



A THOROUGH INVESTIGATION OF THE EFFECTS OF SMART CONTRACTS AND E-CONTRACTS ON THE CREATION AND PERFORMANCE OF CONTRACTS – UNLEASHING THE POWER OF TECHNOLOGY

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I. Abstract

Technology's influence on contract creation and performance, particularly when smart contracts and e-contracts are used, has drawn more and more attention. This essay offers a thorough examination of the effects of technology-driven contracts, building on significant research publications for its analysis. We examine how e-contracts and smart contracts can be used to create and carry out contracts more effectively, transparently, and affordably. The literature study stresses the need for harmonised legal frameworks as well as the opportunities and problems related to the development of smart contracts.

This study intends to provide light on the transformative potential of technology in changing contractual relationships by investigating the possibility of real-time monitoring, performance tracking, and dispute resolution systems. The results provide insight into the state of technology-driven contract management now and provide direction for future study and development in this dynamic field.

II. Keywords – Smart contracts, performance tracking, blockchain, technology, e-contracts, contract performance, dispute resolution, transparency, efficiency, real-time monitoring, contract formation, cost-saving, legal frameworks, automation, digitalization.

III. Introduction:

Technology has changed many aspects of human life in an ever-evolving digital environment, and contract formulation and performance are no exception. Electronic contracts (also known as "e-contracts") [1] and "smart contracts" are modern innovations that have supplemented and, in some cases, superseded traditional contract writing and execution methods. The introduction of these technical developments has caused a paradigm shift in how companies and individuals conduct business, having an influence not only on the effectiveness and

efficiency of contract processes but also on the general environment of commerce and law.

With a specific focus on the realm of e-contracts and smart contracts, the purpose of this research paper is to explore the tremendous influence that technology has had on contract creation and performance. Critical analysis of the effects of these new contract forms on the legal, economic, and operational facets of different businesses is crucial as technology continues to permeate and transform the legal landscape. This study tries to provide light on the role that technology plays in altering contractual relationships by

examining their advantages, disadvantages, and ramifications.

Contracts have traditionally been carried out using papers that called for actual signatures and face-to-face interactions. E-contracts, however, which enable parties to enter into agreements using electronic methods, have emerged as a result of the quick improvements in digital technologies. With the help of electronic signatures and various digital authentication techniques, these e-contracts expedite the contract creation procedure, making it quicker, easier to use, and less harmful to the environment. But there are a number of legal and regulatory issues that need to be taken into account, including the enforceability and legal validity of e-contracts as well as potential worries about data security and privacy.

On the other side, blockchain technology has enabled the revolutionary innovation of smart contracts. Smart contracts [2], in contrast to conventional contracts, are autonomous and self-executing, able to carry out the terms and conditions when certain criteria are satisfied. This automation increases efficiency and transparency by not just speeding up contract performance but also by lowering the need for middlemen and the possibility of human error. Despite their promise, smart contracts have a number of drawbacks, such as security flaws and the difficulty of incorporating them into current legal systems.

This study paper's main objective is to thoroughly examine how technology has affected the creation and performance of contracts, with a focus on e-contracts and smart contracts in particular. This study intends to shed light on the continuous digital transformation of the contract ecosystem by analysing their benefits and drawbacks as well as the legal and regulatory issues they raise.

IV. Literature review

Based on three influential studies, the literature review demonstrates the influence of smart

contracts and e-contracts on contract formulation and performance. In Schrepel's (2021) [3] examination of the effects of smart contracts in the context of the digital single market, the necessity of unified legal frameworks for cross-border trade is emphasised. Zheng et al.'s (2020) [4] thorough assessment of smart contracts covers their technical difficulties, advancements, and prospective deployment platforms. They emphasise how smart contracts may improve transparency and cut transaction costs. The difficulties and potential in creating smart contracts are explored in depth by Zou et al. (2019) [5], with a focus on security flaws and code vulnerabilities. The authors offer recommendations for secure coding and identify areas for future investigation.

Overall, the studied literature highlights how technology-driven contracts have the potential to revolutionise business, providing benefits including efficiency, transparency, and cost savings. However, for widespread use and good contract performance, issues with legal recognition, security, and technical complexity must be resolved. The knowledge gained from these papers advances our knowledge of smart contracts and electronic contracts and will help to direct ongoing research and development in this dynamic field.

V. The Concept of E - Contracts

A. E-contract definition and characteristics:

Electronic contracts, also known as e-contracts, have grown in popularity as a way to formalise and carry out legally binding agreements by electronic means in the current era of digitalization. An e-contract is a legal agreement that is created and transmitted entirely online. It does away with traditional paper-based contracts by allowing parties to electronically express their agreement. These contracts include a wide range of agreements, from straightforward consumer purchases to intricate business dealings.

B. E-Contract characteristics:

Electronic Form: The electronic aspect of e-contracts is their most fundamental feature. These contracts are created, transmitted, and stored electronically rather than on paper, which makes them accessible and portable between digital platforms.

E-contracts must have a clear offer and acceptance from all parties, just like conventional contracts do. This is frequently accomplished in a digital setting by buttons, checkboxes, or clicks that signify approval of the contract's conditions.

Automated procedures: By incorporating automated procedures, e-contracts can simplify the creation and execution of contracts. Fields that are automatically filled in, pre-defined templates, and notifications to parties when specific criteria are met, are examples of this.

E-contracts often have strong record-keeping features that enable parties to keep an electronic trail of all contacts, modifications, and other agreements.

C. E-contracts' legality and enforceability:

E-contracts' legality and enforceability have come under a lot of criticism since their usage is on the rise[6]. Laws and rules have been established in many jurisdictions to guarantee that contracts created electronically receive the same level of legal enforceability as their paper-based counterparts. E-contracts' enforceability and legality are mostly determined by the following factors:

An e-contract must represent the parties' actual assent and intention to be bound by its provisions in order for it to be considered legally binding. All parties involved must express their acceptance in a manner that is both clear and unambiguous.

Law Compliance: E-contracts must abide by the rules established by the relevant jurisdiction. There may be distinct laws governing electronic signatures, consumer protection, and data

privacy that must be followed in different nations and areas.

E-contracts are fundamentally based on the usage of electronic signatures. As long as they satisfy certain requirements, like proving the signatory's identity and purpose to sign, the majority of governments now accept electronic signatures as being legally genuine.

Integrity and security of records: It's essential to guarantee the accuracy and security of e-contract records. To prevent tampering, unauthorised access, and data loss, parties must take precautions.

D. Authentication and electronic signatures:

Electronic signatures are essential to e-contracts since they serve as a means of authenticating the parties' agreement to the contents of the agreement and indicating their assent [7]. Simple, advanced, and qualified electronic signatures are only a few of the different kinds of electronic signatures that are available. Depending on the type and the country in which it is used, an electronic signature's level of security and legal acceptance may change.

The identity of the parties to the e-contract is confirmed using authentication procedures. This is important to do in order to stop fraud and make sure that everyone can be held responsible for their acts under the contract. Username-password combinations, two-factor authentication, biometrics, and public-key infrastructure (PKI) technologies are typical authentication strategies.

E. E-contracting Challenges and Legal Issues :

Consent and Misrepresentation: It might be difficult to make sure that everyone actually agrees to the terms of an electronic contract. Sometimes people unintentionally or unknowingly accept the terms of a contract, which can result in disagreements about the legality of the agreement [8].

Data security and privacy: Sensitive financial and personal data is transferred between parties in electronic contracts. So there are issues with data security and privacy, particularly when there are data breaches or unauthorised accesses.

Cross-Border Transactions: E-contracts can help with cross-border transactions, which can result in complicated jurisdictional concerns and legal challenges. It can be difficult and time-consuming to determine which laws apply to the contract and which courts have jurisdiction.

Legal Recognition: Despite major advancements, not all jurisdictions completely accept e-contracts as valid and enforceable. For some forms of contracts, some legal systems may still demand written documents and physical signatures.

Electronic Evidence: Electronic evidence may need to be shown in court in the event of a contract dispute. Electronic evidence is prone to manipulation and tampering, making it difficult to ensure its legitimacy and integrity.

Building trust and confidence in the usage of e-contracts requires a combination of legal reforms, technology developments, and consumer education to address these issues. The legal framework governing e-contracts will continue to develop as the world becomes more digital and strive to find a balance between encouraging innovation and safeguarding the rights and interests of all parties concerned.

VI. The Concept of Smart Contracts

A. Smart contracts' definition and essential characteristics:

A ground-breaking innovation in the creation and execution of contracts, smart contracts. A smart contract is a self-executing, autonomous contract whose terms and conditions are encoded directly into code. Nick Szabo [10] first used the term in the 1990s. These contracts are implemented on blockchain platforms,

guaranteeing decentralisation, transparency, and immutability. Smart contracts replace the need for middlemen by automatically executing activities when predetermined criteria are satisfied, as contrast to traditional contracts that require human intervention to enforce the terms.

B. Essential Elements of Smart Contracts

Autonomy: After being installed on a blockchain, smart contracts run independently. The risk of human mistake and delays is decreased because they do not rely on third-party middlemen to carry out the contract's conditions.

Smart contracts are self-executing, which implies that if the predefined circumstances are satisfied, the contract's terms are automatically enforced without additional involvement from the parties.

Trust and Transparency: Smart contracts are carried out on a blockchain, which creates a distributed ledger that is transparent and available to all stakeholders. This openness promotes confidence among participants and makes sure that all parties with the necessary permissions can see how the contract is being executed.

Tamper-Resistant: Smart contracts are resistant to tampering and unauthorised modifications due to the intrinsic properties of blockchain, such as immutability and cryptographic security.

C. Smart Contracts' underlying technology (such as Blockchain)

The foundational technology for smart contracts is blockchain technology. A blockchain is a distributed, decentralised digital ledger that securely and chronologically records transactions [7]. The grouping of transactions into blocks and the linking of those blocks using cryptographic methods results in a chain of blocks. The blockchain's distributed architecture guarantees that no single party has total control, boosting security and

reducing the possibility of a single point of failure.

Blockchain and smart contracts together bring several important components to the table:

Decentralisation: The blockchain runs on a decentralised network of nodes, meaning there is no single entity in charge of overseeing it. This increases the system's durability and fault tolerance.

Immutability: The blockchain maintains a permanent and transparent record of all transactions by making it nearly hard to change or delete data once it has been recorded.

Security: Blockchain's use of cryptography makes sure that data is encrypted and secure, protecting it from unauthorised access and manipulation.

Consensus Mechanisms: Blockchain networks check and verify transactions using consensus mechanisms like Proof-of-Work (PoW) or Proof-of-Stake (PoS), ensuring the correctness and authenticity of the data stored.

D. Benefits and Advantages of Smart Contracts

Smart contracts have introduced a host of advantages and benefits that could completely transform contract management and other fields. Several of these benefits include:

Smart contracts automate contract execution, eliminating the need for intermediaries, paper work, and manual intervention. This results in increased efficiency and cost savings. Cost reductions and quicker transaction processing times result from this efficiency.

Trust and Transparency: Smart contracts promote trust and transparency by reducing the likelihood of disagreements and fraud because all contract operations are documented on the blockchain and made public to all pertinent parties.

Elimination of Intermediaries: By operating without the assistance of intermediaries like banks or escrow services, smart contracts can

lower transaction costs and streamline procedures.

Accuracy and Reliability: Because smart contracts are automated, there is less chance of human error, guaranteeing that the conditions of the contract are carried out exactly as intended.

Global Accessibility: Because smart contracts function on a decentralised blockchain, they are available to participants anywhere, regardless of location.

Programmable Flexibility: Smart contracts can be customised to fit a variety of applications, including voting systems, supply chain management, and financial services.

E. Smart contract challenges and potential risks:

Smart contracts come with a number of difficulties and potential concerns, despite the fact that they present promising solutions:

Code flaws: Mistakes or weaknesses in the smart contract code may have unanticipated results, such as monetary losses or security breaches.

Irreversibility: A smart contract practically becomes irreversible once it is executed. It could be difficult to make things right if there are mistakes or disagreements.

Legal Recognition: Smart contracts' legal recognition and enforceability are still developing and may differ between jurisdictions. It can be challenging to integrate smart contracts with already-in-place legal systems.

Security Risks: Although blockchain is thought to be secure, smart contracts may still be at danger from external causes like stolen private keys or 51% attacks on the underlying blockchain network.

Lack of Regulation: Because smart contracts are still in their infancy, there is currently no comprehensive regulation, which could create uncertainties and regulatory difficulties.

Oracles and External Data: Smart contracts may need external data sources (oracles) to carry out certain conditions. If the oracles are faulty or compromised, this could result in vulnerabilities.

Addressing these issues and minimising potential risks will be essential for guaranteeing the general adoption and success of this game-changing technology as smart contracts' use increases. Stakeholders must cooperate as the technology advances to create best practises, standards, and legislative frameworks that strike a balance between innovation and risk reduction.

VII. Technology's Effect on Formation Of Contracts

A. Effectiveness and Quickness in Contract Negotiation and Creation:

The huge increase in efficiency and speed during the phases of contract development and negotiation is one of the most important effects of technology on contract formation. The creation of traditional contracts frequently required laborious manual procedures, such as drafting, printing, signing, and exchanging physical copies. Technology has made it possible for parties to collaborate in real time regardless of their physical locations by allowing contracts to be produced, reviewed, and updated electronically.

Multiple stakeholders can work on the same contract simultaneously thanks to sophisticated contract management software and online collaboration tools, which eliminates the need for back-and-forth communication and speeds up the negotiation process. Automated contract templates and clause libraries simplify contract creation even further by enabling parties to swiftly modify common clauses to meet particular needs.

Technology not only improves speed but also accuracy by reducing human mistake in contract drafting and guaranteeing uniformity in language and conditions across various agreements. Because of the time and money

savings made possible by technology, firms are able to concentrate on other crucial facets of their operations.

B. Lowering the cost of transactions

Technology's incorporation into contract creation has reduced costs for both enterprises and people. Traditional contracting procedures included costs for paper, printing, shipping, and labor-intensive administrative duties. These costs can be greatly decreased or perhaps eliminated by switching to computerised contract administration.

E-contracts significantly reduce expenses by doing away with physical paper and mailing, which is especially beneficial for companies that manage a lot of contracts. Automation also lessens the need for manual data entry, office work, and physical storage, which further lowers operational costs.

Businesses can successfully track contract milestones, due dates, and renewals thanks to technology-driven contract management solutions. By using these tools, businesses can prevent missing important deadlines or chances for contract renegotiation, avoiding potential fines or unfavourable terms.

C. Building Trust and Transparency in Contract Formation

Technology is essential for increasing trust and openness in contract negotiations. All concerned parties can access a shared, impenetrable, and transparent record of the contract's complete lifecycle through electronic contract management systems and smart contracts backed by blockchain technology.

Smart contracts built on blockchains offer an immutable record of all activities and transactions pertaining to the contract. Each party has the ability to independently confirm the contract's execution, preventing any room for manipulation or disagreements brought on by divergent versions of the agreement.

D. The Global Reach and Accessibility of Technology-Based Contracts

Technology has greatly increased the accessibility and scope of contract formation on a worldwide scale. Geographical distances could be problematic with traditional paper-based contracts, necessitating in-person meetings or courier services. Technology, however, makes it possible for parties located all over the world to converse, negotiate, and complete contracts remotely.

By removing geographic restrictions, cloud-based contract management systems allow stakeholders to access contracts safely from any location with an internet connection. This accessibility is especially helpful in the current globalised economy where companies cooperate with partners, suppliers, and clients all around the world.

Technology has also made it possible for individuals and small firms to conduct international business. Smaller businesses can easily engage in international markets with the help of e-contracts and digital payment systems without the need for considerable logistical assistance or local presence abroad.

The worldwide reach of technology-based contracts also makes it possible for parties to collaborate more quickly and effectively, which is especially advantageous for businesses where time is of the essence or where business moves quickly. This accessibility helps companies to take advantage of opportunities, grow their markets, and sharpen their competitive edge globally.

In conclusion, technology has had a fundamentally revolutionary effect on how contracts are drafted, carried out, and managed. An environment for a company that is more flexible, connected, and competitive because of technology-driven contract management's efficiency, cost savings, transparency, and accessibility. The potential for even larger breakthroughs in contract formation will increase as technology develops,

opening up fresh options for businesses and people around the world.

VIII. Technology's Effect on Contract Performance

A. Using self-executing contracts and automation

Automation and the use of self-executing contracts are two of technology's most significant effects on contract performance. By removing the need for manual intervention during the execution stage, smart contracts, which are implemented on blockchain technology, represent the pinnacle of this automation. Without the need for human intervention, the smart contract's terms are automatically carried out once the predetermined criteria stored in them are satisfied.

Automation speeds up contract fulfillment, cutting down on delays and the chance of human error. Technology streamlines the procedure and guarantees a more effective and dependable performance by doing away with the need for intermediaries to supervise the fulfillment of contract requirements.

Smart contracts, for instance, can automate payments if certain delivery milestones are met in supply chain management, doing away with the need for time-consuming invoice processing and reconciliation. Smart contracts can automatically initiate payouts for insurance claims when the prerequisites for claim approval are satisfied, enabling faster and more precise claims processing.

B. Performance Tracking and Real-Time Monitoring:

Technology makes it possible to monitor and track contract performance in real-time, giving stakeholders useful information about the contract's development and compliance. Businesses can collect pertinent data and track the performance of the assets or services covered by the contract in real-time by

integrating Internet of Things (IoT) devices and sensors.

IoT devices, for instance, can be used in construction contracts to monitor progress on a construction site and guarantee that milestones are met on time. Real-time tracking of shipments using GPS technology enables parties to track the movement and delivery of products in logistics contracts.

The capacity to proactively handle any problems or departures from the agreed-upon provisions is improved by this real-time monitoring, which also enables parties to evaluate the status of the contract. Potential breaches can be avoided and the contract's overall performance can be enhanced with prompt intervention.

C. Mechanisms for Resolving Disputes in Technology-Based Contracts:

Technology offers creative ways to simplify contract dispute resolution procedures. Traditional contract disputes sometimes involve drawn-out and expensive legal proceedings, leading to considerable delays and destroying company relationships. Technology-based contracts allow for the direct coding of dispute resolution procedures, guaranteeing that established processes are done to resolve disputes quickly.

In the event of a dispute, a decentralised, immutable ledger made possible by blockchain technology can be used as an objective source of information. To settle disputes and ascertain whether contractual obligations have been completed, parties can consult the contract's history and performance data stored on the blockchain.

Technology also makes it easier to employ online dispute resolution (ODR) tools, which let parties participate in virtual arbitration or mediation proceedings. ODR platforms make it possible for conflicts to be resolved more quickly and easily, especially when the parties are spread out geographically.

D. Performance Guarantees and Smart Contracts:

Performance guarantees are a feature of smart contracts that can be used to make sure that parties keep their promises. Parties can directly programme performance guarantees and penalties into a smart contract's code by putting them on a blockchain network.

A performance bond or escrow, for instance, might be programmed into the smart contract to make sure that money is automatically released when certain milestones are met or withheld in the event of non-performance. These assurances give the parties a sense of confidence by ensuring that the agreements will be upheld and that, in the event of a breach, they will get the appropriate compensation.

Due to the openness of the blockchain, which assures that the terms and circumstances of the performance guarantees are available to all authorised participants, the adoption of blockchain-based smart contracts can also promote confidence between parties. This openness lowers the possibility of non-performance and boosts confidence in the contract's ability to be enforced.

IX. Conclusion

In conclusion, technology has a significant impact on contract performance, introducing automation, real-time monitoring, and cutting-edge dispute resolution procedures. Self-executing contracts automate processes to expedite operations, cut down on delays, and minimise human error. Parties can monitor progress in real time and react quickly to deviations. By immediately integrating protocols into the contract and offering a clear and unbiased source of information, technology also improves dispute settlement. Due to their programmability, smart contracts enable performance guarantees, fostering a sense of security and mutual confidence between the parties. The impact of technology on contract performance will likely result in significant advancements in the efficacy, dependability,

and efficiency of contractual agreements as technology develops.

Additionally, technology has completely changed how contract performance is measured, evaluated, and monitored. The integration of IoT devices and real-time monitoring give stakeholders insightful information on the status and compliance of contracts, allowing for proactive intervention and improving overall performance. Additionally, the use of technology in dispute resolution has resulted in more effective and accessible ways of resolving issues, creating trust between parties, whether through the deployment of online dispute resolution platforms or blockchain-based transparency.

The advantages of technology-driven contracts are accompanied with specific risks and obstacles, though. Continued focus and improvement are still needed in the areas of legal validity and enforceability, data privacy concerns, and the need to integrate technology with current legal frameworks. Stakeholders must address these issues as technology develops in order to guarantee that the digital revolution in contract management creates a secure and peaceful environment for all parties.

Future technological developments, particularly in the areas of artificial intelligence and machine learning, could create new opportunities for improving contract creation and performance. Additionally, we can anticipate growing global adoption as more nations and legal systems acknowledge the legitimacy of e-contracts and smart contracts, extending the reach and influence of technology-based contracts on a global scale.

In conclusion, the incorporation of technology into the creation and execution of contracts has resulted in transformational changes that provide a variety of advantages to enterprises, people, and legal systems. Stakeholders may take advantage of technology's ability to build more effective, safe, and transparent contractual relationships in the dynamic and

ever-evolving world of commerce by embracing the opportunities it presents and tackling the issues it brings with it.

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