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Retraction

Retracted: A Comparative Analysis of Blockchain in Enhancing the Drug Traceability in Edible Foods Using Multiple Regression Analysis

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Manipulated or compromised peer review

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] K. Suresh Kumar, V. K. Nassa, D. Uike et al., "A Comparative Analysis of Blockchain in Enhancing the Drug Traceability in Edible Foods Using Multiple Regression Analysis," *Journal of Food Quality*, vol. 2022, Article ID 1689913, 6 pages, 2022.

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Research Article

A Comparative Analysis of Blockchain in Enhancing the Drug Traceability in Edible Foods Using Multiple Regression Analysis

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The growing need for access to safer food items is increasing, and hence, there is a need for a better supply chain management system in the food industry is increasing. The increased complexity of the existing systems tends to introduce more issues to the stakeholders, and also, the cost of product traceability is quite high. Hence, the industry is looking for effective solutions in relation to drug traceability, and the application of Blockchain technology enables the stakeholders in the food and beverage (F&B) sector to track the movement of goods, supported in gathering the required details so that the contaminated products can be identified and recalled without much delay and lesser recall costs to protect the lives of the individuals. The tampered food items are increasing and are impacting the supply chain process, brand name of the companies, and claim assurance. They create an adverse impact on the health of the individuals and cause higher economic loss to the health-care industry. The existing studies tend to focus on laying emphasis of the need for an enhanced, effective, and end tracking systems in the industry. The emergence of Blockchain technology enables centralized tracking of information support in enhancing the data privacy and increasing transparency and support in eradicating the tampered food products in the supply chain system. These approaches leverage the usage of smart contracts and decentralize the storage of information in a secure manner for enhanced product traceability in the F&B industry. The implementation of smart contracts generates better data governance, which tends to meet the needs and requirements of the stakeholders, and applies effective measures of food traceability. The primary objective of the study is to perform an analysis of Blockchain in enhancing drug traceability in the food sector. The researcher uses quantitative analysis for the study as it helps in understanding the critical determinants influencing drug traceability in food effectively, the survey method is used to gather the information, and past reviews are also used to possess a better understanding of the subject area effectively.

1. Introduction

The current nature and scope of food supply chain management are considered a complex network where different entities such as materials, vendors, distributors, producers, retailers, multiple processing units, and others are involved. Increased complexity not only impacts the inefficiencies in the process and creates more challenges like counterfeit food products with nonprovisioned drug traces but also impacts the food industry adversely. Although the Food Safety and Standards Authority of India (FSSAI) has passed several laws and amended them regularly to ensure food safety, its implication seems to lessen at an individual step in the process ultimately diminishing its effects. This allows the

scope of malicious food tampering and practices leading to unsafe food products in the market. The counterfeit drugs in food items adversely impact public health [1]. The major contribution of the research is to conduct a comparative analysis of Blockchain in improving drug monitoring in foodstuffs. The critical determinants of the study include using Blockchain for best interconnectivity, providing critical help for stakeholders in tracking goods, and protecting against challenges and issues.

The implementation of Blockchain technology has opened up a new model of application creation which is based on the implementation of the critical data structure, the basic approach is that the data structure is related to a linked list of blocks which are mainly shared through the nodes and each node possesses an original copy of the blocks [2]. The emergence of different applications such as the Internet of things, machine learning, and deep learning supports enhancing document management and enables proper tracking and traceability of the data in an effective manner. Additional complexity not only affects operational inefficiencies and generates new issues, such as fraudulent food items containing commonly used diagnostic drug residues, but also has a negative influence on the food sector. That although the Food Safety and Standards Authority of India (FSSAI) has created various regulations and revised them on a regular basis to maintain food safety, their impact appears to erode at each stage of the process, eventually reducing their impacts. These aspects can be leveraged in the food industry to track the illicit drugs in the F&B supply chain effectively. The food retailers can use the Blockchain technology to leverage the validation of the structure and support in gathering related information for each transaction, which are commonly mentioned through hashes and support in the transfer of data through a peer-to-peer network, which will make it difficult in hacking data and records [3].

The application of Blockchain support in identifying and engaging the major stakeholders in food supply chain management, producers, retailers, processing units, distributors, and others, is limited to harnessing the data in an effective manner. The pharmacists enable the presentation of the external entity and support better drug traceability [4]. Blockchain has the ability to change the way food is recorded, delivered, and sold. Blockchain can eliminate errors produced by conventional paper-based records to keep each electronic record of all transactions. Food stores can use Blockchain to validate the framework, assist in gathering associated information for every purchase, which is frequently indicated via hashing, and assist in data transmission via a mentoring network. The implementation of Blockchain creates a better platform by providing better-distributed ledger solutions which are delivering a higher degree of confidentiality, support in enhancing resilience, scalability of operations, and better flexibility. The researcher has mentioned that Blockchain technology like Hyperledger Fabric is one of the critical tools which supports enhancing a suitable aspect for managing complex supply chain networks which involves better physical and logical processes; moreover, the application of Blockchain technology supports guarding against different types of cyber-attacks and malware. [5]. The food supply chain management is now governed by digital technologies, and hence, it is highly critical to protect the data in an effective manner; hence, the implementation of Blockchain supports drug traceability and safeguards the data in an effective manner [1].

The primary objective of the study is to perform a comparative analysis of Blockchain in enhancing drug traceability in food products, the critical determinants of the study involved using Blockchain for better interoperability, offering critical support for stakeholders in tracking the goods and protection from attacks and vulnerabilities.

The research paper has been mentioned into six components. Section 1 describes the introduction of blockchain, while Section 2 focuses on the review literature. The methodology of the research has mentioned in Section 3, and Section 4 describes the data analysis. Moreover, the conclusion of the proposed research has described in Section 5.

2. Review of Literature

Hyperledger Fabric is a platform that delivers universal distributed solutions with a layered architecture that ensures data security, endurance, versatility, and scalability [6]. It is a business-oriented DLT based on Blockchain that employs contracts to establish rapport among many entities. Hyperledger Fabric does away with mining but keeps all of the benefits of a traditional Blockchain cryptocurrency (such as Bitcoin or Ethereum), such as unaltered block sequence determinism and double avoidance cost [7]. With hundreds or even thousands of requests per second, Hyperledger Fabric has proved to give great business performance [8]. When standard programming languages (Java, Go, and NodeJS) are used to create smart contracts, the technology's approval rate is lower than when proprietary programming languages are utilised (e.g., solidity in Ethereum). Blockchain technology aids in the creation of an authorised secure network for detecting and tracking supply chain information events, as well as providing timestamp files for each transaction [9]. This technique will facilitate access to the food supply chain, promote collaboration among untrustworthy parties, and develop an endless and unchanging decentralised drug monitoring system. To build compatible solutions for numerous controllers, sharing of data is required [10].

The successful execution of the Bitcoin application data format has given rise to a new concept for software development based on Blockchain technology. A Blockchain data structure can be compared to a linked list that is shared across the network, with each node having a copy of every block (linked to the longest chain) generated by its generator [11]. In domains such as the IoT, e-governance, and e-document handling, many authentic solutions have lately been developed. Due to its self-encrypting structure between deals (through exchanging) and the public access to a global digital ledger, these solutions reap the benefits of Blockchain technology [12]. Since it would be costly to revise from

Table 1: Better protection of data.

Better protection of data	Frequency	Percent
Strongly disagree	13	7.4
Disagree	9	5.1
Neutral	26	14.8
Agree	47	26.7
Strongly agree	81	46
Total	176	100

inception to final log action, establishing a Blockchain coupled with cryptographic construction makes it exceedingly impossible to break records [13].

3. Methodology

The methodology of the study is involved in using quantitative research design as it supports the authors to investigate the research area in an effective manner; the researcher is more focused on understanding the critical determinants of using Blockchain which supports drug traceability [14]. The research applied quantitative analysis for the research because it helps in successfully identifying the critical determinants influencing drug monitoring in food. A survey method is used to collect data, and previous evaluations are also employed to obtain a better knowledge of the subject. The primary data source is generated through the survey method. The researcher uses closed-ended questions which intend to understand the responses from the sample population on the application of Blockchain technology towards drug traceability. The authors also use secondary data sources for collecting the past reviews related to the topic [15].

3.1. Critical Assumptions for the Study

Ho: There is no critical association between better interoperability and Blockchain influenced by drug traceability in food products.

Ho: There is no critical association between offering critical support for stakeholders and Blockchain influenced by drug traceability in food products.

Ho: There is no critical association between protection from attacks and vulnerabilities and Blockchain influenced by drug traceability in food products.

4. Data Analysis

The next part of the section involves performing critical data analysis related to the data, and the researcher uses frequency analysis, regression analysis, and chi-square test.

The survey approach generates the method for collecting data. The researchers use structured questionnaires in order to comprehend the sampled population's answers to the application of Blockchain technology to medication tracking. The researchers also use secondary data sources to get the previous reviews on the research project. According to Table 1, 46% of participants agreed with the assertion that implementing Blockchain technology will improve data security and promote drug tracking in food products. Furthermore, 26.7 percent of respondents agreed, 14.8 percent said they were neutral, and the rest disagreed. Figure 1 shows the graphical representation of the above-discussed data.

The researcher also intends to understand the opinion of the respondents on the influence of ML approaches in image enhancement.

According to Table 2, 29.5 percent of those surveyed strongly agreed with the statement that implementing Blockchain technology will lower the cost for food businesses in tracking drugs and enable the effective movement of critical data and information, 40.3 percent agreed with the statement, 12.5 percent were indifferent, and the remainder disagreed with the statement. The low implementation cost graph is shown in Figure 2.

4.1. Regression Analysis. The next part of the analysis is to understand the nature of the relationship between the variables, and the critical variables are better interoperability, offering critical support, attacks and vulnerabilities, and drug traceability.

Table 3 reveals that the R-squared value and adjusted R-squared value are more than 0.80 or 80%; hence, it can be stated that the regression model is a good fit, and furthermore, the F value is 248.95, and p value is 0.00; hence, there is a significant association among the variables, based on the coefficient, and the regression equation is framed as

Drug traceability $= 0.298 + 0.375 \times$ better interoperability $+ 0.312 \times$ offering critical support $+ 0.223 \times$ attacks and vulnerabilities.

4.2. Chi-Square Test. The purpose of the last component of the analysis section is to examine the authors' hypothesis for the study; hence, chi-square analysis is utilised.

4.3. Hypothesis 1. Ho: There is no critical association between better interoperability and Blockchain influenced by drug traceability in food products.

The calculated value is smaller than the agreed significance value of 0.05, indicating that there is a vital relationship between greater interoperability and Blockchain as influenced by drug traceability in food goods, as shown in Table 4.

4.4. Hypothesis 2. Ho: There is no critical association between offering critical support for stakeholders and Blockchain influenced by drug traceability in food products.

The calculated value is smaller than the agreed statistical significance of 0.05, indicating that there is a significant relationship between providing critical assistance for stakeholders and Blockchain influenced by drug traceability in foods, as shown in Table 5.

4.5. Hypothesis 3. Ho: There is no critical association between protection from attacks and vulnerabilities and Blockchain influenced by drug traceability in food products.

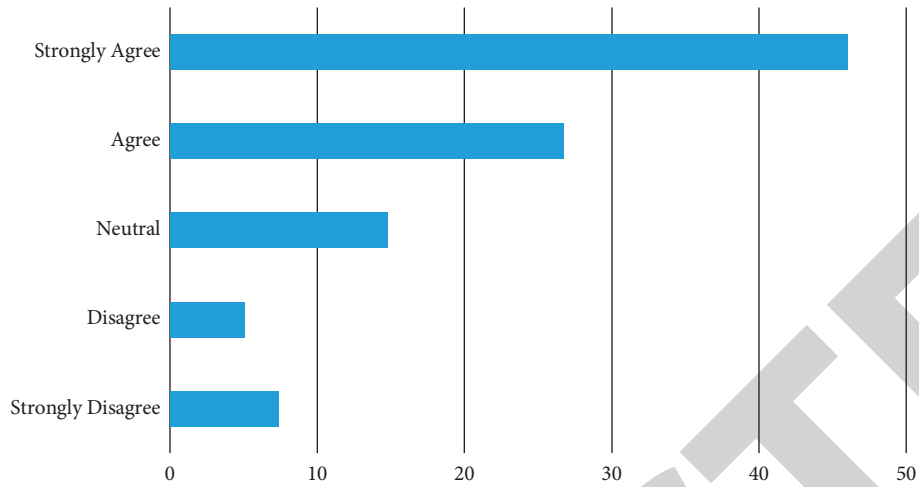

Figure 1: Better protection of data.

Table 2: Low implementation cost.

Low implementation cost	Frequency	Percent
Strongly disagree	13	7.4
Disagree	18	10.2
Neutral	22	12.5
Agree	71	40.3
Strongly agree	52	29.5
Total	176	100

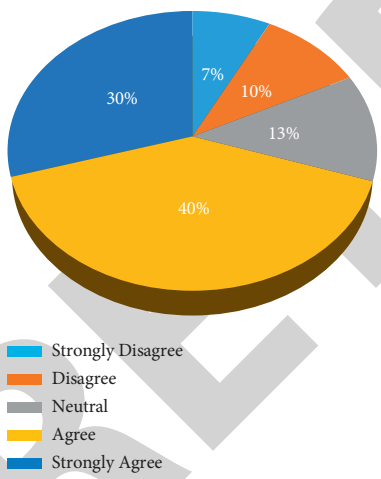

Figure 2: Low implementation cost.

Table 3: Regression analysis.

Model	*R*	*R* square	Adj. *R* square
	0.902a	0.813	0.81
ANOVA			
Model	Sum of squares	df	Mean square
Regression	177.913	3	59.304
Residual	40.974	172	0.238
F	Sig.		
248.95	0.000b		
Coefficients	*B*	*T val*	*P val*
(Constant)	0.298	2.07	0.04
Better interoperability	0.375	5.111	0.001
Offering critical support	0.312	4.123	0.001
Attacks and vulnerabilities	0.223	3.464	0.001

Table 6 shows that the computed value is less than the agreed significance level of 0.05, hence stating that there is a critical association between protection from attacks and vulnerabilities and Blockchain influenced by drug traceability in food products.

The growing demand for food safety and assurance is growing, and therefore, a better system is needed for managing the supply chain in the food industry. The increasing complexity of existing systems often causes more problems for those involved, while the number of tampered food items is increasing in many countries [16]. Therefore, the profession seeks effective solutions in the traceability of drugs; the application of Blockchain technology allows food companies to monitor the movement of goods and support the collection of necessary data to make safe and nutritious food available to enhance human lives. The number of counterfeit products is increasing, and this affects the supply chain, recall, costs, defamation, and so on [17]. They have a negative impact on human health and lead to greater financial losses in the F&B sector. Existing studies tend to emphasize the need for a comprehensive, improved, and effective monitoring system in the industry. WHO has been studying contaminated food products and is working incessantly towards ensuring food safety and has laid down various laws for the same worldwide.

When the need for food safety and security increases, a comprehensive alternative for controlling the food profession's distribution network is required. The rising complexities of the present system frequently produce additional issues for people engaged, while the quantity of tainted food products is increased in many nations. Blockchain helps to improve document management and enables data to be tracked and detected properly. These considerations can be used in the F&B sector for effective drug monitoring

Table 4: Cross tab for better interoperability * drug traceability in food products cross tabulation.

Better interoperability	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total
Strongly disagree	0	4	0	0	0	4
Disagree	5	13	0	0	0	18
Neutral	0	0	22	0	0	22
Agree	0	0	0	15	19	34
Strongly agree	0	0	0	32	66	98
Total	5	17	22	47	85	176
	Value	*df*	*P value*			
Chi-square	365.433a	16	0.001			
Likelihood	262.672	16	0.001			
Linear association	131.531	1	0.001			

Table 5: Cross tab of offering critical support * drug traceability cross tabulation.

Offering critical support	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total
Strongly disagree	0	9	0	0	0	9
Disagree	5	8	0	0	0	13
Neutral	0	0	18	0	0	18
Agree	0	0	4	5	9	18
Strongly agree	0	0	0	42	76	118
Total	5	17	22	47	85	176
	Value	*df*	*P value*			
Chi-square	358.800a	16	0.001			
Likelihood	246.129	16	0.001			
Linear association	132.634	1	0.001			

Table 6: Cross tab of attacks and vulnerabilities * drug traceability cross tabulation.

Attacks and vulnerabilities	Strongly disagree	Disagree	Neutral	Agree	Strongly agree	Total
Strongly disagree	5	4	0	0	0	9
Disagree	0	13	0	0	0	13
Neutral	0	0	18	5	0	23
Agree	0	0	4	14	37	55
Strongly agree	0	0	0	28	48	76
Total	5	17	22	47	85	176
	Value	*df*	*P Value*			
Chi-square	360.149a	16	0.001			
Likelihood	229.319	16	0.001			
Linear association	120.508	1	0.001			

throughout the food supply chain. The food manufacturing, processing, and storage facility can utilize Blockchain technology to leverage framework validation, support the collection of relevant information related to each transaction, often through breakdown, and support peer-to-peer data transfer [18]. By building Blockchain support in cryptographic construction, it becomes difficult to break data and records.

5. Conclusion

Blockchain application creates a better platform to provide a more distributed universal solution that provides a higher level of data protection, greater flexibility, resource scalability, and greater flexibility. Previous studies usually prefer to stress the importance of improved, comprehensive, and end-to-end monitoring systems in the sector. The implementation of Blockchain internet allows centrally managed monitoring, which aids in boosting data privacy, improving transparency, and removing defective food items in the supply chain system. The researchers said that Blockchain technology such as Hyperledger Fabric is one of the most important tools to support the development of a complex network of supply chains with the better physical and logical processes and that the use of Blockchain technology supports protection. The food supply chain is now driven by digital technology, so effective data protection is essential, so a Blockchain application supports drug traceability and protects data effectively.

The advent of Blockchain technology enables centralized tracking of information assistance to improve data protection, increase transparency, and eliminate counterfeit medicines in the distribution chain. These approaches benefit from the use of smart contracts and decentralize information storage in a secure way for better traceability of food products. Implementing smart contracts creates better

data management, generally meets the needs and requirements of stakeholders, and implements effective follow-up measures.

Data Availability

The data shall be made available on request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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