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INTEGRATING BLOCKCHAIN IN VARIOUS ORGANIZATIONAL MODELS PAVE THE PATH TO SUSTAINABLE DEVELOPMENT GOALS

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Krasnokutska N. S., Adiguzel K. Integrating Blockchain in Various Organizational Models Pave the Path to Sustainable Development Goals

Blockchain is considered one of the most significant technological advances integrated into the Business Process Management (BPM) systems of various organizations over the past decade. The introduction of Blockchain technologies is changing the way traditional supply chains are managed. In this sense, Blockchain technologies have the potential to revolutionize complex supply chains in stability, traceability, and accountability. Since Blockchain technology has fostered the development of trust between many different parties, not just leaders and followers, it is assumed that Blockchain will give its adapters revolutionary characteristics. Upon a systematic bibliometric review that determined the impact of introducing Blockchain technology into the BPM, on the basis of previous research and scientific papers published in academic journals, it was found that most of the studies highlight the significance of Blockchain and its impact on the supply chain and financial sectors. However, this article aims to identify new characteristics of Blockchain's impact on the BPM in various other sectors, especially in the telecommunications, non-governmental organizations, industrial, and banking sectors. The statistical analysis of the collected data examines the intermediate variables of the introduction of Blockchain technology (trust, immutability, transparency, and cost reduction) and its impact on increasing sustainability (economic, ecological, and social resilience) as a dependent variable. As a result of the study, the authors concluded that Blockchain has the potential to enhance the revolutionary characteristics of trust, immutability, cost reduction, and reliability in a business process model, accelerating the path to achieving sustainable development.
Keywords: *blockchain, sustainability, characteristics, business process model, sustainable development.*
Fig.: *2.* ***Tabl.:*** *1.* ***Bibl.:*** *34.*

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Краснокутська Н. С., Адигузель К. Інтеграція блокчейну в різні організаційні моделі прокладає шлях до цілей сталого розвитку

Блокчейн вважається одним із найбільш значущих технологічних досягнень, інтегрованих у системи управління бізнес-процесами різних організацій (Business Process Management – BPM) за останнє десятиліття. Впровадження технологій блокчейн змінює спосіб управління традиційними ланцюгами поставок. У цьому сенсі технології блокчейну потенційно можуть революціонізувати складні мережі постачання в стабільності, відстежуваності та підзвітності. Оскільки технологія Blockchain сприяла розвитку довіри між багатьма різними сторонами, а не лише лідерами та послідовниками, передбачається, що Blockchain надасть своїм адаптерам революційні характеристики. Після систематичного бібліометричного огляду, який визначив вплив впровадження технології Blockchain у BPM на основі попередніх досліджень і наукових праць, опублікованих в

академічних журналах, було виявлено, що більшість досліджень висвітлюють значення Blockchain та його вплив на ланцюг поставок і фінансові сектори. Проте дана стаття має на меті виявити нові характеристики впливу Blockchain на BPM в інших різних секторах, особливо в телекомунікаційному секторі, секторі неурядових організацій, промисловому та банківському секторах. Статистичний аналіз зібраних даних досліджує проміжні змінні впровадження технології Blockchain (довіра, незмінність, прозорість і зниження витрат) і його вплив на підвищення сталості (економічної, екологічної та соціальної стійкості) як залежної змінної. У результаті дослідження автори дійшли висновку, що блокчейн може потенційно посилити революційні характеристики довіри, незмінності, зниження витрат і надійності в моделі бізнес-процесу, прискорюючи шлях до досягнення сталого розвитку.

Ключові слова: *блокчейн, стійкість, характеристики, модель бізнес-процесу, сталий розвиток.*
Рис.: *2.* ***Табл.:*** *1.* ***Бібл.:*** *34.*

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In recent decades, blockchain technology has witnessed a major technological revolution that led to the successful launch and investment of the first cryptocurrency in 2009 (S. Huckle et al. [18]). After such a significant milestone, Blockchain has become attractive to many investors and practitioners, not only in the digital and financial world but in the areas of insurance, economics, the Internet of things, supply chain, industrial, communications and software engineering (A. Meidan et al. [22]). The disruptive technologies are receiving much attention in the public sphere. Whether in the financial sector, government service sector, or industrial sector, blockchain technology represented one of the most notable modern game changers. One of the first applications of blockchain technology is cryptocurrency, which is based on the fact that blockchain technology can secure transactions "peer-to-peer". Blockchain technology then expanded to innovate new applications for financial transactions, online transfer payment currency exchange, the Internet of Things, insurance wallets, health systems, and supply chain management (L. Xu et al. [33]). Addressing how integrating Blockchain would affect various organizational frameworks' ability to achieve sustainable results by integrating it into the Business Process Model has to be examined (S. Robbins, T. Judge [25]).

Blockchain-based technology has been integrated into the potential market by several developed countries, but there are still several concerns regarding scalability, privacy and uncertainty when using blockchain technology for sustainability purposes. With the exacerbation of global economic, social, ecological and health problems, blockchain technology can curb current and future challenges. It can help in creating an efficient, transparent, and traceable system that can be used for sustainable development. Additionally, blockchain technology can reduce the costs associated with managing and tracking resources, goods, and services. By decentralizing the data, Blockchain can help in providing secure access and storage of data (D. Tabscott [27]). To achieve consistent, targeted results aligned with strategic objectives, a Business Process Model identifies, designs, executes, documents, measures, monitors, and controls business processes (I. Bek [5]).

Currently, efforts to integrate this technology into BPM are at an early stage (W. Viriyasitavat, D. Hoonsopon [30]). Companies need to consider the nature of the business process, the use of the technology, and its capabilities when deciding how to integrate Blockchain into their BPM. It is essential to ensure that the technology and the process are aligned to maximize the benefits and minimize the risks. For enterprises looking to revolutionize their business processes, Blockchain is an attractive option because of its integrity, resilience, and transparency (X. Xu et al. [34]). Therefore, distributed BPM systems are needed to build an integrated, distributed, and decentralized architecture for Industry 4.0. This architecture would enable the integration of various components, such as IoT, cloud, and CPSs, to support the real-time orchestration of distributed services. To survive in a competitive market, implementing flexible business processes in open environments is unavoidable, as it promotes collaboration, knowledge sharing, and collective decision (Y. Xinyi et al. [32]). This helps to reduce operational costs while increasing efficiency and productivity. It also fosters better customer relationships by providing more customized services. Additionally, it can lead to faster innovation and higher customer satisfaction.

The article addresses novel features and characteristics achieved by integrating blockchain technology into BPM. This is intended to enable business decision-makers to integrate technology for achieving sustainable technologies efficiently.

BLOCKCHAIN EMPOWERS THE TRUST FEATURE IN BPM

According to experts in the field of organizational performance, cutting-edge technological innovations, like the Blockchain, improve trust through open information exchange, the efficiency of various virtual groups, the time management factor, as well as integrity, good-

ness, and ability (F. Hawlitschek et al. [16]). As a result, putting Blockchain into practice increases trust (S. Huckle et al. [19]) Blockchain technology is qualified to advance electronic governance, or e-government, because to its trust component.

This is true for Blockchain since the system acquires its feature of trust by depending on electronic devices to exchange information and store it in production institutions, which is far outside the margin of error.

According to T. TeckMing and S. Saraniemi [29], trust is a crucial factor that needs to be assessed in real-time based on feedback and suggestions from previous interactions and comments. According to N. Alexopoulos, et al. [3], Blockchain technology is based on a trust-based problem that provides network security and anonymity throughout information transfer and storage. Trust has been cited by several authors as a benefit of blockchain technology, the goals are summarized as follows (F. Hawlitschek et al. [16]):

- Network that cannot be tampered with: The blockchain network is more trustworthy since it gathers verified data that all stakeholders have approved. Time-stamped records of transactions between interested parties that are made to manage information appropriately.
- Information validation: Several miners will check the transaction in question and confirm the transaction on every block if reputation- or trust-related information is published on the blockchain network.
- Verification and authentication: Membership authentication is required for any entity wishing to join the blockchain network. Verifying and acquiring entities' identities produces specific keys in response to the defined security policies.

A suitable solution is offered by blockchain technology. Blockchain connects sensor data hashes to blockchain transactions, providing the Internet of Things with an unalterable audit trail of sensor observations (A. Dorri et al. [12]). By employing cryptographic hash algorithms to connect each block to the blocks that came before it in the chain, transactions are organized into blocks that are nearly impossible to change without being noticed. In order to verify transactions and blocks before they are added to a blockchain, public key cryptography can be utilized. In other words, Blockchain is a digital ledger of all cryptocurrency transactions. It is constantly growing as "completed" blocks that are added to it with a new set of recordings. Each block contains a cryptographic hash of the previous block, a time-stamp, and transaction data. Moreover, in highlighting trust as an added value of blockchain technology, authors have specifically emphasized its dimensions, such as tamper-proof networks, information validation, authentication, and verification.

This helps organizations avoid fraud, misappropriation of information, and disruption of internal systems by anonymous hackers (F. Glaser et al. [15]).

Beyond the technical aspect of Blockchain, the trust characteristic of Blockchain is obvious through that data is entered into the system in any BPM. These data could not be altered or deleted without the approval of all participants. The participants could be stakeholders involved in managing the data and analyzing it. As a result, all stakeholders will be directly involved and responsible for the accuracy of the data, and the trust factor would increase among them automatically by the operational mechanism process of Blockchain (M. Casey, P. Vigna [7]). In addition, such mechanisms for Blockchain reduce the need for intermediaries in any trade transaction, where the major stakeholders would trust the execution process and avoid additional costs or commissions by the intermediaries, as the relation is directly happening between the major stakeholders.

In traditional BPM, the operational process was controlled by a centralized system, which could fail in the event of a single point of failure or be accessed by unauthorized individuals. With Blockchain technology, however, the BPM system is becoming decentralized since the nature of the process relies on distributing data among participants, reducing the possibility of one entity having too much power (W. Viriyasitavat et al. [31]). It can contribute to a greater sense of trust in the fairness and security of the system due to this decentralization.

BLOCKCHAIN EMPOWERS THE IMMUTABILITY FEATURE IN BPM

As a component of large software systems, Blockchain's immutability can provide a trusted and neutral data storage platform. This ledger structure and network are immutable and neutral due to their unique design, network, consensus protocol, and cryptographic mechanisms (H. Paik et al. [23]).

The immutability of blockchain ledgers, according to blockchain evangelists, allows a blockchain to serve as a permanent, indelible, and unalterable record of transactions.

Immutability can transform an auditing process into a cost-effective, efficient, and fast one, ensuring high trust and integrity for the data businesses use and share in their daily operations. As a result of the implementation of blockchain technology, all stakeholders can adhere to ethical standards, such as shareholders, governments, consumers, employees, and suppliers. As a result of blockchain implementation, enterprises can benefit from immutability, which reduces overheads and time spent on auditing and fraud prevention. With Blockchain's immutability, tracking the root cause of significant bugs, auditing specific application data, and restoring changes to the database can save time and money (K. Doubleday [13]).

One of its outstanding features is the development of blockchain technology in open and dispersed communities. A blockchain, according to its official definition, is an "immutable distributed database that is maintained by a decentralized P2P network in conjunction with cryptography, consensus mechanisms, and back-referencing blocks to make transactions orderly and validated" (F. Hofmann [17]). The Blockchain's immutability assures that earlier data cannot be altered or updated, i.e., it prevents tampering with the fundamental data of an organization's internal system, through the use of numerous algorithms. In other words, all parties know every financial and accounting aspect. Government organizations will find confirming financial and accounting data simpler without worrying about internal auditor manipulation. Companies will be able to pay taxes and levies without having to disclose their bank accounts to the state.

Additionally, Blockchain's immutability feature will guard all of its data and files against hacking and piracy. This aids businesses in preventing fraud, information theft, and internal system disruption by unidentified hackers. Blockchain's immutability can offer a reliable and impartial data storage platform in massive software systems that use it as a component. The ledger structure and network can establish confidence and neutrality because of their distinctive designs, networks, consensus protocols, and cryptographic techniques (H. Paik et al. [23]).

BLOCKCHAIN EMPOWERS THE TRANSPARENCY FEATURE IN BPM

Transparency plays a vital role in organizations as it not only fosters trust but also improves decision-making and enhances organizational communication (J. Chod et al. [9]).

In the realm of organizational behavior research, several dimensions of transparency are commonly studied by various scholars (P. De Filippi et al.; A Tapscott, D. Tapscott [10; 28]):

- Transparency refers to the ease of access to financial information, policies, and other types of information within an organization.
- The level of transparency of decision-making within an organization is determined by how open and transparent the process is to other members. It can include sharing information about how and why decisions are made.
- Transparency in communication emphasizes the importance of open and honest communication within an organization. Communication channels should be transparent, and people should be open to listening and considering other perspectives.
- In terms of performance transparency, it refers to how visible an organization's and its members' performance is. This can include the sharing of performance metrics and the use of performance evaluations.

Blockchain technology offers a decentralized, unchangeable record of transactions, which is why it is frequently connected with transparency. All network users can see transactions recorded on a blockchain, making it difficult for one person to modify or change the record. Transparency can be advantageous when a clear, auditable record of transactions is required, like in supply chain management, financial transactions, and voting systems. The ability to create smart contracts, self-executing contracts in which the terms of the agreement between the buyer and seller are directly encoded into lines of code, is one of the main features of blockchain technology (E. Bertino et al. [6]). Because smart contracts may automatically enforce the terms of the agreement, which can assist in preventing disputes and guaranteeing that all parties are held accountable, they can contribute to greater transparency.

The UN technical department recently released a CRUD standard for massive data gathered by big businesses.

CRUD (Create, Read, Update, Delete) is implemented in blockchain applications and systems as smart contracts. Smart contracts handle data transmitted between peers in blockchain applications, whether they are business partners or customers. Data transparency may frequently be required to promote AI system ethics, but the opposite may also be true. Transparency and ethical policies can both be implemented via smart contracts.

Users can check whether data are biased, whether transparency requests are handled, and whether the outcomes adhere to ethical standards as soon as the blockchain ledger is updated. In order to verify that the historical analysis and ethics support the data openness required by smart contracts, the smart contract analyses bias and ethical norms on a transaction-by-transaction basis and over the entire of processed transactions thus far (E. Bertino et al. [6]). Because blockchain technology enables a transparent, verifiable record of transactions and agreements, it can contribute to an increase in transparency and confidence across a range of applications. Using blockchain technology in MNCs can also improve supply chain management and financial transactions by increasing transparency and trust in numerous business operations.

BLOCKCHAIN EMPOWERS THE COST REDUCTION FEATURE IN BPM

There has been an apparent reluctance to adopt these apps from businesses operating in various industries since the advent of numerous blockchain applications and services. Until intermediaries in money transfers, such as banks and foreign transfer businesses, started to impose virtual money as a way to reduce money transfer charges and lengthy time (C. Catalini, J. Gans [8]). Due to technology's benefits in cost reduction and money savings, hedge funds, bankers, and merchants have started to employ it more frequently today. Numerous studies have examined this subject, illuminating both

its benefits and drawbacks. Blockchain technology can lower costs in various organizational settings by improving the accuracy and effectiveness of numerous business operations. Cost savings are frequently viewed as a crucial benefit of deploying blockchain technology in organizational behavior research (A. Pal et al. [24]).

By eliminating the need for intermediaries and third parties in corporate processes, blockchain technology can cut expenses. For instance, a blockchain-based system might be used in supply chain management to trace the movement of items and authenticate transactions without intermediaries. This might assist in lowering the fees, commissions, and other expenses incurred by these intermediaries (A. Banerjee [4]).

Blockchain technology can also lower costs by improving the precision and effectiveness of particular procedures. To limit the possibility of errors or fraud, a blockchain-based system might be used, for instance, to record and verify financial transactions, contracts, and other documents. Reduced legal and administrative expenses may arise from this (P. Frauenthaler et al. [14]). According to the findings of a 2016 McKinsey poll on the financial sectors in various areas, 50% of C-level financial executives anticipate that Blockchain would be widely used in the sector by 2020 [21]. By 2025, 66% of the financial sector will have dedicated blockchain networks, according to IBM research (T. Ahram et al. [2]).

Blockchain can also help international corporations save money by improving supply chain management. Tracking the movement of items in conventional supply chains can be difficult and time-consuming, requiring several databases and systems. Companies can follow the movement of commodities in real-time by utilizing a decentralized blockchain system, boosting visibility and lowering the possibility of mistakes and fraud (S. Ahluwalia et al. [1]). Blockchain can also save multinational corporations money by lowering the cost of regulatory reporting and compliance. Companies can more easily meet regulatory standards and lower the cost of compliance by using a decentralized and transparent record of transactions. Workie and Jain stated that $1.5 billion was invested overall in blockchain applications in 2016 in the same context. According to them, these investments would alter the payments sector and produce new industry subsectors with lower costs and higher added value, boosting competition (C. R. W. De Meijer [11]).

LONGITUDINAL ANALYSIS FOR THE SCIENTIFIC STUDIES THAT INVESTIGATE THE RELATION BETWEEN BLOCKCHAIN AND THE INDEPENDENT VARIABLES (TRUST, IMMUTABILITY, TRANSPARENCY AND COST REDUCTION)

A systemic literature review approach referred to as longitudinal literature review was adopted to target peer-reviewed articles examining the relationship between Blockchain and the independent variables ("factors") of trust, transparency, immutability, and cost reduction. It is a tool used to analyze the de-

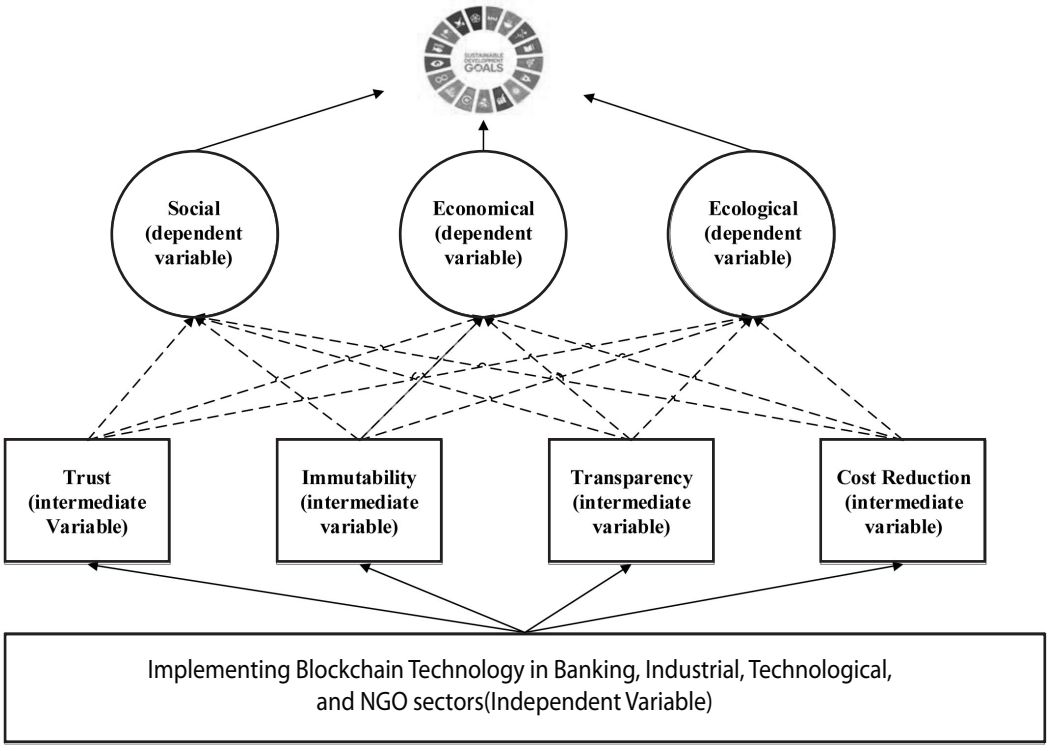

Fig. 1. The research model for testing the relationship between the factors for implementing Blockchain Technology in various sectors is reaching organizations' social, economic and ecological goals

Source: formed by the authors according to literature review analysis for variables to implement Blockchain Technology.

velopment of literature on any topic and in any particular period (A. Martín-Martín et al. [20]). These variables have been demonstrated by the literature review to be the characteristics that distinguish blockchain systems in organizations from any other digital system. Based on advanced search options in Google Scholar, a bibliometric search was conducted:

- The search focused on articles investigating Blockchain's impact and its relationship with four variables only in the targeted sectors: "banking sector, telecommunication sector, NGOs sector, and industrial sector".
- To investigate the impact of Blockchain after COVID-19, the search was limited to articles published since 2021 to analyze Blockchain's last generation 4.0, launched in 2021.
- All the articles published in Q1 journals with the highest impact factor and highest impact index.

According to this bibliometric advanced search, numerous articles investigate how blockchain technology impacts the independent variables in the targeted sectors. Consequently, it was found that these articles used the following variables to demonstrate a positive impact of blockchain adoption. However, the significance of this study lies in showing how these variables can specifically affect the achievement of Sustainable Development Goals (SDGs).

Based on the results of the bibliometric study, 20 articles fall into the category of Q1 articles. According to these articles, blockchain technology adoption is related to four underlying factors: trust, transparency, cost reduction, and immutability. Most articles, however, focus on Blockchain's impact on supply chain management and agriculture.

Only five articles have been found that specifically examine the relationship between blockchain technology and intermediate variables in the financial and industrial sectors. Only two articles published in Q1 journals after 2021 demonstrate the relationship between blockchain technology and the four intermediate variables in the banking sector.

CONCLUSIONS

Through its basic features, such as transparency, trust, stability, and cost reduction, Blockchain technology has the potential to contribute to economic, social, and environmental sustainability. Accordingly, each of these dimensions of sustainability is impacted as follows if the various economic sectors implement it.

1. Economic sustainability

With Blockchain, transparency and traceability are possible, allowing for accountability within economic systems. A fixed record of transactions and operations also helps prevent fraud, corruption, and unethical practices. Better business practices, reduced information asymmetry, and better investor and consumer confidence result from increased transparency in businesses and organizations.

Blockchain's decentralized nature allows peer-to-peer transactions, eliminating the need for intermediaries like banks, payment processors, and clearinghouses. Consequently, transaction costs are lower, settlement times are faster, and financial inclusion is increased, especially in areas with low access to traditional financial services.

A tamper-proof record of the entire supply chain process is provided by Blockchain technology during global trade and supply chains. Economic growth and stability are ultimately achieved by reducing operational delays, reducing stakeholder conflicts, and ensuring fair business practices.

Fig. 2. Bibliometric results for the 127 articles published on Scopus and Web of Science in Q1 journals that investigate Blockchain and its relation with the four factors "Trust, Immutability, Transparency and Cost reduction" from 2021 till 2023, using the advanced search option on Google Scholar

Table 1

Addressing the significant studies cited in SCOPUS that clarify the relation between Blockchain technology and trust, transparency, immutability, and cost reduction

Title for the articles	Sector/Field	Variables addressed	DOI, URL
1	2	3	4
A conceptual framework for blockchain-based sustainable supply chain and evaluating implementation barriers: A case of the tea supply chain	Supply Chain Management	Trust, transparency, immutability, and cost reduction	https://onlinelibrary.wiley.com/doi/10.1002/bse.3027
The Impact of Blockchain Technology on Accounting, Auditing, and Assurance Practices: Turkey Case	Finance and Banking Sector	Trust, transparency, immutability	10.4018/978-1-6684-4153-4.ch011
Blockchain: an ambitious technology for managing SCM	Technology	Trust, transparency, immutability	https://doi.org/10.1109/LOGISTIQUA55056.2022.9938072
Blockchain in Supply Chain Management	Supply Chain Management	Trust, transparency, immutability	https://www.academia.edu/download/68763861/Moosavi2021_Article_BlockchainInSupplyChainManagem.pdf
Blockchain in the Financial Universe: A situational analysis on the interest of academics	Finance	Trust, transparency, immutability, and cost reduction	https://doi.org/10.3390/economies11050140
Ensuring construction material provenance using the Internet of Things and Blockchain: Learning from the food industry	Agriculture and Food Industry	Trust, transparency, immutability, and cost reduction	https://doi.org/10.1016/j.jii.2023.100455
Exploring the Hype of Blockchain Adoption in Agri-Food Supply Chain: A Systematic Literature Review	Agriculture and Food Industry	Trust, transparency, immutability, and cost reduction	https://www.mdpi.com/2077-0472/13/6/1173#
Blockchain for Food Tracking	Agriculture and Food Industry	Trust, transparency, immutability, and cost reduction	https://doi.org/10.3390/electronics11162491
Intelligent transportation systems applications: Safety and transfer of big transport data	Technology	Trust, transparency, immutability, and cost reduction	https://doi.org/10.1007/978-3-031-25863-3_6
A Systematic Literature Review on Using Blockchain Technology in Public Administration	Public Administrations	Trust, transparency, immutability, and cost reduction	https://doi.org/10.23919/MIPRO55190.2022.9803797
How can Blockchain contribute to developing country economies? A literature review on application areas	Supply Chain	Trust, transparency, immutability, and cost reduction	http://dx.doi.org/10.2478/eoik-2022-0009
A novel method to ensure the security of the shared medical data using smart contracts: Organ transplantation sample	Transportation	Trust, transparency, immutability, and cost reduction	http://dx.doi.org/10.1002/cpe.6752
Achieving UN SDGs in Food Supply Chain Using Blockchain Technology	Supply Chain	Trust, transparency, immutability, and cost reduction	http://dx.doi.org/10.3390/su15032109

End of the Table 1

1	2	3	4
Blockchain: A Makeover to Supply Chain Management	Supply Chain	Trust, transparency, immutability, and cost reduction	https://doi.org/10.1007/978-981-16-7059-6_26
The benefits of Blockchain for digital certificates: A multiple case study analysis	Supply Chain	Trust, transparency, immutability, and cost reduction	https://doi.org/10.1016/j.techsoc.2022.102176
Blockchain tokenization of real estate investment: a security token offering procedure and legal design proposal	Supply Chain	Trust, transparency, immutability, and cost reduction	https://doi.org/10.1080/09599916.2023.2167665
Scrutinizing blockchain applicability in sustainable supply chains through an integrated fuzzy multi-criteria decision-making framework	Supply Chain	Trust, transparency, immutability, and cost reduction	https://doi.org/10.1016/j.asoc.2021.108331
Exploring Supply Chain Blockchain Potential in the Pharmaceutical Industry	Pharmaceutical Industry	Trust, transparency, immutability, and cost reduction	https://ieomsociety.org/proceedings/2022istanbul/292.pdf
Combined Digital Signature with SHA Hashing Technique-based Secure System: An Application of Blockchain Using IoT	Technological Sector	Trust, transparency, immutability, and cost reduction	https://turcomat.org/index.php/turkbilmat/article/view/13008/9330
Application of blockchain technology for agri-food supply chain management: A systematic literature review on benefits and challenges	Agricultural	Trust, transparency, immutability, and cost reduction	https://doi.org/10.1108/BIJ-08-2021-0495

Source: Systematized by the authors.

In addition to streamlining operations and reducing administrative expenses, Blockchain technology can enhance operational efficiency. Companies and organizations can benefit from this by saving money.

2. Social sustainability

Using blockchain technology, individuals can securely manage and share their data, allowing them to have self-sovereign identities. Healthcare, education, and financial services are more accessible to marginalized populations without proper identification.

Blockchain technology can enhance transparency in charitable activities by providing donors with real-time visibility into how their donations are being used.

Transparency of employment contracts, wages, and working conditions can be ensured using blockchain technology. Social justice can be promoted, and exploitative labour practices can be prevented.

3. Environmental sustainability

By promoting sustainable sourcing and reducing the environmental impact of supply chains, blockchains can help to facilitate supply chain transparency. Following raw material to finished product journeys can provide consumers with valuable information to help them make more informed decisions.

Using blockchain technology, carbon credits can be traded transparently, and emissions data can be tracked tamper-proof. Companies may be compelled to adopt greener practices and contribute to fighting climate change.

Individuals and businesses can directly buy and sell excess energy using blockchain technology, allowing peer-to-peer renewable energy trade. Reducing fossil fuel dependence can be achieved by promoting clean energy sources.

It is essential to recognize that blockchain technology is not without challenges, regardless of its great potential for economic, social, and environmental sustainability. Stakeholders must collaborate and align with Sustainable Development Goals in order for implementation to be successful. ■

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TRENDS IN THE GLOBAL AND UKRAINIAN MARKETS OF COSMETICS PRODUCTS

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Sviderska S. Ye., Kukhta P. V. Trends in the Global and Ukrainian Markets of Cosmetics Products

The article aims at disclosing and summarizing the current trends in the development of cosmetics products markets, determining their volumes, dynamics and potential; analyzing the impact of global market conditions on the reactions of domestic players to crisis conditions. The research is relevant due to the peculiarities of the current conditions of development of the Ukrainian cosmetics products market. It is currently undergoing transformation due to government regulation affecting one of the largest market players. This opens up opportunities for small businesses, local and international investors to further develop, strengthen their market presence and attract additional investment. The methodological basis of this study is formed by general scientific methods, the complex combination and use of which made it possible to obtain important practical results. The cosmetics products markets, analyzed in the article, are defined as sustainable, stable-growing, and adaptive toward crisis occurrences. Overall, the industry that has undergone a transformation towards self-care, health and naturalness under the influence of the COVID-19 pandemic, accelerating the development of omnichannelness and innovations. Technological advances are crucial, influencing product development, customer interaction, marketing, etc. In particular, the development of e-commerce in the cosmetics products market is changing the way consumers think about the way they shop, facilitating the prior experience of finding the right product and providing the basis for more informed, yet faster, purchasing decisions. These facts are underlined by numerous statistical studies that support forecasts of the sustainability of development of e-commerce in this market in the future. In such circumstances, analyzing global trends in the cosmetics products industry helps to understand the dynamics of the local market and the behavior of players during crises. It is vital for local market players to adapt to global market rules and formulate effective strategies. It is summarized that, in addition to the generally recognized shifts in the cosmetics products market, such as the post-pandemic and the growth of e-commerce, it is important to consider trends that influence consumer choice and purchases, such as the need to personalize the consumer experience, the growth of the face and body care segment, the propensity to consume organic products, and the requirements for sustainable business development.

Keywords: *cosmetics market, trends, e-commerce, omnichannelness, market volume, sustainable development, COVID-19, market dynamics.*
Fig.: *4.* ***Bibl.:*** *13.*

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