Identifying Suite Type of Blockchain for Application: Public and Private

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Abstract- *This study introduced some thoughts in relation to the concept of blockchain, the types of blockchain which include details about the public and the private blockchain and have made a comparison between the public and the private blockchain. Therefore, we first recall what blockchain is and highlights the blockchain as a technology to keep records of the transactions and to make transactions securely. The focus is then moved towards the introduction of public and private blockchain. From which it came to know that in public blockchain the participants' access, read/write into the system whereas, in private blockchain, the participants are restricted, and it is not open for the public. There are number of similarities and differences between the public and the private blockchain, and also this comparison is being a debating topic in both sides of users and developers. This study tried to answer for the question of best type of blockchain can be used, either public or private depend on their specific use. It found that both types of blockchains are better and good in their own ways and provides a variety of benefits depending on the scenarios based.*

Keywords: Blockchain, Public blockchain, Private blockchain, Cryptocurrency, Bitcoin, Blockchain application

I. INTRODUCTION

Blockchain is a technology used to keep a record of transactions; it records the facts and the figures to make it completely impossible for anyone to hack the system or make changes to the system. It was developed in 2009 by grouping. The name of this system also implies its structure. In this system, all the individual records are stored in a block and called blocks and connected in a single chain, called a chain (Christidis and Devetsikiotis, 2016). To keep track of the transactions made through cryptocurrencies (Lee, Guo, and Wang, 2018), such as Bitcoin (Nakamoto, 2008; Conti et al., 2018), we use Blockchain. It is considered as a digital ledger of transactions that is copied, and it is shared with all the systems that are a part of the network.

Many industries are expected to be transformed due to blockchain's ability to provide quick, verifiable transfer and monitoring. (Heath, 2018). The main reason for developing Blockchain technology was to create a new digital money system that could restore the current payment procedures. For many years the project remained under development, and some minor improvements have been made. Later, the potentiality of this project was recognized by the fintech industry. Considering the real Nakamoto's paper (Nakamoto, 2008), many experts started creating their projects. This research is going to make a comparison between two types of blockchain named Public Blockchain and Private Blockchain. It will have a detailed representation of both types of Blockchain technologies (Lepore et al., 2020). Further, we specify the different notations to properly understand the concepts of cryptocurrency and blockchain.

The blockchain can be considered as a kind of database. It can be differentiated from a local database in the aspect of the method it uses to store the facts and the figures or the information; blockchain stores the data into the blocks connected together. When fresh data comes, it is put into the new individual block, and the block is chained with the previous block. The blockchain is capable of storing different types of information, but it is mostly used for storing ledgers of the transactions. Blockchain technology is defined as the decentralized technology that is spread over the network that is used to manage and perform transactions (Royal and Voigt, 2021). The blockchain is used in a decentralized way in bitcoins so that no single person or group can have access or have control; rather, all the users collectively gain control. Blockchain technology apparently seems complicated, but its core concept is based on storing any type of information acting as a database. It is decentralized and can also be a centralized ledger in which the participants can confirm all the transactions in the peer-to-peer network. There is no need for a centralized authority to confirm the transactions. Potential applications include

transferring funds, settling trades, voting, and many other uses (Conway, 2020).

Cryptocurrency (Lee, Guo and Wang, 2018) is a type of digital currency that can be used to make payments, purchase and give goods and services, and be exchanged online. It is a digital or virtual currency secured by using cryptography which makes it impossible to hack. Cryptocurrencies use blockchain technology. Cryptography is a method of protecting messages using keys by ensuring integrity and confidentiality. This is an antique technique for a long time; it was considered an art, and the popularity of this technique started in the 20th century. Several types of cryptography algorithms (Qiu, Lu and Lin, 2019) are used, such as classical cryptography, symmetric

encrypted at the sender side, and then decryption is made at the receiver side. In these technologies, the message is encrypted and then sent to the receiver using the secured protocols in case of transferring messages. The computer protocol named TCP-IP (Transmission Control Protocol and Internet Protocol) allows transferring the packet of messages securely from one point to another point (Hagström and Lindblom, 2018).

The hash function is the signature of the message, which cannot exceed the length of 256 bits, and to transform a large number of message signatures, and we use the hash function. In the first half of 2017, there were counted 20,000 blockchain projects which spang out on the GitHub platform. Only eight percent of these projects are still alive,
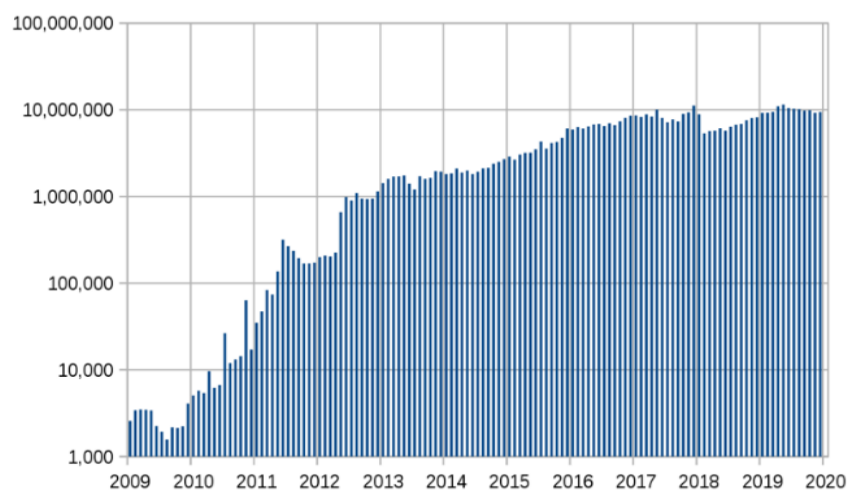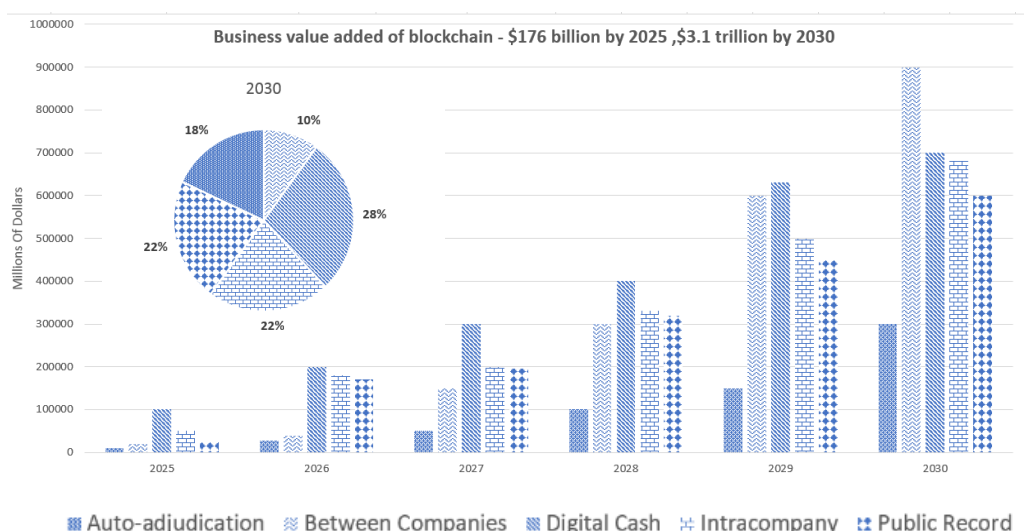

Figure 1: History of Bitcoin

Figure 2: Blockchain Market Value (ConsenSys, 2019)

cryptography, and asymmetric cryptography. The encryption is done using the local key and decryption using the personal key. The message is

and they last, on average, 15 months; this observation was made by the China Academy of

Information and Communications Technology (CAICT) (James, 2018).

Figure 1 shows the history of bitcoin value changes from 2009 to 2020 and Figure 2 depicts that the business value-add of Blockchain increases to $3.1 trillion by 2030 from $176 billion by 2025. On the other hand, blockchain is a secure and transparent technology used for storage and transmission. It is used to transfer messages from point A to point B, and it works without any central controlling device (Guegan, 2017). The blockchain can be categorized into two main types, namely, public blockchain and private blockchain.

A public blockchain network is the one that allows everyone to join into the system and see the system at any time they want is known as Public blockchain. Every user can read into the system, and every user can also carry out the transaction methods. Participation is not restricted to public blockchain; anyone at any time can participate in it. Hence, anyone can see and make changes to the ledger and can also participate in the transaction methods.

Ethereum is an example of a public blockchain (Anoaica and Levard, 2018; Kfoury and Khoury, 2018; Bousaba and Anderson, 2019; Aleksieva, Valchanov and Huliyan, 2020). It does not comprise any centralized system. And does not have any central network system. It is best used in cases when the requirement is of the decentralized system. It is used by people who do not want a centralized system for blockchain. But it becomes a bit problematic when it comes to comparing the public blockchain system with the enterprise blockchain process. The very first type of blockchain technology revolution is the public blockchain. The foundation of blockchain came into existence because of the bitcoin currency. The best part of the public blockchain technology is that each participant gets the chance to have equal rights no matter who they are or why they are using the system. After seeing the success of the public blockchain, people became keen to create different versions of blockchain technology to solve the current issues. People can join the transactions and can also interact with their peers.

Everyone in this system is able to see the transaction ledger. The companies that offer the public blockchain technology also make sure that the participants also get the highest level of security. Therefore, the public blockchain

technology also shares all the flaws among the users equally. Hence, these systems are quite slower than the other systems (Iredale, 2021).

The private blockchain is the second type of blockchain technology. It is a kind of technology in which the authority over the network is given to only one organization. It works on the access control system that restricts the people who can participate in the network. In this type of blockchain, the entities that are the participants of the system can have complete knowledge about the system; on the other hand, others will not be able to access the system. Hyperledger fabric of Linux Foundation (Sharma, no date) is an example of private blockchain.

The private blockchain cannot participate in the system as it is not open to the general public. It is open only for specific people. Hence, all the private blockchain system has some form of authorization technique that helps to identify who is entering the system. Hence, the private blockchain platforms are meant for companies that need an internal networking system. Therefore, to use this system, you need trust. This network model would not work without the trust factor. Thus, the employees of the organization can access the system anytime they want. Hence, we get to know that private blockchain is not fully decentralized. It is said to be a partially decentralized blockchain platform. The private blockchain also comprises some rules and regulations that do not exist on other platforms. Hence, to ensure the company's proper flow, all the users should have to follow the standard rules.

For enterprises that need privacy, a private blockchain is the best fit for them. Without privacy, the competitors of the enterprise can get into the system. They can leak the most valuable information to the press or get information that is confidential to the enterprise. This can then influence the brand's value greatly so, maintaining privacy is the priority. There are also many controversies regarding the private blockchain platforms as people believe that the transactions can be changed by the governing authorities that are not true at all (Iredale, 2021).

The main objective of this research is to lead the users to select the suitable type of blockchain for their needs by understanding public and private blockchain by comparing them. This paper discusses the private and public blockchain in deeper, based on different practical, real-life use

cases in different sectors. Also, it focuses on the importance of private and public blockchain technology, not only in real-life scenarios but also its importance in business and banks, as the Blockchain is being very popular among the general audience now.

The field of Blockchain in the IT area is becoming exceptionally quick. It is assessed that Blockchain innovation has been received by more than 33% of the organizations in the world, and interest for blockchain designers is always expanding. Blockchain innovation gives perhaps the most secure and safe online exchanges, which have shaken every one of the enterprises. Because of its various advantages to the business, numerous organizations and experts have begun to embrace blockchain innovation.

The significance of this study is that the Enterprise Organizations are reliably reluctant with public and private blockchain progresses; thus, we will tunnel further and grasp the features and take a gander at public versus private blockchain. Since the beginning of blockchain advancement, people have talked about open versus private blockchain. In an endeavor environment, it's better to know the huge differences between these two. Basically, public and private blockchain models accept a huge part in the associations looking for the ideal blockchain type for their answers. Regardless, how? For sure, expecting you can't perceive how this differentiation and select some inadmissible stage, your answer won't work. Nevertheless, various people really overwhelm them these days. That is the motivation to deal with you; we will focus on open versus private blockchain today. Ensuing to knowing their resemblances and differences, you can without a doubt pick the one that is proper for your necessities.

II. LITERATURE REVIEW

Fewer authors have carried the work on the comparison between public and private blockchain. Therefore, comparatively, we found less research work on this topic. But this topic is gaining more attention due to its validity in the modern world and the trend to move towards blockchain technology. One of the research papers on the comparison between private and the public blockchain is by Dominique (Guegan, 2017) ; it has been stated in their study that people of the private blockchain are more likely to remain loyal and attached to the private blockchain rather than to move to the public blockchain because of the reason that the private blockchain is centralized. He stated that public blockchain seems to be less attractive for the people if they first started to use the private blockchain because of the reason that the public blockchain is an open blockchain. It is open for everyone to join and participate in the public blockchain, but the private blockchain is secure; it is not open for everyone. Not everyone can join and participate in the private blockchain system. Private Blockchain system only allows the people to participate who are allowed by the organization.

To participate in the private blockchain system, the user has to get registered into the system by the organization. The organization or the company first authenticates the validity of the user before allowing them to participate in the system. That is why once the user starts to use the private blockchain system, they are less likely to move towards the public blockchain. Another research carried out on blockchain is the systematic review of blockchain-based applications across multiple domains (Casino, Dasaklis, and Patsakis, 2019). It focuses on the different applications working on the blockchain, checks the functionality of the different blockchain-based applications, and then does a systematic review about the working and advantages/disadvantages. The author researched the applications that use blockchain technology to make digital transactions. They reviewed different applications and checked the working of each application, the functionality they are providing, and the advantages/disadvantages that are concerned with those blockchain-based applications.

There are a number of applications that are working on blockchain technology and facilitating users in different aspects. One more research paper is of research on the blockchain and applications to secure network control planes. It states about the control planes working on the blockchain technology and states about the complete functionality of the working. It gives a detailed review of the working of the control plane blockchain-based application (ul Hassan et al., 2019), such it works, and what are the functionalities or advantages/disadvantages this control plane based on the blockchain is offering. The main focus of that research paper was to identify how we can make the blockchain-based control-plane system more secure by using neural networks, what are the areas of improvement required for the current working system, How we can improve the system, how we would be able to

make the control-plan system more secure neutrally, and how the control-plane system can be improved and made more flexible for the public users.

III. METHODOLOGY

Blockchain applications are mostly classified into financial and non-financial ones. Our research will use the processes recommended by (Briner and Denyer, 2012) and some features of the PRISMA statement (Moher et al., 2009). The following steps will be included in our methodology:

- Preparation of a review proposal, identifying the need for doing the review, and making a protocol for review.
- Identification of research, select studies, note important points, extract data, and synthesize data.
- Formation of a report based on the results of our research.

Scopus was used as the database to search for all the articles with the keyword "blockchain." This study started with an observation. Observation plays a vital role in the research throughout. In the same way, this research has a straightforward methodology. The methodology adopted for this research is qualitative. Qualitative research is based on what people think and why they think so (Scandura and Williams, 2000). This is for expressing open-ended answers or observations. The topic of this research required a strong back of experts. The expert's opinions can be adopted in two ways (da Silva et al., 2009). It can be adopted through a questionnaire. In contrast, a more appropriate way and the method used in this study is an interview with experts. Moreover, it was obtained through peer review as well.

A depth study for this topic requires analyzing the differences between the type of blockchains. The techniques used to collect the resources for identifying suite type of blockchain for application are the academic journals and the studies from papers that are interrelated with the topic of this study, it became able to get a rich knowledge on the respective subject. The assets for this observation are from a diverse type of more than one database, college repositories, digital libraries, and websites.

And the technological facts consisting of the details about suite type of blockchain statistics are accumulated from various sort of generation

associated and technical-commercial enterprise reliable and official web sites. By means of studying the one's sources which can be published with those web sites had been collected to analyze the commonplace approach related with them to conduct the primary research on identifying suite type of blockchain for application. Those materials that were collected to advantage the information, ideas and the associated scope of them can be labeled as several sources along with the articles from blogs, the associated articles from financial and business websites interacted with their merchandise listing for the customers, and the researches in which they've gathered important facts associated with this examine. The maximum of that information is based on the original works of some authors. Consequently, their originality and the trustworthiness at the side of the content material protected with the one's papers are inside the satisfying degrees. Due to that, it was able to try this observation while considering extra precious and correct information from that updated set of information. It turned into choosing the most appropriate research papers from the various type of studies and the articles that are related to the blockchain, that are with greater similarity with this topic. Further, after the gathering of those resources, it became capable of investigating them in a proper manner to get the summarized thoughts and the knowledge that is written over them. And furthermore, it was tested with the frequently asked questions related to the subject of this study to discover the current and cutting-edge problems with them. Having all facts associated with this subject matter, the behavior of the studies was upgraded. It changed into capable of behavior the studies in a better manner.

IV. DISCUSSION

These two types of blockchain also have something in common such; both the blockchain platforms are non-central peer-to-peer network, every user in both maintains a shared local, both provides the guarantee on the stability of the ledger, both provides the guarantee on the permanence of the ledger (Jayachandran, 2017). Yet, there are several differences between these two types of blockchain.

In Public Blockchains, network actors do not know each other, and in private blockchains, network actors know each other. The value of anonymity of each user participating in the blockchain is also a big difference between the public and private blockchains. Anonymity may

be one of the most important things for only certain applications, which certainly applies to cryptocurrencies. Even so, companies cannot connect their network with anonymous users, in which case they will need a privately owned blockchain. The base of public blockchains seems to be anonymity. Anyone involved with individual users will have a high degree of privacy while using the same resources as anybody else on a blockchain. Anonymity and data protection can create an adequate level of confidence in a blockchain for individual users that can boost faith and credibility within the whole environment. In an enterprise, anonymity is not so well functioning because the enterprise's assets must stay safe and confidential in contrast to the privacy and security of the participating users. There is no way to give any user-specific allowances without knowing what they are doing, and because a private blockchain's key factor is that if it is allowed, anonymity won't work. This is why a private blockchain can build a business wonderful. The speed of public blockchain is slower than private blockchain. Because of the higher number of nodes in the network, "bad actors" cannot attack the system to gain control of the network. A private blockchain is more likely to be hacked, risked, and manipulated. Bad actors can easily impede the whole network (Seth, 2021).

The order of magnitude of a public blockchain is lesser than the private blockchain. Availability to a central authority for the whole network must be given in a public blockchain so that it becomes a private blockchain at this point. Anybody who monitors the network can change or change any transactions to suit their needs in a private blockchain (Sharma, no date). A Native Token is required in a public blockchain, and in a private blockchain, a Native Token is not necessary. Transactions per second are fewer transactions that can be carried out in public blockchain than compared to private. Public blockchains are immutable as well as distributed. Nobody can modify an entry after it has been verified, and customers can be sure that they have not modified or deleted its transactions. In such a case, organizations, although they do not publish their data, use the distributed ledger technology. Private blockchains are not equivalently secure to public blockchains, which means their owner may alter the records.

Public blockchains are untrustworthy, and respondents should not trust one another in a private blockchain setup. In a private blockchain,

it is impossible to independently verify the validity of records because the credibility of a private network is based on the legitimacy of authorized nodes. Consensus Algorithms in public blockchain are proof of stake (Nguyen et al., 2019; P. Rajitha Nair and Dorai, 2021), proof of work (Wüst et al., 2016; P. Rajitha Nair and Dorai, 2021), proof of space (Dziembowski et al., 2015), etc. It is more likely to get attacked because, in this network, no one knows each other. And there is no validation of the participants. The participants in this do not require any permission to get into the system. Consensus Algorithms in private blockchain are Proof of Elapsed Time (PoET), raft, and Istanbul BFT. It is less likely to get attacked as every participant of the network is known, and their authentication is check before allowing them to enter the network (Ashi Srivastava, 2020). The participants in this require permission to get into the system.

There is no chance of a tiny collision in a private blockchain. They are known to each validator and have the appropriate credentials in the network. But no one knows who each validator is in a public blockchain, increasing the chance of potential collision or an attack by 51% (Sabani, Shafana, and Kariapper, 2020). A public blockchain uses more energy than a private blockchain because many electric power resources are necessary for network consensus and operation. Private Blockchains consume less power as well as less energy. Some blockchains are more scalable than other blockchains depending on the number of nodes, the number of transactions, how transactions are stored, and the consensus method used. Public blockchains seem to be infamous for scalability problems, particularly of cryptocurrencies. An ever growth of public blockchains means that far more nodes are available to interact with, more transactions occur, a restriction to how often transactions can be saved per block, as well as a possibly complicated consensus method. The factors that keep the scalability of a public-Blockchain squad can be adjusted in private blockchains with a large amount of control. Suppose a private blockchain begins to be sluggish than wanted. In that case, decreasing node counts, allowing more transactions per frame, or adapting the consensus method can bring huge positive advantages for blockchain effectiveness (Bartel, no date).

We ought to change the incentive for good behavior in Public Blockchain a little since we do not really know who the user is. We count on the

incentives of economics and the theory of games to ensure everybody in the system is honest and compliant. We create situations by group consensus, where honest participants are economically rewarded, where dumb ones incur work or costs and are unable to recover their costs. We rely on the fact that we know who a user is in a private permissioned blockchain. In a company scenario, we also presume that they will behave fairly because otherwise, we exactly know who is mistaken, and they know they will suffer the consequences. So, in a Corporate Case, Blockchain for a Business, Blockchain for supply value chain chains. Blockchains, both public and private, have two vastly distinct offerings. Many individuals have the perception they are competing, but they do not really do. They only offer various types of solutions.

Public and private blockchains differ in the method of operation whenever it comes to authority. More like a decentralized system, the public blockchain is that no one is going to monitor its network. Power is distributed throughout all user groups. But power is only partially decentralized in the private blockchain. There is one authority only at the head of the network, and then the whole system is managed. In terms of data management capability, you will find differences. You can read and write on the common ledger with a public blockchain. However, once it has been written and documented, it cannot be remedied or changed. Only the leading entity can write on the booklet in private blockchains, even with a few nodes. There are many considerable differences between public and private blockchains in addition to functional efficiency. Private versions are much more stable because they operate with small nodes as well as transactions. Since all users in the public blockchain can access the entire network, the number of processes can increase and slow down the entire network, thereby affecting system efficiency.

Transaction quality is a very important issue in the private vs. public blockchains debate. For the latter, a transaction can involve only certain nodes. This means that the resources are not tight, and the transaction speed remains unchanged. On the other hand, there really is no limit on the number of nodes if you are working with public blockchains. The process may become slow if users request too many transactions (Ashi Srivastava, 2020). At first, even so, both networks are operating at the very same speed. Many

blockchain organizations are launching solutions for connecting private and public blockchains to generate the Internet of blockchains. The cryptocurrencies currently have to pass value exchanges among blockchains. However, even using exchanges, data stored on a blockchain cannot be shared with others.

By interoperability of blockchains, data on personal chains will not be isolated. It would instead flow as flexibly as any data that we currently see on the internet. Within the business world, researchers perceive private blockchains are adopting on a scale as the concerns are indeed the opposite. Anonymity is a bad thing in a business scenario. Let's suppose I am a user, and I have public or private blockchains to choose from. I want to know who all participants are exactly, and I have to know what they are doing because I do not want complete transparency. I do not want to share all my business data with all my business network participants and with the general public. I would like to control who is seeing, what information, and who is able to write this information on the blockchain, according to what circumstances. So, for managing supplier-vendor relations, I could use a Private Blockchain solution, where only I and my suppliers can see how much I pay for a specific item. The specifics of the contract I possess with them and not really the contract details I have with some other providers are only available to a particular provider.

Especially public blockchain addresses few specific features such; Authentic security, Anonymous Nature, Open Environment, No Regulations, and Distributed. A public blockchain is preferred to an environment where it needs to be truly decentralized, full transparency, immutability, and full user environment. Further, public blockchain is used by the cryptocurrencies such as bitcoin, Litecoin, and Ethereum. The government can also use it to handle the voting system or to keep the records of health care. Transparency and anonymity are the main features of these platforms. Public blockchain can be considered as a relationship between the business and the users who use its solution. Table 01 summarizes the comparison results between public and private blockchain.

Meanwhile, private blockchain also does not fail to impress the users with the best features such as high efficiency, full privacy, empowering enterprises, stability, and faster transactions.

Private blockchains can be considered to be deployed for especially the purposes of low fees, saves money, no illegal activity, and regulations (Iredale, 2021). Further, in the private blockchain, each participant is provided with a unique and verified identity that is also used to identify the type of access the participant has. In this enterprise solution, the resources and the actions that everyone carried out can be controlled. This allows to perform faster transactions, and the energy consumption is also reasonable. To maintain the supplier-vendor relationship or create a shared network among all the enterprises, for business-to-business relations, the private blockchain is the best option to go for.

Another major concern in this area is "how secure are the blockchains." In a private blockchain as the user's access to the information is controlled, but it is less secure than the public blockchain. The public blockchain provides a completely invisible ledger. As the public blockchain is non-centralized, facts and figures are encrypted and are stored in different places or locations. The greater number of participants, the more secure the public blockchain is. A public blockchain is sometimes called 'censor-free' and is particularly resistant to the distributed denial-of-service (DDoS) attacks. A private blockchain is more at risk of hacking, and on the other hand, the owner of the organization can make changes to the system such that it is able to alter the system (Heath, 2018).

V. CONCLUSION

From the above comparison, it came up to the conclusion that there is no competition between the public and private blockchains. Both are specified for different purposes and used in different scenarios. Both have some number of advantages and disadvantages, and both are the best fit for numerous numbers of scenarios or solutions. If you want a blockchain system that is open to the public, has a high level of user control that is fully transparent, all the users are treated equally, and that is completely decentralized, then public blockchain is the best choice. Suppose you wanted a blockchain system in which all the users are authenticated by the owner of the organization and know its users, whose admin has the ability to permit or take control of the users and to alter the ledgers., in that case, it has a great transaction rate and is private for the general public then you can choose the private blockchain. The choice for the type of blockchain depends on the scenario or the environment for which you want the blockchain.

And as it is concerned that which type of blockchain is the better public or the private? Then the answer to these questions is that both types of blockchains are better and good in their own ways and provides a variety of benefits depending on the scenarios.

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