SBT FINTECH MONTHLY NEWSLETTER

Editor's Note

BY DR. ABENA PRIMO

Dear Reader,

Are you curious about blockchain's viability beyond cryptocurrency? Is blockchain a technology that can be used for data processing, storage, or communication?

In this article, by returning author Dr. Azubike Okpalaeze, these questions are explored. Following a thoughtful analysis, in the end, Dr. Okpalaeze gives his answer to these questions.

His answer will astound you. This article is a must-read!

Sincerely,
Dr. Abena Primo
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SBT

Newsletter Highlights

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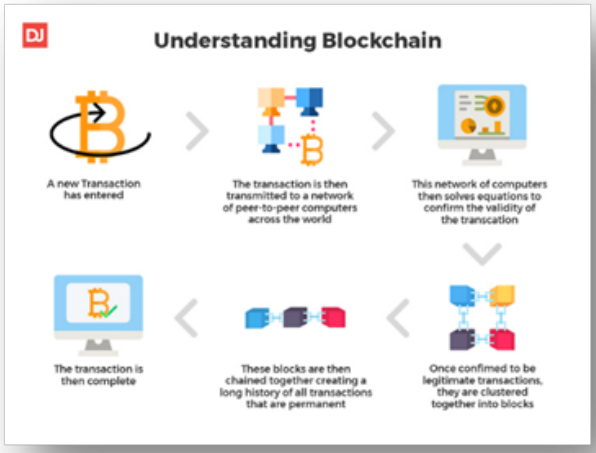
Blockchain Technology: Disruption of Traditional Computing and Communication Implications Perspective

BY AZUBIKE OKPALAEZE, PH.D.



INTRODUCTION:

While there is evidence that some people have embraced the new transactional technology (Blockchain), many though knowledgeable, are skeptical, while some simply lack the understanding or conceptual framework of Blockchain.

Regardless of one's position, any online transaction that involves digital money is challenge given the rising threats of hackers trying to steal online digital information. This leads to the invention of various kinds of crypto currency that included Bitcoin. The Blockchain is simply a technology behind using the Bitcoin. Blockchain is a digitized, de-centralized, public ledger of all crypto-currency transactions. It tries to create and share all of the online transactions, and the resulting data are stored in a distributed ledger, as a data structure on a network of computers. For data security, it validates transactions using peer-to-peer network of computers and an algorithm. Transactions are verified by users' transactions immediately without relying on central authority. In this instance, Blockchain becomes a transaction database which contains information about all the transactions that were executed in the past via Bitcoin protocol.

Has Blockchain-based technologies moved away from just supporting cryptocurrencies? Currently, one key area for Information Technology operations is smart contracts, this operation let one to store, verify, and execute code on a blockchain. But the question that needs to be answered is, will the multiple projects now under development promise to replace traditional elements of the compute stack, from processing to storage to communications? Has Blockchain really changed IT operations in any fundamental way? The evaluation of the three core building blocks of computing infrastructure (Fig. 1) can provide an insight to the asked question.

THE THREE ELEMENTS OF COMPUTING:

When massive data handling and computations are required, digital computer is most effective tool to be utilized. The computer is composed of three major elements: the processor (central processing unit or CPU), the memory, and the input output (I/O)

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devices. The evolution of integrated circuit of computer technology has led to an appreciate increases in the computer performance. For example, a quantity measured by the ratio of the capacity of computer memory to the time required for addition relative to computational speed of the Central Processing Unit (CPU).

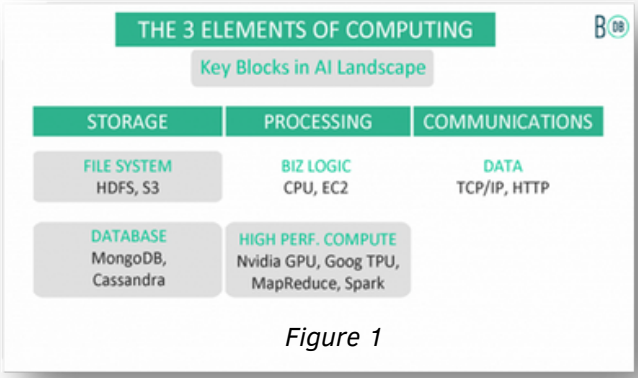

Figure 1

PROCESSING:

How fast a computer can perform a task is largely dependent on a number of factors:

- Speed of the CPU: CPU is the most important component of the computer without it a computer. It also known as the brain of the computer it has two Parts ALU & CU. ALU (Arithmetic & Logic Unit) performs different arithmetic and logical operations. Whereas CU (Control Unit) controls & co-ordinates different components. The Processor accounts for eighty-five percent (95%) of computer's processing performance.
- Size of the Random Access Memory - Main Memory is another important component of the computer. A computer needs a memory during processing where data can stored. Data is fetched by system buses from CPU to RAM or from external storage devices to RAM.
- Data Bus Width: I/O (Input & Output) devices are those part of computer which are necessary for giving instructions and data to the computer and receiving information/result from computer. These are keyboard, mouse & monitor. The width of the Bus if not adequate to transport data and instructions can compromise the computing speed and effectiveness of the CPU.

a) Processing is one of the first areas that blockchain might disrupt. How and the extent is yet to be determined. For instance, in traditional computing, the Central Processing Unit (CPU)s and Graphics Processing Units (GPU) would handle processing logic that includes the traditional and modern cloud-based distributed processing. Moreover, processing collaborates with high-performance processing algorithms, models, and other arrays of processing tools such as:

- MapReduce: a programming paradigm that enables maximum scalability across hundreds or thousands of computer servers in a Hadoop cluster. As the processing component, MapReduce is the heart of Apache Hadoop to operate on separate and distinct tasks.

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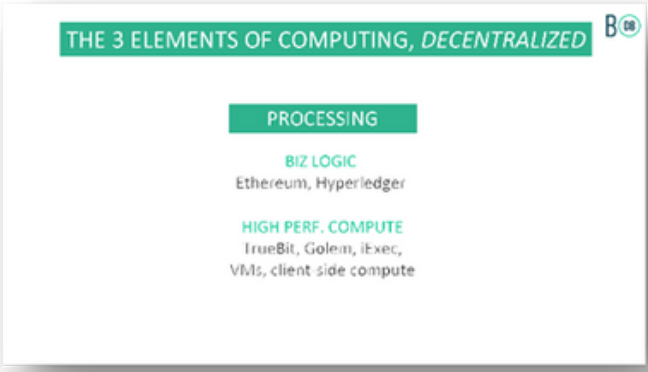
- Spark: is a multi-language engine for executing data engineering, data science, and machine learning on single-node machines or on cluster computers.
- TensorFlow: a free and open-source software library for machine learning and artificial intelligence. It can be used across a range of tasks and it has a focus on training and inference of deep neural networks.

Ethereum and Hyperledger did revolutionize computing that are decentralized in a significant way. Blockchain computing and algorithm must take advantage of advanced computer technology innovation in significant ways.

- **Ethereum:**

Ethereum revolutionized blockchain when it allowed users to run other forms of transactions on a blockchain aside from financial transactions, and that requires some element of computing power. Ethereum introduced the concept of smart contracts to the blockchain, opening up a world of opportunities. Many blockchain-based projects today use Ethereum, or something that is based on it, to handle logical processing and verification.



- **Hyperledger:**

Hyperledger consists of eight tools and projects. Deciding on which to use and where, is challenging, but it is advisable to start with Hyperledger Fabric. It provides foundations for identity, privacy, and processing, and as well as other components that can be built on top of it. The noted advantage is that the entire Hyperledger project is designed for enterprise users. For instance, Ethereum runs as either a public or private blockchain, but Hyperledger Fabric is private. It offers a choice of enterprise computing and friendly programming languages for smart contracts, while Ethereum uses its own JavaScript-like language. And it lets one define ones own understanding of "consensus" and "currency."

- **High-performance computing:**

The decentralized nature of blockchain makes it ideal for massive-scale processing systems. The pit fall is that the current Blockchain design adversely limits scaling. Projects that seek to create decentralized supercomputers, and or cloud computing without vendor lock-in, are projects that are still in the beginning stage. The TrueBit (Figure 2) project is the biggest crypto project with countless tokens in the crypto realm. It attempts to solve this vendor lock-in problem by engaging specific computers in a

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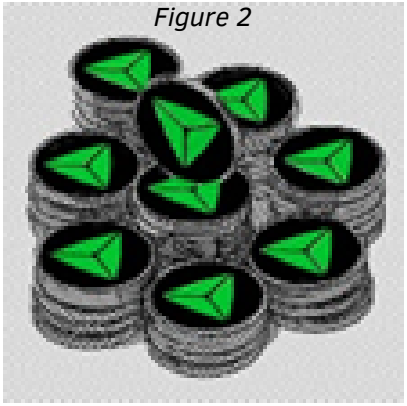
network. But, no matter how plausible the blueprint seem, there has been no appreciable implementation demonstrated. And there's not much detail of the model on the project's website regardless the published TrueBit whitepaper that details how it might work. Thus, the computing potential of blockchain hinges on the production success of these projects, if it is achievable. Although the communities say they are confident that this will happen in the next year, the waiting continues.

Figure 2



b) Storage:

Storage is another major area of blockchain disruption. Several offer a viable large-scale storage options, they equally suffer from the same blockchain issues (vendor lock-in). Traditional computing storage falls into two camps: file and database storage. There are layers of options from individual desktop machines to large-scale storage projects such as **HDFS** (The Hadoop Distributed File System: is a distributed file system designed to run on commodity hardware), **S3** (Amazon S3 is an object storage service that offers industry-leading scalability, data availability, security, and performance.), **MongoDB** (a stage of the pipeline that takes the specified fields in the document and passes them to the next stage of the aggregation pipeline), and **Cassandra** (is a fully managed NoSQL database, deployable in the cloud of your choice). Each require fast access for storage and retrieval as well as adequate computing power.

c) Communication:

Although there has been claims that blockchain will revolutionize business, thereby redefine companies and economies, it however comes with security issues/implications (such as the 2014 collapse of one bitcoin exchange and the more recent hacks of others). Experience emerging from the studying technological innovation indicates that if there is to be a blockchain revolution, many barriers that include technological, governance, organization and society will have to fall. It would be a mistake to rush headlong into blockchain innovation without understanding how it is likely to take hold. Blockchain is not a "disruptive" technology that would attack a traditional business model with a lower-cost solution. Tt is simply a foundational technology. It has the potential to create new foundations for the economic and social systems. The process of adoption will be gradual and steady, not sudden, as waves of computer technological and institutional change gain momentum.

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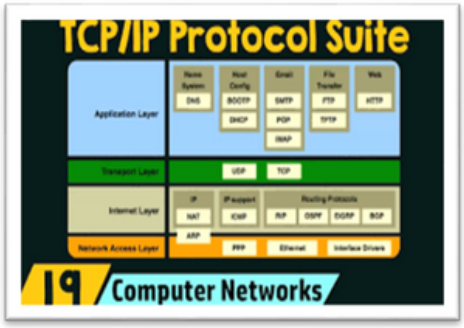
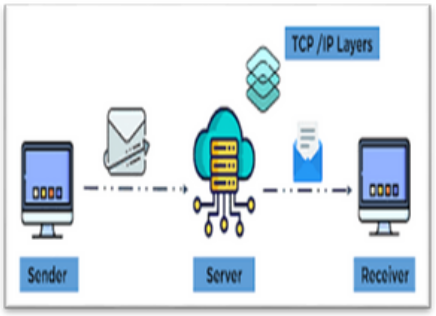
Figure 3





Patterns of Technology Adoption:
Before jumping into blockchain strategy and investment, let's reflect on technology adoption and the transformation process in foundational technologies. One of the most relevant examples is distributed computer networking technology (the foundation of internet development), TCP/IP (transmission control protocol/internet protocol – Figure 3.). TCP/IP first gained traction in a single-use case as the basis for e-mail among the researchers on ARPAnet (the U.S. Department of Defense precursor to the commercial internet). Before TCP/IP, telecommunications architecture was based on "circuit switching," in which connections between two parties or machines had to be preestablished and sustained throughout an exchange. To ensure that any two nodes could communicate, telecom service providers and equipment manufacturers had invested billions in building dedicated lines. TCP/IP turned changed everything. The new protocol transmits information by digitizing data and split it up into smaller packets, each package has address information. Once released into the network, the packets could take any route to the recipient. Smart sending and receiving nodes at the network disassemble and reassemble the packets and interpret the encoded data. There was no need for dedicated private lines or massive infrastructure. TCP/IP created an open, shared public network without any central authority or party responsible for its maintenance and improvement.

Blockchain, a peer-to-peer network that sits on top of the internet. Bitcoin is the first application of blockchain technology. The parallels between blockchain and TCP/IP are clear. Just as e-mail enabled bilateral messaging, bitcoin enables bilateral financial transactions. The development and maintenance of blockchain is open, distributed, and shared. Just like TCP/IP's, a team of volunteers around the world maintains the core software. And just like e-mail, bitcoin first caught on with an enthusiastic but small community. TCP/IP unlocked new economic value by dramatically lowering the cost of connections. Similarly, blockchain might dramatically reduce the cost of transactions by utilizing data capture capabilities of TCP/IP protocols. And, it has the potential to become the system of record for all transactions. If that happens, the economy will once again undergo a shift, because new blockchain-based sources of influence and control would emerge, and so would the technology upon which it rides on.

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Conclusion:

Blockchain may not be a “disruptive” technology after all, but it can attack a traditional business and financial models by providing a lower-cost solutions. Blockchain is a foundational technology. It has the potential to create new foundations for the economic and social systems. In data Communication and distributed processing networks TCIP/IP in addition to providing a good template for blockchain’s adoption, might further smoothed the way for achieving the fundamental financial and business models. TCP/IP has become universal, and blockchain applications may be built on top of the digital data, TCIP/IP communication layers, and computation infrastructure. The success of this adaptation and integration might lower the cost of experimentation and further would allow new use cases to be deployed. But given the time limitations, barriers to adoption, and added complexity involved in getting to TCP/IP levels of acceptance, it is possible to encounter some elements of risks in experimenting with blockchain. Advise is to start small which is a good way to develop any new know-how.

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