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The Legal Framework for Real Estate Property Transaction Based on Blockchain Technology (A Case Study of Iraq)

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Abstract

The system of real estate records is considered ineffective and unreliable worldwide, especially in developing countries. The traditional paper-based record-keeping systems are considered inefficient, consume a lot of time and money, and are prone to corruption, forgery, and manipulation. Iraq is one of the countries that struggle with the challenges of the traditional real estate registration system and has been trying to take small steps to convert the traditional system to electronic to catch up with the technological era. However, it is not possible to achieve a complete transition due to legal and technical shortcomings related to security procedures and the delicate balance between the principle of propaganda and rights of privacy and others. This paper aims to provide brief information about Blockchain technology and the procedures for applying this technological revolution to the real estate transfer and registration system according to Iraqi law and principles.

Keywords: Real Estate, Property Transaction, Blockchain, DLT, Legal Framework.

1. INTRODUCTION

In most countries, real estate is the core of the national economy and one of the essential foundations of credit in economic life. Where the various legislations focused on the method of registering and transferring real estate ownership, and due to the large number of regulations that deal with the various aspects of real estate issues in Iraq, the Iraqi regulator established the first real estate registration department in Iraq in 1850 AD to facilitate the real estate registration, planning, and approvals, among other purposes.

The traditional land registration system in Iraq and other developing countries still depends on massive paperwork and the human element, leading to many human errors. In addition, these procedures are time-

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consuming and require high costs. Where trusted third parties participate in both record keeping and transaction procedures in the traditional system.

Blockchain technology has been proposed as a potential solution to the common problems of the traditional land registry system in some countries. The rationale behind the idea was that a transparent and decentralized distributed digital ledger could be applied to land registry systems, which act as a database containing all information regarding property rights and historical transactions currently stored in centralized systems. It is argued in the current literature that blockchain technology can provide a high level of security, efficiency, accuracy, suitability, and transparency besides being less prone to misuse by officials and recording devastation caused by natural or man-made disasters.

With the rapid developments taking place in the technological field around the world, the Iraqi legislator has also taken timid small steps by promulgating the Electronic Signature and Electronic Transactions Law No. (78) of 2012 AD to keep pace with those improvements. Despite the amendments that have been made in laws and regulations, there are still some legal and technical infrastructure problems that may occur during the transition from the traditional registration system to the electronic system.

It has been claimed that Blockchain technology can be able to solve all of the above problems by eliminating third parties with its unique features as a decentralized, distributed, time-stamped, peer-to-peer, and proof-of-work hash-based server. In addition, it was also mentioned that Blockchain and smart contracts may replace many of the time-consuming and costly functions of the traditional system by allowing peer-to-peer asset transfers, shortening the transaction period from weeks to minutes as well as lowering transaction costs. From high amounts per sale to modest service fees. However, no research has been done to implement Blockchain in the Iraqi registration system in Iraq in an attempt to deal with the current challenges. The paper aims to examine current applications and projects in order to evaluate potential legal problems that may arise from the application of Blockchain technology to the Iraqi land registry system as well as recommend solutions to those potential problems.

2. THE BENEFIT OF USING BLOCKCHAIN TECHNOLOGY IN THE REAL ESTATE REGISTRATION SYSTEM

Blockchain has been proposed as an opportunity to eliminate the shortcomings of the traditional real estate system related to transaction costs, time efficiency, centralized control, and trusted information with its core features as a decentralized, distributed and timestamped server on a peer-to-peer basis. To understand the extent of the benefit of using technology in real

estate registration transactions, we must know the problems of the traditional real estate registration system and the requirements for its development (the first requirement), and try to know the potential restrictions in the event of relying on a real estate registration system based on the blockchain (the second requirement).

2.1. Current real estate regulations and development requirements

Problems of the current real estate registration system and suggested solutions.As stated in the World Bank Group's statement ([1]), real estate rights are of critical importance and may have a significant impact on the economic development of individuals. According to World Bank estimates, nearly 70% of the world's population does not have access to property management services, meaning that only 30% of the world's population has a legally registered title to their land. Given this, securing real estate rights is important to promote growth and investment, so the World Bank Group is trying to address this problem and it has been mentioned in many of the United Nations Sustainable Development Goals ([2]).

In the traditional laws of real estate management, we note that the buyer must first determine the ownership of the property owner through the deed of the property or any other document of proof when he wants to obtain the property. Where the large number of individuals who own real estate in most countries suffer from defects in identification papers, documents, forged signatures ... etc., which leads to a lack of proper documentation of real estate ownership ([3]). In addition, there is a large number of unregistered land in rural cities in developing countries when compared to large cities. Apart from these unregistered lands and properties, there is a problem with the efficiency of the real estate registration system even in large cities. Where records are mostly stored centrally and are based on manual registration by the real estate registration departments. Also, the manual registration system depends mainly on paper and requires long procedures in paperwork and validation of data and information contained in documents and papers, and this leads, as a result, to slow, inefficient and costly transfer and registration procedures. Since the real estate registration system is centralized and paper-based in addition to being under the control of a third party (the Real Estate Registration Department staff), the system is highly vulnerable to human errors, losses, and natural disasters. The real estate management system can also be subject to fraud and corruption, which reduces trust between government authorities and individuals ([4]).

In addition to the general problems that still exist around the world, there are also some specific problems arising from the process of shifting from the traditional system to the electronic system in real estate registration law. As mentioned earlier, although some steps have been taken to improve the

traditional Iraqi real estate registration law in terms of technology, there are still several unresolved problems. In short, deficiencies related to data security, privacy, and legal validity of digital signatures are the main problems of the current mechanism and require further attention and study. Since the electronic cadastre is not an official land registry, it cannot be said that the paper system may be completely removed. This means that the paper-based system is still in place and is a problem for the country in terms of heavy paperwork, human errors, and corruption. For these reasons, blockchain technology has been introduced as a solution to address the above problems, and some countries have recently tried to implement this technology in their land registry systems [5].

It has been suggested that the integration of the real estate sector and blockchain technology could eliminate onerous bureaucracy in the sector. Time-consuming and cost-effective transactions such as buying, selling, and managing property can be done very quickly, cheaply, and without any error. With the help of this modern technology, the data can remain the same for every person and organization at one time and cannot be changed after the transaction is executed.

A blockchain system can be defined as a network system consisting of a group of servers (servers) where each person connected to the system acts as a server. In this system, no process can be changed or destroyed by a third party, because the transaction in any server is transmitted to all other servers in the same way. Since the real estate sector is one of the sectors in which trust is very important, the ability to carry out these transactions without having to trust anyone can lead the sector to a new point[6].

In this way, disasters, wrong registration of the land registry, or improper registration of the corrupt employee cannot harm the registered rights.

A blockchain is a public decentralized ledger derived from a central system that provides a secure, auditable, and transparent database. As this technology is considered more powerful in fending off attacks, misuse by system administrators, and man-made and natural disasters through its features.

There are many applications of technology such as time stamping, disaster recovery [7] and the immutable ledger that can be applied to real estate registration systems and therefore the low rate of corruption cannot be denied. Blockchain technology uses a distributed fingerprint list which allows verification of records as well as keeping a list of transaction records. . In addition, the blockchain protects identities with a secure identifier (ID) [8] and also can eliminate risks arising from human error and fraud [9].

The use of blockchain and smart contracts can reduce the time and cost spent during the transfer and registration procedures of a third party

(the responsible employee). As many payments like sales, rent or fees can be done automatically through the system which can allow peer-to-peer transfers.

As we mentioned earlier, the Blockchain is a decentralized, error-tolerant, and immutable system, so it is considered more secure and resilient than traditional transaction systems and current property registration systems due to the lack of a central database and therefore less prone to any loss or damage [10].

Blockchain can also offer a solution to fraud and human errors that can arise via a traditional single, centralized, paper-based, and human system. Fraud and error scenarios can be derived from document falsification, disappearance, or double selling. Since it is an immutable ledger with a timestamped hash that can record and keep track of all transactions made in the system, property ownership can easily be checked more reliably and securely.

In conclusion, the benefits of employing blockchain technology in the real estate trading sector can be summarized as follows:

1. The blockchain technology used in land records reduces time consumption.
2. It can be accessed from a distance, ie the individual can sell or transfer the ownership of his property even if he is outside the country.
3. It prevents possible fraud attempts.
4. Develop data quality and database reliability.
5. Enhancing economic and social development and confidence in government agencies. It can increase trust in government agencies as well as contribute to the economic and social development of a country [11].

2.2. Requirements for applying the blockchain to the real estate registration system

To understand how to solve problems related to traditional real estate trading systems through blockchain technology, the procedure for applying it to the real estate registration system must be analyzed. Before explaining the application method of the blockchain-based real estate registry system, many prerequisites must be fulfilled before the real estate registry can be adapted to the Bloomchain technology as follows [12]:

a. Solutions to the Personal Identity Problem:

Identity verification is certainly a prerequisite as a digital national identity system based on blockchain technology must be available. At present, there is only one digital identity system in the world based on the Blockchain that was

launched by Canada in 2017, called (SecureKey[13]), with the stated intention of some governments such as Ukraine and Dubai that the services provided by their entire governments will be based on the Blockchain They may develop something of a decentralized personal identity platform based on the blockchain. There are successful trials in Sweden [14], for example, where the big telecom company Telia introduced digital keys for identity verification, as well as in India [15], the identity platform Aadhaar is a logical choice, and Estonia [16] has a robust (but not blockchain-based) system.). As a result, a digital ID must be provided as a personal identity for all those who deal with the blockchain system, and this will hinder progress in developing countries. However, the World Bank launched the goal (16.9), which is one of the sustainable development goals, which includes providing all individuals with a legal digital identity by 2030, and we hope To achieve this goal [17].

b. Digital Records (Digitizing Records):

One of the basic requirements to convert from the current real estate registration system to a system based on blockchain technology is the digitization of real estate records (ie converting them from paper to digital). Here comes the role of the hash, which was mentioned earlier, as it converts the information format (text or images) to another format (text) with a fixed size. In other words, whatever the size of the information or data entered into (hash), it will convert it into data in another format with a fixed size and designed to be a one-way function, meaning that the operation is not reversible (it can be considered as a type of encryption) [18]. One of the most important properties of the hash is the collision resistance, as it is difficult to find two entries with the same hash code. Another advantage of hashing is that even the slightest change in the entered file will result in completely different code - even the file format must be compatible.

When a document is hashed to be placed in the blockchains of a blockchain system, its timestamp (time and date) will be checked before it is added [19]. In addition to the fact that you cannot hash a paper record, however, a paper record can be scanned and converted to a file that is then fragmented; However, any subsequent scan will have a different hash due to timestamp nuances. So everyone will need the same copy in the same format for the hash to agree. And fragmentation is what enables the blockchain to mitigate the change of records. We, therefore, recommend that the record be completely digital before integrating the blockchain. We would like to point out that both Sweden and Georgia had fully digital systems before integrating blockchain into their real estate systems [20].

c. Multi-Signature Wallets:

Some questions come to mind regarding the new real estate system if it is implemented, and among these questions are, what happens if someone steals your key? What if you lost your key? What if someone held a gun to your head and made you give them title to your property with the click of a button without actually taking the key?

To answer the above questions, the public key and the private key embedded in the blockchain ensure that the people who own the keys are Only those who can transfer property ownership. However, in the event of the keys being lost or stolen, the property associated with that property must be retrieved. The issue of legal asylum is discussed in one of the next requirements. One successful solution to this issue is the use of multi-signature wallets ("multisig"). ([21]) These wallets require verification with a minimum number of keys rather than a single key before completing a transaction. Instead of the seller simply pressing the Sell button, creating the record may require the seller and the Land Registry Officer to sign the transaction. A Multisig can be configured in any number of ways, requiring, for example, the use of two out of two, two out of three, or three out of five given locations for the operation ([22]).

Some suggest using a notary as a second site, but we remain unconvinced as there is no reason to restrict blockchain-based platforms with legacy systems where notaries are part of the system of intermediaries who are becoming less important in the face of technological innovation. In the United States, for example, notaries were previously used to assert identity which may not be required by modern identity systems. Other stakeholders who have a vested interest in valid transactions - registry staff for example - can act as other signers. Once identity is confirmed and all transactions are placed in an immutable ledger, there is no need for a human notary in the process of enabling the blockchain, let alone justifying the associated costs. Despite the hacks that can occur due to poor coding, multisig wallets appear secure and we believe they will prevent more problems than they will cause due to the modest delays associated with their use ([23]).

d. Determine the type of blockchain used (private or mixed):

One of the most important requirements for applying the blockchain to the real estate system is to determine the type of blockchain to be applied, whether it will be public, private, or mixed. We don't have a global format for blockchain-based records, at least not yet, but we expect that they will all use the private blockchain in some form for the following plausible reasons:

- *The need for the judiciary and registry staff to control the distributed ledger*

In a public blockchain type (Bitcoin) there is only a record of transactions by two willing parties identified by their public keys, along with any comments added to those transactions. In general ([24]), if fraudulent data is entered and discovered, the only recourse for correction is another transaction that reverses the previous entry.

To clarify that issue on the subject of our research (transfer of property ownership) we take the following scenario as an example if the court ruled that one of the spouses obtains the ownership of the house, but the other spouse does not want to transfer the ownership, what happens then? If a person loses his key or dies without connecting his key to another, how can the allotment of property be restored to the eligible heirs? What about the confiscation of privately owned real estate by the state to build public infrastructure?

In the case of a real estate registration system based on a public blockchain, it is difficult to answer all these questions. But in a hybrid blockchain – where decisions are tracked on a private-type blockchain with the hash of the main documents required in a public-type blockchain – it can be addressed by granting the appropriate powers to the real estate agent or the judiciary, which is critical. When managing real assets. This can take the form of a special variation of multisig where a responsible trust officer in the Land Registry Department has a key that allows them to create reverse transactions on the private string ([25]).

What happens if the responsible employee uses the authority granted to him by law to his advantage? While this is a risk, one of the reasons for the appeal of the blockchain is that it is a record of all transactions. So while we call on exceptional authorities to issue new keys and create reverse transactions (rather than overwriting them) where required by law, we're not suggesting that this be done in secret. Since all transactions will be logged into the private chain and visible to those who have access, if configured appropriately, it will be much easier to identify and correct any abuse of authority.

- *Public blockchain systems cannot handle the huge amount of data*
- Real estate records contain deed information, addresses, maps, plans, etc. as all these documents must be stored somewhere. A public-type blockchain cannot effectively store such large amounts of data. Decentralized storage and transportation systems such as IPFS, Swarm, Sia, Storj, and Maidsafe([26]) may solve this problem in the future([27]), but they are still in the early stages of development and

therefore not ready to be commissioned to register ownership. So, the documents and information of the land registry can be stored on a regular server and the hash (hash) associated with it can be migrated to the public blockchain, but if the documents and information are required in the real estate registry on the blockchain, then the real estate records will need to use a special type of blockchain [28].

- *Anonymity is not an option*

A real estate registry system based on a blockchain needs to know who is registering or transferring property records. A public-type blockchain allows anyone with the correct keys to broadcast the correct transactions, regardless of who they are or who they are. Therefore, a special type of blockchain is needed if the real estate system wants to ensure that the parties that have verified their identity have fulfilled all the conditions for transferring ownership of the property. If not here As another thing, sometimes authority is given to the department responsible for collecting property taxes in the proposed real estate registration system, the IRS may wish to obtain one of the public keys to take responsibility for the taxes [29].

e. Real estate records should be as accurate as possible:

One advantage of the blockchain is that it is virtually immutable, so it is important to ensure the accuracy of any existing data transmitted to it. Real estate records with responsible authorities looking to implement digital solutions are in one of three states: have a paper record, a digital record, or a record that has been destroyed. All existing records, whether digital or on paper, contain inaccurate information. Most of the causes of error are benign or may have occurred in good faith, but fraud and corruption always pose a risk to the accuracy of the Land Registry. Simple administrative errors or landlords forgetting to update their property changes (or avoiding them to evade paying taxes) also lead to inaccurate records [30].

Ideally, the Land Registry should be revised and updated before being placed on a stable platform. The truth is that ceasing to update the registry risks creating conflicts that will hamper the digitization process for years. The audit trail can lead to a platform that allows for greater transparency and lower transaction costs, thus speeding up and facilitating the correction process. In the case of paper registration, it is often difficult to find errors in the registry or land registry until it is digitized, so it is difficult to achieve what is required with a poorly managed registry.

If a registry is in use and acts as a public registry, it should be on BAT. If the transition to a new technology starts with faulty or conflicting records, it can be addressed systematically. Records can be flagged to debug, and the debugging process can be started without delaying execution.

However, if the registry is riddled with errors, the resources may be better used to handle these errors before the blockchain is integrated into the registry ([31]).

f. Digital records require efficient communication and a technology-aware society:

Before real estate registration can be adopted as a digital platform, it must take into account costs and support requirements. The initial response may be that these additional costs make the project unattractive, but the counterargument is that the new system should eliminate several potential operating costs.

Blockchain software is complex and the hardware requirements are great. It is hard to imagine that most public governmental institutions can assume these responsibilities in building a private blockchain infrastructure. That is why we saw blockchain infrastructure, software, and servers are purchased on a subscription basis rather than making a large initial capital investment as it can be offered as a service (BaaS) ([32]) by many global cloud platforms ([33]), but this change in the support model has budgetary implications. That is, while the initial cost is avoided, it is replaced by recurring costs. However, the costs of maintenance and troubleshooting are passed on to the service provider (such as Google), who should be able to guarantee a very low rate of failure. And while public evidence that blockchain works have proven strong, secondary programs like wallets, exchanges, and smart contracts can be easy targets for hackers. Thus, a professional level of quality assurance and quality control will be required, especially while relying on solid international institutions in the implementation of this type of project.

On the other hand, there are some villages, rural areas, and regions where the quality of internet connectivity is limited or citizens are not comfortable with digital transactions. Here, the real estate registry system based on the blockchain may not be optimal. If the land registry isn't already digitized, we suggest starting here and revisiting the blockchain later. As the digitization of real estate records (transferring them from a paper environment to an electronic one) alone is considered a great challenge ([34]).

In this regard, we would like to point out that the Real Estate Registration Corporation in the State of Jamaica ([35]) has retrained and rehabilitated its employees to transfer from the culture of paper-based real estate records to their new digital system, and, likely, the transition of their real estate system based on the Blockchain will face similar challenges.

g. Training a professional community to interact with the proposed new system:

In the long term, some imagine that blockchain is eliminating the middleman of many parties, while in the near term this is unlikely. Where lawyers will continue to file cases, judges will hear them, and real estate analysts and employees will provide value-added services to citizens who prefer the help of professionals. So all of these parties will need to be trained on the new system to function properly as the importance of engaging the professional communities that will interact with the blockchain early in the transition cannot be overlooked.

One of the leading blockchain lawyers, Andrew Hinkes, states that lawyers will need to understand many issues, including how to present records from the blockchain, how to interpret records, and how to align evidence bases with blockchain outputs. To do any of these things, they will first need to be trained in basic blockchain concepts, capabilities, and vocabulary. Even with a clear picture of the technical and structural requirements for blockchain records, there will still be a great deal of work in the form of education and capacity building ([36]).

3. BLOCKCHAIN SYSTEM COMPLIANCE WITH IRAQI LEGISLATION

Although Blockchain is a rapidly emerging technological revolution around the world, Iraq did not welcome this technology and did not care about it, unlike other foreign and Arab countries. Whereas, the Iraqi government institutions did not interact with this technological revolution at all, except that the Central Bank of Iraq held a seminar on 25/7/2018 in cooperation with (KPMG) intending to introduce the blockchain technology, its mechanism of action, and its uses ([37]). The employment and adaptation of blockchain technology may be of great benefit to many basic areas in Iraq such as (banking and financial transactions, transfer and registration of ownership of land and real estate, digital identity of citizens, electronic voting in elections, and payment systems and tax collection).

Concerning the topic of our research, the use of one of the most important modern technologies (blockchain) in real estate transactions will lead to a reduction in fraud and manipulation, illegal land grabs will stop, and the issue of ownership transfer will only take a few seconds and we will overcome the current problems that you get.

In order to transition the traditional Iraqi real estate registration system to a blockchain-based system, the legislation currently in force must be compatible with the features of the technology and the technical infrastructure must be sufficient to maintain the transfer and registration

procedures. The applicability of the blockchain system in the Iraqi real estate registration system depends on its compatibility with the Iraqi real estate registration law and legal principles. And to analyze whether the technology will work in harmony with Iraqi legislation, it must first take into account the principles of real estate registration in force and then conform to the real estate registration procedures.

3.1. The principles:

There are some principles that must be followed during the registration procedure in Iraq. In the first place, the principle of registration requires the registration of the right in rem to the property [38]. The registration will be carried out through a distributed database in the blockchain system, which means that the blockchain can comply with this principle.

Second, the causation principle is also satisfied, because it will automatically validate the legal transaction on which the registration is based [39].

One of the most important principles in Iraqi legislation is the principle of proof of ownership [40], where the Real Estate Registration Department in Iraq provides the right holders with documents proving the ownership of the property to them, and this matter requires that all records kept in the Real Estate Registry Department are periodically audited by a specialized committee to audit each one of the Iraqi real estate registration directorates [41]. Since the blockchain is a shared and transparent database that stores all transactions in blocks and maintains an immutable public ledger of all transactions, information about the real property can be visible to a large number of users.

According to the principle of accreditation and trust, there is protection for the third party (the real estate registry employee) who has documented in the real estate registry in good faith [42] in case of harm to the rights of others as stipulated in Article (215/2) of the Iraqi Civil Code, which states "However, no The public servant shall be responsible for his work that harms others if he performs it in implementation of an order issued to him by his superior whenever it is obedience. However, it can hardly be said that blockchain technology will be able to protect these people due to its mechanism of action. This is also linked to another principle, the principle of state responsibility, which makes the state responsible for all damages caused by records kept in the Land Registry Department. When we assume that the blockchain-based cadastre will become an official one, completely removing state responsibility cannot be considered an option.

However, it should also be borne in mind that a fully decentralized blockchain-based real estate registry will eliminate the role of the intermediary, which means that if harm occurs, it will arise from the

technology itself and not from the fault of the registry officer or the state. In the event of an error by the responsible employee due to inaccurate or insecure data storage, he will be responsible for the damage, while in the environment of the blockchain system it is not clear who will be responsible for the damage.

Due to the fact that liability is an issue of heated debate and requires much investigation and investigation, it will not be analyzed in this paper in detail. Dirk A. Zetzsche presents his proposal for liability from a legal perspective where he notes that a type of liability - joint, multiple, or proportional - can arise from this joint control towards third parties and between the contracts themselves. The type of liability that will arise will depend on the details of the blockchain system, such as the consensus or consensus mechanism, databases, or applicable legal systems. However, his basic position (the researcher) indicates that there are potentially significant risks related to liability for entities participating in the blockchain system, especially those that have roles in design, control, and maintenance.

The last principle is the principle of starting with a new page for each property in the real estate registry [43], which can be compatible with the blockchain system through the block structure that contains all records of transactions that occurred on this property in a sequence.

3.2. The Registration processes

After studying the legal principles, the compatibility of the registration procedures with the blockchain technology should also be evaluated, as the right of ownership of the property is acquired once it is registered with the Real Estate Registration Department. First of all, the parties (the seller and the buyer) must set an appointment at the real estate registry at which the real property will be registered. Secondly, they must bring the required documents and papers on the due date after which the registration fee will be paid.

The most important part of the registration procedures is the contract between the parties [44] (the seller and the buyer), which leads to the registration procedures. As mentioned previously, the sale of the property is subject to the official form under the Iraqi civil law and requires the presence of the registration officer during the ownership transfer transaction, where he must be provided with the title deed and other documents such as agency, legal arguments, legal division, and judicial rulings with a degree of finality [45]. In the current Iraqi real estate registration system, contract officers and notaries act as an intermediary and trust mechanism between the parties to conduct the transfer of funds and bonds. Registration officials are responsible for checking whether the real right required for registration count as real rights under Iraqi law, whether there is a legal reason preventing the

registration process, and whether or not the person applying for registration as proof of ownership[46]. After the necessary investigation, if the above-mentioned conditions are met, the responsible employee shall carry out the registration and transfer. On the contrary, the responsible employee will be obligated to refuse the application for registration. During these procedures, man-made errors and frauds are more likely to occur.

For the purpose of overcoming these problems, it will be proposed to remove intermediary third parties through blockchain technology. However, it should also be taken into account whether this technology can replace intermediaries such as registry employees and notaries under the current legislation.

According to the Iraqi Civil Service Law No. (24) of 1960, registration staff must fulfill certain requirements to perform their duties. One of the general conditions that must be met is to be an Iraqi citizen [47]. In the sense of an Iraqi citizen, it can be understood that the registration officer must be a real person to perform the administrative services, and as explained earlier that the registration staff must verify the authenticity of the submitted documents and verify the ownership.

4. ELECTRONIC TRANSACTIONS AND ELECTRONIC SIGNATURES

In order to implement blockchain technology in the system of real estate and land registration and transfer of ownership between individuals, the requirements for the written form and the conditions related to the signature may pose a problem in terms of the legislative aspect. Under the Iraqi Civil Code and the Law of Obligations, real estate sales contracts are subject to a formal form, which means that the contract must be signed in written form by the parties in the presence of the competent real estate registration officer. In general, a signature can be understood through a handwritten form. These restrictions will prevent the application of digital contracts and digital signatures when implementing blockchain technology in the real estate sector. For this reason, the legal framework must be compatible with the technology that uses digital identification to remove the shortcomings of the traditional system [48].

The Iraqi Electronic Signature and Electronic Transactions Law No. 78 of 2012 is one of the important legislations related to electronic transactions through modern means of communication and encouraging the information technology and Internet industry in Iraq [49]. This master regulation provides the validity of electronic signatures for all legal transactions and provides technological security for e-commerce activities and remittances in general. Under Iraqi law, an electronic signature is defined as "a personal mark that takes the form of letters, numbers, symbols, signs,

sounds, or others, and has a unique character indicating its attribution to the site, and it is approved by the certification authority." ([50]), while it was defined under the Agreement Regulating Provisions An electronic signature in the field of electronic transactions in the Arab countries is defined as "what is placed on an electronic document and takes the form of letters, numbers, symbols, signs, or others, and has a unique character that allows the identification of the signer's person and distinguishes him from others" ([51]).

According to Article (4) of the Iraqi Electronic Signature Law, an electronic signature is described as "First: The electronic signature is valid and issued by the signer if there are means to determine the identity of the signer and indicate his approval of what is stated in the electronic document and according to the agreement of the signer and the addressee on how to conduct the electronic transaction. Second: The electronic signature within the scope of civil, commercial, and administrative transactions shall have the authority prescribed for a written signature if the conditions stipulated in Article (5) of this law are taken into account in its establishment. The main objective of the law is to enable flexibility in the electronic identification and consent of the parties as well as align applicable standards for both electronic and non-electronic transactions ([52]). For this reason, agreements that require an attached signature under the Code of Obligations require an electronic signature if made in electronic form ([53]).

However, according to Article (3/Second) of the Iraqi Electronic Signature and Electronic Transactions Law, it is not possible to implement legal transactions for which the law has drawn a certain formality or transactions related to the disposal of immovable funds and the establishment of rights in kind on them through electronic signatures ([54]).

In order to achieve the purpose of the electronic real estate registration, the current electronic signature system and legislation should be improved, and the scope of its application should be expanded. As there is a need for reorganization due to the fact that this law narrows the scope of application of electronic transactions in the transfer of property ownership. The manner in which electronic documents are sent to the directorates of the real estate registry must also be regulated, and the limits of powers that will be issued within the scope of electronic transactions related to real estate records must be defined for the purpose and productivity of the electronic real estate registry ([55]). In short, since the current legislation regarding electronic signatures gives legal validity to electronic signatures and provides an opportunity for electronic contracts, blockchain technology can be applied in this framework. However, the provisions regulated by the Iraqi Civil Code and the Real Estate Registration Law that require a formal and written form of the immovable contract of sale must be rearranged in order not to prevent the proper implementation of the blockchain-based system.

In addition to articles related to the laws of electronic signatures, the hashing system, which is an essential component of blockchain technology as briefly explained in Chapter One, must also be considered. Each block in the blockchain system contains a type of data called a hash. It is a time stamp and consensus mechanism algorithm used that makes the system immutable and easy to detect any attempt at tampering. In order to adopt the blockchain technology system in the real estate registration system, the definition of the hashing system must be regulated and mentioned in detail under Iraqi law. For example, a hash is defined as a "unique identifier attached to a data message" under the Electronic Transactions Law ([56]).

5. CONCLUSION

To catch up with the technological era, there are small steps that have been taken in Iraq to transform the traditional real estate system into an electronic-based title register. Thus, Blockchain has been suggested as an opportunity to eliminate deficiencies of the traditional system related to transaction costs, time efficiency, centralized control and trusted information with its basic features as a decentralized, distributed, timestamped server on a peer-to-peer basis hash-based proof-of-work. This paper discusses blockchain technology's applicability in real estate registries under Iraqi law. In general, we can conclude that the Iraqi Electronic Signature Law, which gives legal validity to electronic signatures, is compatible with the blockchain system. There have been no unsolvable legal restrictions to implementing a blockchain-based land registry in Iraq. After examining the features of blockchain technology and the legal framework in Iraq, it can be concluded that the collection of data, legal control, verification, and validation of identities in the first place cannot be wholly substituted by automated processes. This adaption will require a guardian institution to execute the procedures under the competence of the government under the re-arranged blockchain-based regulations. In Iraq, a blockchain-based land registry may be managed more efficiently by deed officers for the initial transactions in the near future because the transition to a complete decentralized system at this point does not seem more likely. After the introduction of the blockchain system and legal amendments that are compatible with the technology, research can be carried out to develop the system and reach a complete decentralized system that obliterates the third parties.

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ENDNOTES

(1) It is a group of five global organizations founded in 1946 and responsible for financing countries for development and reducing their spending, in addition to encouraging and protecting global investment.
(2) "Why Land Administration Matters For Development"(Ieg.worldbankgroup.org, 2019) https://ieg.worldbankgroup.org/blog/why-land-administration-matters-development accessed 14 May 2022.
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(6) Hazal Sıla Ekmekçi, "Applicability of Blockchain..", p29.
(7) **Disaster recovery** provides a solution that securely protects your critical workloads and also restores them instantly regardless of the nature of the disaster, ensuring business continuity and never corrupting your backup set, restoring critical data under any catastrophic situations, and delivering greater As reliable as possible during restore operations.
(8) **ID** is the abbreviation of identity, it is a process necessary to verify the identity of a person or thing, and it is a set of unique and indispensable attributes and characteristics associated with an individual. It is commonly used to sign in to a website, application, or online service and maybe a username, account number, or address.
(9) Hazal Sıla Ekmekçi, "Applicability of Blockchain..", p.30.
(10) J. Michael Graglia and Christopher Mellon, "Blockchain and Property In 2018: At The End Of The Beginning", Paper prepared for presentation at the "WORLD BANK CONFERENCE ON LAND AND POVERTY" The World Bank - Washington DC", 2018, p.9.
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(17) Shafi Goldwasser and Mihir Bellare, "Lecture Notes on Cryptography," Massachusetts Institute of Technology, July 2008, accessed 18 March 2022, http://cseweb.ucsd.edu/~mihir/papers/gb.pdf
(18) For more on hashing, see Wikipedia, The Free Encyclopedia, s.v. "Hash function," accessed May 30, 2022, https://en.wikipedia.org/wiki/Hash_function.

(19) Joon Ian Wong, "Sweden's blockchain-powered land registry is inching towards reality," Quartz, April 3, 2022, accessed 30 May 2022. http://qz.com/947064/sweden-is-turning-a-blockchain-powered-land-registry-into-a-reality/

(20) J. Michael Graglia and Christopher Mellon, pp. 12-13.

(21) Website, http://www.economist.com/node/21560242, accessed 2 July 2022.

(22) Jeffrey Dorfman, "Creative Markets For Property Rights Can Solve Many Problems," Forbes,11 May 2022.

(23) To see the latest blockchain transactions in the current Bitcoin block: see https://blockchain.info, accessed on 5/15/2022.

(24) This is what the company (Bitfury) in Georgia has done with its product (Exonum), for more about the product visit the website: https://exonum.com.

(25) They are free cloud storage platforms that allow individuals to take advantage of their free services in storing and saving their files on their servers, where the storage capacity provided may reach (1 terabyte) for each user. We would like to point out that there are well-known cloud storage platforms that are dealt with such as (Google Drive, Dropbox, and Microsoft Azure).

(26) IPFS, " Peer-to-peer hypermedia protocol," 2015, GitHub Repository, github.com/ipfs/ipfs; Ethersphere, "swarm docs," https://github.com/ethersphere/swarm, accessed 30 May 2022.

(27) J. Michael Graglia and Christopher Mellon, pp. 14.

(28) Ibid.

(29) Angela Walch, "The Path of the Blockchain Lexicon (and the Law)," Review of Banking & Financial Law 36, pp. 715-765, accessed 24 March 2022.

(30) Michael Graglia et al., "Prerequisites for Incorporating Blockchain into a Registry," FPR Blog (blog), New America, accessed 5 July 2022.

(31) BaaS (Backend-as-a-Service) refers to providing a cloud service model in which developers outsource all behind-the-scenes aspects of building an electronic system or platform that runs on a phone or computer so that they only have to write and maintain the front end. BaaS providers provide pre-written software for activities on servers, such as user authentication, database management, remote updating, push notifications (for mobile apps), as well as cloud storage and hosting. We would like to point out that the most famous cloud computing platforms such as (Google, Amazon, and Microsoft) have built and prepared the environment for blockchain systems that are ready to work.

(32) Microsoft Azure, "Blockchain on Azure," https://azure.microsoft.com/en-us/solutions/blockchain /, accessed July 30, 2022.

(33) J. Michael Graglia and Christopher Mellon, pp. 15.

(34) Maya Gainer, "From the Ground Up Developing Jamaica's National Land Agency, 2000-2016," Innovations for Successful Societies, 2017

(35) J. Michael Graglia and Christopher Mellon, pp. 15.

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(37) See the Article 247 of the "*Iraqi Civil Code for the year 1951 AD*", which states: "The obligation to transfer ownership or any other right in rem automatically transfers this right if the subject of the obligation is a specific thing owned by the obligor, without prejudice to the rules related to registration."

(38) See the Article 129 of the "*Iraqi Real Estate Registration Law No. 43 of 1971 AD*", which states: "1- The audit committee approves the validity of the transaction or objects to it if it finds fundamental errors or deficiencies in it, provided that these errors or deficiencies are mentioned and the way to address them explicitly and decisively in the Registration form. 2- If the nature of the transaction requires technical auditing, the audit body shall send it to the Directorate of Technical Affairs for the mentioned purpose in preparation for conducting its audit. 3- All transactions shall be returned after completing their audit to the competent department".

(39) See the text of Article (18/1) of "*the Iraqi Real Estate Registration Law*", which states: "The competent real estate registration department shall provide the owner or holder of other real rights, judicial authorities or official departments upon a request submitted to it with copies of the acquired records in the final form."

(40) See the text of Article (85) of the above law, which states: "The head of the department or his authorized assistants check the documents related to the registration in terms of their fulfillment of the legally required form and their agreement with the nature of the transaction and the description of the property." It is also seen in the text of Article 128 of the law, which states: "The transactions that are registered in the real estate registry are checked monthly by the auditing bodies in the General Real Estate Registration Directorate to verify their compliance with the law and their agreement with the registration documents and second copies of the records."

(41) See the text of articles (84/2-3, 107, 110/3, 115, 116) of the "*Iraqi Real Estate Registration Law*".

(42) Dirk A. Zetzsche, Ross P. Buckley and Douglas W. Arner, 'The Distributed Liability Of Distributed Ledgers: Legal Risks Of Blockchain' [2017] SSRN Electronic Journal p.29, accessed 18 March 2022.

(43) Look at the text of Article (1126) of the "*Iraqi Civil Code Law*", which states: "1- Ownership is transferred by contract in movable and immovable property".

(44) Look at the text of Article (1126) of the "*Iraqi Civil Code*", which states: "1- Ownership is transferred by contract in movable and immovable property".

(45) See the text of Article (59) of the "*Iraqi Real Estate Registration Law*", which states: "In support of the original rights in kind, the following is required: -1- That the owner owns the real right that is proven in the bond or copy of the record.2 The document or copy of the record must be sound and contain all the rights and descriptions of the property. 3- That the property file does not contain a document that contradicts the document or the copy of the record to be supported.

(46) Look at the text of Article (7) of the" ***Iraqi Civil Service Law No. (24) for the year 1960***" – "that the property file does not contain a document that contradicts the document or the copy of the record to be supported".

(47) Mats Snäll, "Blockchain and the Land Register – a new "trust machine"?' (2018), accessed on 26 May 2022.

(48) Looking at the reasons for the "***Iraqi Electronic Signature and Electronic Transactions Law No. (78) for the year 2012***".

(49) Looking at the text of Article (1/ Fourth) of the "*Iraqi Electronic Signature and Electronic Transactions Law*".

(50) Looking at the text of Article (1/a/8) of ***the Law of Ratification of the Agreement Regulating Electronic Signature Provisions in the Field of Electronic Transactions in the Arab Countries No. (101) of 2012*** and published in the Official Gazette of Iraq No. 4274 on 4/15/2013.

(51) See the text of Article (4) of the *Iraqi Electronic Signature and Electronic Transactions Law*.

(52) The text of Article (2) of the "*Iraqi Electronic Signature and Electronic Transactions Law*", states, "This law aims to the following: First- Providing the legal framework for the use of electronic means in conducting electronic transactions Second- Granting legal authenticity to electronic transactions and electronic signatures and regulating its provisions. Third: Enhancing confidence in the validity and safety of electronic transactions".

(53) See the text of Article (1/a/3) of the *Law of Ratification of the Agreement Regulating Electronic Signature Provisions in the Field of Electronic Transactions in the Arab Countries*, which states: "Electronic contract: is an agreement concluded by electronic means in whole or in part."

(54) "The provisions of this law do not apply to the following: A- Transactions related to matters of personal status and personal matters B- Creation of wills and endowments and the amendment of their provisions C- Transactions related to the disposal of immovable property, including related agencies and title deeds, and the establishment of rights in kind on them except contracts The rent for this money.D- Transactions for which the law has drawn a certain formality. E - Court procedures, judicial notices, notices of attendance, search warrants, arrest warrants, and judicial rulings. f- Any document that the law requires to be authenticated by a notary public".

(55) Hazal Sıla Ekmekçi, p43.

(56) "Legal And Regulatory Aspects of Blockchain & Smart Contracts in Uganda" (Ortusadvocates.com, 2019), accessed 23 May 2022 https://www.ortusadvocates.com/index.php?option=com_k2&view=item&id=64:legal/and-regulatory- aspects-of-blockchain-smart-contracts-in-uganda&Itemid=124