Enabling Block Chain Skills for Transparency in Marketing Channels: Evidence from Food Processing Industry.

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Abstract

This study examines the role of blockchain skills in enhancing transparency within marketing channels of the food processing industry. Using primary data collected from industry respondents across different socio-demographic backgrounds, the research analyzes perceptions related to blockchain skills competency, supply chain transparency, trust and data integrity, and operational efficiency. Descriptive analysis reveals a highly positive outlook toward blockchain adoption, with mean values indicating strong agreement on its ability to ensure traceability, improve data reliability, and enhance marketing channel efficiency. Trust and data integrity emerge as the most strongly supported factors, followed by supply chain transparency. Significant differences in perception are observed across gender, age, education, experience, designation, organizational size, functional area, and familiarity with blockchain technology. Respondents with higher education, managerial roles, mid-level experience, and high blockchain familiarity demonstrate stronger support across all factors.

1. Introduction

In recent years, the food processing industry has undergone significant transformation due to increasing consumer awareness, stringent regulatory requirements, and the growing demand for transparency across marketing channels. Issues such as food safety, traceability, quality assurance, and ethical sourcing have intensified the need for reliable systems that can provide end-to-end visibility throughout the supply chain. Traditional marketing and distribution channels in the food processing sector often suffer from information asymmetry, lack of trust among stakeholders, data manipulation, and operational inefficiencies, which negatively affect both consumer confidence and organizational performance.

Blockchain technology has emerged as a promising solution to address these challenges by offering a decentralized, immutable, and transparent digital ledger system. By enabling secure and tamper-proof recording of transactions, blockchain facilitates real-time information sharing among supply chain participants such as farmers, processors, distributors, retailers, and regulators. However, the successful implementation of blockchain technology in marketing channels depends not only on technological infrastructure but also on the availability of adequate blockchain skills and competencies among industry professionals. Without the necessary technical knowledge and managerial capability to design, operate, and interpret blockchain systems, organizations may fail to realize the full benefits of this innovation.

Blockchain skills competency plays a crucial role in enhancing supply chain transparency by ensuring accurate data entry, seamless integration of systems, and effective use of smart contracts for traceability and monitoring. Improved transparency subsequently strengthens trust and data integrity, as stakeholders gain confidence in the authenticity and reliability of shared information. This trust is particularly vital in the food processing industry, where product quality, origin, and safety are critical determinants of consumer choice and regulatory compliance.

Furthermore, the application of blockchain technology contributes to operational efficiency in marketing channels by reducing intermediaries, minimizing paperwork, speeding up transactions, and lowering operational costs. Efficient information flow and automated processes improve coordination among channel partners and enable quicker response to market demands and supply disruptions. In this context, the present study aims to examine how enabling blockchain skills can foster transparency in marketing channels within the food processing industry by focusing on key variables such as blockchain skills competency, supply chain transparency, trust and data integrity, and operational efficiency.

2. Review of Literature

Bonetti, E., et.al., (2024) mentioned that by offering an interpretative framework of the major marketing potential and obstacles associated with the use of blockchain (BC) technology for Geographical Indication (GI) products, this article aims to further understanding on BC technology implementation in the agri-food business. Using the cognitive mapping approach, the study used an exploratory qualitative research design to examine the cognitive processes of several market participants in agri-food BC initiatives, including farmers, distributors, businesses, and consultants. This research offers a thorough analysis of BC's marketing effects on a range of marketing goals, including as supplier chain partnerships, customer interactions, market access, product improvement, and brand positioning. It demonstrates how BC may support data-enabled ecosystems integrating supply chain participants and control agencies in the agri-food industry. The paper also clarifies the difficulties (technical, cooperative, political, financial, and organisational) in applying BC to agri-food product marketing.

Rejeb, A., et.al., (2020) discussed that blockchain technology has shown great promise and might have a significant impact on the food business. Extended food supply chains (FSCs) benefit greatly from the combination of immutability, improved visibility, transparency, and data integrity. Blockchain can improve traceability, facilitate more effective recall, and lower the danger of counterfeit goods and other illegal transactions. Furthermore, by incorporating the authoritative source of the claim (such as the certification body or certification owner) into the blockchain to confirm the claim integrity and reassure business clients and end users, blockchain can improve the integrity of credence claims like sustainably sourced, organic, or faith-based claims like kosher or halal. A thorough analysis of the possible advantages and difficulties of blockchain in FSCs is still lacking, despite the industry buzz and promises. We summarise previous research and offer the results of a systematic review and bibliometric analysis of sixty-one (61) journal publications in order to close this knowledge gap. Improved food traceability, increased teamwork, operational efficiency, and simplified food trade procedures are the primary advantages of blockchain technology in FCSs. Technical, organisational, and regulatory problems are possible obstacles. We offer a number of suggestions for further study and talk about the theoretical and practical ramifications of our findings.

Gazzola, P., et.al., (2023) defined that globally, food product quality and safety are regarded as being of the highest importance. Food traceability, which is defined as "the ability to track any food, feed, food-producing animal or substance that will be used for consumption, through all stages of production, processing, and distribution" (European Union), has become much more popular as a result of widely reported food safety incidents. In order to guarantee food safety, the World Health Organisation (WHO) advises governments, producers, and consumers to collaborate. This necessitates the sharing of relevant information across intricate food value networks. Therefore, the implementation of information systems for tracking food commodities is in the best interest of profit-driven organisations, with the possibility of enhanced profitability being a major result. The goal of this study is to examine the many options for such implementations that blockchain technology has made possible. The objective is specifically to investigate the dynamics of this technology and determine how it contributes to the development of positive customer connections. For this reason, the case of Lavazza, a significant Italian roasted coffee company that just released a blockchain-tracked product on the market, is thoroughly examined, covering every stage that enabled the technology's use as well as how it was ultimately conveyed to the customer. The case study provides a specific example that came about as a result of customers' external need for more openness about the company's sourcing procedures as well as stakeholders' internal requirement for more traceability. In this pilot project,

cooperation across all the chain's components was crucial to providing the final customer with a formative, personalised, and ultimately simple-to-understand experience. Lastly, Lavazza is an illustration of a business that chose to push itself by adhering to a trend that will become more prevalent in upcoming socioeconomic situations.

3. Methodology

3.1. Problem identification

The food processing industry faces persistent challenges related to lack of transparency, data manipulation, inefficiencies, and trust deficits across marketing channels. Traditional supply chain systems often suffer from fragmented information flow, delayed transactions, limited traceability, and weak coordination among channel members, which adversely affect operational efficiency and consumer confidence. Although blockchain technology has emerged as a powerful tool to address these issues through decentralized, immutable, and transparent data systems, its effective implementation largely depends on the availability of skilled human resources capable of understanding and operating blockchain-enabled platforms. However, there is limited empirical evidence examining how blockchain skills competency among employees influences supply chain transparency, trust and data integrity, and operational efficiency within marketing channels, particularly in the food processing sector. This study identifies the need to systematically analyze the role of blockchain skills as an enabling factor for transparent marketing channels and to understand how perceptions vary across different socio-demographic and organizational characteristics.

3.2. Objectives

Based on the problem identification, the objectives of the study are mentioned below:

- To find out the socio-demographic profile of the respondent among the food processing industry in India.
- To identify the factors for the block chain skills for transparency in Marketing Channels among the stakeholders of food processing Industry.
- To check the significant difference of opinion among the respondent of food processing industry towards the factors for the block chain skills for transparency in Marketing Channels.

3.3. Sample Size

The study is based on a sample size of 200 respondents drawn from the food processing industry. This sample size is considered adequate for conducting descriptive analysis and inferential statistical tests to examine differences in opinions across various socio-demographic groups. Respondents include individuals from operational, supervisory, managerial, and senior management levels, ensuring balanced representation of both strategic and execution perspectives.

3.4. Sampling Techniques

The study adopts a stratified random sampling technique to ensure comprehensive representation of respondents from different segments of the food processing industry. The population was first stratified based on key socio-demographic and organizational characteristics such as designation, functional area, nature of organization (small, medium, and large-scale units), and familiarity with blockchain technology. From each stratum, respondents were selected randomly to avoid selection bias and to ensure proportional representation.

3.5. Research Design

The study follows a descriptive and analytical research design. The descriptive design is used to examine the socio-demographic profile of respondents and to assess their perceptions regarding blockchain skills competency, supply chain transparency, trust and data integrity, and operational efficiency in marketing channels. The analytical component focuses on identifying significant differences in opinions among respondents based on socio-demographic and organizational variables using appropriate statistical tools. Primary data were collected through a structured questionnaire using a five-point Likert scale to measure respondents' agreement levels.

4. Result and Discussion

Table 1: Socio – Demographic Profile for the Respondent of Food Processing Industry

Socio-Demographic Variable	Category	Frequency	Percentage (%)
Gender	Male	128	64
	Female	70	35
	Prefer not to say	2	1
Age Group (Years)	Below 25	24	12
	25 – 34	68	34
	35 – 44	56	28
	45 – 54	38	19
	55 and above	14	7
Educational Qualification	Diploma	30	15
	Graduate	74	37
	Post-Graduate	62	31
	Professional (MBA/CA/Tech)	26	13
	Doctorate	8	4
Designation / Role	Operational Staff	52	26
	Supervisory Level	46	23
	Managerial Level	58	29
	Senior Management	44	22
Work Experience	Below 5 Years	40	20
	5 – 10 Years	62	31
	11 – 15 Years	48	24
	16 – 20 Years	30	15
	Above 20 Years	20	10
Nature of Organization	Small-scale Food Processing Unit	58	29
	Medium-scale Food Processing Unit	74	37
	Large-scale Food Processing Unit	68	34

Functional Area	Procurement & Supply Chain	46	23
	Production & Processing	52	26
	Marketing & Distribution	58	29
	Quality Control & Compliance	44	22
Familiarity with Blockchain Technology	Low	54	27
	Moderate	88	44
	High	58	29

(Source: Data Outcome)

The majority of respondents are male (64%), though a substantial proportion of female participants (35%) reflects increasing gender participation in industry operations and technology-oriented roles. Age-wise distribution shows that most respondents belong to the 25–34 years (34%) and 35–44 years (28%) categories, suggesting that the workforce is dominated by young and mid-career professionals who are more adaptable and receptive to advanced digital technologies such as blockchain. In terms of educational qualification, a significant proportion of respondents are graduates (37%) and post-graduates (31%), indicating a strong educational foundation that supports the understanding and implementation of blockchain-based systems. From an organizational perspective, managerial-level employees constitute the largest group (29%), followed closely by operational and supervisory staff, ensuring that opinions reflect both strategic and execution-level viewpoints. The majority of respondents possess 5–10 years of work experience (31%), providing them with adequate exposure to traditional supply chain challenges and the need for transparent marketing practices. Medium-scale food processing units account for the highest representation (37%), highlighting their growing inclination toward technological innovation. Functionally, respondents from marketing and distribution (29%) dominate the sample, directly aligning with the study's focus on marketing channel transparency. Finally, while 44% of respondents report moderate familiarity with blockchain technology, the presence of 29% with high familiarity underscores the industry's readiness, while also indicating scope for further skill development to maximize blockchain's potential in enhancing transparency and operational efficiency.
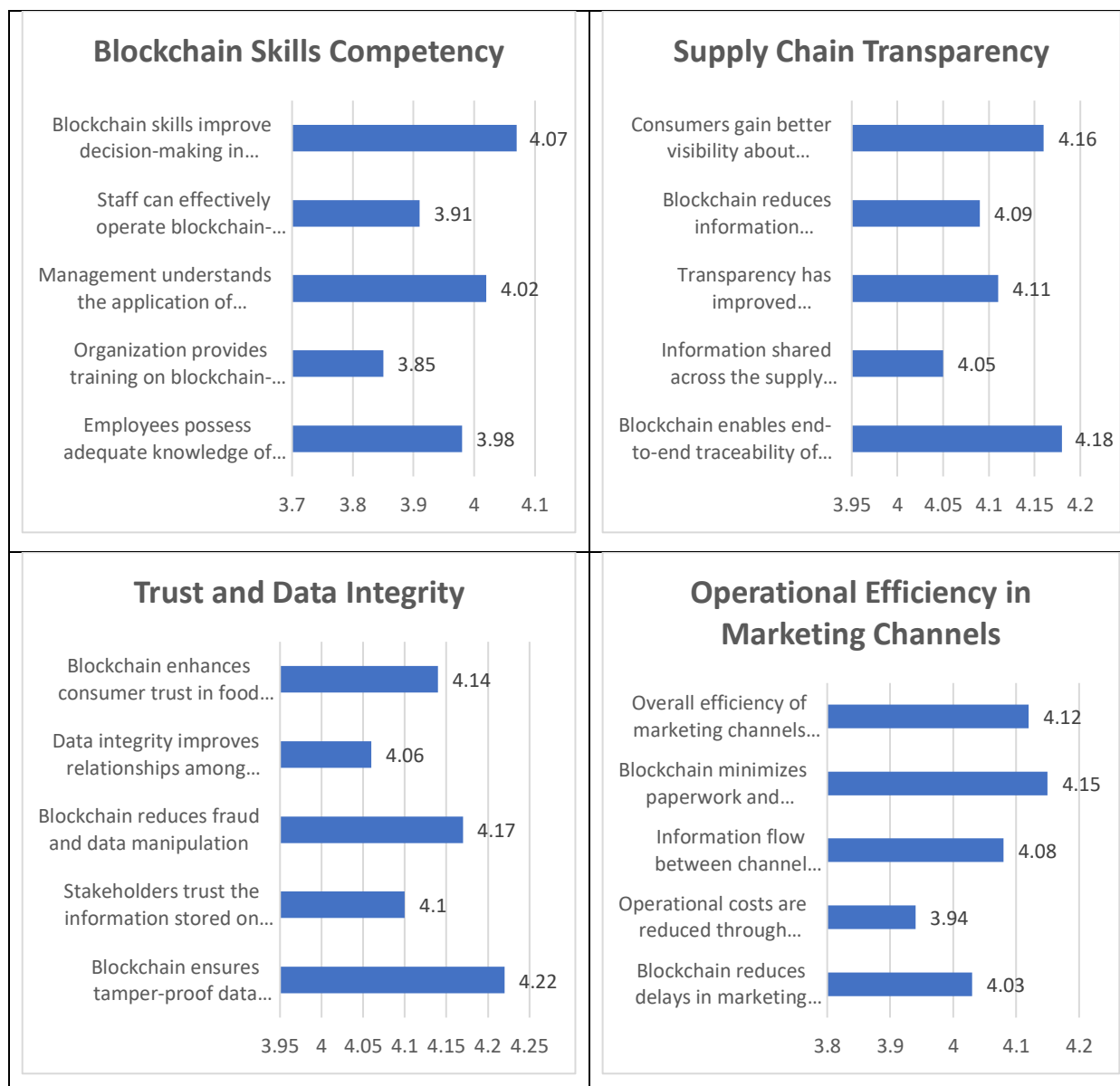
Table 2: Descriptive Statistics for the factors block chain skills for transparency in Marketing Channels (Food Processing Industry)

Statements	Mean	Std. Deviation
Blockchain Skills Competency		
Employees possess adequate knowledge of blockchain technology.	3.98	0.74
Organization provides training on blockchain-based systems.	3.85	0.78
Management understands the application of blockchain in marketing channels.	4.02	0.71
Staff can effectively operate blockchain-enabled platforms.	3.91	0.76
Blockchain skills improve decision-making in supply chain operations.	4.07	0.69
Supply Chain Transparency		

Blockchain enables end-to-end traceability of food products.	4.18	0.66
Information shared across the supply chain is accurate and timely.	4.05	0.7
Transparency has improved coordination among channel members.	4.11	0.68
Blockchain reduces information asymmetry in marketing channels.	4.09	0.72
Consumers gain better visibility about product origin and quality.	4.16	0.65
Trust and Data Integrity		
Blockchain ensures tamper-proof data records.	4.22	0.63
Stakeholders trust the information stored on blockchain platforms.	4.1	0.69
Blockchain reduces fraud and data manipulation.	4.17	0.64
Data integrity improves relationships among channel partners.	4.06	0.71
Blockchain enhances consumer trust in food products.	4.14	0.67
Operational Efficiency in Marketing Channels		
Blockchain reduces delays in marketing channel transactions.	4.03	0.73
Operational costs are reduced through blockchain adoption.	3.94	0.77
Information flow between channel members has improved.	4.08	0.7
Blockchain minimizes paperwork and manual processes.	4.15	0.66
Overall efficiency of marketing channels has increased.	4.12	0.68

(Source: Data Outcome)

Figure 1: Descriptive Statistics for the factors block chain skills for transparency in Marketing Channels (Food Processing Industry)

(Source: Data Outcome)

the descriptive analysis indicates that respondents from the food processing industry hold a highly positive perception of blockchain skills as a key enabler of transparency in marketing channels. All four factors i.e. blockchain skills competency, supply chain transparency, trust and data integrity, and operational efficiency records mean values close to or above the agreement level, reflecting widespread acceptance of blockchain's role in improving marketing channel performance. Among the factors, trust and data integrity and supply chain transparency receive the strongest support, highlighting blockchain's effectiveness in ensuring reliable, traceable, and tamper-proof information across the supply chain. Blockchain skills competency is also viewed favorably, suggesting that organizations recognize the importance of employee knowledge and managerial understanding in successful blockchain implementation, although additional training initiatives may further strengthen these competencies. Moreover, the positive perception of operational efficiency confirms that blockchain adoption reduces delays, minimizes manual processes, and improves coordination among channel members. The relatively low variability in responses further indicates consistency in opinions across respondents.

Table 3: Significant Difference of opinion among the respondent for the factors block chain skills for transparency in Marketing Channels (Food Processing Industry)

H0	Socio-Demo Variable	Variable Showing Significant Difference	Category	Result
H0$_1$	Gender	Blockchain Skills Competency	Male respondents	Significant
		Trust and Data Integrity	Female respondents	Significant
H0$_2$	Age Group	Supply Chain Transparency	25–34 years	Significant
		Operational Efficiency	35–44 years	Significant
H0$_3$	Educational Qualification	Blockchain Skills Competency	Post-Graduate & Professional qualified	Significant
		Trust and Data Integrity	Graduate respondents	Significant
H0$_4$	Work Experience	Operational Efficiency	11–15 years' experience	Significant
H0$_5$	Designation / Role	Blockchain Skills Competency	Managerial & Senior Management	Significant
		Supply Chain Transparency	Supervisory level	Significant
H0$_6$	Nature of Organization	Supply Chain Transparency	Large-scale food processing units	Significant
H0$_7$	Functional Area	Operational Efficiency	Marketing & Distribution personnel	Significant
H0$_8$	Familiarity with Blockchain	All variables	High familiarity group	Significant

(Source: Data Outcome)

Gender-wise results indicate that male respondents exhibit significantly higher agreement with blockchain skills competency, suggesting greater technical exposure or involvement in blockchain-related activities, while female respondents demonstrate stronger perceptions toward trust and data integrity, reflecting a higher emphasis on reliability and data security aspects. Age-wise comparison shows that respondents in the 25–34 years group place greater importance on supply chain transparency, whereas those in the 35–44 years category emphasize operational efficiency, indicating that younger professionals focus more on visibility and traceability, while more experienced respondents value efficiency gains.

Educational qualification also plays a crucial role in shaping perceptions. Post-graduate and professionally qualified respondents report significantly higher agreement with blockchain skills competency, highlighting the influence of advanced education on technology adoption, while graduate-level respondents show stronger concern for trust and data integrity. With respect to work experience, respondents having 11–15 years of experience perceive blockchain as a

significant driver of operational efficiency, reflecting their practical understanding of inefficiencies in traditional marketing channels.

Designation-wise analysis reveals that managerial and senior management respondents strongly support blockchain skill development, whereas supervisory-level employees emphasize supply chain transparency, indicating differing role-based priorities. Furthermore, respondents from large-scale food processing units show significantly higher agreement regarding supply chain transparency, suggesting better technological readiness and resource availability in such organizations. Functional area analysis highlights that marketing and distribution personnel perceive blockchain as significantly improving operational efficiency, aligning with their direct involvement in marketing channel activities. Finally, respondents with high familiarity with blockchain technology exhibit significantly higher agreement across all study variables, underscoring the critical role of awareness and skill development in maximizing the benefits of blockchain adoption.

5. Conclusion

The study concludes that blockchain skills competency plays a pivotal role in enabling transparency within marketing channels of the food processing industry. The findings reveal a strong and positive perception among respondents regarding blockchain's ability to enhance supply chain transparency, ensure trust and data integrity, and improve operational efficiency. Employees with higher levels of blockchain knowledge and familiarity demonstrate significantly greater confidence in its application, emphasizing the importance of skill development and organizational training initiatives. The study also highlights meaningful differences in perceptions across socio-demographic and organizational characteristics, indicating that age, education, experience, designation, and familiarity with blockchain influence the extent to which its benefits are recognized. Large-scale organizations and marketing-oriented personnel exhibit stronger agreement on transparency and efficiency gains, reflecting higher technological readiness.

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