

# THE IMPACT OF BLOCKCHAIN ON ENSURING THE LEGALITY OF ELECTRONIC SALES CONTRACTS IN METAVERSE: EVIDENCE FROM THE HOUSING BANK - A FUTURE STUDY

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## Abstract

Through a prospective analysis based on data from the Housing Bank, this study sought to illustrate how blockchain technology, with its dimensions of block, hash, information, and time signature, affects guaranteeing the legitimacy of electronic sales contracts in Metaverse. In view of the swift digital changes taking place in the banking industry and virtual settings, this study sought to investigate the nature of the relationship between blockchain dimensions and the dependent variable, namely electronic sales contracts. A descriptive strategy was used to accomplish the study's goals. The Housing Bank of Jordan was the study's goal, and the research sample was chosen utilizing a thorough survey procedure. Every Housing Bank branch that made up the study population was included in the sample. Employees in these branches IT personnel, compliance and risk staff, legal affairs staff, and digital transformation staff were given electronic questionnaires (210). The Statistical Package for the Social Sciences (SPSS) was used to examine the 191 questionnaires that were found to be valid for statistical analysis. The findings demonstrated a statistically significant connection between electronic sales contracts in the Metaverse and blockchain technology. The results also demonstrated a significant impact of each blockchain dimension individually. It was found that the block, hash, information, and time signature each play an active role in enhancing the legality of electronic contracts within the virtual environment. The research recommended developing clear regulatory and legislative frameworks to govern the use of smart contracts. Metaverse utilizes blockchain technology, ensuring legal recognition and enhancing the protection of contracting parties' rights.

**Keywords:** Blockchain, Electronic Sales Contracts, Metaverse, Housing Bank.

## INTRODUCTION

Blockchain technology is one of the most prominent technological innovations of the last two decades, having revolutionized the methods of recording, storing, and verifying data across decentralized and secure networks (Al-Hasban, 2019). This technology is based on the concept of a chain of blocks linked together using hashes, ensuring that recorded data is immutable and tamper-proof. A time stamp is added to each transaction, enhancing legal confidence in digital transactions and making them highly traceable and verifiable (Qasaimeh et al., 2025). Furthermore, the content of each contract or transaction is stored as encrypted information on the blockchain, guaranteeing information security and preventing data loss (Aleksy, 2019).

As the internet evolves towards immersive virtual environments like Metaverse, new possibilities are emerging for commercial and electronic transactions, including e-sales contracts conducted within these virtual worlds. In this integrated digital environment, blockchain technology can serve as a robust foundation for ensuring the legality of these contracts by providing an automated environment for enforcing the parties' obligations (smart contracts), verifying the contracts date and execution, and secure transactions against forgery and manipulation (López, 2025).

The literature demonstrates how our conventional conceptions of legal responsibilities have been altered by blockchain-based smart contracts, a type of electronic contract. Once certain requirements are satisfied, they can automatically fulfill obligations without the need for legal or administrative middlemen. Nevertheless, this change is not without legal and regulatory difficulties, especially with regard to establishing a legal framework that acknowledges the efficacy of these contracts in actual disputes, proving the parties' intent, and applying traditional contract law to decentralized virtual environments (Fadel, 2025).

Thus, the purpose of this study is to show how blockchain technology can guarantee the legitimacy of electronic sales contracts in the Metaverse utilizing data from the Housing Bank. It examines the connection between electronic sales contracts in the Metaverse and blockchain technology, including its dimensions (block, hash, information, and time signature), with an emphasis on how to guarantee their legal validity, methods to improve their dependability, and applied evidence from a banking institution (the Housing Bank) as a useful model for further research in this area.

The convergence of three cutting-edge and contemporary fields—blockchain technology, the Metaverse, and electronic contracts, which symbolize the future of digital transactions—makes this research significant. By lowering the possibility of fraud and manipulation and boosting the legal legitimacy of electronic contracts, blockchain technology makes it possible to create a dependable and safe environment for recording transactions. This is especially crucial in the Metaverse, because transactions occur in intricate virtual settings where it would be challenging to confirm the legitimacy of conventional transactions.

A legal and technical framework to ensure the legitimacy of these contracts and the rights of the transacting parties is becoming more and more necessary as the use of electronic sales contracts within Metaverse grows. By enabling the self-execution of contracts (smart contracts) and the recording of a time signature for every transaction, blockchain technology can improve user confidence and make transaction verification easier when needed by law.

Through a case study of Housing Bank, which aims to comprehend how blockchain technology can be applied in a real banking environment to ensure the legality of virtual contracts, this research also provides practical value. This highlights the significance of the research for both academics and practitioners in the banking and digital commerce sectors.

Researchers and practitioners in the fields of law, information technology, and digital business management will find this study to be a valuable resource as it advances scientific understanding of the integration of contemporary technologies with legal frameworks and supports financial institutions' efforts to improve transparency, protect customer rights, and boost investor confidence in electronic transactions within Metaverse (Chen et al., 2024).

The problem addressed in this paper lies in answering the main question: What is the impact of blockchain, with its dimensions (block, hash, information, time signature), on ensuring the legality of electronic sales contracts in Metaverse? This question branches into the following sub-questions: What is the impact of the block on ensuring the legality of electronic sales contracts in Metaverse? What is the impact of the hash on ensuring the legality of electronic sales contracts in Metaverse? What is the impact of information on ensuring the legality of electronic sales contracts in Metaverse? And what is the impact of the time signature on ensuring the legality of electronic sales contracts in Metaverse?

## Research Hypotheses

**Main Hypothesis H0:** There is no statistically significant impact at the significance level ( $\alpha \leq 0.05$ ) of using blockchain technology, with respect to its dimensions (block, hash, information, time signature), on ensuring the legality of electronic sales contracts in Metaverse.

Sub-hypothesis H01: There is no statistically significant impact at the significance level ( $\alpha \leq 0.05$ ) of block size on ensuring the legality of electronic sales contracts in Metaverse.

Sub-hypothesis H02: There is no statistically significant impact at the significance level ( $\alpha \leq 0.05$ ) of hash size on ensuring the legality of electronic sales contracts in Metaverse.

sub-hypothesis (H03): There is no statistically significant impact at the significance level ( $\alpha \leq 0.05$ ) of information on ensuring the legality of electronic sales contracts in Metaverse.

sub-hypothesis (H04): There is no statistically significant impact at the significance level ( $\alpha \leq 0.05$ ) of time signature on ensuring the legality of electronic sales contracts in Metaverse

## **Theoretical framework and previous studies**

### **First: The conceptual basis of blockchain technology**

Blockchain technology first appeared in a paper by Satoshi Nakamoto (Nakamoto, 2008) that introduced Bitcoin as a decentralized electronic cash system based on a peer-to-peer network (Al-Naimi et al., 2023). However, the importance of blockchain has extended beyond the realm of cryptocurrencies to become a digital infrastructure for managing data and transactions in a secure, transparent, and immutable manner. The technology is based on recording transactions within interconnected "blocks" using cryptographic hash functions, such that any modification to a single block alters its digital fingerprint and disrupts the entire chain, making manipulation virtually impossible (Swan, 2015).

Decentralization, transparency, immutability, and cryptographic security are some of the key characteristics of blockchain technology that serve as the theoretical foundation for this investigation. Decentralization lowers the danger of hacking and information monopolies by distributing data among a network of nodes rather than storing it on a single central server. The hash structure, which generates a distinct digital fingerprint for every block and links it to the fingerprint of the preceding block to create a safe and sequential timeline, is closely related to immutability (Tapscott & Tapscott, 2016; Saidat et al., 2023).

The dimensions of blockchain can be summarized as follows:

- 1) Block: A data storage unit containing a set of transactions, linked to the previous block via a hash, thus ensuring the structural integrity of the chain (Al-Gasaymeh et al., 2024)
- 2) Hash: The result of a cryptographic algorithm that transforms data into a unique digital token, and is the cornerstone of data integrity (Al-Jaghbeer et al., 2024)
- 3) Data: The content of a transaction or contract recorded within the block, subject to encryption that guarantees its confidentiality and integrity (Al-Own et al., 2023)
- 4) time signature: Records the precise time of a transaction's creation, providing reliable time evidence that strengthens its legal validity (Al-Gasaymeh et al., 2024)

### **Second: The theoretical basis of electronic contracts and smart contracts**

In traditional legal terms, a contract is an agreement between two or more parties to produce a specific legal effect. With the development of e-commerce, it has become possible to conclude contracts via digital media without the physical presence of the parties. The legitimacy of digital data and electronic signatures has been acknowledged by numerous international legal documents, including the UNCITRAL Model Law on Electronic Commerce (UNCITRAL, 1996).

Smart contracts become a complex legal and technological notion in this setting. Nik Szabo (1997) initially used the phrase, defining it as a computer protocol that, under certain circumstances, automatically carries out contract requirements. The creation of

self-executing contracts with unchangeable terms and transactions is now feasible thanks to the integration of smart contracts with blockchain technology (Al-Qassaymeh, 2020).

The technical theory of smart contracts is based on the principle of “code is law,” a concept introduced by Lessig (1999), whereby software rules acquire a regulatory effect similar to legal rules.

However this concept raises legal issues related to the interpretation of contractual intent, defects of will, and the possibility of rescinding or modifying the contract, especially in the case of unstoppable automatic execution (Al Qassaymeh & Al-Barashdi, 2024).

### **Third: Metaverse as a new legal environment for transactions**

The concept of metaverse refers to a three dimensional digital environment that integrates virtual and augmented reality, allowing users to interact economically and socially through digital identity. Some researchers have described it as the next generation of the internet, where transactions become more integrated and interactive (Mystakidis, 2022).

In this environment, transactions are not limited to simple digital goods, but extend to the sale of virtual land, digital assets, services, and even real world products. This development poses legal challenges related to jurisdiction, identifying parties, consumer protection, and ensuring the validity of contracts (Alomran & Al-Qassaymeh, 2020).

Researchers believe that e-sales contracts in Metaverse require the traditional elements of a contract: consent, subject matter, cause, and capacity. However, proving these elements in a virtual environment can be complex, especially given the cross-border nature of these platforms. This is where blockchain technology becomes crucial in providing a permanent and immutable record of transactions, thereby enhancing digital trust and reducing potential disputes.

Researchers believe that the relationship between blockchain and electronic contracts is not merely a technical one, but extends to reshaping the concepts of proof, execution, and the admissibility of digital evidence.

With an emphasis on jurisdictional concerns, data privacy, liability, and dispute resolution inside decentralized virtual worlds, López's (2025) study sought to provide a comparative legal examination of six key jurisdictions: the European Union, the United States, China, Singapore, Brazil, and South Korea. The results show a disjointed regulatory environment with persistent gaps that lead to a decline in user engagement and trust. The long-term sustainability of metaverse ecosystems is threatened by these unresolved legal issues as well as ongoing security flaws. The article suggests a hybrid governance structure that combines enforceable legal standards with blockchain-native technologies like smart contract arbitration to solve these issues.

Although the goal of Al-Hasban's (2019) study was to draw attention to the problems that arise when blockchain technology is used in practice, the question of applicable law emerged when blockchain was initially developed, with some modifications to the laws whose provisions apply to electronic transactions, such as electronic contracts. Thus,

solutions to disputes arising from its use can be found through other laws. The results showed that the governments of developed countries, their institutions and companies are continuously and directly moving towards adopting blockchain technology to improve their current services, systems and products by taking advantage of the main features offered by this modern technology, including levels of security, transparency and documentation, transaction time and dates, immediate execution of transactions and, most importantly, cost reduction with complete effectiveness.

Demirkan et al. (2020) sought to illustrate the present and potential applications of blockchain technology in the commercial sector. In terms of cybersecurity and accounting, the study demonstrated that using blockchain technology in auditing and general accounting procedures is beneficial and efficient. Because of its high level of security, blockchain has the ability to significantly affect a company's cybersecurity system in accounting and business management. Additionally, the study showed how blockchain has a variety of effects on financial auditing that have the potential to drastically alter the field.

Although Vijai et al. (2019) used a historical approach to clarify the effects of using blockchain technology in accounting, the study predicted that the additional features of blockchain accounting would change traditional accounting functions, reduce internal and external fraud, increase trust and security, enable procedure implementation, and enhance the security of digital data.

## RESEARCH METHODOLOGY

In order to describe and methodically analyze the phenomenon being studied, the descriptive analytical approach was used in this study. A questionnaire was designed to measure the research variables and investigate their relationships, and the extracted data was interpreted to produce the necessary findings. The Jordanian Housing Bank was the focus of the investigation.

All of the Housing Bank branches that made up the study population were included in the study sample, which was chosen utilizing a thorough survey approach. Employees in these branches (IT personnel, compliance and risk staff, legal affairs staff, and digital transformation staff) were given electronic questionnaires (210). Seven of the 198 questionnaires that were gathered were eliminated because their answers were formulaic and similar. The Statistical Package for the Social Sciences (SPSS) was used to do statistical analysis on the 191 questionnaires that were found to be valid.

A questionnaire tailored to the goals and theoretical framework of the study was created. In order to ensure the gathering of precise and statistically analyzable data, its items were methodically created to reflect the dimensions of the research variables. In order to ensure respondents' comprehension and optimize consistency in responses, the questionnaire's design placed a high priority on language clarity and conceptual coherence between items.

The five-point Likert scale was chosen to gauge the sample's attitudes and opinions because it is one of the most used scales in behavioral and managerial research because it can translate qualitative attitudes into quantitative data that can be statistically analyzed. "Strongly Agree" received five points, "Agree" received four, "Neutral" received three, "Disagree" received two, and "Strongly Disagree" received one.

The use of this scale has contributed to providing an appropriate level of accuracy and objectivity in measuring the responses of the sample members, which has made it possible to extract reliable quantitative indicators that can be relied upon in testing the study hypotheses and analyzing the relationships between its variables, leading to scientific results that support the interpretation of the phenomenon under investigation in a systematic way.

$$\text{The length of the period} = \frac{\text{The upper limit of the alternative} - \text{the lower limit of the alternative}}{\text{Number of levels}} = \frac{5 - 1}{3} = 1.33$$

In order to provide a clear quantitative interpretation of the results, a classification criterion based on the arithmetic means of a five-point Likert scale was used to ascertain the degree of interest and practice of the research variables by the bank sampled in the study. Based on the duration of the statistical class, the rating levels were separated into three primary categories:

- High level: When the arithmetic mean falls between 3.66 and 5.00.
- Medium level: When the arithmetic mean falls between 2.33 and 3.66.
- Low level: When the arithmetic mean falls between 1.00 and 2.33.

This classification helps to facilitate the interpretation of arithmetic means and to accurately and objectively determine the degree of interest and practice of the bank regarding the study variables. Additionally, it offers a solid analytical foundation for evaluating the various characteristics and methodically coming to findings that advance the goals of the study.

### **Cronbach's Alpha Coefficient test**

To verify the reliability and validity of the research instrument, the internal consistency coefficient was used. The minimum acceptable reliability value (0.70) is a standard statistical measure used in behavioral and managerial studies. Values exceeding this threshold indicate an acceptable level of consistency between the scale items and their ability to measure the same dimension with a high degree of reliability. The closer the value is to one, the higher the level of reliability and the greater the instrument's ability to measure the study variables. The following table presents the results of the reliability test for the dimensions of the independent variable (blockchain technology), namely: block, hash, information, and time signature, in order to ensure the validity of the tool for use in statistical analysis and testing the study hypotheses.

**Table (1): Coefficient Test**

| No                                | Variable       | alpha value  |
|-----------------------------------|----------------|--------------|
| 1                                 | Block          | <b>0.841</b> |
| 2                                 | Hash           | <b>0.813</b> |
| 3                                 | Information    | <b>0.891</b> |
| 4                                 | time signature | <b>0.875</b> |
| <b>Blockchain</b>                 |                | <b>0.912</b> |
| <b>Electronic sales contracts</b> |                | <b>0.908</b> |
| <b>Search tool</b>                |                | <b>0.943</b> |

The values of the Cronbach's alpha internal consistency coefficient varied between 0.841 and 0.891. The dependent variable, electronic sales contracts, had an alpha value of 0.908, whilst the independent variable, blockchain, had an alpha value of 0.912. The study instrument's alpha value was 0.943. As a result, every value is higher than 0.70, demonstrating the research instrument's dependability for statistical analysis. The following test was carried out in order to validate these findings:

**Table (2): VIF and variance**

| V              | VIF   | Tolerance |
|----------------|-------|-----------|
| block          | 2.152 | 0.465     |
| hash           | 2.874 | 0.348     |
| information    | 3.210 | 0.312     |
| time signature | 3.106 | 0.322     |

There was no issue with multiple linear correlation between the independent variables in the study model, according to the multiple linear correlation analysis results. Variance inflation was not present because the Variable Intensity-Fluctuation Index (VIF) values fell within the statistically admissible range (1–10). The statistical model's validity and the variables' suitability for examining correlations without any notable interactions between them were further confirmed by the tolerance values, which fell within the acceptable range of 0.1–1.

### Description of search variables

**Table (3): Arithmetic averages and materiality of blockchain dimensions**

| No                                | Variable       | Arithmetic average | standard deviation | Rank | Materiality |
|-----------------------------------|----------------|--------------------|--------------------|------|-------------|
| 1                                 | Block          | 3.964              | 0.455              | 1    | High        |
| 2                                 | Hash           | 3.867              | 0.644              | 3    | High        |
| 3                                 | Information    | 3.912              | 0.475              | 2    | High        |
| 4                                 | time signature | 3.791              | 0.474              | 4    | High        |
| <b>Blockchain</b>                 |                | <b>3.884</b>       | <b>0.483</b>       |      | <b>High</b> |
| <b>Electronic sales contracts</b> |                | <b>3.841</b>       | <b>0.429</b>       |      | <b>High</b> |

Given that the independent variable's overall average was (3.884), the overall average in terms of relative relevance was high. Block was the variable with the highest relative importance, followed by information in second place, hash in third, and time signature in

fourth and last place. The monitored variable, electronic sales contracts, received a high relative relevance, with an overall average of 3.841.

### Hypothesis testing

**Table (4): the impact of "blockchain" on "securing electronic sales contracts in Metaverse"**

| Dependent Variable         | Model Summary |                | ANOVA        |    |        | Coefficients                           |       |                |              |        |
|----------------------------|---------------|----------------|--------------|----|--------|----------------------------------------|-------|----------------|--------------|--------|
|                            | R             | R <sup>2</sup> | F calculated | Df | Sig F* | Dimensions of the independent variable | B     | standard error | T calculated | Sig t* |
| Electronic Sales Contracts | 0.751         | 0.561          | 89.215       | 4  | 0.000  | block                                  | 0.354 | 0.051          | 6.941        | 0.000  |
|                            |               |                |              |    |        | Hash                                   | 0.264 | 0.056          | 4.714        | 0.000  |
|                            |               |                |              |    |        | Information                            | 0.322 | 0.053          | 6.075        | 0.000  |
|                            |               |                |              |    |        | Time signature                         | 0.221 | 0.052          | 4.250        | 0.000  |

The findings show that the blockchain variable and the electronic sales contracts variable have a statistically significant association. According to the test results, the aggregate blockchain dimensions account for 56.1% of the variation in electronic sales contracts. Additionally, electronic sales contracts are significantly impacted by all blockchain dimensions (block, hash, information, and time signature).

Main Hypothesis: There is a statistically significant impact at the significance level ( $\alpha \leq 0.05$ ) of using blockchain technology, with respect to its dimensions (block, hash, information, and time signature), on ensuring the legality of electronic sales contracts in Metaverse.

- There is a statistically significant impact at the significance level ( $\alpha \leq 0.05$ ) of block size in ensuring the legality of electronic sales contracts in Metaverse.
- There is a statistically significant impact at the significance level ( $\alpha \leq 0.05$ ) of hash size in ensuring the legality of electronic sales contracts in Metaverse.
- There is a statistically significant impact at the significance level ( $\alpha \leq 0.05$ ) of information size in ensuring the legality of electronic sales contracts in Metaverse.
- There is a statistically significant impact at the significance level ( $\alpha \leq 0.05$ ) of time signature in ensuring the legality of electronic sales contracts in Metaverse.

### CONCLUSION

This study aimed to demonstrate the impact of blockchain technology, with its dimensions of block, hash, information, and time signature, on ensuring the legality of electronic sales contracts in Metaverse. This was achieved through a prospective study based on evidence from the Housing Bank. The study sought to examine the nature of the relationship between blockchain dimensions and the dependent variable, electronic sales contracts, in light of the rapid digital transformations occurring in the banking sector and virtual environments. The findings demonstrated a statistically significant connection

between electronic sales contracts in the Metaverse and blockchain technology. The power of the explanatory model and its capacity to clarify the researched effect were demonstrated by the analysis, which showed that the combined dimensions of blockchain could account for 56.1% of the variance in electronic sales contracts. Additionally, the findings showed a substantial influence of each blockchain dimension separately, demonstrating that block, hash, information, and time signature all contribute significantly to improving the legality of electronic contracts in the virtual world.

The alternative hypothesis, which recognizes a statistically significant impact ( $\alpha \leq 0.05$ ) of utilizing blockchain technology in its various dimensions on guaranteeing the legality of electronic sales contracts in Metaverse, both at the macro and micro levels for each of the studied dimensions, was thus accepted and the main hypothesis was rejected in its null form. These findings demonstrate that using blockchain technology greatly improves digital trust, achieves legal validity, and lowers the possibility of contract disputes or manipulation in virtual environments.

The study recommends developing clear regulatory and legislative frameworks to govern the use of smart contracts and blockchain technology in Metaverse, ensuring their legal recognition and strengthening the protection of contracting parties' rights. It also recommends enhancing integration between technical and legal departments within banks to ensure the alignment of blockchain technology with legal and regulatory requirements, and conducting future comparative studies that include other banks and financial institutions, or that address additional variables such as cybersecurity, data protection, or digital trust, to enhance a comprehensive understanding of the impact of emerging technologies in the virtual environment.

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