
Accounting in the Era of Blockchain Technology What Prospects?

المحاسبة في عصر تقنية Blockchain
ما هي الآفاق؟

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Abstract: Since its appearance in 2008, Blockchain technology has spread to all areas. The growth and development of projects based on this technology are proof of this. Among the fields that are making use of the potential of this new technology is the field of accounting. Thus, the latter aspires to benefit from the possible innovations brought by the Blockchain. The aim of this article is to determine the potential innovations that this technology can provide to the accounting sphere and the benefits that it can draw from it. Indeed, the Blockchain can transform the field of accounting in several ways: the Blockchain, a smart accounting instrument, the Invoicing via Blockchain technology and the Blockchain as a tool for auditors.

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1. Introduction

Blockchain technology is attracting growing interest in the economic sphere and in particular in accounting. The publication in 2018 for the fourth consecutive year of a "Barometer of the Digital Transformation of Accounting Firms" shows the importance that accounting professionals attach to the digital transformation of their profession (Olivier Desplebin, 2019).

This technology has a large number of digital tools and great potential could to transform the accounting function in companies and among accountants. Historically, the Blockchain is the digital medium for crypto currency such as *Bitcoin*. The world of finance and banking has used its services as well. However, in the field of accounting Blockchain technology is ignored and remains little requisitioned and discussed in journals and conferences (Sadjo Kaoutoing, 2021).

Indeed, accounting professionals, accountants, chartered accountants and auditors remain reluctant to use Blockchain, they do not understand how it works and its various applications. They fear that technology will win out and they will lose their jobs. This fear is unfounded. On the one hand, it has proven itself in all fields. On the other hand, they are called upon to accompany this change.

Thus, we question in this article the role that the Blockchain can play in the accounting sphere. How the recognized potentialities of this new technology can impact it. The article will be organized in three parts, the first one will focus on a **state of the art of Blockchain** technology, and the second one will address the interest of Blockchain technology for the companies, the third one will concern Blockchain opportunities for accounting

2. State of the Art of Blockchain Technology

*"The idea of a large, shared, unforgeable and indestructible computer notebook is at the heart of a new revolution, that of the Blockchain"*¹.

Blockchain means a chain of blocks on which information of any kind is stored. The blockchain is generally defined as a "technology for storing and transmitting information and transmission of information, transparent, secure, and operating without a central control body (Marion, 2019). Blockchain technology allows for the maintenance of a public register of transactions, organised in chronological order, and relies on a decentralised network of users, for example the Internet. "One must imagine "a very large notebook, which everyone can read freely and without charge, on which everyone can write, but which is impossible to erase and indestructible" (Delahaye, 2015). In the rest of this section, we will discuss a brief history of Bitcoin, the characteristics of the Blockchain, and how it works.

2.1. Brief History of Bitcoin

The concept of "Bitcoin" first appeared in 2008 in an article entitled "Bitcoin: A Peer-To-Peer² Electronic Cash System" by Satoshi Nakamoto.

¹Jean-Paul Delahaye, researcher at the Lille Centre for Research in Computer Science, Signal and Automation: « Les blockchains, clefs d'un nouveau monde », in Review : « Pour la Science, n° 449, mars 2015 »

²"The proper meaning of the word peer-to-peer is "node-to-node". In this process, the interconnected nodes share resources with each other without using a centralized administrative system. In other words, each node of the computer network is both client and server, unlike the old client-server model » (Mounia Khelfaoui, Soraya Sedkaoui, Sharing Economy and Big Data Analytics : <https://www.wiley.com/en-us/Sharing+Economy+and+Big+Data+Analytics-p-9781119694991>)

This paper described a peer-to-peer version of the electronic cash that would allow online payments to be sent directly from one party to another without going through a financial institution. Bitcoin was the first realization of this concept (Crosby Michael, 2015).

As one of the most successful cryptocurrency, Bitcoin has enjoyed a huge success with its capital market reaching 10 billion dollars in 2016. With a specially designed data storage structure, transactions in Bitcoin network could happen without any third party and the core technology to build Bitcoin is Blockchain (Zibin Zheng, 2017).

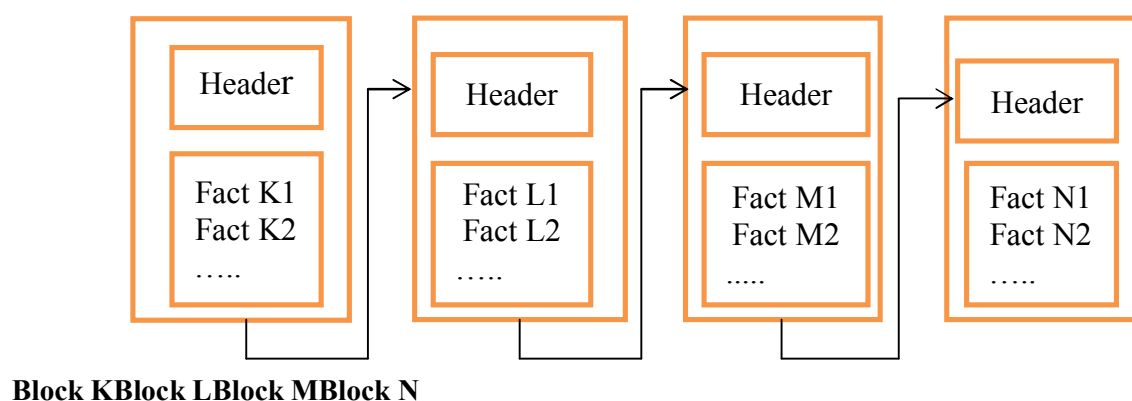
In January 2009, as soon as the first block was mined, the Bitcoin network began to operate. The 50 BTC block, now known as the genesis block, was mined by Satoshi Nakamoto. The BTC client, distributed at the time under an open source license, allowed other users to join the network, and together they began building the Bitcoin blockchain³.

The popularity of Bitcoin has been growing ever since and so has the underlying technology, the Blockchain. For example, 10,000 BTC was worth the price of two pizzas in 2010, but the same amount of BTC bought five new Airbus planes in 2021⁴.

2.2. How Blockchain Technology Works

In this section we will describe how Blockchain technology works in the simplest possible way. Etymologically, the term blockchain comes from the way the network stores transaction data, i.e. blocks linked to form a chain. The blocks collect and confirm the times and sequences of transactions. The blocks collect and confirm the times and sequences of transactions, which are recorded in the blockchain, in a separate network, governed by rules agreed among its members⁵ (See figure N° 01).

Figure 01. Simplified Example of a Blockchain



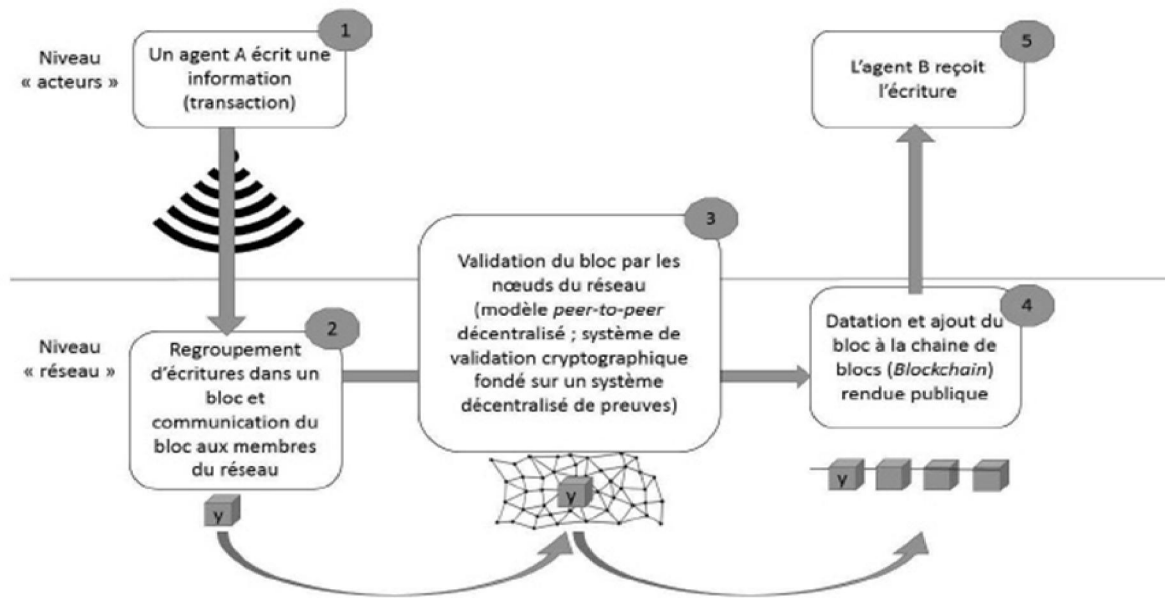
Source: Abderraouf Ayadi, 2019, 55

Some researchers explain this by the way Bitcoin works. “However, the blockchain technology is applicable to any digital asset transaction exchanged online” (Crosby Michael, 2015).

³<https://www.xtb.com/fr/formation/histoire-du-bitcoin>

⁴<https://photo.capital.fr/bitcoin-a-10-ans-les-20-grandes-dates-de-son-histoire-31189#31-octobre-2008-publication-du-white-paper-538275>

⁵<https://www.ibm.com/downloads/cas/W64RXDAB>

Figure 02: Blockchain's Operating Process

Source: Desplebin *et al.* 2018, p.5

The explanation of Figure 02 is inserted in Appendix 02.

A Blockchain is a computer database capable of storing all types of information (shopping list, photos, bank data, patient data, batch records,...). One of the fundamental characteristics is that this database is replicated among users of this blockchain.

To ensure data quality and maintain database synchronisation despite the decentralised storage of data, the blockchain uses a number of technical mechanisms (Adrian, 2018) :

- **Authenticity** : In a public channel open to all, passive participants (clients) connect to one or more active participants (nodes). In order to unambiguously assign inputs to a participant to a participant, each client has a private key as well as a public key generated from the former. As the client signs his data with his private key, other participants can verify the authenticity of the data at any time by the authenticity of the data at any time by using the public key ;
- **Integrity** : Each node has an identical copy of identical data. To avoid any subsequent modification of the stored data, the hash⁶ value of the previous block block is embedded in the next block, which This ensures that the data cannot be be modified ;
- **Synchronisms** : All nodes in the blockchain have equal rightsequal rights and can add new blocks.blocks. To ensure an unambiguous block sequenceblock sequence, blockchain implementations use different consensus algorithms.consensus algorithms. In public blockchainsblockchains, the implementation of the proof-of-work mechanism is often used.In public blockchains, the implementation of the proof-of-work mechanism is often used.Other blockchains use the proof of participationOther blockchains use the proof-of-participation mechanism or combinations of different algorithms.

⁶Hash functions are used in computer science and cryptography to quickly identify files or passwords (See Appendice 01).

2.3. The Characteristics of Blockchain

The characteristics of the Blockchain are summarised in the following items⁷ :

- **Decentralization** : Contrast to the centralized mode, third party is no longer needed in blockchain. Consensus algorithms in blockchain are used to maintain data consistency in distributed network,
- **Persistency** : Transactions can be validated quickly and invalid transactions would not be admitted by honest miners. It is nearly impossible to delete or rollback transactions once they are included in the blockchain. Blocks that contain invalid transactions could be discovered immediately ;
- **Anonymity** : Each user can interact with the blockchain with a generated address, which does not reveal the real identity of the user. Note that blockchain cannot guarantee the perfect privacy preservation due to the intrinsic constraint ;
- **Auditability** : Bitcoin blockchain stores data about user balances. Any transaction has to refer to some previous unspent transactions. Once the current transaction is recorded into the blockchain, the state of those referred unspent transactions switch from unspent to spent. So transactions could be easily verified and tracked.

3. The Interest of Blockchain Technology for the Companies

Blockchain technology with its distributed data structure and automated guarantee of the authenticity of the information not only allows for the encryption of currencies, but also for the use of many applications without central authority. The blockchain is also adapted to the sharing and processing of data between independent or even competing. The blockchain is also adapted to the sharing and processing of data between independent or even competing companies. All companies involved in blockchain and the market as a whole will benefit from the increased efficiency achieved⁸.

3.1. The Company Faced with the Problem of Transactions

All the tools developed to facilitate and protect commercial transactions, such as coins, notes, and letters of credit and banking systems. Thanks to important innovations, in particular the telephone, credit card systems, the Internet and mobile technologies, transactions have become more convenient, faster and more efficient, to the point of reducing, and even eliminating, any distance between buyers and sellers. However, many business-to-business transactions remain inefficient, costly and vulnerable due to the following limitations (Cupta, 2018):

- Liquidity is only useful for local transactions and with relatively small amounts;
- The time between a transaction and its settlement can be long;
- The redundancy of actions, the need for third party validation and/or the presence of intermediaries contribute to the inefficiency of this system;

⁷Zibin Zheng., Op.cit., p.558

⁸Adrian., Op.cit.,p.3

- Fraud, cyber-attacks or even simple errors contribute to the costs and complexity of operations. In addition, they expose all network participants to risk if a central system, such as a bank's, is breached;
- Half of the world's population has no access to a bank account and has been forced to develop parallel payment systems to make transactions.

Also, the volume of transactions worldwide is increasing exponentially and will obviously amplify the complexity, vulnerabilities, inefficiencies and costs of current transaction systems. The growth of e-commerce, online banking and in-app purchases, as well as the increasing mobility of users around the world, have contributed to the increase in transaction volumes. Thus, to address all of these issues, businesses need payment networks that are fast, have a mechanism for building trust, require no specialised equipment, have no fees or monthly charges, and provide collective record keeping ensuring trust and transparency. Hence, the interest of Blockchain technology for companies and for sustainability.

4. Blockchain Opportunities for Accounting

Some experts anticipate profound changes in accounting, changes that are likely to be as significant as the changes experienced by the retail and travel industries with the Internet. Technological innovation, and more specifically the development of the Blockchain, will have a major impact on all accounting professions within the company.

4.1. How to Apply Blockchain to Accounting?

Then, Blockchain technology will have a significant impact on the organisation of the accounting business through the protection of accounting data and the automation of transactions⁹.

- **Protection of Accounting Data:** The specificity of Blockchain technology is to allow actors to use the web to access information within a public or private network. By ensuring a secure and reliable transmission of information. However, whether it is private or public, the Blockchain must ensure the security and confidentiality of data.

“The final tech trend that has significant implications for accounting and finance professionals that I wish to cover is blockchain. A distributed ledger or blockchain is a highly secure database. It's a way to securely store and accurately record data, which has broad applications in accounting and financial records. Blockchain enables smart contracts, protecting and transferring ownership of assets, verifying people's identities and credentials, and more. Once blockchain is widely adopted, and challenges around industry regulation are overcome, it will benefit businesses by reducing costs, increasing traceability, and enhancing security »¹⁰. Blockchain constitutes the "edifice technology" of internal control (certainty of accounting and financial information for stakeholders: shareholders, customers, financial institutions, government, etc.). It also makes it possible to eliminate the transactional processes of the traditional system: the same transaction is used to make the transfer, the settlement, the transfer and to transmit

⁹Kaouting., Op.cit., p.51

¹⁰Bernard Marr is an internationally best-selling author, popular keynote speaker, futurist, and a strategic business & technology advisor to governments and companies : (<https://uk.linkedin.com/in/bernardmarr>) .

information, thus ensuring a quasi-real time availability of data and the traceability of its holding (Olivier D., 2018).

- **Automation of Transactions:** For accounting, the Blockchain appears to be a source of trust, to secure exchanges. Indeed, each transaction will be recorded and not erasable. This traceability, security and inviolability is made possible by the exchange of an encryption key between two recipients, and the recording of the transaction in a chain. « It will make it possible "to speed up the audit from the moment we have real-time data, secure, reliable data, and therefore to be able to carry out exhaustive checks and do so almost in real time"¹¹. And most importantly, the blockchain is both distributed across several systems and immutable, which means that no one can change the blockchain alone. Then, transactions are more secure.

Data protection and transaction automation are two tools for introducing Blockchain into the accounting field. However, there is one question that catches our attention: How can the Blockchain impact accounting? The answer to this question is in the following part of the article.

4.2. The Potential Applications of Blockchain to Accounting

Accounting as a business practice has not remained unaffected by the advances of digital technology. Accounting as a business practice has not remained unaffected by the advances of digital technology. It is already using computerized supports for the registration and processing of transactions. In the current digital era, these registers take the form of databases, and different solutions (proprietary and open source) exist with similar basic characteristics (Coyne J. G, 2017). The Blockchain is the best current representative of a digital database.

Indeed, White (2016) argues that *"Any attempt to manipulate a previous transaction requires reprocessing of all subsequent blocks on the chain. This activity would need to exceed the rate at which new blocks are added to the chain. As a result, many consider the Blockchain to be immutable or immune to manipulation, which is the main attraction of trying to adapt it to accounting as a ledger of transactions."*¹². Since blockchain is the only technology (for the time being) that can offer reliability and inviolability. It is therefore a tool that can be adapted to the field of accounting.

Also, the Blockchain admits a solution for the control of the data flow by the possibility to define degrees of transparency, through the use of public and private keys, which allow both to have a registry (and a ledger) freely definable as public or private and therefore in fine open to many audiences, many user configurations (Leloup, 2017). This specificity of the Blockchain will give the company the possibility of practicing levels of confidentiality. That is to say, it will have the means to organize a hierarchy in access to information. In other words, the selection of users, who will have the authority to use such and such information.

In relation to all these advantages offered by the Blockchain, accounting can use it in the following ways:

- **The Blockchain, smart accounting instrument:** The concept of smart accounting is based on smart contract programs, which automatically control the implementation of a

¹¹Frédéric Léger, Chartered Accountant, Partner and Member of the Management Board at BDO France (a Firm Specialising in Auditing, Consulting, Accounting, Social and HR Expertise) :

<https://www.blackline.com/fr/blog/blockchain-quel-impact-pour-la-comptabilite/>

¹²<https://www.sec.gov/news/speech/chair-white-silicon-valley-initiative-3-31-16>

contract. This system of secure contracts covers an automated process of validation of contractual transactions and authenticates the execution of the parties commitments (Pluchart, 2020). Blockchain and smart contracts could thus the inclusion of stakeholders in the company's value creation chain of the company¹³, through the use of interconnected accounting systems. There is resistance to the implementation of Blockchain in organizations. The main interest in using a Blockchain therefore lies in the reliability of the transaction, which in a public network increases with the number of decentralized users, but in a private blockchain, the networks are centralized, its code is controlled by an administrator and its data can thus lose its unforgeability¹⁴.

- **Invoicing via Blockchain technology:** Experiments proposing the processing of invoices via a Blockchain process are now emerging. For example, some companies are already proposing the principle of putting into service a decentralized payment and exchange network, and more generally invoice management, based on the blockchain. The service would offer automation of the invoice cycle processes for the sender and receiver; security of invoices and their data; real-time monitoring of invoices; the possibility of sharing them instantaneously with a set of actors to be determined (e.g. administration, audit firm, factor)(Friscour, 2017). Many advantages are advanced regarding the use of technology as a billing medium. First of all, free payment methods can be associated with the invoice to facilitate its processing (e.g. automatic payment via the smart contract system discussed in the previous section. The Blockchain protects against the risk of fraud and secures payments. The tool would therefore make it possible to eliminate late payments for both the customer and the supplier(Iansiti M., 2017). According to Friscour, thanks to smart contracts and a shared network, Blockchain would make it possible to automate factoring and thus to reduce to a minimum the means necessary for its use (delays; time for processing and exchanging information) and therefore its cost. We would then move from an exchange situation to a real-time information sharing situation (Real-Time Accounting).
- **Blockchain as a tool for auditors:** The accounting and financial audit consists of examining the financial statements of an entity. The review involves checking and verifying the various accounting records that are supposed to support the transactions recorded in the books. The auditor thus verifies the fairness of the accounts assesses their compliance with accounting standards and determines whether the accounts reflect a true and fair view of the financial position of the audited entity. The auditor helps to detect non-compliant transactions, account manipulation and fraud. Their work is therefore of great importance to all stakeholders who make decisions based on the quality of the financial statements¹⁵. So, this function will undergo profound changes with the arrival of the Blockchain by modifying the performance of certain tasks: the partial alleviation of the audit of financial statements and the standardization of financial statements with real time access. The Blockchain should make it possible, through the guarantee of

¹³Coyne J., Op.cit., p.105

¹⁴ Pluchart., Op.cit., p. 4

¹⁵<https://www.journaldunet.fr/business/dictionnaire-comptable-et-fiscal/1445092-auditeur-definition-simple-role-et-salaire/>

inalterability it offers, to guarantee a fundamental element of the audit of financial statements: the verification and certification of the existence (of the reality) of a transaction by means of the triple part. As such, some of the transaction verification work could be removed¹⁶.

Although Blockchain supports the auditing profession. It may lead to the disappearance of the auditing profession. Is it wise for this to happen? Only time will tell.

5. Conclusion

Blockchain is an innovative technology. It invests in the field of accounting and wants to transform its functioning. The main objective of our research was to determine the potential innovations that this technology can provide to the accounting sphere and the benefits that it can draw from it. The present study therefore had the ambition to identify the different types of transactions that accounting can use via Blockchain technology.

In order to answer our research question, we adopted a descriptive approach in which we gave an overview of the Blockchain technology. Then, we discussed the interest of the latter for companies. Finally, we looked at the different ways in which accounting can access the digital age via the Blockchain.

Blockchain remains a technology with many advantages but also with disadvantages. Therefore, accountants will become the guarantors of the proper functioning of the system and will have to ensure that it is maintained. This will also mean having to develop the information systems. Monitoring technological developments, particularly through working groups, will soon be part of the accountant's job.

¹⁶Sadjo Kaoutoing., Op.cit., p.60

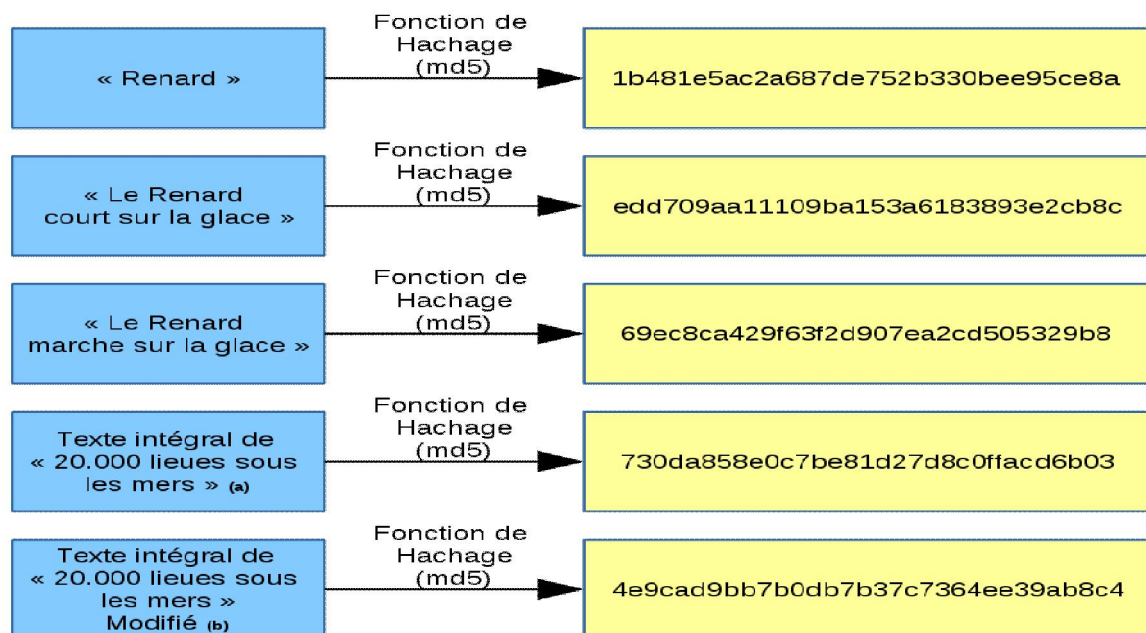
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7. Appendices

Appendice 01: Examples of hashes



Appendix 02: The explanation of Figure 02

In the first step (1) an agent A registers a request to an agent B to write to the blockchain register (e.g. financial transaction, accounting entry, contract, delivery, transfer of ownership...). For this registration, agent A uses software which will transmit the request to users, gathered within a network (e.g. Internet). This entry by agent A is then added to a "block" of information, which gathers the entry requests entered in the register by all users during a certain period. This block is then placed "in queue" (step 2).

The validation of this block and the actual writing of its information within the blockchain will require validation by a consensus of the network users. This validation is the key step of the Blockchain technology (step 3). It is a cryptographic protocol that allows the validation of block information via consensus of the network users. The users who carry out this validation are called "miners".

The latter provide the network with the computing capacity of their computers in order to carry out the cryptographic operations necessary for the validation of information. The purpose of these operations is to enable the identification of blocks of information without revealing their content, which allows the integrity of the entries to be verified.

When the block is validated by the user consensus, it is validated, time-stamped and added to the blockchain (step 4). This validation is irreversible, the block is added in an orderly fashion following the others in the register. This chain of blocks is accessible by all the members of the network (agents A and B in the example of figure 1) who hold the same copy of the information recorded in the blockchain (step 5).

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