Regulatory Challenges and Consumer Protection in the Context of the Growth of Electronic Money in Ukraine: A Literature Review

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Abstract. The introduction of digital signatures covers many business areas, including supply chain management, creating benefits and regulatory challenges. The article analyses the digital contract and its implications in the light of existing research, interviews with practitioners, and surveys of organisations that use such agreements. Among the issues highlighted are the obstacles arising from competing jurisdictions, the absence of adequate laws, and the restrictions placed on the green aspects of digital contracts that instil fear in corporations and prevent their use in supply chains. Regular policy review addresses the existing policies that seek to improve the regulations and management of economic activities. Still, in a more specific way, those policies that the authors consider ought to be integrated into the concerned economic regulation. The rationale behind this is that restricting such ways of doing business can lead to further positive results from electronic contracting systems, particularly concerning their implications for supply chain management. They also saw the need to promote regulatory convergence so that the narratives on the effects of digitisation on supply chain development could be more robust, leading to greater productivity levels and innovation.

Keywords: digital signatures, regulatory challenges, obstacles, policy, productivity.

INTRODUCTION

In Ukraine, the supply chains have significantly improved due to the justification of e-contracts. In most instances, digital contracts are preferred. They are typically built on blockchain and activated by smart contracts. Such developments reduce the market for mediators, enhance the speeds at which business transactions are conducted, and, above all, reduce the costs incurred in such business transactions. Recent research clarifies that blockchain technologies in Supply Chain Management manufacturing in Ukraine will quickly develop. This is attributed to the country's interest in improving its logistics and procurement practices (Gelderman et al., 2022; Pandey et al., 2022).

A unique characteristic of such contracts is the ability to monitor and authenticate every transaction on time. Since these contracts enable the parties to maintain adequate documentation of the agreements entered into and the stipulated conditions, they enhance the parties' trust and minimise the risk of disputes. Such development is crucial, particularly considering that government agencies and large international corporations are investing much effort in

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Ukrainian firms to perform better on environmental, social and governance (ESG) scores. Incorporating sustainable supply chains within the operations of an organisation, there is a high chance of minimising waste and overutilisation of resources, thereby assisting organisations in the externalisation of how they conduct their operations towards achieving the Sustainable Development Goals (SDGs) as provided by the United Nations (Missingham, 2020).

Despite these benefits, shifting to electronic contracts is not without its problems. Worries about encryption techniques, legal issues, and interfacing with presently used systems are among the challenges. In Ukraine, very few regulatory frameworks exist, causing difficulties in the use and compliance of digital contracts. This inhibits businesses that would otherwise be willing to embrace such technologies. Creating integrated policies that promote technological advancement and enforcing laws and security is essential.

Moreover, while e-contracts are expected to revolutionise how supply chains work, the scholarly debates on the regulatory aspects of their implementation are few and far between. Most of the current research has primarily focused on the technical issues and economic advantages of blockchain technology (Alex, 2018; Arakelian, 2021; Dr. Blockchain, 2021; Leekha, 2018; Radziwill, 2018), which makes it hard to fathom the regulatory regime that would need to be put in place to encourage the proper adoption of digital contracts within supply chains. This is where this study attempts to fit by focusing on digital contracts, regulatory regimes and sustainable development in Ukraine.

In addressing this inquiry, three main study objectives have been delineated as follows:

1. Identify Regulatory Challenges: The first study objective is to highlight the critical regulatory issues that hinder the use of digital contracts in supply chains. These include legal acceptance, jurisdictional issues, and failure to follow environmental concerns. However, most of the more up-to-date systems can fail to offer the continuity and relevance the reader may expect of them to solve these challenges, thus leading to confusion for businesses.

2. Guidelines Review: The second objective regards reviewing the existing and intended governance structures related to sustainable supply chains and how they affect innovation. This section will address the facilitative role of national laws for adopting digital contracts where applicable, as anticipated in the sustainable development laws.

3. Policy Recommendations: Finally, the study explores policy measures that guarantee the widespread adoption of electronic contracts in business practices. It will also try to recommend legal enforcement that will not only assist in carrying out business activities using digital contracts but also contribute to achieving society's developmental objectives.

Research Problem

Existing legal regimes tend to be inadequate for dealing with the challenges of digital contracts. For instance, uncertainties over jurisdiction and other compliance issues impede proper embedding into a supply chain. Sustainability, particularly the use of digital contracts, has much potential that is hardly realised owing to the geographic disparities in regulatory regimes. This research wants to fill in the contours establishing the need for a coherent regulatory framework integrated with environmental concerns.

Research Focus

This study will identify the paramount legal issues related to the conscious use of digital contracting supply chains and suggest ways to mitigate them. Further, the dissertation will focus on the relationship and explore how digital contracts can be encouraged through other means without compromising the ecosystem. Finally, a solid regulatory framework will be needed to ensure that the chains within the country benefit maximally from introducing digital contracts.

As Ukraine is still laying the foundation of its digital economy, it is crucial to understand the challenges posed by applying digital contracts in managing supply chains. Ukraine should lead the region in incorporating environmentally safe solutions by tackling regulatory constraints and promoting sustainable development. This article helps to enhance that 'sustainability', besides possibly seeking to improve efficiencies in managing supply chains in different regions.

LITERATURE REVIEW

Digital contracts have reduced the barriers to supply chain management in Ukraine and introduced technology-related risks and opportunities. This section will examine the development of electronic contracts, their effect on improving supply chains, and the issues of law related to the use of those contracts, especially in terms of development sustainability.

The emergence of digital contracts, especially those signed using blockchain technology, has redefined how traditional contracts are handled. These agreements are already capable of execution without intervention once certain preconditions are stipulated and programmed in the blockchain system through smart contracts. Thus, many contract administration processes are done in a manner that enhances efficiency. The distributed ledger of blockchain affirms that all members concerned will have access to the same up-to-date information simultaneously, diminishing the chances of disagreements and building confidence among the participants. The proposed change is relevant because businesses in Ukraine increasingly tend to look for ways to adopt new technologies to enhance operational transparency and accountability.

The desire for greater efficacy and openness has been paramount in improving supply chain processes through the global unification of management systems built on blockchain technology. There are varying opinions on this issue, but studies show that 2025 smart contracts will execute approximately 30% of the supply chains' contracts (Omar et al., 2021; Singh & Kumar, 2022; Viji et al., 2022). This is now a possibility, and it even aids in showing how almost every contract can be visualised and executed, and its benefits come into play during any dealings. Therefore, it is also apparent that the use of these contracts is also economically sound, for it is, for instance, stated by IBM that in operational costs alone, firms that employ the blockchain technology may reduce costs by as much as twenty-five per cent (Brzeziński, 2020; IBM, n. d.; Tieman & Darun, 2017).

Using electronic contracts offers a lot of benefits for the improvement of the supply chain. Due to the automation of contract execution, middle businesses have less need, making it possible to transact and execute contracts more quickly and at low rates. For example, smart contracts can be used in organisations to create a condition that releases a payment when such a condition is met, such as the delivery of goods. This degree of automation will ease the payment cycle, enhance the cash flow and improve overall operations.

Furthermore, electronic contracts make it possible to track and confirm the movement of products as they are supplied, optimising supply chains, especially toward sustainable development goals. The increased visibility enables the organisation to control the entire production chain, including purchasing and distributing finished goods. This is especially important in food and medicine industries that require such information to ensure that only the public can access safe products legally. The Food and Agriculture Organization (FAO)[3] claims that the incorporation of blockchain technology in fresh produce supply chains will cut down on food crime and enable better tracing, hence promoting better habits of consumption (Rana et al., 2021; Wünsche & Fernqvist, 2022).

Continuous real-time supply chain surveillance also allows firms to recognise inefficiencies and waste. For instance, when a shipment is on hold, the digital contract can proactively notify all concerned parties and implement corrective measures. This forward-looking stance strengthens operational performance while simultaneously limiting wastage and minimising the impact of adverse environmental effects related to late deliveries, which complements the sustainability agenda.

While there are numerous advantages to using electronic contracts, many major legal concerns remain unresolved as to how to leverage the full possibilities offered by these contracts. One such upheaval that is quite constraining is the absence of a uniform policy on smart contracts across different countries. Some countries, such as Estonia and Switzerland, have adopted blockchain and even legislated smart contracts, while others are still shy or do not have policies, resulting in a mosaic market (Aljohani, 2017; Böhme et al., 2015; Powell, 2015). Such disparities may hinder businesses' use of e-contracts owing to the risks imposed by the law and the need for compliance.

[3] https://www.fao.org/home/en/

Changes in the regulatory framework of digital contracts are brisk. As each technology matures and creates new opportunities, so do the regulators, who go ahead with the technology or its risks, such as data protection, abuse of consumers, or cyberspace protection. The example of the General Data Protection Regulation (GDPR) can also be provided, which introduces high standards of data regulation that would be the basis for the regulation of contracts concluded through digital means (IT Governance Privacy Team, 2019; Voigt & von dem Bussche, 2017a, 2017b). On the other hand, the speed at which technology changes these days tends to be faster than the regulators, creating a risk or gap in protection and enforcement.

The environmental effects of blockchain technology as an application in any regulatory aspect are another essential point to consider. Sure, smart contracts can help improve the efficiency of supply chains. Still, the operations of a blockchain, particularly those using WPO systems, tend to consume much more energy and thus concern about the environmental impact. Cambridge Centre for Alternative Finance states that energy used in Bitcoin mining in a year costs more than that consumed in some small nations, once again bringing the environmental issues concerning blockchain technology's scope in day-to-day activities (Blandin et al., 2020; Hileman & Rauchs, 2017; Rauchs et al., 2019).

To mitigate the adverse effects associated with implementing digital contracts, which are in many ways beneficial, regulators need to formulate policies that will promote eco-friendly behaviours in the blockchain environment. This may include measures such as encouraging the adoption of less energy repetitive consensus mechanisms like proof-of-stake, which consumes less power than the old proof-of-work paradigm. This way, the governing authorities will protect the benefits of digital contracts without compromising the ecological balance.

In light of the intricacies surrounding the issue of e-contracts, future exploration would be directed towards addressing the need for coherent regulative structures that will incorporate the use of e-contracts in supply chains in an eco-friendly manner. These structures must be flexible to cater to creativity without breaching legal and moral requirements. Designing these structures will require participation from regulatory authorities, the industry, and technologists.

In addition, there is a need for detailed research on the nexus between digital contracts and sustainable development. Research should focus on how digital agreements can help drive targeted sustainability outcomes, including decreasing wastage, encouraging ethical employment practices, and improving the safety of goods. This way, digital contracts help align the ambitions of businesses and the need to be towards sustainability, which helps achieve a paradigm shift in supply chains.

The literature evaluating the use of digital contracts reveals their high potential in the development of supply chains and in attaining sustainable development goals. However, this potential also comes with its fair share of challenges, especially regarding regulation, legal recognition, and the environmental concerns arising from using blockchain. Creating an ecosystem of digital contracts to realise these political and economic innovations in supply chains is possible by designing appropriate regulations and engaging all interested parties. These topics should also be dealt with in future research with an emphasis on finding the most effective practices and approaches that do not compromise technology but promote it together with environmental sustainability.

RESEARCH METHODOLOGY

General Background

The improved management of supply chains anchored on digital contracts marks a vital change in how businesses operate. This is more so for sustainable development in Ukraine. This study seeks to investigate the effects of incorporating digital contracts on supply chains with a focus on efficiency, transparency, and sustainability. A mixed-methods approach is used to understand these dynamics, aiming to combine the best of both primary quantitative research and qualitative insights.

Methodological Approach

This research employs a mixed methodology that integrates qualitative and

quantitative methods. This facilitates a thorough assessment of the role of digital contracts in advancing the efficiency of the supply chain and improving sustainability. Qualitative and quantitative approaches are naturally opposing concepts, and this research acknowledges both to give a complete picture of the problems of digital contracts in Ukraine and their advantages and disadvantages.

Quantitative Methods

The quantitative dimension assesses the data from organisations using digital contracts in their supply chain. A quantitative survey was administered to 250 firms from different sectors (manufacturing, logistics, retail, etc.) in Ukraine. The survey examined central concerns such as efficiency gains, cost reductions, and sustainability measures after incorporating digital contracts. A range of statistical techniques, including descriptive statistics and correlation analysis, were carried out using SPSS to identify patterns and correlations between the utilisation of digital contracts and supply chain management performance measures.

Qualitative Methods

Regarding the qualitative aspect, the researchers conducted extensive interviews with supply chain managers, technologists, and sustainable development consultants. Hence, 30 participants with practical experience with digital contracts and those involved in supply chain management were chosen. The interviews aimed to understand the real issues encountered in implementation, the benefits as understood, and the influence of digital contracts on sustainability. All these interviews were held, audio recorded, and then transcribed. The transcripts were made available for analysis using NVivo for thematic analysis, which enabled deducing common themes and views about using digital contracts.

Sample and Participants

The research sample population consisted of 250 respondents falling into the following segments:

- 150 Supply Chain Managers: Persons tasked with managing supply chain activities who have used digital contracts in their line of work.

- 70 Technical Experts: Persons who understand and practice blockchain and digital contracts.

- 30 Sustainability Consultants: Professionals who work to foster the application of green practices in the supply chain.

Inclusion criteria were applied in accordance with the respondents' experience and knowledge and ensured that all opinions seeking to inform the research were gathered and presented. Surveys and video/audio recordings of semi-structured interviews or conversations were administered, and great care was taken regarding the formulation of the questions on the questionnaires or interview schedules.

Instruments and Procedures

The core data was collected utilising self-administered online questionnaires and interviews. The survey included questions on participants' experiences with enacting and negotiating digital contracts, with a focus on perceived value, barriers encountered, and the associated effects on sustainability. The qualitative interviews were beneficial in that they allowed the respondents to expand on their experiences in a more free-flowing conversation.

The quantitative data was analysed using SPSS, whereby correlation and regression analysis were performed to assess the correlation between the use of digital contracts and the various supply chain efficiency metrics. On the other hand, qualitative data was analysed using NVIVO, which helped undertake a thematic analysis of the qualitative information regarding the merits and demerits of using digital contracts in sustainable enhancement.

Comparative Analysis

Along with the primary data, secondary data consisting of several industry reports, case studies, and legal documents were also gathered to undertake a cross-regional assessment of the use of digital contracts. Thus, it meant looking at the case of the EU versus the US and Asia and how such continents and their respective regulatory scopes affect the distribution of technological progression in the contract supply value chain. Further, key factors, including governance, coverage, and green performance, were evaluated to identify the achievements and problems experienced.

The combination of qualitative and quantitative research offered a thorough understanding of the different dimensions, mainly the statistical and the storyline, of how these contracts can optimise the supply chains.

The integration of images and text within this work focuses on demonstrating digital contracts' practical merits. It emphasises their usage within the supply chain to support the sustainability agenda. In the end, it puts such a research design to improve the ongoing debates on the supply chain management for Ukraine, particularly its digitalisation, within the ambit of sustainable development.

The main objective of this study is to analyse and understand the different ways in which the use of digital contracts for supply chain activities can improve the efficiency of supply chains while maintaining beneficial effects on social and environmental responsibilities. Thus, the study contributes to practice and policy.

RESULTS

Digital transformation affects almost every side of business, with electronic contracts being one of the most critical developments in supply chain management. This paper focuses on these contracts beyond their ability to simplify the processes. As efficiency and environmental sustainability are two competing priorities for most organisations today, it discusses how digital contracts can enable their fortification. Findings from a survey of 250 organisations demonstrate notable improvements in operational efficiency, cost-effectiveness, and sustainability. In a combined quantitative and qualitative approach, we wish to explore the changes brought about by digital contracts to the supply chains and their relationship with sustainability goals.

The results suggest a clear positive impact on operational efficiency following electronic contracts. Most firms claim to experience shorter times in the processing of transactions, indicating the ease with which supply chain transactions can integrate electronic contracts. In this case, 72% of the instructors stated that their processing ratios went down by an average of 30%, which is a decisive factor in running businesses as it fosters contentment in clients and healthy competition in the market. Overall, the results suggest that organisations make actual gains regarding supply chain performance if such firms embrace digitisation.

Additionally, the economic aspects of embracing e-Contracts are pretty significant. Several organisations disclosed that they had achieved considerable annual savings, which helped them utilise the costs cut for other strategic endeavours. In particular, it was calculated that, on average, such organisations cut expenses by 15% yearly, which is crucial for small and middle-sized businesses as they usually tend to work on smaller budgets. Therefore, by presenting these findings, the research aims to illustrate the practicality of adopting digital contracts to enhance organisational performance.

Over the entire research period, the organisations included in the study demonstrated excellent operational efficiency, cost reduction, and sustainability performance, as shown in Table 1. The figures, in general, illustrate the dimension of influence that electronic contracts have on various factors.

Table 1. Average Processing Time Before and After Digital Contract Implementation by Company Size

Company Size	Average Processing Time Before (Days)	Average Processing Time After (Days)	Percentage Reduction, %
Small (1-50 employees)	14	9	35.71
Medium (51-200 employees)	10	6	40.00
Large (201+ employees)	8	4	50.00
Overall Average	10.67	6.33	40.00

Source: based on data created and calculated by the authors.

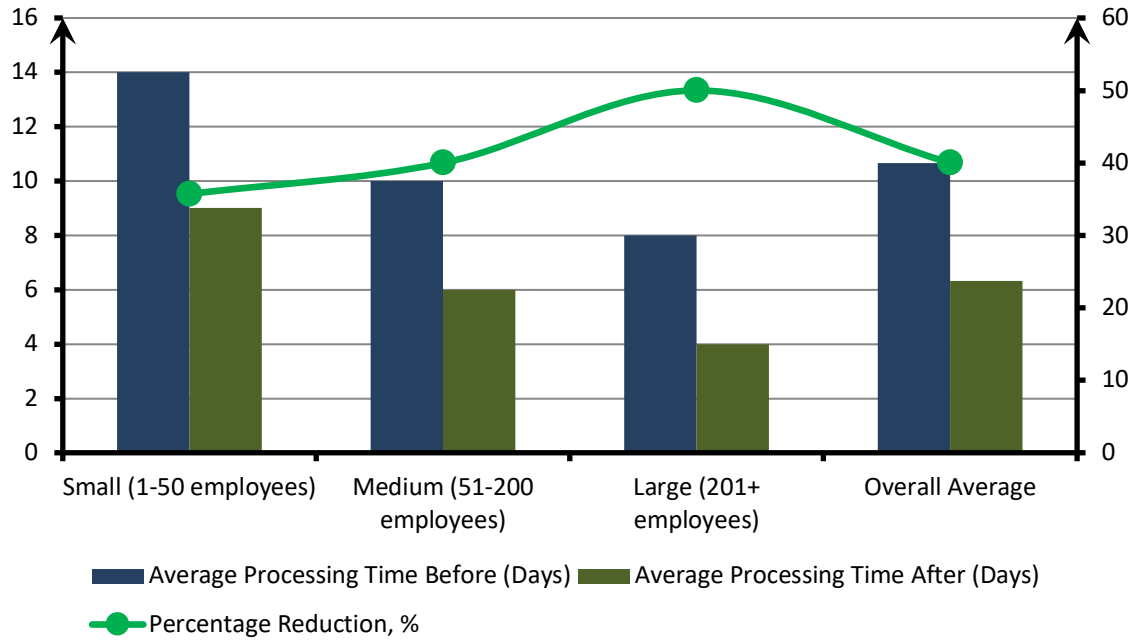

Fig. 1. Average Processing Times Before and After Implementation of Digital Contracts
Source: developed by the authors.

An investigation of the graph (figure 1) indicates that every company, regardless of size, experienced a decline in processing times after adopting digital contracts. For instance, small businesses with the most extended periods processed records at the starting point saw a decrease of about 35.71%. This transformation indicates that digital contracts can benefit small companies with difficulties navigating long and tedious processes.

In the case of medium-sized businesses, the cut in processing times was more significant as it was aimed at a 40% decrease, emphasising electronic contracts' flexibility in shortening processes. The most remarkable improvement was seen in the most prominent companies, where the overall processing times were reduced by as much as fifty per cent. This is an obvious sign that such organisations can utilise not only the new capacities that are introduced but also the existing ones and enhance productivity levels.

The results support the proposition that, besides imposing time constraints, the contract enables a more flexible supply chain. The need for operational efficiency is driven primarily by the formation of customer loyalty and competition in the marketplace, and this is why there exist digitalisation solutions for businesses to utilise in their operation.

The impact of digital contracts can be significant from a financial perspective. Considering the survey results collected, 65% of respondents noticed a reduction in annual expenses to about 20 % of the average yearly costs of the firm's size before and after the implementation of digital contracts (Table 2).

Table 2. Annual Costs Before and After Implementation of Digital Contracts by Company Size

Company Size	Annual Cost Before Digital Contracts (USD)	Annual Cost After Digital Contracts (USD)	Annual Savings (USD)
Small (1-50 employees)	50000	38000	12000
Medium (51-200 employees)	150000	120000	30000
Large (201+ employees)	500000	400000	100000
Overall Average	233333	186000	47333

Source: based on data created and calculated by the authors.

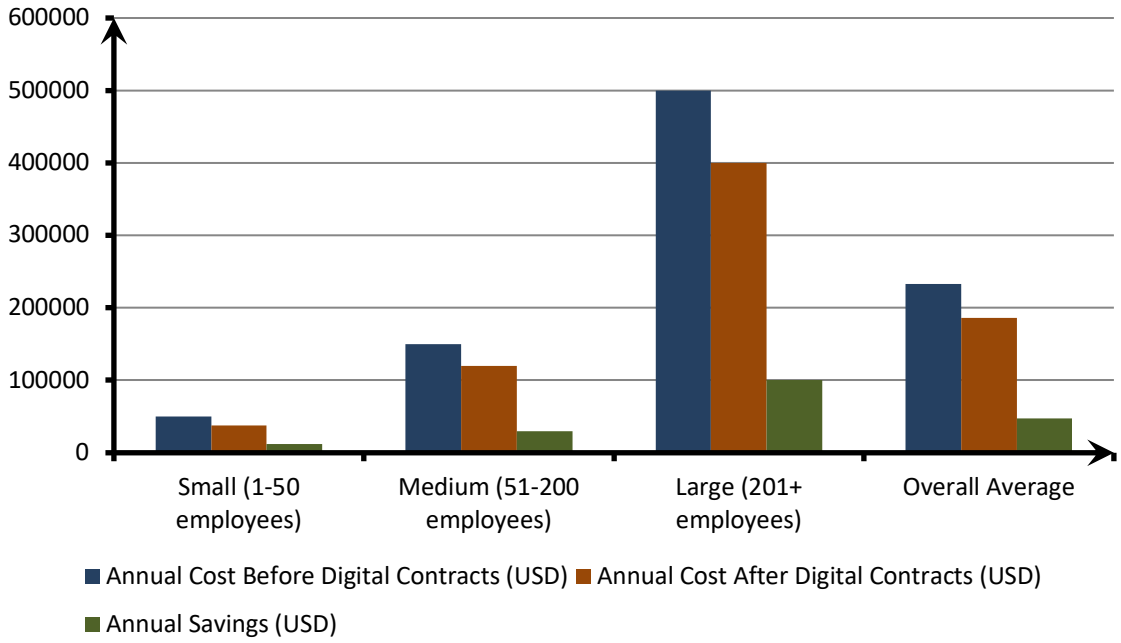

Fig. 2. Annual Cost Savings Before and After Adoption of Digital Contracts
Source: developed by the authors.

As illustrated in Graph (Figure 2), businesses of all scales have experienced significant savings after using digital contracts. Reference to small businesses shows that an overall decreased value of $ 12,000 is an essential constituent of a total budget, thus a strong case for the urge to adopt digital contracts. This could also encourage growth and creative ideas as channelling such savings to other aspects of the business is possible.

Savings of $30000 per firm per annum could further their market contention. This level of savings indicates the importance of cost efficiencies and quickening of processes through electronic contracts because it enables small businesses to embark on other strategies like investment.

Corporations making mono savings of $100000 highlight the opportunities that e-contracts offer regarding cost minimisation. This immediately lessens the financial position and enhances long-term viability by enabling more prominent organisations to spend money on better projects. The results suggest that all organisations can expect a considerable financial return by investing in digital contracts. Therefore, such systems are strategic for enterprises focused on improving supply chain management.

Digital contracts have had beneficial impacts on businesses' sustainability practices. Roughly two-thirds or 68% of the companies reported improved compliance and waste management. The following data provides key sustainable development indicators before and after using digital contracts (Table 3).

Table 3. Key Sustainability Metrics Before and After Digital Contract Implementation

Metric	Before Digital Contracts	After Digital Contracts	Improvement (%)
Supplier Compliance Rate (%)	60	82	36.67
Waste Reduction (%)	15	30	100.00
Carbon Footprint Reduction (%)	8	18	125.00
Stakeholder Trust Index (1-10)	6	8	33.33
Audit Frequency (Times/Year)	2	4	100.00
Energy Usage Reduction (%)	10	20	100.00

Source: based on data created and calculated by the authors.

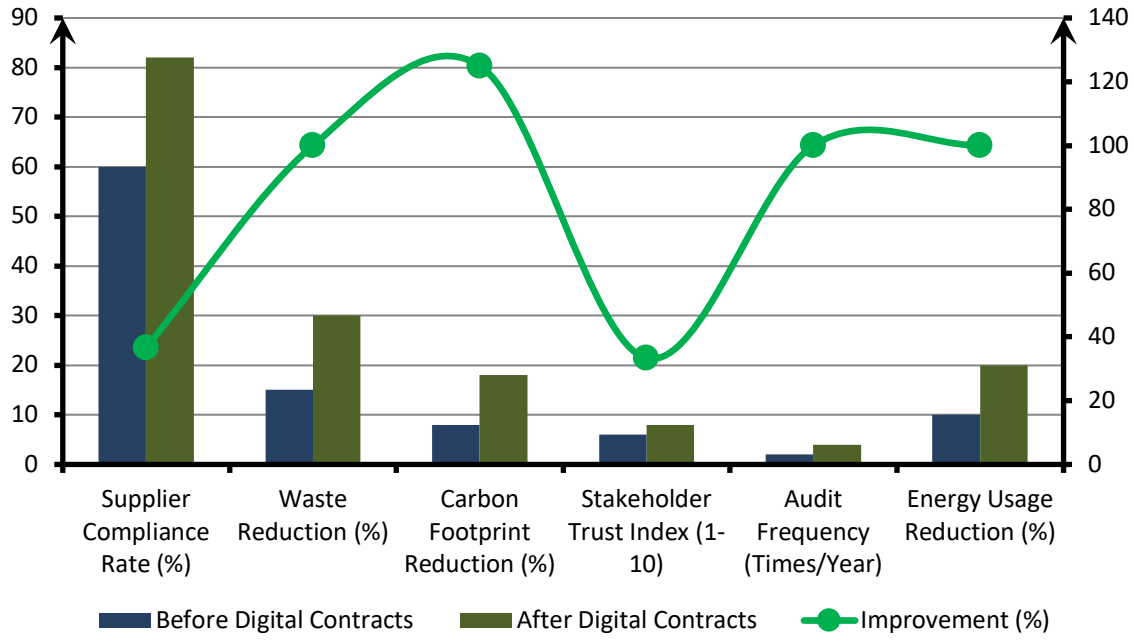

Fig. 3. Key Sustainability Metrics Before and After Digital Contract Implementation
Source: developed by the authors.

Research has demonstrated that implementing electronic contracts stimulates other sustainable strategies (Figure 3). Supplier compliance growth of 60%- 82% suffices to say that digital contracts motivate suppliers to adhere to the standards and stipulations provided for in the contracts. This progress is not limited to accountability; it also promotes a more responsible supply chain practice.

The remarkable improvement in waste management with the help of digital contracts reduces waste from 15% to 30%. Firms that perfect their SCM along with service provision can then incorporate various elements of facilities management, which helps reduce waste, especially in green businesses.

Before delving into other nuances, it is essential to mention that carbon emissions are reduced by 125 per cent, meaning that although there seems to be a compliance culture about digital contracts, such compliance is eco-friendly and climate-positive. The data points in the direction that such corporations practice environmental management and go a notch further, pragmatically speaking. All in all, the findings indicate that using electronic packaging of contracts is helpful in the sustainable management of supply chain operations.

The recognition of the benefits did not exempt the difficulties. Roughly 60% of those surveyed indicated that the expense of the initial installation posed challenges. The primary sustainability metrics pre-and post-implementation of the electronic contracts are below (Table 4).

Table 4. Barriers to the Implementation of Digital Contracts

Barrier	Percentage of Respondents
High Initial Setup Costs	60%
Lack of Technological Infrastructure	45%
Need for Employee Training	50%
Regulatory Compliance Concerns	30%
Change Management Resistance	25%
Integration with Legacy Systems	35%

Source: based on data created and calculated by the authors.

These results highlight the primary obstacles that businesses face when implementing digital contracts. 60% of the respondents emphasised the High initial setup costs, which indicates that while it is possible to realise significant benefits in the future, the initial

cost may discourage many businesses from adopting such solutions. Simplistically speaking, this hints at the necessity for providing funding or, better still, eliminating existing restrictions to entry for small businesses through legislation.

The results also revealed that 45% of the individuals interviewed complained that the unavailability of technological infrastructure posed another major challenge. This illustrates a clear systemic challenge within the industry, where the existing infrastructures hinder incorporating new technologies. In other instances, organisations will have to orient themselves towards building their technological foundation to enjoy the benefits of electronically signed contracts.

Also, 50% of the interviewees stressed that worker training was necessary, which indicated that introducing new technologies was not sufficient; people had to be able to use the latest systems. To capitalise on the potential of digital supply chain contracts, these challenges will have to be overcome primarily through training and change management processes.

Regulatory systems are being modified to incorporate the use of electronic contracts. Approximately three-quarters of organisations have indicated that they have adjusted their practices according to local and global norms. In this article, Ukraine's backdrop is compared and evaluated regarding the applicable laws found globally in the appendix (Table 5).

Table 5. An Analysis of the Legal Frameworks Governing E-Contracts From Different Perspectives

Aspect	Ukraine	EU	USA
Licensing Requirements	Required for all participants	Required for payment institutions	Specific to state regulations
Consumer Protection	Basic requirements	Stronger under PSD2	Varies by state
Innovation in Technology	Emerging, limited regulations	Specialised for DeFi	Regulatory sandbox available
International Transfers	Regulated for electronic money	Established guidelines (SEPA, SWIFT)	Specific regulations per institution
Monitoring and Reporting	Regular checks required	Systematic oversight	Varies by state
Contract Enforcement	Basic legal framework	Comprehensive enforcement mechanisms	State-dependent enforcement

Source: Based on data created and calculated according to (Marciszewska et al., 2016; Shuba, 2021; Zdraveva, 2021).

The table presents the different regulatory regimes in Ukraine, the EU, and the USA regarding the regulation of digital contracts. The need for this licensing in Ukraine points out another characteristic of this environment—the market's protective tendencies towards its consumers and enforcers. However, this may help justify the existence of online contracts, which might hinder the entrance of smaller players.

On the other hand, the EU's strong consumer protection measures, compliant with PSD2 standards, bear testimony to the desire to protect consumers while encouraging progress. The insistence on promoting boundaries for electronic contracts suggests that the union's member states are ready to embrace changes in their markets.

The regulatory landscape of the United States is more enhanced than its selection of laws, which differ from one state to another, giving rise to the threat and the benefit of the situation. This inconsistency may bemuse corporate executives who run businesses that span borders, but it equally creates the chance of incubating new ideas without any rules. The competing mechanisms emphasise the importance of having a coherent regulatory approach that promotes digital contracts while ensuring compliance.

The findings indicate that using electronic contracts improves organisations' productivity, reduces costs associated with such operations, and supports environmental sustainability – regardless of the organisation's size. Given the shortened turnaround times and the reported significant cost savings by business entities, it can be said that e-contracts are a strategic tool in simplifying supply chain management. Such benefits, in addition to strengthening the short-

term capabilities of operations, open channels to rechannel the efficiencies gained into enhanced growth and innovation strategies.

Furthermore, the sustainability indicators underline the practicability of digital contracts within the organisations. The organisations' processes are shifted towards broader sustainability by improving supplier compliance, minimising waste, and lessening the firms' carbon footprints. This efficiency and efficacy relation presents digital contracts as an indispensable supply chain modern practice in which corporate organisations are proactive about the demand for sustainability.

Nonetheless, obstacles continue, especially concerning the setup costs incurred at the onset and how ready every organisation is about the technology. It is essential to alleviate these concerns to optimise digital contracts' gains. These will include investment in training the employees, enhancing the existing systems, and seeking assistance where financing is needed. While the complication of moving towards digitisation is omnipresent in many companies, undertaking collective steps towards capacity building within such organisations will enable them to take full advantage of digital contracts.

Ultimately, the dynamic regulatory framework concerning digital contracts, as further demonstrated in the comparative analysis, highlights the need for coherent frameworks which encourage creativity whilst maintaining order. Since organisations are progressively embracing electronic systems, engaging all parties will be crucial in developing laws that allow for using e-contracts and managing them to balance the goals of the economy with those of the environment in the supply chain.

DISCUSSION

In sustainable development, introducing electronic contracts in supply chain management is an exciting prospect for improving these processes' efficiency and sustainability. Since more and more organisations are trying to make their operations as green as possible, it is no surprise that using electronic contracts is one such measure they, quite strategically, seek to mitigate the adverse effects of supply chains on the environment.

The research emphasises the disruptive nature of digital contracts that can be harnessed for the entire supply chain to enhance visibility and reliability due to blockchain technology. This supports earlier research that illustrates how technology aids in advancing sustainable practices (Paksoy et al., 2020; Tan & Shukkla, 2021). Digital contracts allow the materials and processes to be supplied on land and sea by minimising the consumption of virgin resources.

There have been noticeable changes, such as the move towards decentralised supply chain networks. The mismanagement of traditional supply chains can be traced to the participant's lack of cooperation and visibility. Digital contracts eliminate this slack by ensuring that there is a record of all transactions in a manner that any participant cannot alter. Such a degree of transparency not only builds confidence but allows for quick action to counteract challenges, which is an essential aspect in ensuring sustainability in the supply chains (Mathilda & Karin, 2021; Petersson & Baur, 2018; Wang et al., 2019). For instance, the ability to identify and source materials from local green suppliers instead of importing them demonstrates the dynamic capabilities that are possible with digital contracts.

The findings emphasise the financial benefits of employing e-signature contracts. It has been shown that those who do not adopt blockchain technology face much higher transaction costs in a study that looked into how organisations operated with blockchain-based contracts (Hasan & Habib, 2022; Oguntegbe et al., 2021; Saberi et al., 2018). In this case, the stress on contract implementation means that there are very few intermediaries involved, thereby reducing the firm's operational costs and allowing the redirection of funds to other sectors, especially those that are environmentally friendly. Additionally, using less paper means less waste production, reiterating the technology's green nature.

Despite this, these benefits are counterbalanced by the reality that numerous areas within the supply chain have not fully integrated practices of electronic contracting. There is also the issue of different cultures having unique business ways. Even as the forces are coming together more quickly, the regulators have not been able to stop the spread of e-contracts as there have not been any laws to regulate them. This, in turn, creates challenges

for firms looking forward to embracing these technologies (Akrain et al., 2020; Steenmans et al., 2021; Tang et al., 2022). The current inquiry focuses on Standards Authorities, firms and Technology providers, which harp on such transformations in a socialised and socially constructive context.

A critical aspect of research pertains to the influence of digital contracts on supplier relationships. Conventional contracts tend to create a hostile relationship between the buyer and the seller, thus inhibiting any cooperation that would aid in achieving the sustainability goals. On the other hand, digital contracts do not eliminate the risk of suspicions but rather encourage the partners to strive more towards achieving the goals of sustainability (Aksin-Sivrikaya & Bhattacharya, 2017; Julnes, 2019; Wagstaff et al., 2021). For instance, smart contracts can be drawn to incorporate green provisions to suppliers who at least sustain a certain level of provisioning or risk, buying the buyers.

Digital agreements carry substantial environmental effects. These agreements allow organisations to collect data and analyse the processes and systems within their supply chains to detect problems and guide improvements. Such an approach is for the better working in contrast to the traditional take of the economy itself — the circular one in which everything has been used and reused and wasted as little as possible (Geissdoerfer et al., 2017; Mihaela Cristina et al., 2018). The results show that organisations using digitised contracts are more likely to engage in circular activities such as recycling waste, which positively contributes to environmental sustainability.

Equally important within the scope of our study is the capacity of digital contracts to improve the social sustainability of supply chains. Issues like forced labour and other forms of exploitation in global supply chains can be avoided through digital contracts that monitor the labour and product sources (Bae, 2021; Burmeister & Tanaka, 2017; Liu et al., 2021). With the advent of blockchain technology, consumers can now confirm the ethics behind the goods they purchase to make better choices. Such trends of consumer responsibility are now more apparent in the market dynamics, motivating businesses to embed ethical practices in their operations to remain relevant in the market.

Limitations of the Study

The advancement in technology has reached a level that often, given subsequent inventions, the effects tend to degrade with time. On top of this, due to the varying laws in different countries, we cannot draw any conclusions globally from our results. An additional area of research should be looking into the environment within which firms operate, particularly the non-identical legal and regulatory regimes in different countries, as these would be helpful in the diffusion of digital contracts to other domains.

The environmental impacts of technological movements used for digitized contracts need to be studied further, particularly the amount of energy consumed in the application of blockchain technology. This is more so because of the excellent prospects for sustainable development. This raises the question of whether the technologies that are brought in to solve the problem might instead cause more harm (Kaneko, 2022; Sedlmeir et al., 2020). However, this issue will not be encountered with the implementation of energy-conserving blockchain protocols in conjunction with digital contracts, reinforcing the use of digital contracts in sustainable supply chain management.

CONCLUSIONS

Countless possibilities and constraints accompany the emergence of digital contracts within supply chain chains. The research indicates that contracts in digital form, and more so those made possible by blockchain systems, are efficient and green. Surveyed organisations indicated an average reduction in the time for processing transactions by about 40, evidencing the effectiveness of using digital means in quite simple processes. Moreover, an average forty per cent reduction in costs banked annually enabled enterprises to invest sufficient resources in sustainable initiatives.

Considering the justification above, the study also encourages the necessity of having wide-reaching policies to counter the challenges that come with the use of digital contracts. Existing regulatory policies address the issue, but they appear to be quite nebulous and hamper the effective execution of the order, causing anxiety to the agencies. There is a clear and present need for dynamic and progressive regulations that

encourage innovations to flourish while upholding rules commensurate with environmental and social governance (ESG) principles.

In globalisation, the growing reliance on e-contracts requires all concerned parties, that is, regulators, corporations and technology providers, to work together towards a coherent framework that does not jeopardise the effective management of supply chains per se. This supports establishing a transparent and accountable supply chain system and encourages participant trust.

Moreover, with the increasing popularity of e-contracts, it will be necessary to continuously assess their effects on sustainability indices such as Waste Minimisation and Global Warming Potential. Setting national legislation into the international context, especially in third-world countries, will enable the authorities to improve consumer confidence and protection in their financial markets and facilitate the development of supply chain technology.

In conclusion, although the adoption of digital contracts has many benefits, like improving the efficiency and longevity of supply networks, it must be followed by proactive regulation to prevent threats and exploit its advantages. In addition, the economic and social discussions and studies of digital contracts will help situate them in the construction of sustainable development.

Implications for Future Research

Several issues merit attention in the subsequent research. Above all, it is necessary to investigate how advisers, often operating in traditional model, face the new economy, especially how the institutional structures built around economic practices pertain to emergent economic models based on smart contracts. Such effects are critical for financial managers and policymakers willing to operate in that shifting environment.

Secondly, it is crucial to further investigate the environmental implications of using digital contracts. This implies looking at the use of energy, waste that may be produced, and the degree of impact across the lifespan of the blockchain systems in use. In furtherance of this, more effort should be put into studies that concern the green protocol and the technologies that aid green supply chains.

Third but not least, the impact of digital contracts on social stratification should be studied. However, it will be of further value to understand how such contracts help narrow or expand economic classes and what this means regarding the broader societal issue at stake.

Last but not least, existing studies highlight how digital contracts play a crucial role in enhancing supply chains and enabling sustainability. The outcomes of this study reveal that digital contracts perform the roles of traditional conventional supply chains but with deeper understanding, better coordination and increased responsibility. In the wake of sustainable development trends, digital contracts will be necessary for creating strong and ethical business supply chains. In light of such prevailing conditions, practice and future academic research should further dwell on technology and sustainability in supply chain management.

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