

Challenges of Applying Blockchain Technology to the Algerian Financial Accounting System

Les enjeux de l'application de la technologie blockchain sur le système comptable financier Algérien

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Abstract:

This study aims to highlight on the benefits, challenges and limits expected from applying blockchain technology to the financial accounting system in particular. We have concluded that despite the many benefits such as the method of third-party ledger of accounting records through the electronic signature of receipts and giving accounting processes greater transparency and credibility; it is very difficult to apply this technology because the lack of compatibility with current accounting regulations, laws and applications.

Keywords: Blockchain; Technology; Accounting; Triple Entry Ledger; Financial Accounting System.

Jel Classification Codes: M14, M41, O33

Résumé:

L'objectif de cette étude est de mettre en évidence les avantages, les enjeux et les contraintes attendus de l'application de la technologie blockchain sur le système comptable financier. Nous avons conclu que, malgré les nombreux avantages, comme le concept de la comptabilité en partie triple par l'entremise de la signature électronique et donner aux processus comptables plus de transparence et de crédibilité ; qu'il s'avère très difficile d'appliquer cette technologie en raison du manque de compatibilité avec les réglementations, les lois et les applications comptables actuelles.

Mots clés: Blockchain; Technologie; Comptabilité; grand livre à trois entrées; Système Comptable Financier

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1. INTRODUCTION

Blockchain technology is one of the most important innovations of the current century. Many research papers and projects on the Blockchain are focusing on cryptocurrencies. However, this only a small part of Blockchain, which can be applied to many fields including accounting.

The current financial accounting is based on a double-entry bookkeeping system as the registration of any financial transaction affected by two parties, one debited and the other credited at the same value. This double-entry bookkeeping system has provided the reliable double-registered bookkeeping mechanism required within the organization. However, according to blockchain technology, instead of keeping separate records of accounting transactions based on transaction receipts, organizations can write their transactions directly in a common register, through the encrypted digital signature of receipts from a third entity (triple-entry accounting) which reduces the accounting problem about whether or not the receipt exists, creating an interlocking system of permanent accounting records.

Since all entries are distributed and encrypted, which results in the impossibility of manipulation or falsification. The triple entry accounting based on blockchain may open the door to many advantages to the various current accounting systems, especially the financial accounting system applied in Algeria, and here we come to the main problematic of our subject in the following question: What are the challenges of applying blockchain technology to the financial accounting system in Algeria ?

To give answer to our main question, we divided our study into three main axes, where we discussed various concepts about blockchain technology and on blockchain applications in accounting, and then we focused on showing the advantages and the limits of applying blockchain to the Algerian financial accounting system.

2. Blockchain Concept:

2.1 Definition of Blockchain

Blockchain is a technological protocol known also as Distributed

Ledger Technology (DLT) is a public ledger, where groups of transactions or events are recorded and stored in a chain, these transaction groups are called blocks and are ordered on the chain by transaction time. Later blocks are appended to the end of the chain, while maintaining the hash of the previous block, so blockchain enables data to be exchanged directly between different participant - known also as nodes or ledgers - of the chain without interaction of any intermediaries (Inghirami, 2020) (Liu et al., 2019).

Blockchain technology is a way to structure data without the need for a central authority. A blockchain is a distributed database that hosts a continuously growing number of records. The database stores records in blocks and each block is chained to the next one in chronological order using a cryptographic signature; as a result, records cannot be revised, and any attempted changes are visible to all participants. This process allows the blockchain to be used as distributed ledgers, which can be used by anyone with the appropriate permissions. It can also spread across multiple locations, countries, or organizations (Young, 2017).

Blockchain technology has gone through three generations of technological development (Swan, 2015):

Blockchain 1.0 is currency, the deployment of crypto-currencies in applications related to cash, such as currency transfer, remittance, and digital payment systems.

Blockchain 2.0 is contracts, the entire slate of economic, market, and financial applications using the blockchain that are more extensive than simple cash transactions: stocks, bonds, futures, loans, mortgages, titles, smart property, and smart contracts.

Blockchain 3.0 is blockchain applications beyond currency, finance, and markets—particularly in the areas of government, health, science, literacy, culture, and art.

2.2 Types of blockchain:

There are three types of blockchain technology, public blockchain, private blockchain and hybrid blockchain:

2.2.1 Public and permission-less blockchain: The first blockchain

development was permission-less and hosted the Bitcoin cryptocurrency, a non-fiat currency, offering a disintermediation mechanism to safeguard trust between transacting parties, decentralizing and distributing transparent ledgers of transaction data (Helliari et al., 2020). All transactions in these blockchains are public, and no permissions are required to join these distributed entities (Young, 2017) and anyone can join the network and read, write, or participate within the blockchain. Data on a public blockchain are secure as it is not possible to modify or alter data once they have been validated on the blockchain. Bitcoin and Ethereum are well-known examples of a public blockchain (Vijai et al., 2020). However, it has some Disadvantages, for example, a permission-less blockchain, such as Bitcoin, has a speed limit in processing large volumes of transactions, which constrains its large-scale application as compared to the existing payment systems such as Visa and Mastercard. Also, business owners have concerns that distributed ledgers might compromise business secrets (Liu et al., 2019).

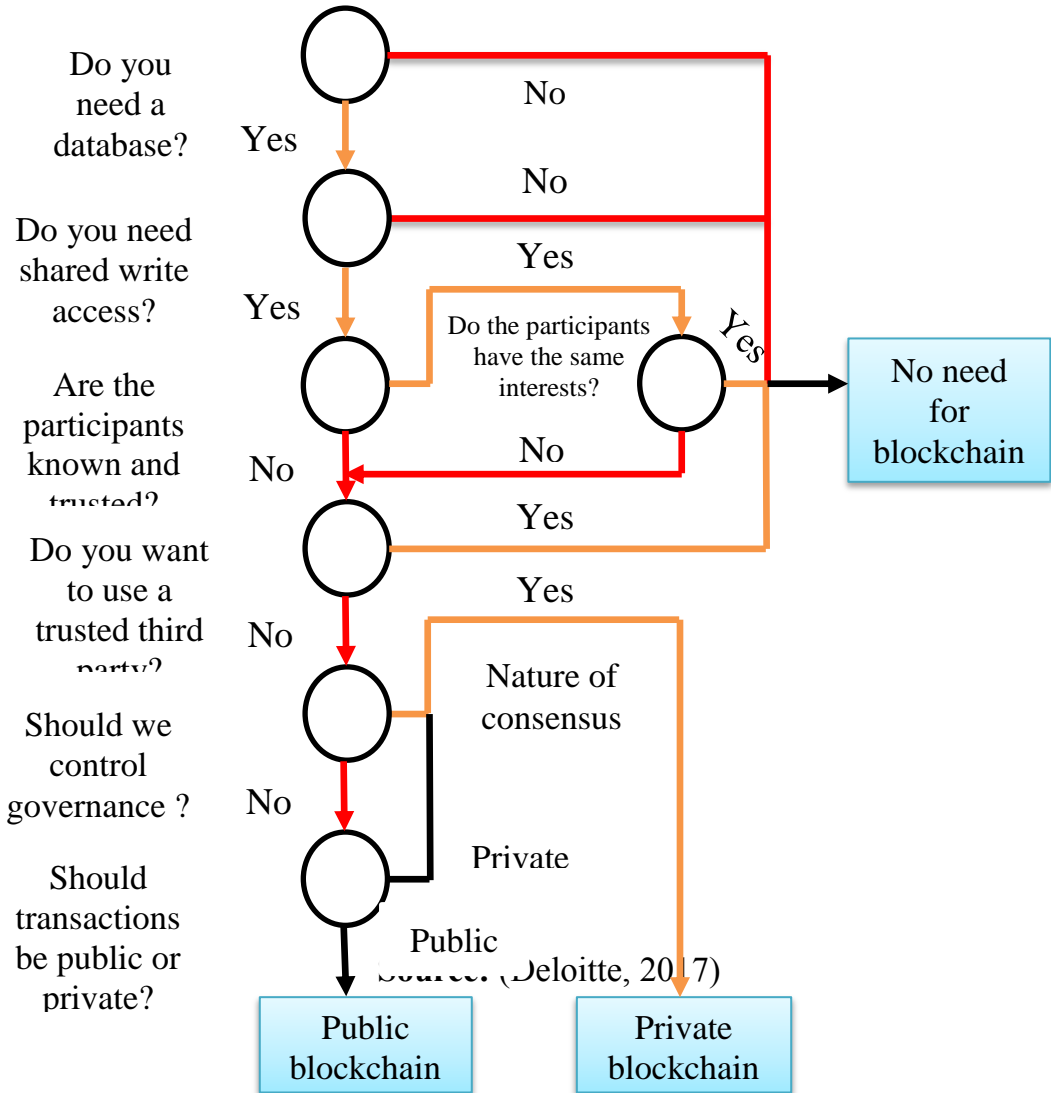
2.2.2 Private and permissioned Blockchains: A permissioned blockchain refers to a type of blockchain with restrictions in its membership and control procedures (Liu et al., 2019), meaning it operates like a centralised database system of today that limits access to certain users. Private Blockchains have one or multiple entities that control the network, leading to the reliance on third parties to transact. A well-known example would be hyper-ledger (Vijai et al., 2020). On one hand, with appropriate deployment of access-control layers, a permissioned blockchain has a greater potential to maintain privacy and fit business governance needs than a permission-less blockchain. On the other hand, a centralized agency with override privileges is allowed in a permissioned blockchain and might undermine the credibility of the blockchain (Liu et al., 2019).

2.2.3 Consortium (Hybrid) blockchain: This blockchain structure can consist of a few organizations. In a consortium, procedures are set up and controlled by the preliminary assigned users (Vijai et al., 2020) which allows for different blockchain (public or private) to communicate with each other, enabling transactions between participants across blockchain

networks (Young, 2017)

To choose the appropriate type of blockchain, whether or not needing this technology. The economic institutions must answer this questions as illustrated in this figure

Fig N° 01: Does we need Blockchain ?



2.3 Applications of Blockchain:

Blockchain technology is finding applications in both financial and non-financial areas that traditionally relied on a third trusted online entity to validate and safeguard online transactions of digital assets (Crosby et al.,

2016) The most well-known area of application of the blockchain is cryptocurrencies as we will see below, but it is also having growing applications :

2.3.1 Cryptocurrencies: Cryptocurrencies is the label that used to describe all networks and mediums of exchange that uses cryptography to secure transactions-as against those systems where the transactions are channeled through a centralized trusted entity (Crosby et al., 2016). The most well-known area of application of the blockchain is cryptocurrencies, There are hundreds of cryptocurrencies, of which Bitcoin - known as BTC when traded in transactions or exchanges - is the first and largest, this cryptocurrency was introduced in paper published in 2008 by Satoshi Nakamoto, it was a concept of a decentralized trustless peer-to-peer digital currency. It was not issued and backed by a central authority, but by automated consensus among networked users (Abreu et al., 2018) The background of Bitcoin is the blockchain technology, a distributed ledger which contains the details for every record processed since the very first one.

The validity and authenticity of each transaction are protected by digital signatures resorting to cryptography, thus the denomination cryptocurrency (Abreu et al., 2018).

Bitcoin prices rose rapidly and more cryptocurrencies appeared, almost daily, and Bitcoins became headline news (Helliard et al., 2020). Adding to the Bitcoin cryptocurrency, the Litecoin blockchain was launched in 2011 followed by Ripple in 2012, and others like Dogecoin, NXT, Peercoin,...

2.3.2 Cryptoassets:

Cryptoassets are digital assets in which cryptographic techniques are used to regulate the generation of units of an asset and to verify the transfer of those units between parties in a decentralized way. The original developers of cryptoassets were FinTech startups. A decade after the emergence of Bitcoin, a boom in both number and type of cryptoassets has taken place (Dimitropoulos, 2020).

2.3.3 Smart contracts: A smart contract is a contract between two or more

parties electronically programmable by a computer and their execution will be automatically via its blockchain, based on the occurrence of events as encoded within the contract, Smart contracts are trustless, autonomous, and self-sufficient. Instead of reinventing contractual relationships, smart contracts are making their formation and performance more efficient, cost-effective, and transparent (Inghirami, 2020). Blockchain accommodates smart contracts by embedding programming code. These programs can execute transactions and create corresponding ledger entries when certain contract conditions are triggered. Self-executing smart contracts allow timing of ownership transfers from one party to another in a decentralized environment (Liu et al., 2019).

2.3.4 International settlement. The existing international currency exchange model is mainly through the accession to Society for Worldwide Interbank Financial Telecommunication (SWIFT). In Ripple system, which is a distributed financial technology based on blockchain technology that enables banks to send real-time international payments across networks. In Ripple, both real and virtual currencies can be exchanged and transferred (Zhiyong Li, 2017).

2.3.5 Trade finance. Blockchain technology could bring the advantages of automation to trade finance by using cryptographic keys and multi-signature wallets, this can create a replacement for traditional trade finance based on physical documents, which are stored on the blockchain as a Smart Contract. The document is updated by blockchain transactions as it moves through the steps of the trade process (Inghirami, 2020).

2.3.6 Capital markets. The exchange is a market for securities transactions, and it needs a transaction registration institution. Because of the features, such as non-modifiable, shareable, anonymous, open source, economic. Hence, an application of blockchain in the securities transaction can notably improve the efficiency of securities registration, issuance, transfer, and delivery (Zhiyong Li, 2017).

The application of the blockchain having growing applications in other industries including (Nicolò, n.d.): big data analysis, Internet of Things (IoT), supply and distribution chain, risk management, copyright management, health, public services, security services,...

2.4 Cost of Implementation:

Based on cost-benefit analyses, organizations will decide whether, to what extent, and how they will adopt blockchain (**fig n°01**). We provide a list of explicit and implicit costs of adoption for organizations to consider (Liu et al., 2019):

- Cost of implementing and maintaining a blockchain.
- Repetition and competition between an existing ERP system and a blockchain.
- Reconciliation between records on a blockchain, other reports, and physical existence.
- Potential information leakage to outsiders, including business competitors and customers.
- Obstruction from managers due to externality of increased transparency.

3. Blockchain Technology in Accounting

The traditional accounting practice comprises of the financial records in private ledgers and relies on accountants to reconcile them against those maintained by the third party counterparts. Records are stored in a centralized location, be it a collection of spreadsheet files or the database of an accounting software application (Vijai et al., 2020). Blockchain is an accounting technology, it is concerned with the transfer of ownership of assets, and maintaining a ledger of accurate financial information (Vijai et al., 2020). Blockchain technology may represent the next step for accounting, instead of keeping separate records based on transaction receipts; companies can write their transactions directly into a joint register, creating an interlocking system of enduring accounting records. Since all entries are distributed and cryptographically sealed, falsifying or destroying them to conceal activity is practically impossible (Inghirami, 2020). So the most significant effect of blockchain for accounting will be to eliminate the very basic data inputting and transaction processing work associated with bookkeeping. With smart contracts able to execute transactions day-to-day interaction, also accountants will need to consider the implications of real-time data since blockchain will simultaneously update once new

transactions are entered into them and distributed—potentially eliminating the need for laborious month or year-end closure practices(Conway & Byrne, 2018).

To explain the notion of Blockchain-based accounting some researchers use the term Triple-Entry Accounting which is described as an enhancement to conventional double entry accounting where the accounting entries of the involved parties are cryptographically sealed by a third entity (Inghirami, 2020).

3.1 Triple-Entry Accounting Using Blockchain Technology:

Modern and today financial accounting is based on a double entry bookkeeping system, a credit/debit mechanism where any entry in an account demands a corresponding entry to a different account. The mechanism of double entry bookkeeping has provided the reliable accounting needed within the enterprise to support the growth of firms since being first documented by Luca Pacioli in 1494 (De Oliveira et al., 2017). In contrast to the classical double entry, Yuji Ijiri in 1986 introduced triple entry accounting, in which he proposed that in addition to the debit and credit entries, a third layer of entries called trebit should be included with a new set of accounts to explain changes of income. The idea of such a ‘triple-entry bookkeeping’ system is to provide more momentum financial information to the organization, enabling better strategic decision-making (Cai, 2019).

In a conceptual framework, the digitally signed receipt can represent a new challenge to double entry bookkeeping. The cryptographic invention of the digital signature gives a strong evidence to the receipt, and reduces the accounting problem to one of the receipt's existence. This problem is solved by sharing the records and make each of the agents has a good copy (Grigg, 2010). The triple entry accounting was more recently popularized when Ian Grigg associated it with blockchain technology. Since the Blockchain is immutable to any data amendment it is impossible to falsify or delete the written accounting entries (Inghirami, 2020). The implementation of Triple Entry Accounting will in time evolve to support patterns of transactions, what has become clear is that double entry does not sufficiently support these patterns, as it is a framework that breaks down as soon as the number

of parties exceeds one. Triple entry is not widely understood, nor are the infrastructure requirements that it imposes well recognized (Grigg, 2010).

In processing terms, it falls short. Double entry book keeping fills in the processing gap, and thus the two will work better together than apart. In this sense, our term of triple entry bookkeeping recommends an advance in accounting, rather than a revolution (Grigg, 2010).

In conclusion, the triple entry bookkeeping contributes to more transparency, trust, assurance, reconciliation and future reference (Gröblacher & Mizdraković, 2019).

3.2 Benefits of Blockchain Based Accounting

The application of Blockchain technology in accounting result to many advantages as the following (Vijai et al., 2020):

- Faster Processes of record transaction in real time.
- High security of transactions with the use of data encryption signature, which make blockchain a tamper-proof and help to reduce internal fraud
- Transparency by allowing blockchain's users to view all transactions on the operating system.
- Simplification in auditing with quick access for books with automated audit trail which reduce an audit's time and cost
- Automation such as self-executing smart contracts.

Also blockchain technology can provides cost reductions by eliminating third-party verification.

4. The Algerian Financial Accounting System and the Blockchain:

In the framework of achieving compatibility with international accounting standards and international financial reporting standards (IAS/IFRS), the Algerian financial accounting system has introduced according to Law No. 07-11 of November 25, 2007. In order to adapt the financial accounting system to international practices that depend on information technology, the legislator issued Algerian Executive Decree No. 90-110 of April 7, 2009, specifying the conditions to maintain financial accounting through information technologies using computers. Algeria has begun implementing the financial accounting system, starting January 01,

2010.

Given that electronic transactions are required, the Algerian legislator issued Law 04-15 of February 01, 2015 setting out the general rules for digital signature and certification,

In the Finance Law 2018, the Algerian legislator referred for the first time to the most important applications of blockchain technology, which are virtual currencies (cryptocurrencies). He established the law No. 17-11 of 27 December, 2017 that defined cryptocurrencies as a virtual currency in which is used by Internet users over the Internet, and it is characterized by its absence Physical support such as coins, banknotes, and payments by check or bank card (The, Official Journal, 2017)

Although the Algerian financial accounting system did not refer to any blockchain application, it does not contradict it, because as we see below, this system is essentially based on the international accounting standards and international financial reporting standards (IAS/IFRS). The IFRS Interpretations Committee (IC) has developed the method of accounting treatment for the main application of blockchain, and concluded that IAS 2 (Inventories) applies to cryptocurrencies when they are held for sale in the ordinary course of business. If IAS 2 is not applicable, an entity applies IAS 38 to holdings of cryptocurrencies (Gaap, 2009).

4.1 Advantages of Blockchain Application on Algerian Financial Accounting system:

4.1.1 Transparency of accounting transactions: According to the article 8 of the law 08-156 the information contained in financial statement must be transparent (The, Official Journal, 2008). All data in the blockchain is open to everyone. In addition to the invisible private information of both parties to the transaction, everyone can query the entire network data in the blockchain database through a public port (Cheng & Huang, 2019). Blockchain's transparency gives visibility to all accounting transactions for approved users, and this may decrease accountants and auditors work with sampling and validating transactions.

Blockchain could enable a real-time, verifiable, and transparent accounting ecosystem.

4.1.2 Digitalization of signed receipt: Article 01/02 of Law 15-04 defines the digital signature as an electronic data in electronic form attached or logically linked to other electronic data used as an authentication method. Also in the article 07 of the same law defines the described digital signature as a normal electronic signature that fulfills some of the requirements mentioned in the article, and in particular that it be created on the basis of a described electronic certification certificate.(The, Official Journal, 2015). The digitally signed receipt, with the entire authorization for a transaction, represents a dramatic challenge to double entry bookkeeping at least at the conceptual level. The cryptographic invention of the digital signature gives powerful evidentiary force to the receipt, and in practice reduces the accounting problem to one of the receipt's presence or its absence (Grigg, 2010) (The, Official Journal, 2015).

4.1.3 Reduction of time seizures for the accountant: If the Blockchain as such does not allow a reduction in accounting entries, the implementation of smart contracts could eventually allow it. Indeed, for example, recurring transactions with suppliers and customers, payment and then the receipted invoice, could be easily managed by this technology using smart contracts. The automation of these tasks could also make it possible to avoid a very large recurring correction work in the accountants such as errors on invoice numbers, transfers entered that do not correspond to the amounts invoiced,... (Desplebin et al., 2019)

4.1.4 Securing accounting data:

Each node or a ledger of the blockchain has a full record of the data that has been stored on the blockchain since its inception. If a single node is attacked, other nodes can still work as usual and even if the data of a single node is tampered with later, other nodes in the whole network fail to verify the transaction, and the data will not be written into the account book of any node, which makes the data untamperable. (Cheng & Huang, 2019).

4.1.5 Real-time update

The data is updated across the network in real time, if any activity occurs at any node in the blockchain system, it will notify the other nodes

by broadcasting the entire network. The economic activity data will also be stored in the account book of the current node and then automatically copied and stored in the ledger of other contract accounts. In other words, all users of the entire network supervise economic activity in a timely manner, thus avoiding problems as they occur (Cheng & Huang, 2019).

4.1.6 Data traceability

This feature guarantees the traceability of data, each node on the blockchain system has all the data within a chronological order since the system was created, which is convenient for managers and supervisors to trace the entire network data according to the timestamp at any node (Cheng & Huang, 2019).

4.1.7 Trustless accounting operations:

Trustless means that the participants involved in the system do not need to know or trust each other or a third party. The Blockchain as a source of trust can also be extremely helpful in today's accounting structures. It can be gradually get integrated with typical accounting procedures, starting from securing the integrity of records, to traceable audit trails (Inghirami, 2020).

4.2 Limits of Application of Blockchain n Algerian Financial Accounting System

As we see before, blockchain is a promising technology; however, there are some limits and risks due the application of this technology.

4.2.1 Incompatibility of accounting software to blockchain technology:

Most accounting softwares are not compatible with blockchain technology. So even if organizations are ready to put in this technology, record-keeping softwares probably are not interested in playing along. Adoption will require purchase of cloud-based accounting services as they become available, and possibly hiring a blockchain developer to create custom user interfaces for your firm. As more and more blockchain accounting platforms emerge to fill this new market, cost-effective solutions will help reduce the need for custom-designed blockchain (Vijai et al., 2020).

4.2.2 Government Regulations:

The world of blockchain is still autonomy, to avoid illegal activities it needs regulations and laws, specially the cooperation of different countries, when

international trade occurs. In Algeria, the main application of blockchain in which is cryptocurrencies has been totally prohibited as mentioned in financial law of 2018 (The, Official Journal, 2017)" The purchase, sale, use, and possession of so-called virtual currency are prohibited". A virtual currency is one used by Internet users over the Internet. It is characterized by the absence of physical support such as coins, paper money, or payments by check or credit card.

Any violation of this provision is punishable in accordance with the laws and regulations in force.

4.2.3 Changing the way and the behavior of accounting:

Changing the double entry system to triple entry system is a one of the highest challenges to the actual Algerian financial accounting system. In the world of non-tangible trusted third parties introduced by blockchain, both accountants and customers need to get used to the fact that their electronic transactions are safe, secured and complete (Crosby et al., 2016).

4.2.4 Scaling:

Scaling blockchain systems also presents a challenge for accounting financial system users, as it is very important that blockchain systems can scale efficiently as the number of transactions increase (Walsh et al., 2020). For example first executing a blockchain transaction need to have to go through downloading the entire set of existing Blockchain and validate before executing this first transaction. This may take hours or longer as the number of blocks increase exponentially (Crosby et al., 2016).

4.2.5 Fraudulent Activities:

Even that blockchain is a secured technology as we've seen that in advantages, given the pseudonymous nature of Blockchain transactions, coupled with ease of moving valuables, fraudsters may use this technology for fraudulent activities like money trafficking. That said, with enough regulations and technology-support, law enforcement agencies will be able to monitor and prosecute these individuals (Crosby et al., 2016).

5. CONCLUSION

From what we have seen above, blockchain technology can revolutionize accounting. It has the ability to change the practices and skills

of future accountants by giving accounting processes greater transparency and credibility with the possibility of tracking information in real time through real-time update and thus reducing accounting processing time and facilitating audit procedures. The use of distributed bookkeeping can effectively avoid the disadvantages of double traditional bookkeeping, thereby significantly improving the efficiency and accuracy of bookkeeping.

The adoption of blockchain technology to the financial accounting system can bring it all the positives we have mentioned before. However, given the limitations of application in real world, blockchain technology remains disabled because of the complete lack of implementation conditions. The incompatibility of accounting applications that support this technology, conflicts of some blockchain applications with the current legislative laws, technological delays in Algerian economic organizations,... in addition to the aforementioned flaws, all this reasons limiting the possibility of exploiting this technology in accounting at least for time being.

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