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Applied Perspective to Blockchain Across Multiple Domain :A Study

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Abstract: We are moving towards digitalization and the most common term which comes to everyone's mind while talking about the same is," currency". To support this, we have 'Bitcoins', Bitcoin is a type of digital currency that can be exchanged on the Blockchain, the shared ledger technology. In this paper, we present a non exhaustive list on the state of the art about Blockchain technology in multiple application fields, both from an industry and business perspective and from a consumer one. Countries are shifting towards digital currencies i.e., an initial application of blockchain. It omits the need of central authority by its distributed ledger functionality. This distributed ledger is achieved by using a consensus mechanism in blockchain.This paper presents a comprehensive overview on blockchain technology across multiple domain.

Keywords: Shared-ledger, bitcoin, blockchain, , Cryptocurrency, Smart Contracts.

1. INTRODUCTION

Blockchain is a revolutionary paradigm that has introduced new concepts into securely sharing data and information. This modern technology consists of a chain of blocks that allows to securely store all committed transactions using shared and distributed networks [1,2]. To fulfill this goal, several basic technologies are adopted, such as the cryptographic hash function, distributed

consensus algorithms, and digital signatures. All transactions are carried out in a decentralized way, removing the need for any mediators to confirm and verify them.

1.1 Working Flow of Blockchain

The information in a blockchain is stored in cryptographically encrypted chunks known as blocks [12]. The next successive block contains information about the previous block and hence forms a chain. Thereby it gets its name. Each block in a blockchain contains a unique hash, transaction data and hash of the previous block. The initial block is known as genesis block. A genesis block does not contain a previous hash. Participants of the blockchain network can be organizations, individuals or institutions which share a copy of the ledger that contains their valid transactions in a sequential manner [13]. The new transactions are added to the existing records by consensus of the miners participating in that network. To validate the transactions, miners have to implement the blockchain's algorithm in order to be rewarded with a native token as per existing economic consensus mechanisms like proof of work, proof of stake, etc. The fastest miner validate each transaction in a block and add it to the blockchain. In bitcoin, miner nodes take approximately 10 minutes to validate and add to the blockchain. A miner is selected from a pool of miners using a proof-of-work (PoW) consensus mechanism [14]. A blockchain uses a consensus mechanism to allow the miners to agree on a single value. After successful validation by all the miners in the blockchain network, the block is added to the blockchain. The miner obtains a transaction fee and new block addition fee in case of PoW [15]. The ledger runs on a peer to peer network and thus all the nodes participating in the network get a copy of the original information.

1.2. Research Questions

The following are the research questions are answered in this survey.

- How can blockchain can be deployed in different applications?
- What are the potential consensus methods for public and private blockchains?
- Which platforms offer development of blockchain?
- What are potential attacks for blockchain and what are the research issues in different applications of blockchain?

2.CHALLENGES IN BLOCK CHAIN TECHNOLOGY

As per our discussion in above paragraph, the block chain technology offers very comfort solutions like transparency, decentralization, integrity, immutability, and security without requiring any centralized trusted authority. However, some challenging issues are to be addressed for various applications.

Energy Consumption: - To validate the transaction for insertion into network Proof- of-Work mechanism is used, which requires lot of computational power for the processing of complex mathematical puzzles.

Scalability: - Ability to handle plenty number of nodes at a time is challenging task for this technology. It also involves complication calculation for single transaction which may slow down performance.

Privacy: - As it is open ledger, anyone can view the contents, which might be beneficial in many applications, but in case of sensitive application it becomes liability.

Lack of Talent: - Currently, there are few employees to build decentralized block chain. Educating employees to work with block chain will be lengthy process.

Security: - Security is another crucial topic here. We have a tendency to all skills each block chain technology boasts regarding its security. However, like every different technology, block chain conjointly comes with a couple of security loop holes. There are various attacks on the network is one among the protection flaws of the network. While imposing these attacks, hackers will take over the network and exploit it in their method. They will even modify method and prohibit others from making a block.

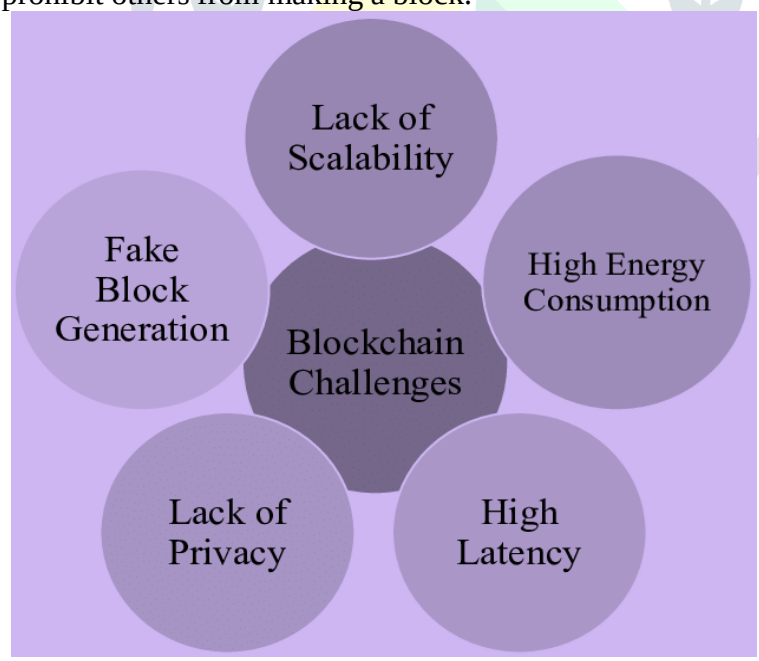

Fig.1.Challenges in blockchain Technology

3. PROMISING APPLICATIONS OF BLOCKCHAIN

3.1. E-Government Services

e-Government is an effort by governments to use Information and Communications Technology (ICT) to automate public services and facilitate their use by citizens (G2C), businesses (G2B) and intergovernmental (G2G), such as secure data transfer, e-procurement, filling tax returns, identity management, electronic voting, etc. The purpose of this effort is to integrate public services electronically, in which the service of citizens and businesses to be done safely, transparently and with trust in a decentralised way without the involvement of public authorities and to eliminate bureaucracy. Due to the increasing demand for online services from citizens and the need for reducing bureaucracy, more and more governments are turning their services to electronic forms. Electronic services are all time available and accessible from everywhere, and easy to use. The European Commission, recognizing the demands of citizens, businesses and governments for having access to e-government services, has been working on an e-government action plan. This action plan has based on the e-government benchmark for the period 2016–2020, which collects data on an annual basis from online stakeholders for new proposals for the future action plan [16] The action plan envisages user-friendly public administrations to reduce administrative burdens through digital services, crossborder services through connecting public administrations across Europe, opening up government data, services and procedures to create better or new services and improve policies. Four principles define the action plan: digital-by-default, cross-border by default, once-only principle and inclusive by default.

3.2. Application of the Blockchain have multiplied

From what has been said so far, it is clear that the listed benefits are closely related to the world of finance and everything that surrounds it. In fact, initially, the Blockchain was used to certify transactions between people. Nowadays, anyone has already heard terms like Bitcoin, Cryptocurrency, Ethereum , smart contract , etc. In recent years, however, the areas of application of the Blockchain have multiplied, going to affect sectors such as: logistics, public administration, food chain, health care, telecommunications, insurance and so on. Despite the great ferment, the technologies are not yet fully mature and there are still few concrete applications. The flip side of the coin is that there are still huge opportunities to be exploited: only 37% of large companies and 20% of Italian SMEs are familiar with these technologies. Less than 2% of large and 1% of small companies have started projects . Internationally, in 2019, there were 488 blockchain and distributed ledger projects launched worldwide, up 56% from 2018, bringing the total to 1,045 over the last 4 years. But of these only 158 are implementations, of which just 47 are already operational, the rest are experiments or Proof of Concept, while as many as 330 are just announcements. Despite the pandemic we are experiencing, the growth of blockchain-based technologies has not seen any slowdown. On the contrary, there has been significant growth. Out of 1,242 initiatives surveyed from 2016

to 2020 , there are 267 initiatives launched in the last twelve months at the international level by companies and public administrations, which include 70 announcements and 197 concrete projects (of which 83 are operational, the rest experiments or proof of concept). Compared to 2019, concrete projects grew by 59%, while announcements dropped by 80%, a sign of 82 Francesca Fallucchi et al. CEUR Workshop Proceedings 80–88 a market that is moving away from media hype to focus on more operational initiatives; 47% of cases mapped in 2020 use existing platforms, a sign that operators' focus is shifting more toward application development and less on creating new platforms. In this context, almost all the projects currently in use, in the development and design phase cannot disregard the presence of smart contracts, i.e. computer-based contracts that allow the full exploitation of the potential of the blockchain. In the next section, we explain what smart contracts are and why they are so important in the innovative context that blockchain brings. While in the next one we will indicate a list of applications and examples of Blockchain use, certainly not exhaustive but enough to understand the enormous affect that this technology is having and will have, from now on all of us.

3.3. Healthcare:

Healthcare systems control and monitor the health of patients with the assist of superior technologies. The advancement of these structures desires to contain an unequivocal spotlight on making these systems efficient [7]. Blockchain generation should play a pivotal position in the healthcare enterprise with numerous programs in areas like public healthcare control, longitudinal healthcare information, automatic fitness claims adjudication, online affected person get entry to, and person oriented medical studies, drug counterfeiting, medical trial, and precision medicine. Especially, blockchain era and using SCs could resolve issues of clinical credibility of findings (lacking data, endpoint switching, facts dredging, and selective guide) in clinical trials as well as problems of patients' knowledgeable consent [8]. Blockchain carried out to the fitness sector can provide new and powerful possibilities to enhance numerous activities related to the prevention and manipulate of pathologies and, therefore, higher medical danger management within the context of a virulent disease emergency consisting of the current one.

3.4. Banking:

Block chain technology is a center, underlying era with promising utility potentialities in the banking industry [11]. Banking and technology are very intently related and innovations have modified banking considerably over the time frame. The virtual improvements within the banking sector commenced with the creation of cash that changed the barter machine, and then the sluggish substitute of wax seal with digital signatures. Such innovation that is changing the banking sector globally is Block chain technology (BCT).

3.5. Education

Sharples and Dommingue [19] suggested the use of blockchain to keep educational records and rewards. They also suggested the use of an educational reputation currency to be given as reward. described how the founder of

education use blockchain for online courses can. This technology can record the student signed up for the course and verify that the student has completed and learned the course. A payment feature can be added for the use of smart contracts by students to ensure lifelong learning plans [16]. Mega University is an example of technology being used by the students to establish their own ways of learning and access the faculty for collaborative experiences. A higher education credit and grading systems is suggested in [12] which is a consolidated outlook for higher education institutions and students.

3.6. Taxation

Blockchain can help in the collection of taxes from end to end and expenditure of taxes by the government. Taxation is one area where blockchain can possibly make a big impact. The key terms of blockchain, transparency, provenance and traceability can be related to the needs of taxation systems. Blockchain can be applied to tax transactions, VAT, stamp duties and withholding tax etc. Shifting taxation cab remove the responsibility of tax authorities where they collect taxes. While the tax provenance aspect is very important so also is the consumption of tax incomes. The biggest issue, however, would be to digitize the non-digital sellers who reply mostly on paper records.

3.7. Smart contracts

As compared to the traditional• ledger the blockchain ledgers surely present several interesting and novel features. It not just records the time and a detail of transactions but beyond that it also plays a more active and potentially autonomous role in the implementation and management of transactions. Blockchains also have the feature of automatic execution of transaction with response to certain conditions being met, providing a 'guarantee of execution'. Based upon this self-executing smart contract are being developed rapidly. Smart contracts can be defined as a 'computerized transaction protocol that executes the terms of a contract'. In simple terms it means that, the terms of an agreement between two or more parties are programmed into set of instructions or say code that are stored.

4. TYPES OF BLOCKCHAIN SYSTEMS

Nakamoto (2008) introduced the idea of the first blockchain-based system, Bitcoin—a peer-topeer electronic cash system, which is a decentralized public ledger; however, there are now various blockchain systems and options for individuals and businesses. These different types of blockchain systems can be classified according to two main categories: access to blockchain system (permissionless and permissioned blockchains) and access to blockchain data (public and private blockchains) (BitFury Group, 2015; Peter & Panayi, 2015).

- **Permissionless blockchains:**

In these blockchains, all participants can take part in the process of transaction verification. There are no restrictions or prior authorization required for the users to create blocks.

- **Permissioned blockchains:**

In these blockchains, only a number of preselected known users can create/verify blocks of transactions.

• **Public blockchains:**

In these blockchains, anyone can join the network, read data, and submit transactions. Proof of Work (PoW) Proof of Stake (PoS) Practical Byzantine Fault Tolerance (PBFT) Delegated Proof of Stake (DPoS) Example - Bitcoin, Ethereum (current protocol), Litecoin, Namecoin, and Dogecoin - Peercoin,Cardano, Nxt, Mintcoin, and Ethereum (target protocol) - Hyperledger Fabric and Stellar - Bitshares and EOS Node identity management - Open and entirely decentralized: nodes can join the network freely - Open and entirely decentralized: nodes can join the network freely - Permissioned: nodes need to know each other's IDs - Open and entirely decentralized: nodes can join The network freely Power consumption (Energysaving) - Very poor - Wastes much energy - Good - Saves some energy compared to PoW, as less mining work is required due to limited research space - Excellent - No mining is needed, so great energy saving - Good - Saves some energy compared to PoW, as less mining work is required due to limited research space Tolerated power of an adversary - < 25% of computing power - < 51% of stake - < 33 % of faulty replicas - < 51% of validators Blockchain Technology and its Applications Baiod – Light - Mahanti ©International Information Management Association, Inc. 2020 89 ISSN: 1941-6679-On-line Copy .

• **Private blockchains:**

In these blockchains, data access, reading, and submitting transactions is all limited to predefined users within a single organization or some organizations.

5.BENEFITS OF BLOCKCHAIN TO THE SOCIETY:

If someone hears of the blockchain for the first time, then it may seem complicated or complex in nature but in reality the idea behind blockchain is quite simple. It is kind of database having penetration distribution and is used all over the word through millions of devices. Now the database or say the information can be on anything from scientific discoveries to needs like money, or even votes. It ensures trust and also integrity between the strangers and also vanishes the chances of cheating or betrayal. In this technology faith and trust is established through the Mass relationship or say cooperation, and also the most important of all “smart code” which out numbers the powerful bodies such as banks, governments or the enterprises of technology.

It is known by now that the blockchains are transparent, provides a decentralized medium and a platform of recording lists of the transactions that take place each and every day or more precisely seconds. The most common example of this technology is Bitcoin. Since Bitcoin creates faster, cheaper public records on blockchain based transactions of currency other ways have result in to create the new currency which can also be used for the non-financial transactions like casting of votes and which comes with a lot of features and aims.

Blockchains are a boon in resolving the problem of music and video piracy and hence enabling digital media to be legitimately brought, inherited and sold. they can also be used in public services such as health and welfare payments Blockchain distributes the daily interactions with technology to the users, which

was previously with the central bodies. By this, they make the system more transparent and hence democratic. The government and business men who are implementing this technology are doing it to enhance their services.

6. Conclusion

The categorization of this paper provides an insight into blockchain technology along with its applications in different areas. We have also discussed benefit to society that blockchain offers. . Applications are not specific to those mentioned in this paper so more applications can be explored and added. Open blockchain-based research issues in academic subjects like software engineering, databases and networks etc must be considered.

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