Blockchain and real estate
Mining unexplored terrain
Introduction

Blockchain could radically change the real estate sector and other sectors in the years ahead. How will this work and what will it mean for the world of real estate? Its players? What will blockchain deliver when it comes to uniformity, efficiency, transparency? How does blockchain strengthen the knowledge and networking power of the real estate sector?

Because we are dealing with innovation and a technology that is not yet commonplace in the sector, these questions cannot yet be answered wholeheartedly and/or with adamant certainty at this point. What is clear to us, now that we have been building our Real Estate Blockchain platform for a year, is that blockchain is here to stay and directly or indirectly will lead to changes.

Jurriën Veldhuizen
Managing partner
Deloitte Real Estate NL
What is blockchain?
Blockchain is a disruptive innovation, which potentially changes the current roles and tasks of players in the real estate market. It can potentially be a uniform trusted source of real estate information for various stakeholders and makes multiple checks of the same data unnecessary.
Why blockchain?
Blockchain allows you to create an encrypted digital distributed data ledger with identical copies maintained on each of the network’s members’ computers. Since all users have an identical database it ensures that a single user is unable to change the data.
Blockchain in the real estate world

The real estate industry is plagued by a “Matrix of Imperfections”, with transaction costs and asymmetric information being the main drivers. The imperfections are closely related to the intransparency of real estate data. Intransparency has caused data in real estate to become very valuable, as a consequence companies in the industry have created business models around resolving this data. Since there is no global standard or public ledger where all the data is registered, the industry has the need for third parties to verify the data more than once. Auditors, banks, financial authorities, appraisers and owners each individually have to validate the data which they receive. All these validations result in higher transaction costs in the brokerage, legal, recording, and banker fees. Stakeholders agree that there is a necessity for more transparency and standardized interoperable data structures. Technical innovations and a growing availability of (open) geospatial data will improve transparency and reduce information asymmetry in the upcoming years. While big data is already finding its way into the real estate sector, blockchain is an innovation that could lay the foundation for a common source of truth in real estate.

The use of blockchain technology, potentially creates a uniform source of real estate information, that various stakeholders can use, which makes multiple checking of the same data unnecessary.
Is the Real Estate Industry ready for blockchain technology?

As CRE companies invest in a multitude of technologies to meet their varied business requirements, it may be worthwhile to first understand the benefits of blockchain technology that are highlighted in Figure 1.

Figure 1: Benefits of blockchain technology

<table>
<thead>
<tr>
<th>Benefit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Near real-time</td>
<td>The blockchain enables near real-time settlement of recorded transactions, removing friction and reducing risk, but also limiting ability to charge back or cancel transactions.</td>
</tr>
<tr>
<td>Trustless environment</td>
<td>Blockchain technology is based on cryptographic proof, allowing any two parties to transact directly with each other without the need for a trusted third party.</td>
</tr>
<tr>
<td>Distributed ledger</td>
<td>The peer-to-peer distributed network records a public history of transactions. The blockchain is distributed and highly available; it also retains a secure source of proof that the transaction occurred.</td>
</tr>
<tr>
<td>Irreversibility</td>
<td>The blockchain contains a certain and verifiable record of every transaction ever made, which mitigates the risk of double spending, fraud, abuse, and manipulation of transactions.</td>
</tr>
<tr>
<td>Censorship resistant</td>
<td>The crypto economics built into the blockchain model provide incentives for the participants to continue validating blocks, reducing the possibility of external influencers to modify previously recorded transaction records.</td>
</tr>
</tbody>
</table>

Source: Deloitte LLP

Companies should then assess whether and where blockchain can be useful, as the technology has its own unique characteristics and perhaps may not address each inefficiency in current processes. The technology should meet certain prerequisites for blockchain to be relevant (see prerequisites in Figure 2 on the following page).

Once companies identify a process that is ready for blockchain technology, they should evaluate costs and benefits. While doing so, they will potentially benefit from assessing the extent of overhauling existing systems and interoperability with the various technology systems used by different stakeholders of CRE transactions.

Reprinted with permission from Deloitte University Press, with thanks to the authors Surabhi Kejriwal & Saurabh Mahajan.
Figure 2: Prerequisites for adopting blockchain technology

Why consider blockchain for real estate leasing?

<table>
<thead>
<tr>
<th>Need for a common database</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shared databases are critical for leasing transactions. One of the key examples is a multiple listing service, which collates property-level information from private databases of brokers and agents.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Multiple entities can modify database</th>
</tr>
</thead>
<tbody>
<tr>
<td>Managing real estate properties involves several entities, such as owners, tenants, operators, and service providers, who provide, access, and modify a variety of information.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lack of trust among entities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Many times, different participants in the leasing lifecycle do not have pre-existing relationships, which results in mistrust.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Opportunity for disintermediation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trusted intermediaries in real estate, such as notaries, can be disintermediated through blockchain, as transactions can be independently verified and automatically reconciled.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Transaction dependence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Many leasing and property management transactions are correlated and part of the same database. For instance, in case of a net lease structure, the tenant pays a base rent amount to the landlord and maintenance expenses directly to the vendor.</td>
</tr>
</tbody>
</table>

Source: Gideon Greenspan, “Avoiding the Pointless Blockchain Project,” LinkedIn, November 24, 2015; Deloitte Center for Financial Services analysis.

As set forth in Figure 2, we believe that among the core Commercial Real Estate (CRE) processes, leasing is ripe for blockchain adoption, as it can take advantage of its inherent benefits and meets the prerequisites for using the technology.

Reprinted with permission from Deloitte University Press, with thanks to the authors Surabhi Kejriwal & Saurabh Mahajan.
How can blockchain technology elevate CRE leasing processes?

CRE owners have an opportunity to alleviate some of the existing challenges in their leasing transactions using blockchain technology (also visualized in Figure 3 on the following page):

- Inefficient property search process due to fragmented listings data
- Time-consuming, paper-driven, predominantly offline due-diligence process
- Complexity in managing ongoing lease agreements, property operations, and cash flows
- Absence of real-time rich data affects management’s decision-making capability

Reprinted with permission from Deloitte University Press, with thanks to the authors Surabhi Kejriwal & Saurabh Mahajan.
Figure 3: Using blockchain technology in a CRE lease transaction

1. Property search through blockchain-enabled MLS
2. Property visit and inspection
3. Negotiation and signing of the letter of intent
4. Pre-lease due diligence by using smart identities
5. Preparation of the heads of agreement
6. Lease agreement using smart contracts
7. Automated payments and cash flow management using the smart contract
8. Real-time data analysis

Indicates steps which could utilize blockchain technology

Reprinted with permission from Deloitte University Press, with thanks to the authors Surabhi Kejriwal & Saurabh Mahajan.
The lessor and the lessee or their respective brokers list their requirements on the multiple-listing services (MLS). A transparent MLS system enables all parties to view the available listings based on their requirements.

### Property search through blockchain-enabled MLS

The brokers discuss their clients’ requirements and arrange for property visits and inspection.

### Property visit and inspection

Both sides negotiate the terms and value of the deal. The lessee sends the letter of intent (LOI) to the lessor, expressing interest in the property.

### Negotiation and signing of the letter of intent

Using blockchain-based digital identities of individuals and assets, the lessor conducts a background check on the lessee and the lessee checks the prior transactions and liens on the property.

### Pre-lease due diligence by using smart identities

The heads of agreement, containing all the clauses and terms agreed between the two sides, is prepared and verified by the accounts and legal teams on both sides.

### Preparation of the heads of agreement

The key terms of the agreement are recorded on the blockchain and this becomes the smart contract. The smart contract initiates payment of security deposit/advance rent either through Bitcoin wallets or bank accounts using a payment interface. The lessor then transfers the possession of the property to the lessee. The transaction agreement is officially recorded.

### Lease agreement using smart contracts

Based on the terms of the agreement, the smart contract initiates the regular lease payments from the lessee to the lessor, after paying the outstanding maintenance expenses to the contractors, using the preferred mode of payment. On completion of the lease term, the smart contract initiates the transfer of the security deposit to the lessor.

### Automated payments and cash flow management using the smart contract

As several payments and transactions are recorded on the blockchain along with the digital identities of individuals, properties, and organizations, the lessor can perform real-time data analyses using appropriate analytics tools.

### Real-time data analysis

--- Indicates steps which could utilize blockchain technology

Reprinted with permission from Deloitte University Press, with thanks to the authors Surabhi Kejriwal & Saurabh Mahajan.
Blockchain is an innovation that is still in its exploratory phase, and a multi-disciplinary approach is needed in order to fully develop it. Stakeholders in the real estate industry must come together and work together to fully utilise the potential of blockchain. That’s why, Deloitte Real Estate, together with the council of Rotterdam and Cambridge Innovation Center (CIC), worked on a project aimed at discovering in practice what the value of applying blockchain technology is for the real estate sector.

Under the name ‘Blockchain in Real Estate’, work was undertaken to build a platform that can process rental and other contracts fully digitally. The result is a first proof-of-concept concrete application for rental contracts, based on blockchain. This blockchain and lease application was officially presented.

A concrete application for blockchain in real estate

Opinions around blockchain

60% of people want to apply, or already apply, blockchain.

98% is convinced blockchain will influence the real estate market.

4% thinks blockchain creates too much transparency.
How the blockchain app was built

**Colored Coin**

While originally designed to be a currency, Bitcoin supports a limited scripting language that can be used to store metadata on the blockchain. Colored Coins is a concept that allows attaching metadata to Bitcoin transactions and leveraging the Bitcoin infrastructure for issuing and trading immutable digital assets that can represent real world value. The value of such digital assets is tied to a real-world promise by the asset issuers that they are willing to redeem those digital tokens for something of value in the real world. Digital assets on top of the Bitcoin Blockchain can be used to issue Financial assets (securities like shares, commodities like Gold or new currencies), prove ownership (A digital key to a house or a car, a concert ticket), store information (Documents, Certificates) or create smart contracts. The advantage given by using the blockchain as the backbone for such asset manipulation is that one can rely on the blockchain’s transparency, immutability, ease of transfer and non-counterfeitability to transfer and trade such digital tokens with unprecedented security and ease.
Five important steps were taken in the project.

**Digitalisation of building records**

An important first step relates to creating a blockchain ledger with real estate information about every building, which is registered on the blockchain. By digitizing the building, a digital mould of the building is created so that the physical world (the building) can be used on the blockchain network. Basically, using this token, a digital representation of the building, and all its details, is made. This unique fingerprint points to a database in which the building details are stored. For the basis of this first step, existing registers, such as from the Kadaster and BAG, are currently used. In The Netherlands for instance, these details can be expanded with other basis data, such as the number of square basic metres, the energy label, building design and floor/feet plans. Only a few of these data points are currently included in the building dossier/passport. By using blockchain technology, these details are given a time stamp and it is indisputably registered when, and from which database, the details were taken.

**Digitization of the ownership situation**

The next step after digitalisation of the building records is attaching an owner to the digital mould that the building, or the part of the building, represents. In order to do this, a digital identity of the owner must be made. For this step, the existing registers are again used, such as those from the Kadaster and Chamber of Commerce. In the Dutch practice, these registers have been used for years, and in legal transactions, these registers are also used. The current state of technology makes irrefutable registration of the digitalisation a big issue. Currently, the central authorities (such as the abovementioned Chamber of Commerce) are used in transactions. In a future situation, in which blockchain has become commonplace, the role of the central parties (the trusted third parties), could change drastically.

**Transferring ownership**

The real estate sector has many players, stakeholders and involved parties. The only constant factor in the entire process is, in fact, the immovable property itself. Ownership transfers, in the course of time, from party A to party B. This is also the case for the tenant, financing and other obligations. In the current situation, real estate is transferred with the help of a solicitor. The financial, legal and fiscal obligations of the current owner and the future owner are charted and involved in the transaction. Using digital tokens, which represent the building, and a trustworthy digital identity, the transfer of ownership becomes easier. The certificate of ownership of the building can be easily transferred through an online transaction. The holder of the so-called 'ownership key' is the only party allowed to 'burden' this key with legal obligations, such as a rental contract. In the current practice, this will require a big change in thinking, and plenty of legal and fiscal questions will arise, which will need to be solved.

**Lease agreements**

The next step to be solved is the simple, online, signing of lease contracts. With the increasing need for a more flexible use of space – for example for the start-up community at the Cambridge Innovation Center in the Groothandelsgebouw, Rotterdam—the process for entering into real estate agreements will be changed. There are many possible optimisations to be achieved in the so-called customer journey of the tenant/user. In this project, a contract template module was chosen, which allows several parties to work on the signing of the rental contract in a digital environment. Based on the results of the final negotiations, the contract is custom-made online for the actual tenant. Using a blockchain transaction, this rental contract is digitally signed by one of the contract parties and sent to the other party for signing. The other party receives a notification and also signs, after checking the contract, digitally. This again involves a blockchain transaction. After finalising these steps, a version of the rental contract, signed by both parties, is added to the blockchain. This irrefutably registers which agreements the landlord and tenant have entered into. The other important advantage is that it saves a lot of time in the process, for both the landlord and the tenant.

Now what is stated above for rental/lease contracts can easily be applied to other real estate contracts as well, such as purchase agreements, and maintenance contracts.
Making contract information available to third parties

During the lifecycle, the real estate owner will, at set times, share information about his property with third parties. The bank, when it comes to (re)financing, an auditor when it comes to the check of the annual statements, a surveyor for a valuation and a (potential) buyer upon the sale of the property. With each of these events, checks are performed by the various parties on how up-to-date and accurate the data is. Blockchain provides the potential for all parties involved in the network, to make use of the same (decentralised) source of information. Furthermore, blockchain ensures that the registered details can be shared with third parties in a trustworthy, uniform and quick way.

Life cycle leasing real estate

Within the solution each real estate transaction is mirrored by an anonymized transaction on the blockchain that follows a strict protocol. Using the information on the blockchain all parties involved in a real estate transaction can proof validity of the documents down to the last detail. We use the common source of truth as a basis for exchanging the full length documents between administrative systems. The proposed document exchange API allows these systems to automate the exchange of information and be certain of the quality of what is stored. This last step opens possibilities to fully automate an asset portfolio and perform fact based risk assessments.
Lessons learned

Based on the knowledge and experience acquired in the project, we have learned some lessons in the field of blockchain in real estate:

1. Innovating is dosing: The changes can potentially be huge. Dreams about future prospects and the new future are important, but in the present, taking small steps with big impact is more important.

2. Innovating is investing: The use of blockchain in real estate is largely unexplored terrain. In order to mine this terrain you must personally invest in acquiring knowledge, wanting to understand the technology and its implications. This makes curiosity a good trait to have. By being curious about the unknown, you experience adventures that do not experience.

3. Innovating is evangelising: Once you see the potential, the best way forward is making a concrete start on developing a first application. This means that in conversations with stakeholders and parties in real estate, you can convey your vision and message based on a concrete example, even if it is unsure if, and when, that message will become reality.

4. Innovating is coordinating: Blockchain requires a change in the way organisations think. Starting on blockchain as a company, or as a department within a company, does not make sense. Discovering opportunities, but also challenges, can best be done together. Blockchain acts as the catalyst that stimulates cooperation and ensures existing processes are examined critically within, but also explicitly between, organisations. The resulting cooperation in multi-disciplinary teams at the interface of real estate and technology should not be underestimated in terms of importance and value.

5. Innovating is putting things into perspective: Blockchain is a means, not an end. Solving concrete problems and adding value are key. It therefore remains necessary to remain critical about the added value of technology in the relevant application.

6. Blockchain requires a complete ecosystem where all the participants in the industry need to do their part to fully create one single uniform data standard. The accuracy of data that is registered needs to improve by creating standards for measuring real estate data.
Going forward

“A blockchain is seldom, or never, a solution in itself but can be used as a building block for a multitude of online applications.”

The biggest promise blockchain offers is an infrastructure that can decentralise trust services. A blockchain is seldom, or never, a solution in itself but can be used as a building block for a multitude of online applications. What blockchain above all adds is the opportunity for everyone in the network to connect with it in their own way, or, if they do not want that, to choose which application by a third party they want to use.

The biggest challenge for the actual application of blockchain is perhaps the human factor. Blockchain is a disruptive innovation, which potentially changes the current roles and tasks of players in the real estate market. In this sense, it is more than just a technological innovation. The organisational changes and the adjustment of processes, ways of working and methods, as a result of technological opportunities offered by blockchain, are likely to be a challenge.

Based on the insights outlined above, we are convinced that blockchain will deliver a positive contribution to the world of real estate, in terms of uniformity, efficiency, and transparency. Working with this technology leads to the transfer of knowledge between organisations that traditionally may be less inclined to do so. There are also new inspiring networks blossoming within the world of real estate and a multitude of new business opportunities. What the definitive impact is will be largely determined by the players themselves and the way in which they react to the potentially disruptive innovations.

We look forward to taking the next steps.

“We always overestimate the change that will occur in the next two years and underestimate the change that will occur in the next ten.”

Bill Gates
Our application has shown that blockchain has the potential to form the digital ledger for the real estate information flow. To fully grasp the power of blockchain the application would need new developments into the following topics.

**Payment monitoring**
One of the steps involving this application would be expanding its scope to monitoring payments, contract compliance and deposit management for contracts that are signed with the application. By doing so banks, auditors and appraisers can verify that the commitments in the contract are fulfilled. Once this extension is made the information of the lease agreement flow would be enhanced to suit more parties involved.

**Loan and valuation industry**
In the figure below we see the information flow in the real estate industry. With our application we have enhanced the lease agreement information flow between tenant and owners. With the expansion of payments monitoring, we hope to expand the flow to auditors, banks and appraisers. The same application can be made for loan and valuation markets, integrating the whole real estate information flow.

**Live real estate data management**
Once the complete information flow of the rental contracts is registered and recognized by all parties, new data can be added to the contracts. For example, smart meters could register how many minutes you were in the office this month so that tenants only pay rent for the actual time they spent in the office. These kind of solutions could be applied to parking, waste, water, energy billing and maintenance.

**Smart cities**
Once the real estate information flow is fully registered on the blockchain, local governments could manage cities by having access to the detailed or aggregated data. This would mean that governments can follow waste, water and energy demands in real time and truly create a smart city.

**One single source of truth for the whole industry**
Our vision for this project is to expand the real estate information flow on the blockchain through the whole commercial real estate industry, having one uniform and trustworthy source for all real estate data.
New business models for the real estate industry

Deloitte sees the combination of blockchain technology and real estate as an important focus area. Blockchain acts as a catalyst for the generation of completely new applications and business models within the real estate ecosystem.

“We believe, together with real estate decision-makers, that blockchain is going to create a digital revolution in the real estate sector. Blockchain in the real estate sector increases the feeling of trust between the different parties because data is saved in a transparent way and the risk of mistakes in information decreases. The application we have developed, lays the foundation for developing new business models and applications for the real estate sector, but also for other sectors. For consumers it means that the transaction costs for renting, and especially for buying property can be significantly lower than they are now. We want to further build on this in the various partnerships.”

Jurriën Veldhuizen
Managing partner Deloitte Real Estate NL

“As a part of the Roadmap Next Economy, the real estate sector is one of the sectors in which the municipality of Rotterdam is working with commercial partners on real innovations, that truly step away from the old way of working. Besides real estate, this is also happening in the financial sector and in transport & logistics. It should make doing business easier and more efficient.”

Maarten Struijvenberg
Councillor Economy City of Rotterdam

“Blockchain is going to have a huge impact on government, that’s why we, the city of Rotterdam, are committed to the joint project with Deloitte and CIC.”

Hans Beekman
Director Roadmap Next Economy
Contacts & Team

Contacts

Jurriën Veldhuizen
Partner – Deloitte Real Estate
JVeldhuizen@Deloitte.nl
+31 88 288 1636

Wim Scheper
Partner – Deloitte Innovation
WScheper@deloitte.nl
+31 88 288 1249

Jan-Willem Santing
Manager – Deloitte Real Estate
Jsanting@Deloitte.nl
+31 88 288 8984

Jacob Boersma
Manager – Deloitte Risk Services
Jboersma@Deloitte.nl
+31 88 288 2069

Team

Jasper van Gelder
Joost Naaijen
Maarten Duijn
Egemen Uzunali
Rijk van Kooy
Rik van Dijk
Daniëlle van Lier
Bozidar Vujanovic
Ewout Bolhuis

“Rotterdam is proud to be a partner in the development of the first Real Estate blockchain platform and to open our doors for the next Economy.”

Maarten Struijvenberg
Councillor Economy City of Rotterdam
Blockchain in the real estate sector increases the feeling of trust between the different parties because data is saved in a transparent way and the risk of mistakes in information decreases.

Jurriën Veldhuizen, Deloitte