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BLOCKCHAIN TECHNOLOGY AND APPLICATION – SMEs ASPECT

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Abstract

This review article is designed for SME owners and directors to understand better what blockchains are and how they work and to support them to start an entirely new blockchain or fork an existing one and create a new token. The article presents technology bases and how blockchains can serve SMEs and foreseeable challenges that could jeopardize the achieved results. Particular attention the authors paid to blockchain applications, transaction cost reduction, and sensitive business information security. Even more attention the authors gave to the challenges connected with digital infrastructures and business practices, investments, lack of interoperability, lack of skills, and legal aspects. Chapter four discusses the creation of blockchains for SMEs from the aspects of choosing a type of blockchain, choosing of consensus mechanism, a platform selection, nodes design, operating systems, instances design, application programming interfaces, and user interfaces, and the blockchain finalizing. In chapter five, Conclusions, the authors draw conclusions based on the work presented in the article.

Keywords: *blockchain, hash, non-fungible token, IIoT, artificial intelligence, distributed ledger technology, operating system*

1 INTRODUCTION

Thanks to cryptocurrencies, blockchain technology has recently become the focus of interest of both scientists and the public. (Cekerevac & Cekerevac, 2022) Although many authors have published their articles about blockchains in the last 30 years, most of the public, even scientists, are not familiar with blockchains. That would not be significant if the founders and directors of SMEs were not in that group. Ignorance of blockchain technology at this moment can be an aggravating factor in the development of SMEs.

For ease of understanding, one can look at blockchain as a computer operating system suitable to run different business applications, but more professionally speaking, blockchain is *a distributed ledger that facilitates the process of recording transactions and tracking assets in the business network SMEs and their connection to the Internet* (Gupta, 2017). By the term blockchain, we will understand a distributed

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database shared among the nodes of a computer network. The main difference between a classic database and a blockchain is how data is structured. The databases collect data and keep them in tables, but blockchains collect information in blocks. (Cekerevac & Cekerevac, 2022) Blockchain is the secure decentralized database technology that allows each node on the network receives valid information about a transaction, confirm it, update, and register it. The most popular record of the blockchain, de facto, becomes the official record. It is worth adding that blockchain technology does not have a centralized server but distributes the data to all nodes.

Due to the characteristics of blockchain technology, products based on it can become widely used tools to ensure the protection of sensitive data, but also to increase trust between business parties. Medium and small businesses and entrepreneurs are most interested in blockchain-based applications outside the financial services sector, especially in sectors such as healthcare, business services, logistics, and retail. In these areas, SMEs can participate as participants in the chain and as service providers in the creation and chain maintenance. If we ignore cryptocurrencies, which are not the subject of this paper, at the time of writing, most SME and blockchain projects were still in the early stages of development or before commercialization. Although the potential is high, no application based on distributed ledger technology (DLT)[1] has been widespread until now.

Blockchain technologies provide SMEs with opportunities to reduce information asymmetries and transaction costs and can help them overcome the challenges of scaling, opacity, and lack of business history, making it easier for them to trade and access finance. SMEs and startups can also benefit from blockchain due to greater efficiency and quality of products and services, improved supply chain management, and innovation in business models. The precondition for all this is the existence of appropriate digital infrastructure. It is expected that the growth of the Internet-of-things (IoT) will accelerate the implementation of blockchains.

However, the development of an application of blockchain technology does not depend exclusively on SMEs and companies in general. In addition to the insufficient readiness of SMEs to adopt new technology, there are a lack of interoperability in different systems, limited access to high-speed digital infrastructure, and uncertainty about legal responsibilities. Regulatory attention first focused on digital assets and then on the DLTs used in production and services. The governments have recently begun considering ways to promote the industrial application of DLTs. Several governments have started to design their national blockchain strategies. (OECD, 2021)

2 BLOCKCHAIN TECHNOLOGY

If we simplify what we wrote in chapter 1, a blockchain is a database replicated over a peer-to-peer network. One notable feature of the blockchain is consensus.

Multiple parties, network nodes, can continuously reach their consensus on the new blocks of information creation and then add them to the data chain. The data entered in the chain are immutable. That means that they cannot be altered but can be added. That ensures the integrity of the chain. The newly updated chain is stored in all nodes on the network. The consensus finding begins with adding the next block of information. People often call it a distributed digital ledger because they can use it to store any information (including transactions and values) in an unalterable public record distributed among all nodes. The DLTs' key technical components programmers developed in cryptographic research over the past decades. (OECD, 2021)

The principles of blockchain work are explained in literature many times. One good source is the book *Blockchain for dummies* (Gupta, 2017). For SMEs managers it is appropriate to explain blockchains on the example of Bitcoin:

Step 1 – Transaction data.

Each block in the Bitcoin blockchain contains approximately 1MB of data. That blockchain consisted of 417.59 GB of data on July 21, 2022.

[1] For simplicity, the *DLT* and *blockchain* we use interchangeably, although blockchain is a sub-set of the DLTs.

(YCharts, 2022) Twelve years before, in April 2010, the blockchain contained 0.01GB of data (Best, 2022).

Step 2 – Changing the blocks.

When the first block was closed, it received a unique signature. Any future change causes the creation of a new block that will include that signature and create a new one, and so on, as shown in figure 1.

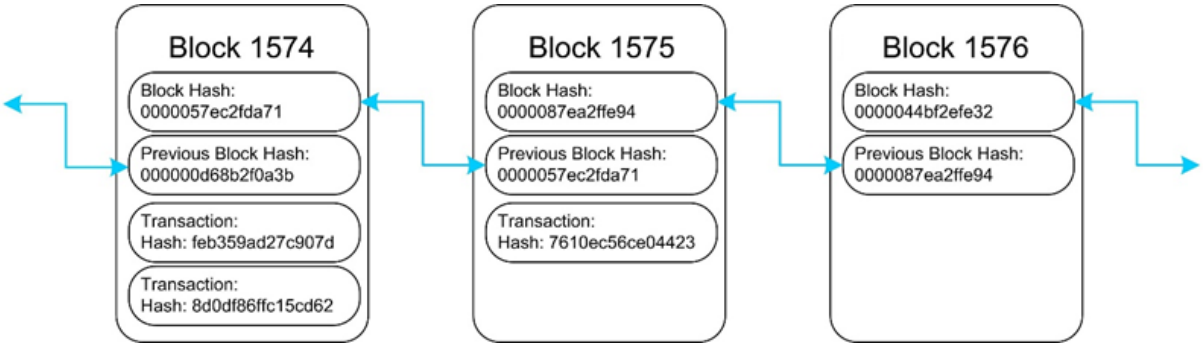

Fig. 1 Blockchain stores transaction records in a series of connected blocks
Source: (Gupta, 2017)

Step 3 – Creating the signature (hash).

In the blockchain, this signature is created by a cryptographic hash function, a very complex formula that any input string transforms into a unique 64-digit string. Only hashes (signatures) that meet requirements are accepted on the blockchain. (Jimi, 2018)

Step 4 – Signing a block and signature qualifying.

The block will be accepted on the blockchain only if its digital signature meets the set conditions. For example, only blocks with a signature that starts with at least ten consecutive zeros are eligible to be added to the blockchain. Each data string has only one unique hash associated with it. What happens if the signature (hash) of the block does not start with ten zeros? To find a signature that meets the requirements the trial-and-error method is applied to change the block data until that specific data string leads to a signature that starts with five zeros. Since transaction data and metadata (block number, timestamp, etc.) must remain unchanged, a small random number is added to each block. That number has no purpose other than to change to find the appropriate signature. That data is called the nonce block. (This is what the Bitcoin miners do.)

Step 5 —Make the blockchain immutable.

Each block change will separate it from the following blocks. If someone tries to falsify a block, he needs to change it and tie it to the next block again. That requires every block that comes after it gets a new signature that should also meet the set conditions! Giving new signatures to all these blocks is very expensive and time-consuming, although at first glance it does not seem impossible. What makes that action impossible is that also the rest of the network calculates new signatures for new blocks. So, a corrupt miner would have to calculate new signatures for all blocks added up to the end of the chain. To achieve this and catch up with the latest transactions, a malicious miner must have far more computing power than the rest of the network. Otherwise, it will never catch up with the rest of the network in finding signatures. In the past, when the blockchain was much shorter such attacks (called *a 51% attack*) were possible, but now it is completely unprofitable.

Step 6 - Blockchain management.

Blockchain follows a democratic model of governance. It updates its transaction log according to what most users say is true. It does this automatically by always following the record of the longest blockchain it has because it assumes that this chain represents the majority. That is, at the same time, how the modified block is automatically rejected by most of the network because it is not tied to the longest chain. The transaction history is public on the blockchain. Anyone can look for any wallet or transaction that ever happened from the very first transaction.

Step 7 - Where are the cryptocurrencies here?

Cryptocurrencies are a modified form of bitcoin. Most cryptocurrencies are built on their blockchain protocol. They are essentially money; however,

they can be assigned another function depending on their issuer. They can be called *tokens*. These tokens can give owners the right to *something*, i.e., any type of value can be associated with a *cryptocurrency* token. Blockchains are not limited to the registration of tangible assets. They have the potential to securely register data in the form of medical records, identities, historical records, tax records, etc.

To summarize, because the DLTs distribute data among the nodes of a network and each of them stores the complete history of transactions such databases are secure without requiring that any participant in the network trusts another. In addition to security, the distributed nature of the blockchain significantly reduces the problem of single-point errors and failures because multiple nodes retain identical data. Transactions can range from simple (e.g., property rights transfer) to complex (e.g., smart contracts[2] with automatic transfer of digital assets upon agreed terms meeting).

3 CREATING A BLOCKCHAIN

3.1 Choosing the blockchain type

The different blockchain protocols and architectures can be adopted when developing a blockchain-based application, but the decision about the blockchain type is also significant. The designer can choose between two groups:

- the public blockchains, or
- the private blockchains.

The first group corresponds to the principle that every user has the right to read and write without special permission. The records verification would be according to the consensus protocol, as with Bitcoin, Ethereum, etc. A subvariant would be read-only, where everyone has the right to read the record, and only authorized users can add blocks to the chain, as in the case of Sovrin[3] and European Blockchain Services Infrastructure[4].

The private blockchains can be organized as a consortium or an enterprise. In the consortium blockchain, only consortium partners can read and write data. Some examples are Hyperledger Fabric and Quorum. The enterprise blockchain forms at the enterprise level, and the central administrator grants read and write permissions.

In addition to these basic groups, depending on the needs, also hybrid solutions can be formed, which increases the number of potentially different groups.

The SMEs can either create their private or join the blockchain of their larger partners.

3.2 Choosing of consensus mechanism

After choosing the blockchain type, the company should choose a consensus mechanism by its needs. There are different consensus mechanisms, and it is crucial to choose the one that will be optimal for the needs of the goal of a particular company. The most popular is Proof-of-Work (PoW) mechanism, but it is not ideal for SMEs because it is a huge energy consumer and requires powerful hardware. The blockchain creator must study the other DLT systems (e.g., Hyperledger, Quorum, Corda…) and consensus mechanisms (Proof-of-stakeholder, Proof of Elapsed Time, Byzantine fault-tolerant, Federated Consensus…) to determine which will best suit the set project task.

3.3 Platform selection

It is not to expect SMEs to develop a platform for their specific needs on which they will implement their blockchain. It is best to choose one of the existing ones. Choosing is not easy because each platform has its specifics and offers something that others do not (still). It is certain that over time and through further development, they will be more unified, but this is not the case now. That is why SMEs need to find a platform that will suit their needs and available budget. The offer is excellent. A website *101 Blockchains* (2020) recommends Corda, Ethereum, Hyperledger Fabric, Hyperledger Sawtooth Lake, Hyperledger Iroha, Quorum, Stellar, OpenChain, BigChainDB, and others. For businesses, it especially recommends

[2] Stored on blockchain ledgers (e.g., Ethereum), smart contracts between two or more parties are simply programs stating reciprocal obligations that run when predetermined conditions are met.

[3] See (Sovrin, 2022)
[4] See (EC, 2022)

Hyperledger Fabric 2.0 and Hyperledger Fabric Use Cases and Case Studies.

3.4 Nodes design

After choosing the consensus mechanism and platform, it is necessary to design the nodes. An important decision is whether the nodes will be in the cloud or the company locally. Hybrid solutions are also possible, a part in the cloud and the rest in the company. It is necessary to define the minimum hardware requirements for the in-the-company-located part. The solution is influenced by the chosen blockchain type and the consensus mechanism.

3.5 Operating systems

After selecting the hardware, the SME must decide on the choice of the operating system in which the nodes will work. Free OS based on Linux and paid Windows are available, and several specialized blockchain OSs are also.

As with traditional operating systems, blockchain OSs introduce a layer beneath the software to make interfacing with the hardware easier. In this case, the hardware is blockchain. Such OSs offer benefits in security and privacy and deregulated decentralized OS use. They intend to facilitate easier development and a better user experience. The concept is new and emerging, and its real-world use is still limited. But we will see thousands of devices running on such blockchain OSs very soon. Some of the blockchain OSs are (Sharma, 2022):

- *ConsenSys Codefi* – This operating system is a product suite with the modular capability to digitize financial instruments focused on being an easy-to-use tokenization system for finance, such as payment systems, data analytics, and more.
- *EOSIO* – is a multi-purpose platform for decentralized application creation and operation (Dapps). Using the EOSIO, users can create scalable databases on the network and open accounts with low fees, large transaction velocity, minimal risk, and maximum profit. (eosio, 2022)
- *Overledger OS* – is an operating system that enables connecting or interoperating with any network, and every current and future blockchain, without extra overhead. It is an interoperability platform for bridging multiple blockchains and supports up to 10 popular blockchains, including Hyperledger Fabric, Corda, Ethereum, Bitcoin, EOS, and Ripple. As an enterprise OS, it interconnects blockchain enterprise platforms and networks. (Seq, 2019)
- *LibertyOS* - Creators claim it to be the operating system focused on user privacy, security, speed, stability, and accessibility without ads. It offers vast libraries of software and applications for usage in production, business, gaming, web surfing, and more. LibertyOS is probably the closest to an *operating system* in the way most people think (Bussler, 2022).
- *TRON* – is a decentralized, open-source blockchain-based operating system that comes with smart contract functionality and a cryptocurrency called Tronix (TRX). (Sun, 2022)

There are several blockchain operating systems, but they all are in their nascency. It is expected that there will be years, even decades before they stabilize their position in the market. It is all logical because the classic systems needed decades to be developed and are still under development. However, the adoption of new technologies is accelerating. It is especially true for blockchains whose adoption is faster than IoT and AI[5].

We witness the growth of the blockchain OSs, and it is likely that moving into 2025, blockchain will incorporate complementary technologies, from IoT to AI and decentralized self-sovereign identity (SSI). (Panetta, 2019)

3.6 Blockchain instance design

Instance creation and management are done based on the chosen platform. Here, SMEs can configure different aspects of the instance, including asset issuance, asset re-issuance, permissions, key management, atomic exchange, native assets, key formats, block signatures, and more. This step is crucial, and SMEs should take the proper time to design the blockchain instance.

[5] AI – artificial intelligence

3.7 Application Programming Interface and user interface

When the blockchain instance is up and running, it is time to manage the application programming interface (API). Some platforms offer pre-made APIs, but some platforms might not offer them at all. SMEs need them to perform audit-related functions, generate key pairs and addresses, and for data retrieval and storage, data authentication using hashes and digital signatures, and smart contracts.

To be useful, blockchain needs to have appropriate, friendly interfaces for the admin and the users. For the admin interface, blockchain needs to provide as much information as possible but not overwhelm the interface with unnecessary information. For the user, SME can decide to showcase a piece of significant information only. Additionally, if the users are KYC[6] users in a permissioned network, the blockchain can show them their status with the network, their roles, and other vital information. Programmers can use any of the front-end programming languages out there, i.e., HTML5, CSS, C#, PHP, JavaScript, Java, etc. (101 Blockchains, 2020)

Managing smart assets includes payment, issuance, escrow, exchange, and retirement.

3.8 Blockchain finalizing

Blockchain needs to meet the current and future SMEs' needs. It must be reliable, adaptable to new requirements, and scalable. It is likely that over time business conditions will change together with blockchain requirements. The blockchain must be constantly monitored and maintained to be protected. New elements, such as analytics, cloud, artificial intelligence, and so on, should be added to it.

4 SMEs AND BLOCKCHAIN – OPPORTUNITIES v CHALLENGES

Although blockchain technology is the most frequently used for cryptocurrency transactions, there are no obstacles to using it for other purposes. Storing information on legal contracts, inventory of products and warehouses, transport of goods monitoring, supply management, various identifications, etc., are activities where SMEs can see their applications. Given the potential of blockchain, now almost everyone who has an entrepreneurial spirit, and understands blockchain, is trying to devise some application of blockchain in society and work. (Cekerevac & Cekerevac, 2022) In this respect, startups play a significant role. Tens of thousands of applications are being developed or under development. The 10,397 cryptocurrencies were active in February 2022. (Statista, 2022), and more than 19,000 in Jun 2022 (Kharpal, 2022). According to the same source, for comparison, in 2013, there were 66 cryptocurrencies.

Now, it is hard to point to a single application based on the DLTs that has already been widely used in business. The reason is the fundamental change in the organization of company data and the cautious approach of stakeholders in the private and public sectors. As stated in a 2019 survey of executives of large companies worldwide, *Implementation* (replacing or adapting existing legacy systems) (30%), *Regulatory issues* (30%), and *Potential Security Threats* (29%) are the main barriers to the adoption of blockchain solutions. Interestingly, these percentages are lower than in 2018 (36%, 39%, and 35%, respectively), pointing to an increased trust in the new technology (Pawczuk, Massey, & Holdowsky, 2019). It comes the time when companies will no longer ask whether to use DLTs, but how to apply blockchain in their business.

If one analyzes the position of SMEs in the blockchain applications area, one can find that, due to limited resources, SMEs are the most vulnerable part of all companies. Blockchain technology can help them overcome ongoing challenges, such as access to finance and intellectual property protection, and cyber-security.

4.1 Opportunities for SMEs' blockchain usage

The nature of startups allows them to explore different applications and create innovative solutions. It is hard for an SME to create an adequate blockchain, but Blockchain-as-a-Service (BaaS) providers have also emerged

[6] KYC – Know Your Client, or Know Your Customer

offering their platforms. They provide cloud infrastructure and management for companies developing DLTs applications. BaaS providers run the back-end operations of the blockchain system, allowing entrepreneurs and startups to focus on their applications. That way, the SMEs can use the specific features of blockchain technology without massive investments in DLTs development. It is enough to have an idea and to understand this technology. New companies offering blockchain-based services are being encouraged in many countries and various sectors. The cases of Israel and Italy, presented in the (OECD, 2021), can serve as examples.

SMEs in the fast-growing blockchain industry have their chance primarily outside the financial services sector. Startups can develop Proofs-of-Concept (PoCs) blockchain solutions in multiple sectors, such as healthcare, environment, cybersecurity, supply chain management, international trade, digital identity, creative industries, voting, and more. (Cekerevac & Cekerevac, 2022)

The adoption of blockchain applications requires the provision of conditions, capabilities, and incentives. It has been proven that the adoption of digital technologies leads to increased productivity at the enterprise level. However, for a company to adopt internet technologies, it is necessary to have access to the appropriate physical infrastructure (e.g., high-speed internet connection) and to have a quality product, a good management team, adequate organizational capital, and workers with the appropriate skills. Most of the new BaaS platforms possess features that make them particularly viable for applications by SMEs. The BaaS providers manage all the back-end management and offer *ready-to-go* platforms without additional investments.

4.1.1 Transaction cost reduction.

The transaction- and agency costs always follow the classic transactions. For many, reducing costs is a major short-term benefit of adopting blockchain-based systems for businesses. Blockchain technology allows companies to reduce costs by removing intermediaries and reducing administrative efforts to keep records and reconcile transactions. The additional benefits of the technology are reflected in reduced verification costs and lower networking costs (no need for control by a centralized intermediary). These cost reductions enable efficiencies in, for example, data ownership, privacy, licensing, and monetization of digital content. Non-fungible tokens[7] (NFTs) can serve as an example of the monetization of digital content.

4.1.2 Sensitive business information security.

Business security has always been relevant, and with the growing importance of information, it is becoming increasingly important. The digital transformation of business and *teleworking* is accelerating this. Blockchain enables the creation of new methods for securing data storage and transmission. The decentralized, untrustworthy, and equitable structure of the network makes these methods inherently resistant to malicious digital attacks. In addition, blockchain technology is characterized by storing time-marked data/transactions in chronological order in distributed networks that are protected from interference and cannot be changed, because the information is stored/published separately in each node of the network. This feature makes the blockchain suitable for a variety of IoT applications for large logistics and transportation systems and business and analytical applications that use machine learning[8] and advanced AI for data analysis.

There is no doubt that blockchain technology can be used in large supply chains efficiently, but this technology can also increase the operational efficiency of SME supply chains. It can simplify processes and help eliminate errors by making processes more transparent, reducing the number of physical documents, and increasing consistency among information sources. Smart contracts can help optimize order management, deadlines, and delivery and limit delays in debt collection. However, to take full advantage of the

[7] Non-fungible tokens are digital files based on blockchain. Although the digital files themselves are infinitely repeatable and accessible to anyone, the NFTs that represent them are tracked on their core blocks and provide customers with proof of ownership of the NFTs.

[8] Machine learning is a methodology used to train Artificial Intelligence algorithms.

use of blockchain in IoT devices' management, it is necessary to overcome current limitations, such as storage capacity and blockchain scalability. (J.Taylor, Dargahi, Dehghantanha, Parizi, & Choo, 2020)

4.1.3 Automatic contractual obligations enforcement.

Smart contracts can enable SMEs to facilitate contracts with third parties. The use of cryptographic rules and mathematics increases trust in the system's operation. The characteristic of this application is that the contracting parties can agree that after fulfilling a certain condition, the transfer of digital funds will be instantaneous. This *algorithmic enforcement* of the contract is very favorable for the management of SME claims. Such agreements SMEs can apply in the trade but also the protection of intellectual property rights and the issuance of digital certificates of authenticity. (OECD, 2021)

4.2 Challenges for the SMEs' blockchains usage

Like any new technology, a blockchain brings several challenges that could jeopardize the potential benefits. Because blockchain technology relies on the Internet, the precondition of all preconditions is that SMEs have access to high-speed internet.

Further, factors such as regulatory compliance, technical scalability, mistrust among consumers, and acceptance of well-established business practices significantly influence the mass adoption of blockchain technology by small businesses.

4.2.1 Digital infrastructures and digital business practices.

A broadband connection is crucially significant for SMEs to participate in blockchain networks. Research about SMEs' digitalization showed a relationship between digital technology integration into SMEs and their internet connection according to the parameters included in the dimensions *Integration of digital technologies* and *Connection to the Internet* of the IDSME 2018 index. (Bogavac & Cekerevac, 2019) The authors found no strong relationship between the size of SMEs and their connection to the internet. (Bogavac & Čekerevac, 2020) In 2020, more than 90% of SMEs in the OECD economies had access to the Internet, but there remained businesses that were less connected or lacked the adequate speed of connection for effective blockchain adoption. For instance, data showed that access to high-speed connection (at least 100 Mbit/s) for European medium-sized firms has risen from 7% in 2011 to 23% in 2018.

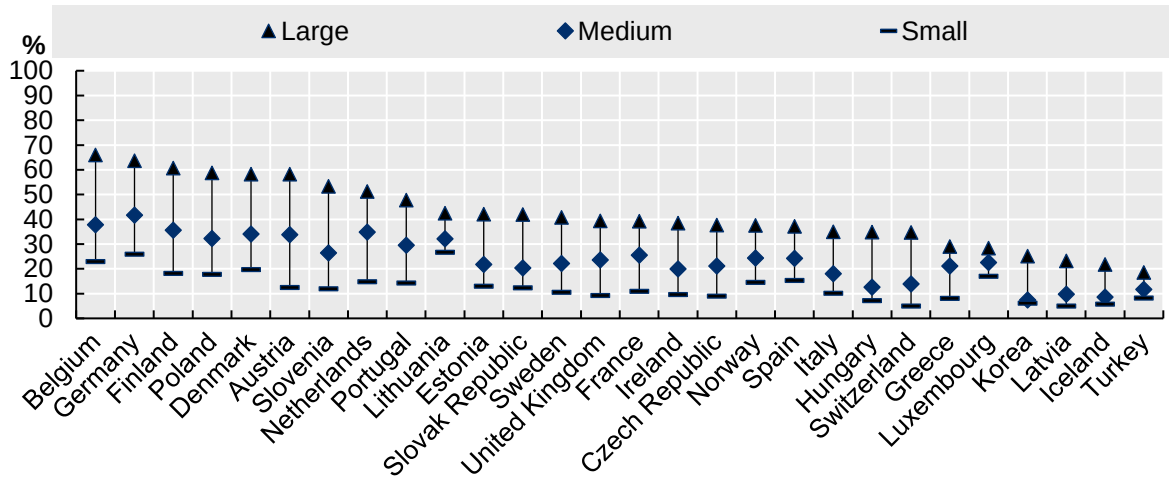

Figure 2. Businesses that share supply chain management (SCM) information with suppliers and customers electronically

Source: (OECD, 2021B)

Even in developed countries like the UK, three out of five SMEs in 2020 did not have access to high-speed internet (Jones, 2020). The gaps between small and large firms are widening. For example, in Finland, Denmark, and Slovenia, 82%, 86%, and 59% of large firms had access to high-speed

connections in 2018, as compared to 26%, 40%, and 15% of small firms, respectively (OECD, 2019). A complementary digital infrastructure is also required for blockchain adoption in business processes, and SMEs do not always have easy access to them. A noticeable gap exists between large and small businesses in the adoption of systems that enable data sharing digitally. For example, we can consider sharing supply chain management information electronically with suppliers and customers shown in figure 2. The gap amounts to 29% on average across the OECD area and up to 40% in some countries (OECD, 2021B).

The recent introduction of 5G networks will improve the situation with SMEs' access to a high-speed internet network.

4.2.2 Investments.

Blockchain technology implementation requires investments. In the case of supply chains, companies must invest in the industrial Internet of Things (IIoT) and other digital technologies to ensure data quality. Errors are unacceptable because any eventual correction brings increased costs due to the nature of the blockchain. To provide quality data, they need to be correct at the time of generation. To avoid human error and increase data accuracy, it is best to generate and enter data digitally, using IIoT sensors. The IIoT sensors are designed for harsher conditions and safer operation. They are protected from improper and/or malicious use, better than the IoT sensors. Consequently, they are more expensive, which can burden SME accounts. However, the lack of readiness to adopt the IIoT could cause limiting the participation of interested SMEs in supply chains.

4.2.3 Lack of interoperability.

As there is no standard for industrial blockchain networks, and blockchains are being adopted *en masse*, the ecosystem remains fragmented. The current blockchain projects are limited in scope, involve a small group of users, and are usually vertical. The supply chain monitoring applications are often tailored to the manufacturers of final products, so they only track actors who communicate directly and indirectly with the manufacturer. A similar situation is with projects in the agri-food sector.

The lack of interoperability is not specific only to individual blockchain ecosystems. There have been such situations at a much higher level, e.g., in the case of the EDI standard (Electronic data interchange[9]). Due to differences in premises and authors of individual blockchains, a lack of interoperability occurs. That can be an increased challenge for SMEs. Using Application Program Interfaces (APIs) can support interoperability, but enterprises would still have to rely on intermediary entities to obtain and exchange data between networks. No doubt improved interoperability would facilitate the application of blockchains in SMEs because companies involved in different ecosystems must use several applications now. An aggravating circumstance is that companies that work with one system due to low interoperability between blockchain platforms find it hard to decide to replace the existing platform with a more efficient one.

4.2.4 Lack of skills.

As mentioned in the introductory chapter, the vast majority are unfamiliar with blockchains and what they offer. The transaction costs reduction and increasing accountability can be evident, but it is much harder to build trust among possible users. For example, for an application of a blockchain system, it is necessary to ingrain into business processes all stakeholders, and they all must accept it. In the global level chains, dozens and dozens of entities must participate. Small companies often do not have the capabilities to understand the system and use it. This means that only the larger stakeholders can decide to shift toward blockchain and then include all other participants in their supply chain.

4.2.5 Legal aspects.

Any advantage of blockchain technology can be a disadvantage at some point. The DLTs provide excellent safety and reliability with their security and transparency. However, there can still appear to be fraudulent behavior that could jeopardize intellectual property and sensitive data protection. Due to the characteristics of the blockchain and resistance to unauthorized use, a lack of proper technical knowledge on how to manage the

[9] See (TX2, 2020)

system (e.g., poor key management) or carelessness can lead to unsolvable problems if something goes wrong. No one knows how many cryptocurrencies remained locked in wallets because the owners lost or forgot the access data. Blockchain relies on decentralized ownership and a network distributed worldwide. That can lead to complications in the event of litigation when it comes to identifying a responsible jurisdiction. Encryption and possible anonymity of users, two key characteristics of the technology, hamper the legal responsibilities identification. That implies blockchain transactions of non-digitalized assets require legal consideration and off-chain settlements, which can be particularly burdensome for SMEs. In the case of smart contracts, algorithmic accountability and the reliability of automated systems pose additional challenges.

5 CONCLUSIONS

Based on the analysis, one can conclude that there is a wide field of possibilities for blockchain technology applications. One of the significant applications is the application in the field of finance and cryptocurrency payments. Due to the small amount of money on the market, it is highly sensitive to any significant change. Now, it largely depends on banking events, the development of the economy, and the development of the fiat money market. With the increase of the share of cryptocurrencies in the total available money, the market will be more stable.

The possibilities of applying blockchain technology in other areas are much wider. The advantages, such as reducing transaction costs, protecting sensitive information, providing a timeline, and others, enable the successful application of blockchain technology in supply chains, transport, tracking inventory in warehouses, protecting facilities, etc.

It is necessary to provide investments, high-quality digital infrastructure, uniform legislation, trained staff, and standardization of all aspects of blockchain technology to take advantage of the technology benefits.

In the end, we cannot avoid asking whether what blockchain technology provides is possible to do with the systems already in use and whether blockchain technology was needed at all. The answer might be yes, it can be done, but blockchain technology has made things move by searching for better solutions.

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