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*How blockchain will
change your business.*

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Introduction

The rise of blockchain

The term blockchain is inextricably linked to bitcoin. And for good reason. Because of the introduction of this currency and the enormous publicity surrounding it, the general public has become familiar with the technology. And although much has been written on bitcoin, it is particularly the blockchain technology behind it that is so revolutionary. Bitcoin and other cryptocurrency such as litecoin, peercoin and ripple are only a few of the possibilities that blockchain offers. For instance, it allows you to record who possesses what property. And the transactions recorded with blockchain don't necessarily have to be payments. These could also constitute steps in a logistics chain or production process, for instance.

What is the added value?

Iquality is always looking for trends and digital innovations that allow us to strengthen the business of our clients. We believe that blockchain will play an important role in this. And we notice that increasingly more people are willing to consider those possibilities. Therefore, we investigate the possibilities of blockchain for the various sectors in which our clients are active. And we experiment with the technology, together with our clients and partners.

This whitepaper

With this whitepaper, we seek to include even more organisations and people in our research and experiments. Not only technicians, but certainly also business managers, product owners, startups or simply people with an interesting idea. Within all sectors. First, we will start at the beginning. We will explain what blockchain is, name a few interesting applications of it, discuss the advantages and disadvantages, look at trends and expectations and give a few interesting conclusions from a study that Manon Kovács conducted for us as a graduation project.

More information

Would you like to know more about blockchain after reading this whitepaper? Or share and test a good idea with us? Please do not hesitate to contact us. For instance, contact Marvin van Wingerde, marvin.van.wingerde@iquality.nl.

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What is blockchain?

Blockchain is the name for a technology where the transactions of the participating parties are kept in a decentralised log (also referred to as a ledger). Every node (server or device of a participating party) that is part of the complete blockchain network has its own copy of the log. Each node also has a public and private key. Through encryption, it is possible to ensure that parties only see what they're allowed to see. If someone wants to add a transaction, every node looks into its own copy of the log to see if this is valid. If sufficient nodes approve (if there is consensus), the transaction is combined in a block together with other transactions and a time stamp.

From block to blockchain

Each block is secured by a complicated formula and is subsequently added to the log. This creates a chain of approved blocks, a blockchain. This blockchain is also secured by means of a complicated formula. This formula is dependent upon all previous blocks and only provides the right result if the order of the blocks in a chain is still correct. This means that nodes can only add a transaction when they've correctly included all previously approved transactions in their log. In other words: you can only open the next door if you were able to close the previous door.



The source code on which a blockchain application runs can be public or private.

No controlling party necessary

A major difference between blockchain technology and current methods to record transactions is that blockchain no longer requires a central (often third) party to manage and control the log. This difference can be properly explained by looking at money transactions. If you want to transfer money to a business partner, for instance, you need a bank to do so. This bank checks if you have sufficient balance, reduces the amount you wish to transfer from your account and makes sure it's added to the balance of your business partner. That is, the bank manages and controls the log. In cryptocurrency based on blockchain, you can directly transfer the amount to your business partner. If all (or the majority) of the nodes agree, the transaction has been completed. No third party is required to grant permission or to handle the transaction for you.

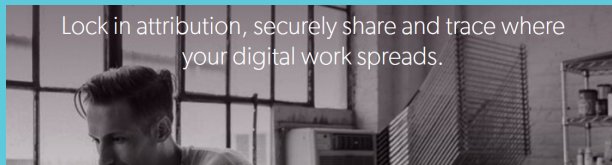
Controlling party is possible

It is possible to use blockchain technology and at the same time have one or multiple parties exercise control over the network. For instance by letting 'trusted parties' determine who is or is not allowed into the blockchain. Or by having those trusted parties determine which parties are allowed to perform transactions.

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Application example

An example of an application to authenticate documents via blockchain is Ascribe (Ascribe.io). Via the website, persons with copyright can register their digital work. Buyers will receive an authenticity certificate stating who the owner is. Additionally, a possible history of ownership can be consulted. And artists can see where their work is distributed across the Internet.



Lock in attribution, securely share and trace where your digital work spreads.

Possible applications for blockchain

Blockchain has two basic features:

- You can use it to safely identify, verify and distribute confidential documents or information. Think of contracts, proof of ownership, mortgages, cadastral information, etc.
- You can use it to demonstrate that something happens at a given moment. For instance, a transaction of a document between parties or an adjustment of a document.

The fact that you can perform these actions without a controlling third party offers a wide range of possible applications in practice. Below are a few examples.

Verification documents

The technology behind blockchain is powerful in authenticating documents. You can use blockchain to verify whether the digital fingerprint of a document you have in possession matches the digital fingerprint of a document at a given moment in the blockchain. If yes, this is the same version of the document. If not, something in the document has been changed. This does not just allow you to verify the authenticity of documents, but we also see who is or was the owner of something and when.

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Transport sector

Also in the transport sector, the advantages of blockchain could be significant, as many rules, contracts and documents come together there. Think of letters of credit, export letters, consignment notes, and so on. Raw materials, producers, transporters, transport times; all this data can be recorded in a blockchain. This makes the entire chain transparent, which makes a lot of paperwork that is currently necessary as parties want to check up on each other redundant.



Gathering documents

The registration of documents with a blockchain can make it easier to gather documents. In all those cases, it concerns a company or governmental institution that needs many different documents from one or multiple parties. Now, such a company or institution gathers and archives all those documents itself. If you need data from those documents at a later date, you have to check whether you have the right version of the documents. If you include the digitally delivered documents in a blockchain, it is much easier to check whether you have the most current version of a document. Or when another party has submitted a new version of a document.

Payment

Blockchain has become well known thanks to cryptocurrency such as bitcoin, litecoin, peercoin and ripple. Companies can include this currency in its payment opportunities, but companies can also develop such alternative currencies and use them as a means of payment themselves. 'Pay per use' services are also becoming increasingly easy to offer via blockchain. For example, Samsung and IBM have looked at the possibility of applying blockchain technology in domestic devices (Internet of Things). One example is a laundry machine that notices when it has run out of laundry detergent. The machine subsequently orders the detergent on the Internet. This could be done at the customer's favourite supplier, but the laundry machine could also search for the cheapest supplier on the Internet. Payment then occurs via a blockchain.

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Smart contracts

Smart contracts are digital contracts to which a piece of conductable code has been added. This goes beyond merely including documents in a blockchain or recording a transaction. For instance, you could arrange that if a certain condition has been met, a predetermined transaction automatically occurs. One example is a demo that Samsung and IBM showed for advertisements on TV screens. An advertiser chooses the screens he wishes to advertise on within a network. He sends the advertisement as smart contract via the blockchain. If the owner of the screen accepts the advertisement, the script ensures that he will immediately receive the correct amount for this.



Nasdaq (the American stock exchange for technological companies) started a pilot that runs on blockchain technology. In doing so, they seek to make the trading of shares easier and decreases the expenses for traders.



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Advantages and disadvantages of blockchain

Blockchain is interesting because the technology allows verifications and transactions to be performed without a central, controlling party. This facilitates higher speed and fewer expenses. Additionally, it's possible to add code to the blockchain via smart contracts that automate certain actions. There are also potential disadvantages. For instance, who inspects the code? And what if smart contracts have an undesired effect; can you stop the execution of these? Below you can read more on the advantages and disadvantages.

Increased speed

Blockchain makes it possible to approve, execute and record all sorts of business transactions and processes in real-time. This because within the blockchain, the nodes directly check the validity of a transaction and only include it if it's valid. The approving, executing and recording is the same automated action.

Fewer expenses

Because it's not longer necessary to perform and record all sorts of inspection actions parallel to a transaction order, blockchain allows you to save significantly on expenses. Compare the bitcoin, where the ledger itself is shared with all nodes, to regular money traffic, where the bank does not only have to approve all transactions, but also has to record in a way that can be inspected by administrators.

IBM Research

Fewer disputes and faster settlement at IBM Global Financing

IBM Global Financing is involved in over 2.9 million transactions between over 4000 suppliers and partners as financier. Those transactions do not always run smoothly, for instance when a shipment of hardware is not delivered. Settling disputes on claims takes a lot of time when each party has to check in its own administration what the status is and has to reach an agreement from there. Both the number of disputes and the settlement speed is significantly reduced when IBM Global Financing records the transactions between the parties in a blockchain and shares the log with the parties. See this video on [YouTube](#).

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Less fraude

Blockchain could also help to counter fraude. Because each transaction is stored and the encrypted fingerprint of it is public, it's very difficult to commit fraude. In the current state of affairs with a controlling third party, this is easier in theory. First, that third party has the opportunities to do so itself. Additionally, a party with ill intentions only has to deceive one party to perform 'false transactions' in the current situation. For instance, within a digital environment, he could pose as the central party towards other traders or he could try to give the central party false information. With the blockchain technology, this type of fraude is possible in theory, but in practice it's much more difficult to commit, as you would have to deceive the vast majority of all nodes if you wish to add a malafide transaction.

Additional possibilities

In the previous chapter, we have already mentioned smart contracts. These concern digital contracts, managed via a blockchain technology, to which you add conductable code. For instance to set additional conditions for such a transaction. Such a condition could be that specific parties in the network must approve a transaction before it can be performed. A possible example is that the SVB transfers money to a client who can subsequently only use it to pay rent. If the amount is not used for rent, it's automatically withdrawn.

Monopolies?

The enormous calculation capacity large public blockchain networks require is not just cumbersome, it also increases the chance of monopolies within a network. And when a few parties receive a disproportionate amount of power within a network, the integrity or safety of it may be endangered. The size of a private blockchain can be controlled by giving one or multiple 'trusted parties' extra power. However, you must trust these parties or place them under 'old-fashioned' supervision.

Sufficient calculation capacity?

A blockchain in which everyone can participate, without special regulatory parties, demands a great deal of calculation capacity from the computers and servers when the number of transactions grows. If you can't determine and scale the number of users, the programs you require in order to become a member of the blockchain increases, as does the log. For bitcoin, this disadvantage has become clear and new bitcoins can practically only be 'mined' by complete, specially equipped server parks.

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High power use?

The large calculation capacity needed to perform all calculations for making fingerprints and encrypting information naturally requires a great deal of energy. And, depending on how this energy is generated, this could have a negative impact on the environment. This is particularly problematic if the blockchain technology starts to grow explosively, which is what is expected to happen. Calculation centres also take up a lot of space. This creates a larger ecological footprint.

Difficult to stop?

If you don't need a controlling third party for your transactions, everything happens faster and the costs are lower. But, this does mean that the participants have to be able to trust the software is without errors. If the code is public, you could have it checked, but that's not possible for closed software. This is particularly important for smart contracts. For instance, what do you do if the code leads to unforeseen circumstances? Approved transactions within a public blockchain are difficult to stop or reverse. This would require a fast majority of parties. For applications in the business world, this disadvantage is limited, as it will often concern private blockchains. In this case, you would always approve scripts or parties before admitting them. And you can give 'trusted parties' the right to intervene if something goes wrong.



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Trends and developments

Worldwide, hundreds of companies are thinking about how and for what purpose they can best use blockchain technology. These concern large multinationals such as IBM, Microsoft and PwC, but certainly also lots of startups. Blockchain is particularly interesting for this last category of companies because they are often able to combine new technologies with a new business model. As a result, these startups are sometimes able to acquire a significant market share within a very short time. But, a large portion of the startups eventually doesn't make it or is taken over in an early stage.

Specific or generic

Within the group of applications that are now being developed with blockchain, two directions can be discerned. First, applications for a specific target group or organisation with a specific functionality. This includes all applications we have previously named as an example in this whitepaper. Another direction consists of attempts to found a platform on the basis of blockchain technology on which other companies can 'relatively easily and quickly' shape their own blockchain applications. Examples of this are Ethereum or R3CEV.

The customers

An interesting questions is what aspects customers will eventually notice with regard to the use of blockchain technology. More than likely, not that many aspects of the technology itself. Most people don't exactly know how the sending of an email or paying electronically in a store works today. It's important that both proved to be easier than sending a letter or paying in cash in most cases. The same is true for services that will be offered on the basis of blockchain. Because a third controlling party is no longer necessary, or will play a different role, certain services will become more transparent, faster and less expensive.

Blockchain at financial service providers

A special group of companies that are working with blockchain are financial service providers such as banks, insurers and lease companies. Their interest was undoubtedly raised because bitcoin is often presented as an alternative means of payment where banks are no longer necessary. It's only logical that banks therefore want to know exactly what bitcoin entails. And following that what blockchain is, because perhaps the technology presents a major opportunity rather than a threat. In the 'Strategic Advice Plan Blockchain Technology', Manon Kovács investigated for Iquality to what extent financial service providers are working with blockchain.

Follow the developments

One conclusion of the study is that banks and other financial service providers weren't exactly waiting for blockchain. Digital currencies are perhaps not a direct threat to currency regulated by the government, but the blockchain technology will certainly gnaw away at the revenue model of banks and insurers. In the future, financial information may be stored in the blockchain. Payment data will then no longer exclusively belong to banks.

Companies and private persons can then do business with other parties in a different way. This means that banks will no longer, or to a lesser extent, be necessary to validate and register certain transactions. The same is true for the work of notaries, insurers and such.



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Better service

Yet, financial service providers realise that the rise of blockchain technology is unstoppable. And so they're certainly working on ways to incorporate it. Partly because it can also lead to great advantages. Efficiency, speed, ease and cost saving are reasons for financial service providers to use blockchain. In any case, it reduces the costs of maintaining the current, stacked, ICT infrastructure from the '70s and '80s. In addition, service provision to customers can be improved by means of the blockchain technology. Several examples banks are working on include:

- Interbank payments: with blockchain, the number of steps currently necessary for payment between banks could be reduced. This could especially be beneficial for international payments.
- Fast mortgages: For a mortgage, all manner of documents and information needs to be gathered.
- This could be done much more efficiently via blockchain.
- Know Your Customer (KYC): Banks must identify customers in order to counter theft, fraude, money laundering and the financing of terrorist activities. Via blockchain, banks could quickly share this information with each other.
- Now, this often occurs manually.
- Leasing: blockchain could be used to lease certain devices, company assets or cars and pay per use. Additionally, you could make these devices, assets or cars so smart that they can enlist the help of a repair shop if there's a problem. In doing so, not only the communication is handled, but also the payment without the intervention of a bank or other intermediary.

Public is not an option for banks

Banks probably don't want a public blockchain for their services. Regulations and the supervisory framework banks are dealing with determine that approval from a substantial number of nodes is insufficient to approve certain transactions. Because the bank is responsible, the bank itself must approve these. The spread of the transaction and the registration thereof can be arranged by an entire blockchain, however.

Expansion work field

A striking development is that there are financial service providers who are thinking about offering the blockchain technology themselves as a service to their customers. Together with their ICT partners and suppliers, they have invested a lot of time and money in research into technology in a short time and could generate new income with the knowledge and experience they have gained in this. The financial service providers would then, as intermediaries, penetrate the market of ICT companies and in doing so more or less reverse the development in the introduction of the bitcoin, where the ICT technology entered the field of banks.

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About Iquality

Increasingly more companies, institutions and governmental organisations are interested in the possibilities that blockchain technology offers. Initially, they often ask us the question: what is it? We sought to answer this question in this whitepaper. We are convinced that blockchain will become very important, but also that no one knows exactly how important and for what applications. Blockchain will undoubtedly emerge in sectors no one has even thought of yet. At the same time, old technology will not simply be replaced everywhere.

Blockchain as a means

In our view, technology is always a means, never a goal. The same is true for blockchain. Therefore, we want to investigate, together with our clients and partners, what exactly the possibilities of blockchain are. We do so by experimenting in Iquality Labs, where multidisciplinary teams make interesting client ideas tangible within just a few days by creating a minimum viable product. Discovering and creating together. This allows clients to look at their own business from the perspective of a startup. An ideal method to start working with a disruptive technology such as blockchain.



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Would you also like to do things smarter within your organisation? We are happy to think about the possibilities with you. For this purpose, we bring the triangle of business, technology and experience together in the right proportions. In short cycles of discovering, creating and using. This is how we make users enthusiastic.

More information

Would you like to know more about blockchain after reading this whitepaper? Or share and test a good idea with us? Please do not hesitate to contact us. For instance, contact Marvin van Wingerde, marvin.van.wingerde@iquality.nl.

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Sources

The most important sources of inspiration for this whitepaper are:

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