

UDC: 657.6:658.8:656.61(477.7)

*I. Smyrnova,
Doctor in Pedagogical Sciences, Professor, Assistant Director of Academic and Pedagogical
Activities, Danube Institute of National University "Odessa Maritime Academy"*

ORCID ID: <https://orcid.org/0000-0003-2085-5391>

*T. Zhytomyrska,
PhD in Pedagogical Sciences, Associate Professor, Associate Professor of the Department
of Management in the Transportation Sector, Danube Institute of National University
"Odessa Maritime Academy"*

ORCID ID: <https://orcid.org/0000-0002-7015-0819>

*A. Haidarzhby,
PhD in Pedagogical Sciences, Associate Professor, Associate Professor of the Department of
Management in the Transportation Sector, Assistant Director of Teaching and methodological work,
Danube Institute of National University "Odessa Maritime Academy"*

ORCID ID: <https://orcid.org/0000-0002-4072-1772>

*M. Musorina,
PhD in Pedagogical Sciences, Associate Professor, Associate Professor of the Department of Marine
Power Plants and Systems, Danube Institute of National University "Odessa Maritime Academy"*

ORCID ID: <https://orcid.org/0000-0002-0769-2199>

DOI: 10.32702/2306-6814.2023.11.15

ANALYSIS OF THE PROSPECTS FOR IMPLEMENTING BLOCKCHAIN TECHNOLOGIES IN ACCOUNTING, MANAGEMENT, AND MARKETING IN SEAPORTS: UKRAINIAN CASE

*I. М. Смирнова,
д. пед. н., професор, заступник директора з науково-педагогічної діяльності,
Дунайський інститут Національного університету "Одеська морська академія"*

*Т. М. Житомирська,
к. пед. н., доцент кафедри управління в транспортній галузі,
Дунайський інститут Національного університету "Одеська морська академія"*

*А. І. Гайдаржи,
к. пед. н., ст. викладач кафедри управління в транспортній галузі, заступник директора
з навчально-методичної роботи, Дунайський інститут Національного університету "Одеська морська академія".*

*М. О. Мусоріна,
к. пед. н., доцент кафедри суднових енергетичних установок і систем,
Дунайський інститут Національного університету "Одеська морська академія"*

**АНАЛІЗ ПЕРСПЕКТИВ ВПРОВАДЖЕННЯ БЛОКЧЕЙН ТЕХНОЛОГІЙ В БУХГАЛТЕРСЬКИЙ
ОБЛІК, МЕНЕДЖМЕНТ ТА МАРКЕТИНГ У МОРСЬКИХ ПОРТАХ: УКРАЇНСЬКИЙ КЕЙС**

In the domestic economy, there is currently active implementation of blockchain technologies, which we interpret as a distributed database that ensures secure storage and transmission of accounting, managerial, and other information. This possibility is driven by the fact that such technology is based on the principle of a chain of blocks. Taking into account the outlined significance, there is an active implementation of blockchain technologies in accounting, management, and marketing in seaports. Therefore, the article's comprehensive analysis provides the prospects for implementing blockchain technologies in accounting, management, and marketing in domestic

seaports. The research findings indicate that the blockchain technologies implementation in accounting, management, and marketing in domestic maritime ports can bring significant benefits to all stakeholders, including port organizations, government authorities, shipping operators, and other participants in sea transportation. In particular, it has been proven that the overall advantages of implementing blockchain technologies include a secure and tamper-resistant information environment, the use of cryptography and decentralized nature for data integrity, and the enhancement of transparency and governance in seaports. It has been demonstrated that specific advantages of implementing blockchain technologies include the improvement of efficiency and optimization of management processes in seaports, enhanced effectiveness of marketing efforts in attracting new clients and developing partnerships, improved efficiency, security, and transparency of financial transactions, as well as facilitating process automation and cost reduction. The prospects for further research in blockchain technology implementation in the accounting, management, and marketing of seaports lie in the development and adoption standards sphere that define data exchange methods, the structure of blockchain systems, accessible cryptographic protocols, and more. Research in this field can focus on both creating and improving such standards.

У вітчизняній економіці наразі відбувається активне впровадження блокчейн-технологій, які ми інтерпретуємо як розподілену базу даних, що забезпечує безпечне зберігання та передачу облікової, управлінської та іншої інформації. Така можливість зумовлена тим, що ця технологія базується на принципі ланцюжка блоків. Враховуючи окреслену значущість, відбувається активне впровадження блокчейн-технологій в бухгалтерський облік, менеджмент та маркетинг у морських портах. Відтак у статті реалізований комплексний аналіз перспектив впровадження блокчейн-технологій в бухгалтерський облік, менеджмент та маркетинг вітчизняних морських портів. За результатами дослідження було встановлено, що впровадження блокчейн-технологій в бухгалтерський облік, менеджмент та маркетинг у вітчизняних морських портах може мати значні переваги для всіх зацікавлених сторін, зокрема портових організацій, урядових органів, операторів судноплавства та інших учасників морського транспорту. Доведено, що загальними перевагами від впровадженням блокчейн технологій є безпечне, недоступне для змін інформаційне середовище, використання криптографії та децентралізованої природи забезпечення даних, поглиблення транспарентності та прозорості управління морськими портами. Доведено, що специфічними перевагами від процесу впровадження блокчейн технологій є покращення ефективності та оптимізація процесів управління морськими портами, покращення ефективності маркетингових зусиль (із залучення нових клієнтів та розвитку партнерських відносин), покращення ефективності, безпеки та прозорості фінансових операцій, а також сприяння автоматизації процесів та зниженню витрат. Перспективи подальших досліджень в галузі впровадження блокчейн-технологій в бухгалтерський облік, менеджмент та маркетинг морських портів полягають у розробці та впровадженні стандартів, які визначатимуть спосіб обміну даними, структуру блокчейн-системи, доступні криптографічні протоколи тощо. Дослідження в цій області можуть спрямовуватися як на створення, так і на вдосконалення таких стандартів.

Key words: seaports; efficiency improvement; process optimization; management; cryptography.

Ключові слова: морські порти; покращення ефективності; оптимізація процесів; управління; криптографія.

TARGET SETTING

In the domestic economy, there is currently active implementation of blockchain technologies, which we interpret as a distributed database that provides secure storage and transmission of accounting, management, and other information. This possibility arises because such technology is based on the principle of a chain of blocks, where each block contains a set of transactions that are verified and authenticated by a network of participants. Considering the outlined significance, active implementation of blockchain technologies is taking place in the accounting, management, and marketing of seaports. For

example, in 2019, several stevedore ports in Ukraine conducted test trials of blockchain technology in their electronic document management systems intending to reduce document processing time [3]. Furthermore, the majority of domestic ports are already implementing pilot projects for the full-scale adoption of blockchain technologies in marketing and management [3]. Therefore, in the next few years, we expect a series of transformations and systemic changes in financial operations within seaports, business process management in international trade, and marketing activities. Among the systemic changes that will accelerate operational and process

transformations in seaports are the establishment of a shared blockchain infrastructure among all industry participants (including seaports, shipping operators, logistics companies, and other stakeholders) and the development of standardized formats protocols for data exchange between different seaport actors, among other initiatives.

ANALYSIS OF RESEARCH AND PUBLICATIONS

The analysis of recent research, including the articles by Balazyuk O., Pilyavets V. [1] and Lapko O. O., Solosich O. S. [2], confirms the increasing relevance of blockchain technology in accounting, management, and marketing fields. Researchers indicate that blockchain can bring significant benefits and improve process efficiency in these areas through distributed database that ensures immutability, data integrity, and high-level security. Blockchain has the potential to enhance transparency and openness, reducing the possibility of manipulation and information falsification. In their research, Lapko O. O., and Solosich O. S. [2] emphasize the ability of blockchain to create secure digital contracts and automate transactions and data exchange with clients. Despite the extensive body of research and publications examining the application of blockchain technologies in accounting, management, and marketing, it is worth noting that the prospects of implementing these technologies in seaports are not yet fully determined.

THE WORDING OF THE PURPOSES OF ARTICLE

The purpose of the article is to provide a comprehensive analysis of the prospects for implementing blockchain technologies in accounting, management, and marketing in domestic seaports.

THE PAPER MAIN BODY WITH FULL REASONING OF ACADEMIC RESULTS

A seaport can currently exist as a stevedoring, fish processing, or specialized enterprise or a complex of enterprises that facilitate the connection between water and land transport, provide services to vessels, handle cargo and passengers, or perform other functions [4]. In particular, the main stevedoring ports in Ukraine include the Odesa Port, Mykolaiv Port, Kherson Port, Izmail Port, and Pivdennyi Port. These ports handle and transship various types of cargo, such as grain, ore, coal, oil, and gas, and also provide services for passenger vessels. In addition, Ukraine also has fish processing ports where fish and other seafood are processed. There are specialized ports that cater to specific types of cargo, such as the Chornomorsk Port for grain and mineral fertilizers handling. Furthermore, there are port terminals in Ukraine that are fully or partially specialized in the handling and storage of oil and petroleum products, for example, the Yagorlivskyi Terminal near the Odesa Seaport.

Considering the broad and diverse range of functions, all seaports utilize specific accounting, management, and marketing systems. These systems, due to their comple-

Table 1. Experience of implementing blockchain technology in seaports accounting

Ports in Ukraine blockchain technology uses	The foundation of implementation blockchain technology	The specificity of usage blockchain technology	Associated areas of implementation blockchain technology*
Odesa Port	Wave platform	utilizes blockchain technology for creating digital contracts	1, 3,5
Kherson Port			1,2, 3
Mykolaiv Port			3
Izmail Port	Wave platform	utilizes blockchain technology for creating digital contracts and automating the accounting of container arrival operations.	3,4
Pivdennyi Port			3,4,5

Note

* (1) Implemented blockchain for financial transaction tracking and transparency in accounting processes; (2) Utilized blockchain for secure storage and sharing of accounting data, improving reliability and efficiency; (3) Implemented blockchain-based smart contracts for automating financial transactions and ensuring accuracy in accounting records; (4) Leveraged blockchain technology for seamless data exchange and real-time auditing in port accounting operations; (5) Implemented blockchain-based systems for enhanced transparency and traceability of financial transactions in port operations.

Source: formed based on [3].

xity, give rise to: lengthy logistical processes in ports; extensive data and documentation exchange among various parties (such as customs, cargo owners, vessel operators, stevedores, and other stakeholders [3]); high risks of data security breaches and document loss; the need for constant monitoring of cargo origin. Therefore, blockchain technology is actively being implemented to address these challenges [1; 2].

According to the specified context, the authors have identified blockchain technology in the accounting of seaports as the adapting process of distributed ledger blockchain for storing and processing financial information related to seaport operations. It should be noted that such operations encompass a wide range of activities related to cargo handling, ensuring security, and efficient functioning of port infrastructure [3]. In traditional accounting, financial transactions in a centralized accounting system are recorded, which can create issues with transparency, security, and data integrity. The use of blockchain in the accounting of seaports aims to enhance the reliability, transparency, and efficiency of accounting processes. Currently, the blockchain technology accounting implementation is present in stevedoring seaports and is limited to the Wave platform (Table 1). Wave utilizes blockchain technology to create digital contracts that enable the automatic execution of financial transactions among supply chain participants [3].

According to the table data, it is evident that blockchain technology optimizes the traditional accounting scenarios in stevedoring seaports, specifically when a container arrives at the port. With the help of Wave technology, container arrival data is automatically recorded in the accounting system (through relational databases) and referenced to respective contracts [3]. Upon container unloading, the owner receives an automatic notification of the operation completion (also recorded in the accounting system) and the payment (automatically processed by the system). It allows for accelerated

operations, reduced risks of errors and unnecessary costs, as well as facilitating the accounting and reporting process. The implementing blockchain technology practice has already minimized the need for multi-step payment procedures, document circulation, and payment confirmations. It is already evident that blockchain technology enables the creation of chains of blocks containing transactions and financial data (where each block is verified by the network of participants, ensuring data immutability and financial and accounting information integrity).

In addition, blockchain technology is currently being tested in the system of monitoring and validating freight contracts, as calculations and confirmation of the execution of such contracts can be time-consuming and involve documents confirming the delivery of goods or provision of services.

Therefore, the analysis of the content of these technologies, their specific features, and the experience of implementation in the accounting of seaports allow us to state that this process can provide several advantages, summarized in Figure 1.

According to the provided data, it is evident that the implementation of blockchain technology in the accounting of domestic seaports offers the following advantages [5–6]:

1. Data Integrity and Immutability: The mentioned technology ensures the integrity and immutability of records since each data block contains the hash codes of previous blocks. This guarantees security, prevents tampering with financial data, and avoids errors and fraud.

2. Transparency and accessibility of accounting data.

The mentioned technology ensures transparency in accounting and financial reporting, as all network participants have access to an identical copy of the blockchain. This enables tracking of financial transactions and verifying their authenticity.

3. Automation of data exchange and processing processes. The mentioned technology can be used to create "smart contracts" which are automated programs that execute specific conditions and actions. This allows for the automation of payment processes, calculations, and financial interactions with other network participants. In seaport, there can be multiple parties involved such as cargo owners, stevedores, terminals, customs, and others. Each of these parties may have financial obligations and settlements related to cargo handling. Using blockchain technology, "smart contracts" can be created to automatically execute based on predefined conditions. For example, a contract may include payment conditions for cargo-handling services.

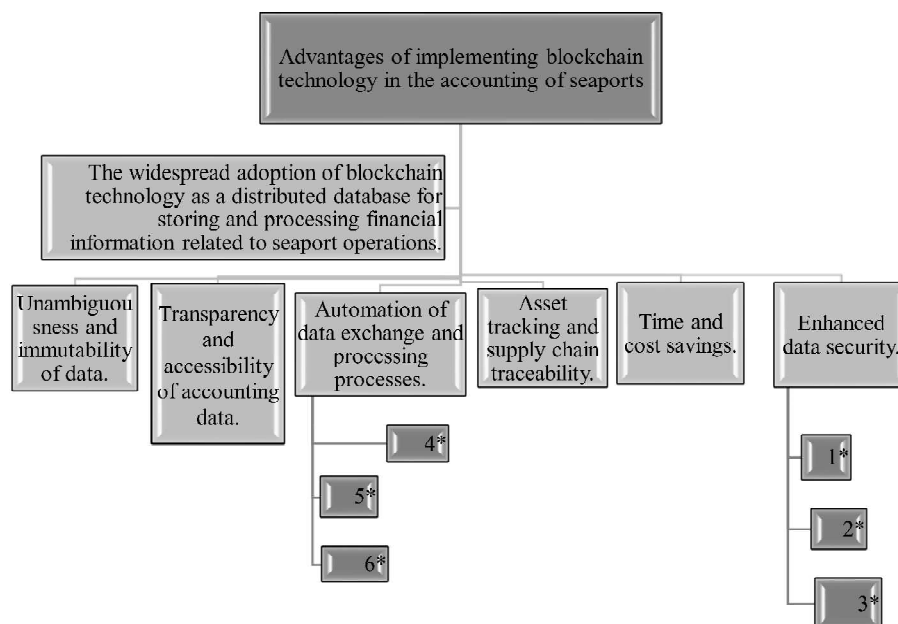


Figure 1. Advantages of implementing blockchain technology in seaports accounting (Ukrainian case)

Note

* (1) Information stored in blocks is encrypted; (2) Information stored in blocks is distributed across the network; (3) Information stored in blocks becomes difficult to access and alter without authorization; (4) Automation and optimization of processes; (5) Reduction in time and costs for accounting operations.

Source: formed based on [3; 5–6].

When a cargo owner transfers the cargo to the stevedores for processing, the transaction information is recorded on the blockchain. The smart contract automatically verifies whether the contract conditions have been met and initiates a payment from the cargo owner to the stevedores. It allows automation of settlement processes and reduces the time and costs associated with financial transactions.

4. Asset tracking and supply chain traceability. The mentioned technology can provide transparency and traceability of assets within the supply chain, enabling the detection of fraudulent schemes and improving resource utilization efficiency [3].

5. Time and cost saving. Implementing blockchain technology in accounting can contribute to:

- automation and optimization of processes;
- reducing the time and costs associated with accounting operations;
- minimizing the number of intermediaries or third parties, which helps to lower commission fees and service costs (facilitated by the use of smart contracts).

6. Enhanced data security. The mentioned technology provides a high level of data security. The information stored in blocks is:

- encrypted;
- distributed across the network;
- made tamper-resistant and inaccessible to unauthorized access or modifications.

Therefore, the prospects of blockchain technology implementing analysis in the accounting of seaports reveal their focus on improving efficiency, security, and financial operations transparency, as well as automation and cost reduction facilitating the process. However, important to

consider the technical, legal, and organizational challenges involved in implementing this technology.

Blockchain technologies in seaports management have been identified by the authors as implementing processes of new approaches and solutions, as well as the widespread use of distributed blockchain databases to enhance management efficiency and address specific management tasks (such as logistics and cargo tracking, document management, and electronic documentation, implementation of "smart contracts"). Currently, this initiative, called TradeTrust, has been implemented by major stevedoring ports in Ukraine and the specialized port of Chornomorsk (Table 2).

Thus, this initiative aims to leverage blockchain technology to enhance transparency in management operations, facilitate direct data exchange among network participants, and ensure secure document and data exchange between various stakeholders in logistics chains, including ports, customs authorities, vessel operators, and other relevant parties.

By leveraging digital signatures and cryptographic methods, TradeTrust ensures the authenticity, reliability, and security of document exchange [3].

Participants in the logistics chain can confidently share data about shipments and, in the future, will have the ability to transmit ownership documents, insurance policies, and other information, thereby reducing the risks of errors, delays, and fraud. The outlined benefits, in our opinion, create a range of advantages from implementing blockchain technologies in the specified domain (Figure 2).

According to the given information, it is evident that implementing blockchain technology in the management of domestic seaports provides the following advantages:

1. Increased efficiency. Implementing mentioned technology in seaport management allows the automation of processes that previously required significant time and resources. It helps reduce costs, improve data processing speed, and decrease the likelihood of errors.

2. Ensuring transparency of managerial operations.

Blockchain technology establishes transparent management processes in seaports since all transactions are recorded in a distributed database accessible to all network participants.

3. Improved analysis and prediction of underlying economic processes.

Mentioned technology ensures the immutability of data stored

Table 2. Experience in implementing blockchain technology in seaports management

Ports in Ukraine blockchain technology uses	The foundation of implementation blockchain technology	The specificity of usage blockchain technology	Associated areas of implementation blockchain technology*
specialized port of Chornomorsk	TradeTrust initiative	Using blockchain to enhance transparency in management operations	1,2,4
Odesa Port		Using blockchain to enhance transparency in management operations and enable direct data exchange among network participants	1,4
Kherson Port			4
Mykolaiv Port			4
Izmail Port		«...», Ensuring the security of document and data exchange among various stakeholders in logistics chains.	1,3
Pivdennyi Port			1,2,3,4

Note

* (1) Blockchain used for supply chain management; (2) Blockchain-based smart contracts for operations; (3) Blockchain-enabled documentation system; (4) Blockchain for vessel tracking and scheduling.

Source: formed based on [3].

in blocks by utilizing the concept of cryptographic hashes. Each block contains a hash code of the previous block, making the system resilient to changes in previous records and ensuring a high level of security and data tampering resistance.

4. Simplified data exchange and collaboration among participants in the management process. Blockchain technology enables network participants to exchange data without intermediaries, which: 1) reduces the need for complex procedures and paperwork; 2) facilitates collaboration between different participants in the seaport, simplifying communication and data sharing.

5. Improved analysis and prediction of underlying economic processes. Mentioned technology stores large volumes of data that can be utilized for analysis and trend prediction. This allows managers to obtain detailed

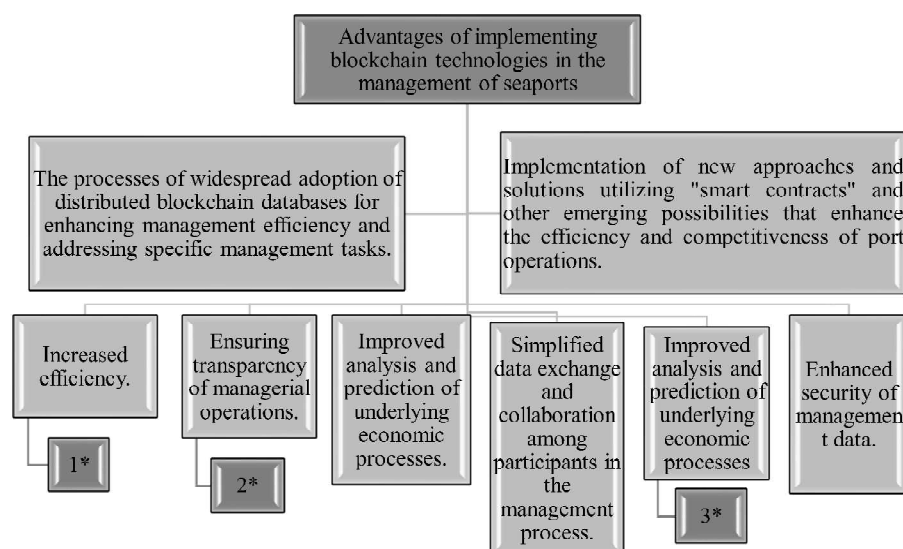


Figure 2. Advantages of implementing blockchain technology in seaport management (Ukrainian case)

Note

* (1) Automation of most processes that previously required significant time and resources; (2) Data and transactions are recorded in a distributed database accessible to all network participants; (3) Immutability of data stored in blocks, preventing unauthorized changes.

Source: formed based on [1—3].

insights and forecast cargo flows, service demand, as well as plan resources and optimize processes.

6. Enhanced security of management data. Mentioned technology ensures a high level of security and confidentiality of data in seaports through encryption and a distributed structure.

Indeed, the analysis of the prospects of implementing blockchain technology in seaport management reveals its focus on improving governance, enhancing transparency and data security, simplifying data exchange and collaboration, as well as creating a conducive environment for innovation.

Within the research, it is noted that blockchain technologies in the marketing of seaports can be identified as processes of widespread adoption of distributed blockchain databases to enhance marketing efforts and facilitate effective interaction with stakeholders. The establishment of a system for transparency and credibility of information about services and offerings at the Odesa seaport is indeed one example of using blockchain in marketing [3]. In particular, the Odesa seaport is currently working on utilizing blockchain technology to create a marketplace platform where cargo owners and ship operators can interact directly. It is expected that each party will be able to submit their proposals or find partners for cargo transportation. With the help of blockchain technology, all data regarding proposals, agreements, and payments can be securely stored and accessible to all network participants [3].

Furthermore, advertising campaigns in ports typically involve multiple participants, including advertisers, agencies, vessel owners, and port operators. This complexity often leads to issues with transparency, payment difficulties, and frequent data loss. Therefore, the Odesa seaport has transitioned to building advertising campaigns through the Ad Ledger platform, which allows for the application of blockchain technology in managing advertising campaigns [3]. Ad Ledger utilizes blockchain to create a secure and transparent advertising ecosystem (specifically for advertising on board vessels and in seaports [3]).

Using blockchain technology, the Ad Ledger platform creates a decentralized system where data about advertising campaigns and their results are recorded in immutable blocks, requiring the consensus of all network participants to make any changes.

This ensures transparency and trust among all parties involved. Specifically, advertisers upload their advertising materials into the blockchain system along with the campaign conditions and details. Port operators and vessel owners can browse through available advertising

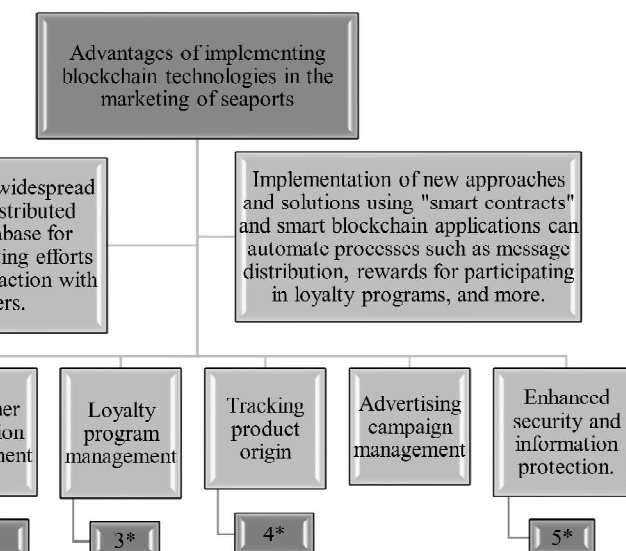


Figure 3. Advantages of implementing blockchain technologies in seaports marketing (Ukrainian case)

Note

*(1) Utilization of a publicly distributed database that records all marketing activities, offers, and agreements. (2) Creation of a system where clients can interact with various services and receive personalized offers. (3) Development of loyalty programs where network participants can earn and exchange bonus points, discounts, and privileges. (4) Implementation of a product traceability system for goods offered in seaports. (5) Establishment of databases with data protected by cryptographic methods.

Source: formed based on [1—3].

proposals and choose the ones that best suit their vessels or port facilities. Each stage of advertising placement, including impressions and results, is recorded in blocks, allowing participants to view and verify campaign results in real time.

The conducted analysis of the content of the specified technologies, their operational specifics, as well as the experience of implementing blockchain technologies in the defined field, allows us to conclude that it will provide several advantages, the main ones of which are systematized in Figure 3.

According to the provided information, it is evident that the outlined blockchain technologies in the marketing of seaports will provide the following advantages [1—3]:

1. Transparency and trust in data. By utilizing blockchain technology, a publicly distributed database can be employed to record all marketing activities, offers, and agreements. This enhances transparency and trust between seaports and their clients.

2. Customer interaction management. This technology enables the creation of a system where clients can interact with various services and receive personalized offers.

3. Loyalty program management. Loyalty programs: This technology allows for the creation of loyalty programs, which facilitate the attraction of new clients, retention of existing ones, and increased loyalty to the seaport.

4. Tracking product origin: With the help of blockchain technology, a system for tracking the origin of goods can be created. This enables clients to access reliable information about the origin of a product and its journey from the manufacturer to the port.

5. Advertising campaign management. This technology can provide transparency and authenticity to

advertising campaigns, particularly through a distributed database that allows verification of which advertising materials were placed, who they were shown to, and what results were achieved.

6. Enhanced security and information protection.

This technology can provide a high level of security and protection for marketing information of maritime ports, ensuring confidentiality and integrity of marketing data.

Furthermore, analyzing the prospects of implementing blockchain technologies in the marketing of maritime ports opens up new opportunities for enhancing efficiency, marketing efforts, transparency, security, and innovation in marketing companies. These technologies enable maritime ports to effectively manage their marketing initiatives, interact with clients and partners, and ensure a high level of information security and transparency.

CONCLUSIONS FROM THIS STUDY AND PROSPECTS FOR FURTHER EXPLORATION IN THIS AREA

The aforementioned specifics allow us to conclude that the implementation of blockchain technologies in accounting, management, and marketing in domestic seaports can bring significant benefits to all stakeholders, including port organizations, government authorities, shipping operators, and other participants in maritime transport.

The general benefits of implementing blockchain technology include:

1. A secure and tamper-proof information environment helps reduce errors, and the auditing process simplifies and ensures accurate and reliable data exchange.

2. Cryptography and its decentralized nature to secure data help prevent unauthorized access, manipulation, and data falsification.

3. Enhanced transparency and visibility in the management of seaports, allowing stakeholders to instantly view and verify transactions and records.

The specific benefits of implementing blockchain technology are:

1. Improved efficiency and process optimization in the management of seaports, reducing time and costs associated with various operations such as order processing, contract execution, data collection, and analysis.

2. Enhanced effectiveness of marketing efforts in attracting new clients and developing partnerships. Blockchain technology enables the creation of loyalty programs, and the exchange of bonuses and privileges, which stimulates interest and customer engagement with seaports.

3. Enhanced efficiency, security, and transparency of financial transactions, as well as facilitating process automation and cost reduction.

The prospects for further research in blockchain technology implementation in the accounting, management, and marketing of seaports lie in the development and adoption standards sphere that define data exchange methods, the structure of blockchain systems, accessible cryptographic protocols, and more. Research in this field can focus on both creating and improving such standards.

Література:

1. Балазюк О., Пилявець В. Технологія блокчейн: дослідження суті та аналіз сфер використання, Економіка та суспільство, 2022, (43). <https://doi.org/10.32782/2524-0072/2022-43-13>

2. Лапко О. О., Солосіч О. С. Технологія блокчейн: поняття, сфери застосування та вплив на підприємницький сектор. Бізнес Інформ. 2019, Вип 6. С. 77—82.

3. PricewaterhouseCoopers database, PwC report "Implementation of blockchain technologies in accounting, management, and marketing in seaports", 2022URL: https://www.pwc.com/content/pwc/userReg/login.en_gx.html?redirectUrl=gG0V—55llpsw21J2UMYgbIH5kctcJLK2-lwWPau2GN84=&referrer=gG0V—55llpsw21J2UMYgbIH5kctcJLK2lwWPau2GN84=&parentPagePath=/content/pwc/gx/en (дата звернення: 01.10.2022).

4. Склярєнко І.Ю., Смирнова І. М., Герчиков О.О., Сидорчук О.Р. Розробка і впровадження алгоритму безпечного маневрування суден внутрішнього плавання, Водний транспорт, 2021, Вип. 1 (32), С. 134—144.

5. Яровенко Г. М., Ковач В. О. Перспективи застосування технології блокчейн у системах забезпечення кібербезпеки банків. Підприємництво та інновації. 2020, Вип 12, С. 206—214.

6. Ярошук О., Белова І. Технологія блокчейн в бухгалтерському обліку та аудиті. Інститут бухгалтерського обліку, контроль та аналіз в умовах глобалізації. 2020, Вип. 3—4, С. 28—44.

References:

1. Balazyuk, O. and Pyliavets, V. (2022), "Blockchain technology: a study of the essence and analysis of areas of use", *Ekonomika ta suspilstvo*, Vol. 43. <https://doi.org/10.32782/2524-0072/2022-43-13>

2. Lapko, O.O. and Solosich, O.S. (2019), "Blockchain technology: concept, scope of application and impact on the business sector", *Biznes Inform*, Vol. 6, pp. 77—82.

3. PricewaterhouseCoopers database (2022), PwC report "Implementation of blockchain technologies in accounting, management, and marketing in seaports", Available at: https://www.pwc.com/content/pwc/userReg/login.en_gx.html?redirectUrl=gG0V—55llpsw21J2UMYgbIH5kctcJLK2-lwWPau2GN84=&referrer=gG0V—55llpsw21J2UMYgbIH5kctcJLK2lwWPau2GN84=&parentPagePath=/content/pwc/gx/en (Accessed: 01.10.2022).

4. Sklyarenko, I.Yu., Smirnova, I.M., Gerchikov, O.O. and Sydorchuk, O.R. (2021), "Development and implementation of the algorithm for safe maneuvering of inland navigation vessels", *Vodnyy transport*, Vol. 1(32), pp. 134—144.

5. Yarovenko, G. M. and Kovach, V.O. (2020), "Prospects for the application of blockchain technology in the cyber security systems of banks", *Pidpryyemnytstvo ta innovatsiyi*, Vol. 12, pp. 206—214.

6. Yaroshuk, O. and Belova, I. (2020), "Blockchain technology in accounting and auditing", *Instytut bukhalters'koho obliku, kontrol' ta analiz v umovakh hlobalizatsiyi*, Vol. 3—4, pp. 28—44.

Стаття надійшла до редакції 16.05.2023 р.