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USING CRYPTOCURRENCY IN E-COMMERCE: BUILDING A MODERN PROCESS IMPROVEMENT MODEL

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ABSTRACT
The use of cryptocurrency in e-commerce is becoming increasingly relevant in the modern world due to a number of advantages. It is this process that ensures the security of transactions, as cryptographic protocols protect personal information and unique identification. It is important to understand that the use of cryptocurrencies allows you to instantly make international payments without the need to involve intermediaries or high bank commissions. This simplifies the processes of economic interaction and increases the speed of transactions. Finally, cryptocurrencies open up access to new markets and customer bases, attracting more users to e-commerce who prefer digital forms of payments. The main purpose of the study is the formation of a modern methodological approach to improving the process of using cryptocurrency in e-commerce. The object of the study is e-commerce and cryptocurrency. The introduction of cryptocurrencies into e-commerce has a significant impact on commercial law in general, causing the need for new legal norms and regulations. Since cryptocurrencies are digital assets, they raise questions about their legal status, ownership, exchange, taxation and liability. The scientific task set within the article involves the construction of a modern model for ensuring the effective use of cryptocurrency in e-commerce. The research methodology involves the use of various methods, one of which is the IDEF modeling method. As a result of the study, a decomposition of a model for improving the use of cryptocurrency in e-commerce was presented. The study is limited by not taking into account the specifics of most countries in the world regarding the use and regulation of cryptocurrency. Prospects for further research are aimed at expanding the modeling process by taking into account the peculiarities of the impact of the use of cryptocurrency on ensuring financial security.

Keywords: cryptocurrency; commercial activity; e-commerce; commercial law; modeling.

1 INTRODUCTION

Cryptocurrency and its active use have brought changes to the e-commerce system in recent years. Thus, in these transactions, currencies such as Bitcoin and Ethereum are used. Unlike established and traditional payment methods implemented through international banking systems, which already have powerful centralized control and monitoring mechanisms, cryptocurrency, on the contrary, is characterized by a

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significant level of decentralization and dynamism. Another distinctive feature of cryptocurrency is that it is based on blockchain technology, which is currently difficult to control. From the point of view of an ordinary user, carrying out transactions through cryptocurrency begins with opening your own digital wallet and replenishing it with the necessary cryptocurrency. For each transaction, the platform on which the user's electronic wallet operates provides the user with an individual QR code for the transaction. Today, such electronic wallets can be used on most Internet platforms, which makes cryptocurrencies an important object in terms of its management in e-commerce.

For merchants, accepting cryptocurrency opens up new opportunities. Businesses need to integrate cryptocurrency payment gateways, which are specialized services that facilitate the acceptance of digital currencies. These gateways convert cryptocurrencies into fiat money (e.g., USD, EUR) in real-time if the merchant prefers, minimizing exposure to the volatility of digital currencies. This ensures that businesses can offer an additional payment method without taking on significant financial risk. The use of cryptocurrency can also reduce transaction fees, as there are no intermediary banks involved, and cross-border transactions become simpler and faster, which is particularly beneficial for international e-commerce.

The networked nature of modern society, free and ever-growing access to information flows, a network monopoly on exclusive information and the previously unheard of possibilities of virtual reality for instantaneous as well as unlimited exchange of information in order to satisfy one’s own needs and interests, indicate that virtual reality has become unknown . part of all areas of life. Of course, one must be very naive to hope that the network authorities will not have influence on the financial and economic system of the world in general, as well as on an individual state in particular. The time when information becomes a commodity, and the media space is monopolized, when important information is manipulated, turning it into a profitable business, and the information itself becomes the final product of the economy, material goods begin to be considered in terms of their own information essence, and their importance is determined by the value of information, which they contain. The netocratic revolution has led to the emergence of a global electronic network culture, but this has not changed the nature of transnational financial corporations, with increasing profits still being their main goal. But in the conditions of a post-industrial society, corporations are interested in the possibility of transferring their own financial

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systems to a fundamentally new level that would meet modern requirements for security, reliability, efficiency, and most importantly, expand the freedom of transactions and reduce the potential consequences of third-party control and state control.

In terms of security, cryptocurrency transactions are highly secure due to their cryptographic nature and the decentralized blockchain system. Each transaction is recorded on the blockchain, which is an immutable ledger visible to all network participants. This transparency and traceability significantly reduce the potential for fraud and chargebacks, which are common issues in traditional e-commerce transactions. Moreover, the use of smart contracts in some cryptocurrencies can automate and enforce the terms of agreements, adding an extra layer of trust and efficiency to the transaction process. The future of using cryptocurrency in e-commerce looks promising as more consumers and businesses adopt digital currencies. The growing acceptance of cryptocurrencies by major companies and the development of regulatory frameworks are contributing to their legitimacy and stability. As technology advances, we can expect to see even more streamlined and user-friendly solutions for integrating cryptocurrencies into e-commerce platforms, making it easier for everyone to participate in the digital economy. This trend towards decentralized finance (DeFi) is likely to drive innovation and provide more inclusive financial services, reshaping the landscape of global commerce. Cryptocurrency in e-commerce is particularly relevant now due to the rapid digital transformation accelerated by the COVID-19 pandemic. With a significant increase in online shopping, consumers are seeking more secure, efficient, and flexible payment options. Cryptocurrencies offer these benefits by providing decentralized, transparent, and faster transaction methods compared to traditional banking systems. Moreover, the rise of blockchain technology has enhanced the security of online transactions, reducing the risk of fraud and identity theft, which are significant concerns for both consumers and businesses. Additionally, the increasing mainstream acceptance of cryptocurrencies is driving their adoption in e-commerce. Major companies like Tesla, PayPal, and Overstock have begun accepting digital currencies, which has boosted consumer confidence and interest in using these assets for everyday purchases. Furthermore, regulatory advancements in various countries are creating a more stable environment for cryptocurrency transactions. This growing acceptance and regulatory clarity make it an opportune moment for e-

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commerce platforms to integrate cryptocurrency payments, catering to a broader audience and staying ahead in the competitive online market.

The main purpose of the study is the formation of a modern methodological approach to improving the process of using cryptocurrency in e-commerce. The object of the study is e-commerce and cryptocurrency. The scientific task set within the article involves the construction of a modern model for ensuring the effective use of cryptocurrency in e-commerce.

2 LITERATURE REVIEW

The integration of cryptocurrency in e-commerce represents a transformative shift in the digital economy, promising enhanced security, efficiency, and inclusivity. This literature review examines key research on e-commerce development, consumer satisfaction, and the implementation of innovative technologies such as cryptocurrencies. The goal is to establish a comprehensive understanding of current trends and models that can inform the creation of a modern process improvement model in e-commerce. Alazzam et al. (2023) emphasize the importance of developing innovative models to ensure the economic security of e-commerce businesses. Their study presents a framework that highlights the significance of integrating advanced technologies and strategic management practices to foster business growth and stability in the digital marketplace. Similarly, Li, Gu, and Yang (2017) provide insights into the evaluation of e-commerce implementation effects, particularly for small and medium-sized enterprises (SMEs). Their research underscores the need for robust evaluation mechanisms to measure the impact of e-commerce initiatives on business performance.

Pang and Pang (2022) explore the factors influencing consumer satisfaction with e-commerce platforms. They propose an evaluation model that considers various aspects such as user interface design, transaction security, and customer service. Their findings suggest that consumer satisfaction is a critical determinant of e-commerce success and can be significantly enhanced by leveraging innovative technologies and customer-centric strategies. Zhao et al. (2015) review the literature on network public opinion regarding e-commerce. Their study highlights the role of social media and online reviews in shaping consumer perceptions and behaviors. They

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argue that understanding network public opinion is essential for e-commerce businesses to manage their online reputation and improve customer engagement . The works of Kamepalli and Bandaru (2019) and Bikku (2018) delve into the application of pattern mining models in real-time e-commerce databases. These studies focus on identifying frequent and infrequent patterns in consumer behavior, which can be used to optimize marketing strategies and inventory management. The proposed models demonstrate the potential of data mining techniques to enhance decision-making processes in e-commerce. Alazzam et al. (2024) present a methodical approach to selecting business management strategies within the framework of changing commercial activities. Their research emphasizes the need for adaptive strategies that can respond to dynamic market conditions and technological advancements. This approach is particularly relevant for businesses looking to integrate cryptocurrency into their e-commerce operations . Alsabbagh and Azeez (2023) investigate the motivating and inhibitory factors affecting e-commerce adoption using the UTAUT2 and SQB models. Their study identifies key drivers such as perceived ease of use, trust, and social influence, as well as barriers like security concerns and technological complexity. Understanding these factors can help e-commerce businesses design more effective strategies for cryptocurrency integration.

Tuktarova (2023) discusses the economic aspects of sustainable development in e-commerce enterprises. Her research highlights the importance of sustainable practices in ensuring long-term business viability and environmental responsibility. This perspective is crucial for developing a process improvement model that aligns with sustainable development goals .

Tricahyadinata and Za (2017) analyze the use of Google AdWords to boost e-commerce sales. Their study demonstrates the effectiveness of digital advertising in increasing online visibility and driving consumer traffic to e-commerce platforms. This finding underscores the potential of leveraging digital marketing tools to enhance the reach and impact of e-commerce businesses. Shoakhmedova et al. (2021) explore the acceleration of digitalization in the economy during the COVID-19 pandemic. Their research indicates that the pandemic has acted as a catalyst for the rapid adoption of digital technologies in e-commerce, highlighting the resilience and adaptability of businesses in the face of unprecedented challenges . Tridalestari et al. (2022) examine the application of process and data mining techniques in the downstream section of supply chain management. Their study provides insights into optimizing supply chain

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processes through data-driven approaches, which can be instrumental in improving the efficiency and effectiveness of e-commerce operations (Fig.1).

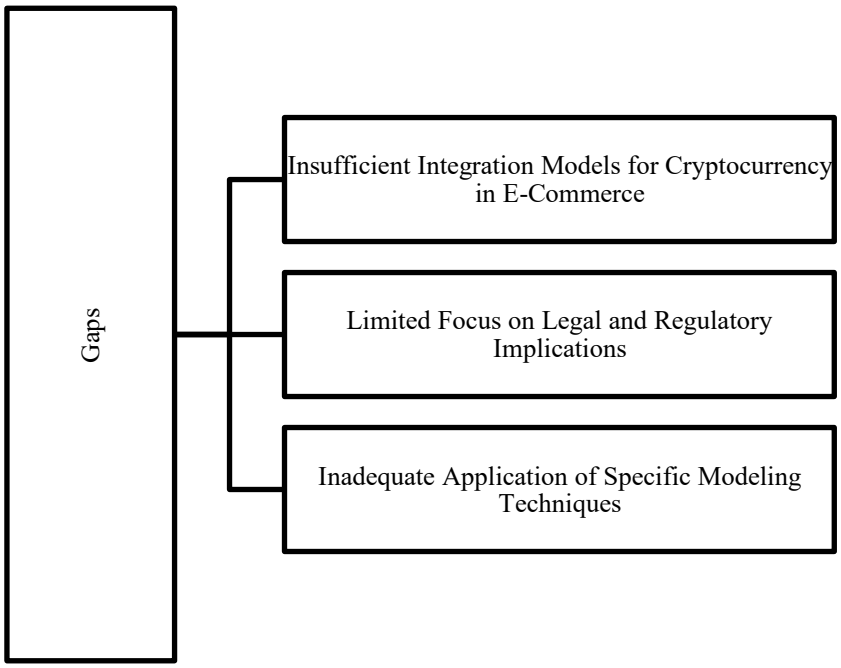

Figure 1. The main gaps in literature review

Addressing these gaps is essential for advancing the use of cryptocurrencies in e-commerce. Future research should focus on developing comprehensive integration models, exploring the legal and regulatory landscape, and applying specific modeling techniques to optimize cryptocurrency-related processes. This will contribute to a more robust, legally sound, and efficient e-commerce ecosystem that fully leverages the potential of digital assets.

3 METHODOLOGY

To achieve the research goal, we used a methodology aimed at developing a model for improving the use of cryptocurrency in e-commerce. In this context, we used a range of qualitative and quantitative research methods, a key one being the Integrated Definition (IDEF) modeling method. Using this approach, we were able to effectively analyze and systematize the key processes and mechanisms for using

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cryptocurrency on e-commerce platforms. This systematization made it possible to provide a full understanding of the various factors influencing these processes.

Structural analysis was developed in the 60s and 70s by Douglass Ross in the form of the SADT methodology - structural analysis and design technology. Structural analysis involves the study of a system using its graphical model representation, which begins with a general overview and then becomes more detailed, acquiring a hierarchical structure with increasing levels. The goal of structural analysis is to transform general knowledge about the original problem area into accurate models that describe the various subsystems of the organization being modeled. The main concept of structural analysis is a structural element (object) - it is an element that performs one of the elementary functions related to the subject, process or phenomenon being modeled. Decomposition is a conventional tool that allows you to present the system in a form that is convenient for perception and to assess its complexity. As a result of decomposition of the subsystem, separate structural elements and connections between them are distinguished according to certain characteristics.

The IDEF modeling method, known for its effectiveness in process and system analysis, was chosen due to its ability to represent complex systems in a clear and structured manner. IDEF methods, particularly IDEF0, provide a functional modeling framework that helps in understanding the functions, activities, and processes within a system. In the context of this study, IDEF0 was used to decompose the e-commerce cryptocurrency integration process into detailed components. This decomposition facilitated a granular analysis of each step involved, from transaction initiation to completion, and identified potential areas for improvement and optimization.

To complement the IDEF modeling, we conducted a literature review and case studies analysis. The literature review provided a theoretical foundation by examining existing research on cryptocurrencies and their application in e-commerce. This helped identify the key challenges and opportunities associated with cryptocurrency transactions. Case studies of businesses that have successfully integrated cryptocurrency payments were analyzed to gather practical insights and validate the proposed model. These real-world examples enriched our understanding and ensured that the model was grounded in actual business practices. Additionally, expert interviews were conducted to gain insights from industry professionals, legal experts, and e-commerce practitioners. These interviews provided valuable perspectives on the regulatory, technical, and operational aspects of using cryptocurrencies in e-

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commerce. The feedback from these experts was instrumental in refining the model and addressing potential legal and regulatory challenges. By incorporating these diverse methodologies, the study ensures a robust and holistic approach to developing a modern process improvement model for cryptocurrency use in e-commerce.

4 RESULTS

Based on the requirements for creating the IDEF0 functional model, we will analyze and describe the initial prerequisites for its creation. To do this, we will build the corresponding table (Table 1).

Table 1. The requirements for creating the IDEF0 functional model

Elements	Characteristics
Purpose	The purpose of the modeling is to develop a functional model IDEF0
Point of view	E-commerce users
The target audience	The target audience of the model is subjects of cryptocurrency transactions
Functional model context	List of functions and objects of IDEF0 functional model diagrams
Modeling technology	Functional modeling methodology
Modeling software	An application program for constructing vector diagrams

In our study, the process of preparing and making decisions on the use of cryptocurrency on e-commerce platforms consists of a number of stages. In order to

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depict this process schematically, we built a context diagram of the top level of the functional model. To create them, a number of functions and objects were used with explanations of the starting points (Fig. 2).

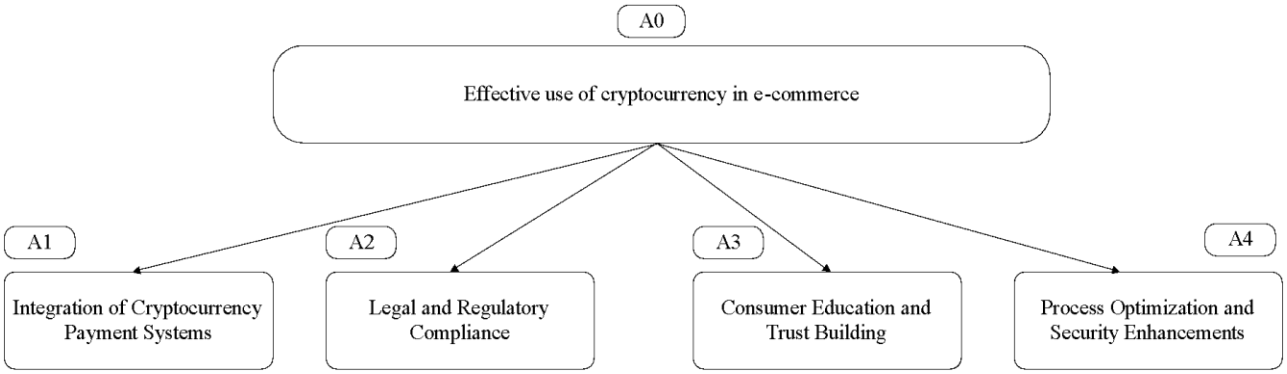

Figure 2. Hierarchy of IDEF0 functional model blocks

Each functional model block in IDEF0 diagrams transforms inputs into outputs during control through specific mechanisms. In our case, we are talking only about the transformation of information flows (Fig.3).

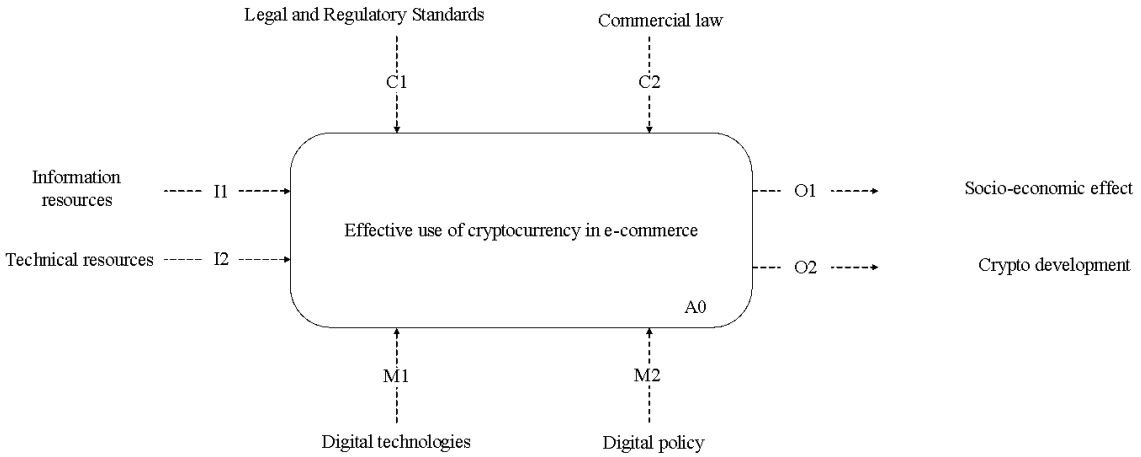

Figure 3. IDEF0 model context diagram

A1. Integration of cryptocurrency payment systems. This stage includes the search and further cooperation with the most reputable payment systems in the field of cryptocurrency. This step ensures that the selected providers can handle transaction volumes and provide the necessary support. At the same time, it becomes possible to

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seamlessly introduce different parts of cryptocurrency payments into the overall infrastructure of electronic commerce. This integration must be seamless, minimize business disruption, and provide a consistent user experience. This step also includes adapting standard security protocols such as SSL, encryption and two-factor authentication to protect transaction data and user information, reducing the risks of fraud and hacking.

A2. Legal and Regulatory Compliance. An important aspect of understanding the activities of cryptocurrencies in the e-commerce system is awareness of the current legal framework associated with cryptocurrencies, which varies by country and can affect how transactions are conducted and reported. This element includes working with lawyers to create comprehensive terms of service and contracts that cover the unique aspects of cryptocurrency transactions, protecting both the business and its customers. It is also important to continually adapt your own business policies (individual or company) to meet changing regulations, ensuring ongoing compliance and minimizing legal risks.\

A3. Consumer Education and Trust Building. Producing informative materials that will help consumers understand how cryptocurrencies work, their benefits and potential risks, facilitating informed decision-making. This step also includes increasing transparency in transaction processes and providing reliable customer support to build trust. In this context, it is important to continually strengthen the security measures and reliability of the payment system to reassure users. Ultimately, all targeted marketing strategies should aim to highlight the benefits of using cryptocurrencies, such as lower transaction fees and faster processing times, to encourage adoption.

A4. Process Optimization and Security Enhancements. An important element of any e-commerce platform is collecting and analyzing user feedback on the experience of cryptocurrency transactions. In the future, this data will be used to improve educational initiatives and eliminate problems or errors. This information will allow you to view and analyze the entire cryptocurrency transaction process to identify areas of inefficiency or delay, ensuring a smooth and fast user experience. Additionally, it is important to prepare for potential security breaches by developing a comprehensive incident response strategy. In this regard, steps to identify, respond to, and recover from security incidents should be detailed to minimize the impact and quickly restore trust. (Fig.4).

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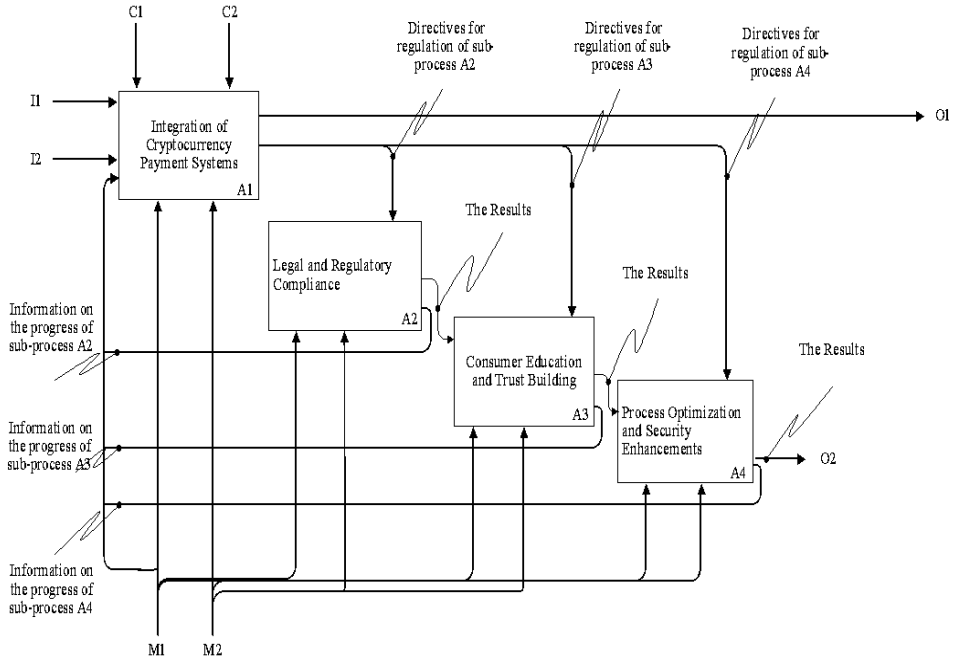

Figure 4. Decomposition of the first level of the context diagram of the IDEF0 model

Each sub-process addresses a critical aspect of implementing cryptocurrency in e-commerce. Integration focuses on the technical and operational aspects of incorporating cryptocurrency payment systems. Legal and regulatory compliance ensures adherence to relevant laws and regulations, mitigating legal risks. Consumer education and trust building aim to enhance user understanding and confidence in using cryptocurrencies. Process optimization and security enhancements strive to improve transaction efficiency and protect against cyber threats. Together, these sub-processes form a comprehensive approach to achieving the effective use of cryptocurrency in e-commerce.

5 DISCUSSIONS

Our study's objective to build a modern process improvement model for using cryptocurrency in e-commerce intersects with and diverges from existing research in several key areas, integrating insights from a broad range of references. Comparing our results with the study by Alazzam et al. (2023), which focuses on developing an information model for e-commerce platforms within the context of global digitalization

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and legal compliance, we observe a shared emphasis on the need for robust regulatory frameworks. Alazzam et al. highlight the importance of adapting legal norms to digital transformations, a point that our study reinforces by addressing the legal implications of cryptocurrency use in e-commerce, such as ownership, exchange, and taxation issues. Both studies underscore the necessity for e-commerce platforms to evolve in tandem with technological advancements and legal standards. In contrast, the research by Iswari et al. (2019) on e-business application recommendations for SMEs using random forest classification provides a more technology-centric approach, emphasizing the customization of digital tools based on organizational profiles. While our study focuses on process improvement through cryptocurrency integration, Iswari et al.'s method of leveraging machine learning for personalized recommendations complements our approach by highlighting the importance of tailored solutions in digital commerce. Both studies advocate for the strategic use of technology to enhance e-commerce capabilities, albeit through different methodologies.

Our use of the IDEF modeling method to decompose the cryptocurrency integration process aligns with Jiang's (2023) work on enhancing operational efficiency in e-commerce through AI and information management integration. While Jiang focuses on AI's role in streamlining e-commerce operations, our study applies a structured modeling approach to map out and improve the integration of cryptocurrency transactions. Both approaches seek to optimize e-commerce processes, highlighting the broader trend in e-commerce towards leveraging advanced technologies for operational improvements. The practical implications of our model, particularly in reducing transaction costs and enhancing security, resonate with the findings of Rahayu and Day (2017). Their research on e-commerce adoption by SMEs in developing countries underscores the potential for e-commerce to drive economic growth and operational efficiency. Our study complements this by providing a model that can help SMEs integrate cryptocurrency payments, thereby lowering barriers to entry and fostering broader adoption of digital payment methods. This synergy suggests that adopting cryptocurrency can be particularly transformative for SMEs, offering new opportunities for growth and competitiveness.

The work of Tubishat (2024) on the role of digital technologies and e-commercial law in environmental sustainability introduces another dimension to our study. Tubishat emphasizes the importance of legal frameworks in supporting eco-friendly business practices. While our study does not explicitly address environmental sustainability, the

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integration of cryptocurrencies can indirectly support this goal by reducing the need for physical financial intermediaries and thereby lowering the carbon footprint of transactions. Our study's limitations, particularly its lack of consideration for country-specific regulatory environments, echo the challenges identified by Bani-Meqdad et al. (2024) regarding the protection of intellectual property and the need for tailored regulatory approaches. Bani-Meqdad et al. emphasize the importance of localized regulatory frameworks to address specific challenges in different regions. Similarly, our study recognizes that the effectiveness of the proposed model may vary significantly across different legal and regulatory contexts. Future research should aim to incorporate these regional variations to develop more universally applicable solutions. Lastly, the insights from Ansari et al. (2001) and Kryshtanovych et al. (2023) provide valuable context on integrating advanced data analytics and optimizing state regulation in business safety and security. Ansari et al.'s work on integrating e-commerce and data mining aligns with our focus on using detailed modeling to enhance e-commerce operations, while Kryshtanovych et al.'s emphasis on regulatory optimization parallels our call for better legal frameworks to support cryptocurrency use.

In summary, our study builds on and diverges from existing literature by providing a focused, methodological approach to integrating cryptocurrency into e-commerce. It aligns with broader themes of regulatory adaptation, technological optimization, and operational efficiency while highlighting the need for context-specific solutions. The practical implementation of our model promises significant benefits, yet it must be continuously refined to address evolving legal and regulatory landscapes worldwide.

6 CONCLUSIONS

In conclusion, it should be noted that in the process of research, a key task was solved - the formation of a modern and effective methodological approach to improve the process of using cryptocurrency on e-commerce platforms. To do this, we used the IDEF modeling method, through which a complex model was formed. This model clearly and in detail describes the key elements, measures and mechanisms that are important in the process of integrating cryptocurrency on modern e-commerce platforms. This model can serve as an effective mechanism for different users of e-

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commerce platforms. The model is relevant due to the fact that it describes the key steps that are important for the process of increasing the security of using cryptocurrency, optimizing it and meeting the requirements of both consumers and current legislation. However, the study has a number of limitations. One of the key limitations is that each country has its own regulatory framework that regulates the activities of e-commerce platforms and the use of cryptocurrencies. This fact may reduce the effectiveness of this model for the realities of individual states.

Additionally, the rapid evolution of cryptocurrency technology and market dynamics means that the proposed model will require continual updates to stay relevant and effective. Practical implementation of the model developed in this study could lead to significant improvements in the e-commerce sector. Businesses can adopt the model to integrate cryptocurrency payment systems, enhancing their transaction processes and expanding their customer base. By doing so, they can benefit from reduced transaction fees, increased transaction speed, and improved security. Policymakers can also use the insights from this study to develop more effective regulations that balance innovation with consumer protection, fostering a conducive environment for the growth of cryptocurrency in e-commerce.

Destabilization and uncontrollability of transnational financial and credit institutions by the state de facto undermines the financial component of state sovereignty. In the context of the globalization of financial and economic relations, the development of neo-monetarism and the dematerialization of labor, the ideological support of which is the neoliberal model, it can be argued that there is a financial factor in the influence of netocracy on the transformation of traditional state and legal institutions of society. The financial factor - the virtualization of financial relations, the emergence of electronic money and payments, digital counting units, contribute to the formation of conditions for the inefficiency of existing traditional customs, tax, and tariff levers of state regulation. Cryptocurrency, when any powerful computer can be its issuer, is a tempting option for making a profit outside of government control, which, in turn, at first glance, significantly reduces the influence of the role of transnational banking capital, because it is capable of reducing international borders. stored on a hard drive rather than in a bank, unaffected by inflation risks or policies.

Looking forward, further research is needed to refine and expand the proposed model. Future studies should consider the unique regulatory and market conditions of different countries to develop more tailored solutions. Additionally, there is a need to

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explore the impact of cryptocurrency on financial security in greater depth, particularly concerning data protection and fraud prevention. By addressing these areas, future research can provide more comprehensive guidance for the effective and secure use of cryptocurrencies in e-commerce, ensuring that the benefits of this technology are fully realized.

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