:

Longitudinal Study: Tracking blockchain adoption over time would reveal how isomorphic pressures evolve and their long-term impact on supply chain performance.

Comparative Case Studies: In-depth studies of organizations within the same sector but with varying blockchain adoption levels could provide insights into decision-making processes.

Expanding Geographic Scope: Including regions with diverse levels of technological development and regulatory frameworks would deepen understanding of context-specific factors.

Examining Blockchain Implementations: Investigating different types of blockchain implementations (public, private, permissioned) could shed light on their impact on supply chain efficiency.

III. Exploring Practical Implications and Policy Recommendations:

Developing Best Practices: Creating guidelines for overcoming challenges in blockchain adoption across sectors could improve implementation outcomes.

Policy Recommendations: Proposing regulatory frameworks and investment strategies to support blockchain adoption could accelerate its integration in supply chains.

Sustainability and Ethics: Examining blockchain's environmental impact and its potential to support ethical sourcing and transparency could encourage responsible adoption.

SMEs Impact: Assessing the unique challenges and opportunities for small and medium-sized enterprises (SMEs) could help design policies to facilitate their blockchain adoption.

By building on the study's strengths and addressing these future directions, the research could significantly impact both theory and practice in the field of blockchain technology adoption in supply chains.

9.Discussion and Conclusion

This dissertation examined the adoption of blockchain technology in global supply chains, focusing on the interplay of *institutional isomorphism*, the "shadows of the past and future," and power dynamics, all framed within a holistic model. Through a mixed-methods approach across three interconnected arenas, the study provided a nuanced understanding of the factors shaping blockchain adoption. *Arena 1* employed qualitative methods to explore the motivations and challenges behind adoption, highlighting how past infrastructure and future expectations influenced decision-making. *Arena 2* quantitatively assessed the impact of institutional isomorphism across sectors, revealing sector-specific variations in adoption patterns. *Arena 3* analyzed power dynamics within the supply chain, showing how stakeholders with greater market control influenced adoption processes. The integration of these findings across the three arenas, framed within the holistic 3 Arenas model, offered a comprehensive understanding of blockchain adoption, emphasizing the importance of both global and local contextual factors in shaping technological change in complex supply chains.

This research contributes significantly to the literature on technological adoption in complex organizational networks by offering a multi-faceted perspective that integrates institutional theory, a temporal framework, power dynamics, and the holistic model. It challenges simplistic views of technological adoption by highlighting the complex interplay of individual motivations, institutional pressures, and power relations in blockchain integration decisions. The study's multinational, multi-sector approach strengthens the generalizability of its findings while acknowledging the contextual diversity across different geographical and cultural settings. Certain limitations, the research provides valuable insights for both academics and practitioners, helping organizations navigate the complexities of blockchain integration. It offers guidance for policymakers aiming to encourage responsible blockchain adoption in global supply chains and broadens the understanding of how technological innovation affects the global economy.

10.List of Publications

1. Behavioural and Organisational Factors Determining Blockchain Adoption ,

Journal: Current Journal of Applied Science and Technology. **Published** ,**2022.**

DOI: 10.9734/cjast/2023/v42i74077

2. Blockchain adoption: the decision flows through three arenas,

Journal: Journal of Economics, Management and Trade (JEMT). **Published** ,**2023.**

DOI: 10.9734/jemt/2024/v30i71221

3. The impact of blockchain on transparency & trust in sustainable agri-food SC

Book: Springer: Web 3.0 and Metaverse. **Published** ,**2024.**

4. 3 Arenas Models. **Magazine**: Deal. Business and Economy. **Published** ,**2024.**

5. Micro-Level Perspective on Blockchain Adoption: A Fuzzy Cognitive Map Analysis of Motivations. **Journal**: Prosperita. **Accepted**, **2025. DOI**: *PROSP-2025-0146*

6. How Finance stages and shapes strategic Blockchain technology adoption decisions **Journal**: Frontiers- **Published**, **2025**. **DOI**:10.3389/fbloc.2025.1578493 - **Q1**

7. The role of power in market control in supplier-buyer relations

Journal: Edelweiss Applied Science and Technology- **Published**, **2024**.

DOI: 10.55214/25768484.v8i6.3858 - **Q3**

8. How Isomorphism Forces Shape Blockchain Adoption for Sustainability in Supply Chains: A Multi-Level Analysis**. Journal:** Springer Nature, **Accepted** ,**2025**

DOI :22972-b97f-4e89-b96a-b04c3891e548 - **Q1**

11.Cofrencess Participations

1. IPSERA International Conference

•Year: 2022

•Conference Date: 2nd – 5th April 2022

•Location: Jönköping, Sweden

•Mode: In-person

•Participation: Participated and presented

2. IKSAD INSTITUTE International Conference

•Year: 2022

•Conference Date: 9th October 2022

•Location: Izmir, Turkey

•Mode: Online

•Participation: Participated and presente

3. Pannon National Conference

•Year: 2022

•Conference Date: 9th November 2022

•Location: National Conference (in-person)

•Mode: In-person

•Participation: Participated and presented

4. IKSAD INSTITUTE International Conference

•Year: 2022

•Conference Date: September 2022

•Location: Online

•Mode: Online

•Participation: Participated and presented

5. IPSERA International Conference

•Year: 2023

•Conference Date: 2nd – 5th April 2023

•Location: Barcelona, Spain

•Mode: In-person

•Participation: Participated and presented

6. MDI International Conference

•Year: 2023

•Conference Date: 5th – 7th January 2023

•Location: Online

•Mode: Online

•Participation: Participated and presented

7. IKSAD INSTITUTE International Conference

•Year: 2023

•Conference Date: 13th – 15th December 2023

•Location: Mardin, Turkey

•Mode: Online

•Participation: Participated and presented

8. UNeECC International Conference

•Year: 2024

•Conference Date: 9th – 11th October 2024

•Location: Timișoara, Romania

•Mode: In-person

•Participation: Participated and presented

9. BBU 1857 National Conference

•Year: 2024

•Conference Date: 14th November 2024

•Location: Budapest, Hungary

•Mode: In-person

•Participation: Participated and presented

10. IPSERA International Conference

•Year: 2024

•Conference Date: 5th – 9th April 2024

•Location: Rio de Janeiro, Brazil

•Mode: Online

•Participation: Participated and presented

11. IKSAD INSTITUTE International Conference

•Year: 2024

•Conference Date: 11th – 13th November 2024

•Location: Antalya, Turkey

•Mode: Online

•Participation: Participated and presented

12. AI-Hungary International Conference

•Year: 2024

•Conference Date: 11th – 13th September 2024

•Location: Berlin Germany

•Mode: In-person

•Participation: Participated and present

13. IPSERA International Conference

•Year: 2025

•Conference Date: 30th March – 4th April 2025

•Location: Rotterdam, Netherlands

•Mode: In-person

•Participation: Participated and present

14. IKSAD Conference

•Year: 2025

•Conference Date: 29 -31 May

•Location: Turkey

•Mode: Online

•Participation: Participated and present

13. References

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Gharehdaghi, M. & Kamann, D.J.F. (2024b). The role of power in market control in supplier-buyer relations. 8(6):8709-8717. **DOI:** 10.55214/25768484.v8i6.3858.

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