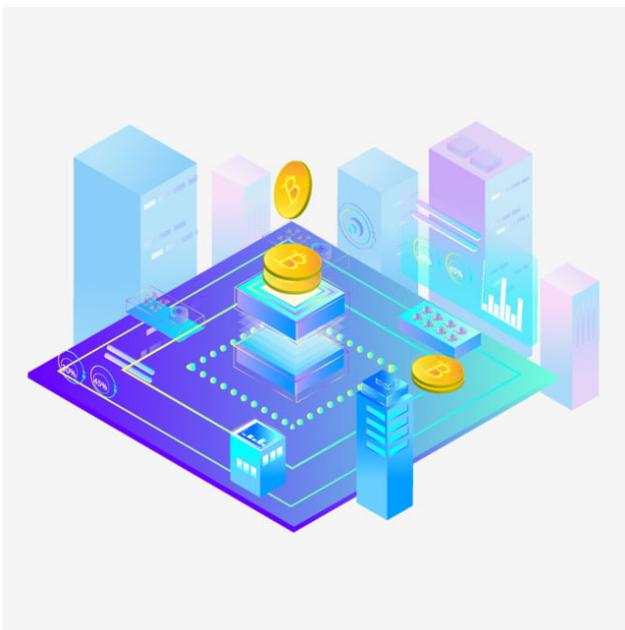


Blockchain

Beginners Guide

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Introduction to Blockchain

Whereas most technologies tend to automate workers on the periphery doing menial tasks, blockchains automate away from the center. Instead of putting the taxi driver out of a job, blockchain puts Uber out of a job and lets the taxi drivers work with the customer directly.

- Vitalik Buterin, Co-Founder of Ethereum

In this chapter, information regarding the definition of blockchain technology, its importance, impact, attributes, and the specific problem it solves will be explained.

July 4, 1776. This was the day America received independence from the British government. This was the official beginning of the Americans' will of being a part of the government and becoming a democracy - one where the people would decide on rules and regulations together. Then in the summer of 1787, the Preamble to the United States Constitution was written, ``We the people''. This phrase clearly showed the American's strong will for full democracy where the people in the majority mattered and felt important. However, although we are said to be democratic and have a democratic society, are we really? The power of central authorities in the government, jobs, and more still exist, still sacrificing the freedom of the majority of individuals for the enjoyment of a few. Where there is power in a central hand there will be corruption. This is one problem blockchain technology solves, it takes power away from central authorities and gives it to the people. It does this by providing transparency, immutability, and distribution of all information in the blockchain while providing strong security and quick transfers. More information regarding this will be discussed below.

DEFINITION

Blockchain as defined by TechTarget is “*a record-keeping technology designed to make it impossible to hack the system or forge the data stored on it, thereby making it secure and immutable.*”

Blockchain focuses on the development of a decentralized database where no single person oversees what happens. Blockchain can be utilized in many different careers to stop problems such as corruption. Most Blockchain jobs solve a problem in identity theft, banking, asset transfer, contracts, supply chain, crowdfunding, healthcare, government management, voting, and more. Blockchain uses nodes and blocks to make a secure decentralized database. Blockchain is currently being most used in finance: to make transactions quicker, easier, and more secure(company: Gemini). It is also being used to implement smart contracts, which make contracts more secure-unchangeable and more accurate, solving issues everywhere (company: etherium). Blockchain can revolutionize many fields as it stops misunderstanding, lost items/money, and corruption and allows everyone to be on the same page at all times.

Key points

1. Decentralized
2. Distributed
3. Immutable
4. Secure
5. Programmable
6. Anonymous
7. Time-Stamped

DECENTRALIZATION

Decentralization in blockchains is the idea of transferring control and decision-making from a central authority to a distributed network. This decreases the worry related to trusting another individual, instead since agreed upon and validated information is automatically spread among all participants in the network. Removing the need for a 3rd party.

Through the use of Decentralization one is able to increase fairness in the system, however, one trade-off to this is higher transaction throughput. This can be seen in instances such as the Etherium lack of scalability/ throughput in September of 2021. During this time as ETH was becoming more popular and more used, the number of documents and data stored in the ledger created congestion. This caused the system to slow down drastically and increase transaction fees greatly.

Benefits of Decentralization

1. Trustless environment

No need to trust a third party - each member in the network has the same copy

2. Data reconciliation

Every entity has access to a real-time, shared view of the data. (AWS)

3. Reduces points of weakness

Eliminate chances of Human error

Centralized Vs. Distributed Vs. Decentralized

	Centralized	Distributed	Decentralized
<i>Network/hardware resources</i>	Maintained & controlled by a single entity in a centralized location	Spread across multiple data centers & geographies; owned by network provider	Resources are owned & shared by network members; difficult to maintain since no one owns it
<i>Solution components</i>	Maintained & controlled by central entity	Maintained & controlled by solution provider	Each member has exact same copy of distributed ledger
<i>Data</i>	Maintained & controlled by central entity	Typically owned & managed by customer	Only added through group consensus

<i>Control</i>	Controlled by central entity	Typically, a shared responsibility between network provider, solution provider & customer	No one owns the data & everyone owns the data
<i>Single Point of Failure</i>	Yes	No	No
<i>Fault tolerance</i>	Low	High	Extremely high
<i>Security</i>	Maintained & controlled by central entity	Typically, a shared responsibility between network provider, solution provider & customer	Increases as # of network members increase
<i>Performance</i>	Maintained & controlled by central entity	Increases as network/hardware resources scale up and out	Decreases as # of network members increase
<i>Example</i>	ERP system	Cloud computing	Blockchain

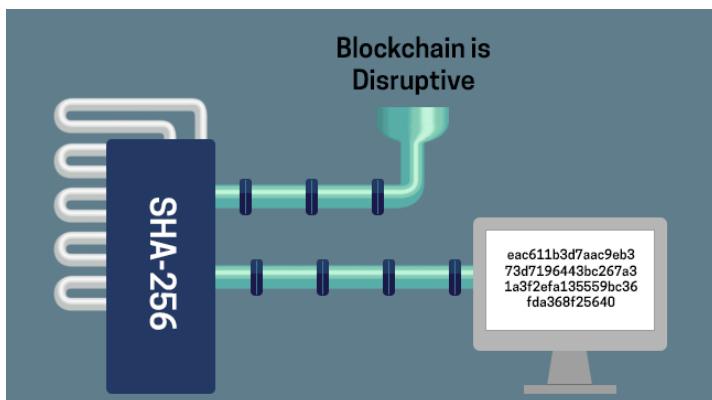
Table from AMZ "What is Decentralization in Blockchain?"

IMMUTABLE

The Concept of Immutability in blockchain technology is one that is extremely common. Essentially Immutability in the blockchain is the idea that all information added or recorded in the blockchain is a **permanent, indelible, and unalterable history of transactions**. This brings more trust among peers in cases such as business transactions and more. Similar to decentralization, immutability decreases the trust needed of other individuals in order to achieve the highest amount of fairness.

We spend millions of dollars on cybersecurity every year in order to ensure unwanted eyes are not on our personal information. But what about the data we see everyday, how do we know that information has not been replaced, changed, or manipulated. We can't use any method to ensure this does not happen. This is where immutability brings in a new level of security and trust toward data (this also allows for oracle data to be valid). Through immutability one can ensure the data they see has not been tampered with, corrupted, or changed — immutability provides integrity (both in its technical and primary definition).

This immutability is achieved through hashing (more information can be found on [ByBit](#)).



SECURITY

In Most blockchains or distributed ledger technologies (DLT), transactions or a group of transactions are grouped into blocks. Each new block added to the system becomes connected to its previous blocks. This means that every single block in the Blockchain is cryptographically connected together. This means that if one were to hack the system they would need to be able to hack all the blocks in the whole system which is near impossible for larger more stable blockchains such as Bitcoin. Additionally in a blockchain, all transactions are validated through a consensus mechanism to ensure all transactions are true and actually happened.

Security in Different Types of Blockchains

In types of blockchains there exists 4 major types:

- ***Public Blockchains***

A public Blockchain allows anyone to join and remain anonymous. In this type of blockchain, the members of the system together validate transactions and achieve consensus. A great example of this is Bitcoin. Bitcoin allows anyone to join and participate in its system and use “miners” to validate transactions and create proof of work.

- ***Private Blockchains***

A private blockchain allows only specific members to join, this means not everyone is welcome to join the blockchain. Consensus is achieved through a concept of selective endorsement, where only known users can verify transactions. In this type of blockchain, more identity and control is necessary.

PROGRAMABLE

More details on this will be discussed later, however, what makes a blockchain programmable is the use of a smart contract. A smart contract allows one to use creative freedom to create and code any function they want in a blockchain. What makes it different from ordinary coding is its key factor of being decentralized.

SMART CONTRACT



TIME - STAMPED

This in simple terms just means that every transaction, edit, change, etc. is well recorded in a ledger. This means every action is time stamped. This can be very important in use cases such as data storage - medical records and more.

Extra Resources & Assignments

1. Read “A Summary of Research on Blockchain in the Field of Intellectual Property” Research paper
2. Look into How Hashing works
3. Youtubers: Crypto animations
4. Research How Bitcoin works and how it's a Public Blockchain.
 - a. Identify other examples of different blockchains
5. Read “IBM Smart contracts ”

Decentralized Finance

"We have elected to put our money and faith in a mathematical framework that is free of politics and human error."

- Tyler Winklevoss, Rower & Entrepreneur

Decentralized Finance (De-Fi) is the method of conducting finance in a decentralized manner, meaning without a central authority. An example of this is the central bank. Instead of the central bank printing and governing money as they see needed, though De-Fi the value of objects is based on the population's view, through a form of auction-like system. Essentially the value of certain objects changes based on the people's wishes.

Defi's main purpose is to reduce trust by replacing centralized financial facilities with decentralized ones. Creating a *trustless* system where no single entity needs to be trusted in the storing and sending of financials. Additionally, due to its decentralized manner, individuals are stripped of their power to dictate prices and conditions, instead, it is transparently managed by the members of the system - supply and demand. Due to the fact that third parties such as banks are removed, the members of the system take the roles of lenders and such. This also means that the people themselves have full control over their finances (which can be a good and bad thing).

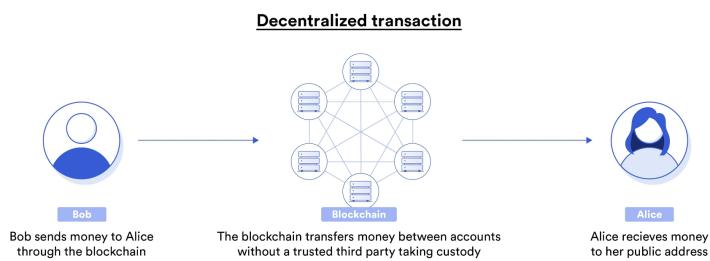
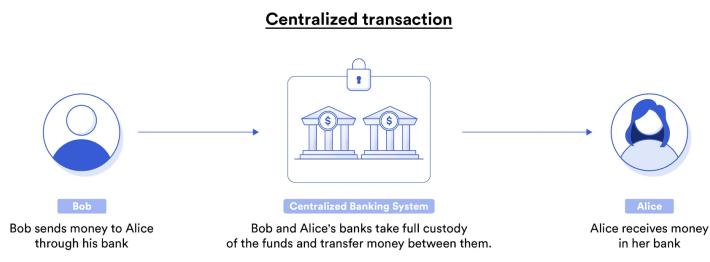
DeFi DEFINITION

Defi is a technology where traditional financial capabilities(such as Interests, loans etc) are built on blockchain using smart contracts, this enables automatic execution of financial processes without intermediary systems/people. Ethereum is the first block chain developed to execute smart contracts.

PROBLEM IT SOLVES

Speed, accuracy, KYS process is easy, cost savings for users. People can manage assets easily themselves and not depend on slow processing of legacy methods.

- **Cryptocurrencies**
 - Decentralized vs centralized transaction/finance



- **Smart contracts definition**

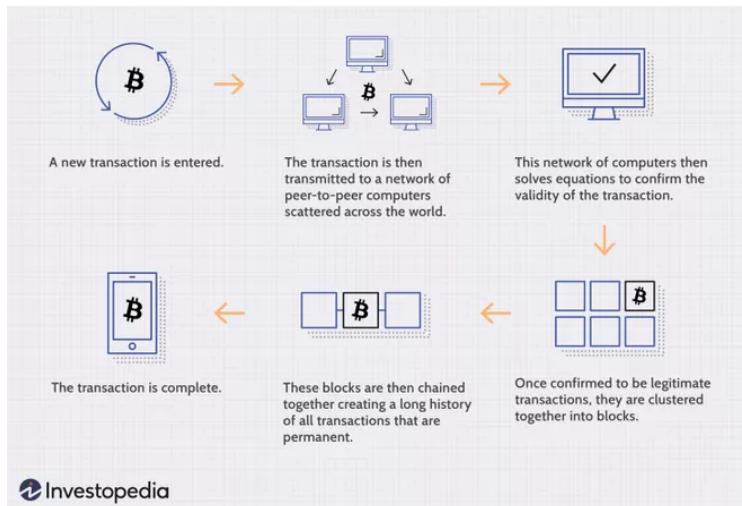
Smart contract is a computer program that executes automatically based on rules defined in the program to solve real world contracts in a more efficient and error prone way, avoids manual and cumbersome time consuming steps and in turn avoids frauds as these contracts cannot be changed illegally

DeFi Use case's

- Digital identity
- High security transactions
- Cross border payments loans
- Mortgages,
- Land records
- Rental contracts

Cryptocurrencies

Transaction Process



Attributes of Cryptocurrency

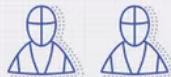
While blockchains are mostly used to store cryptocurrency transaction history, other things like legal contracts or product inventories can be stored.



Has intrinsic value as it is a trustworthy, secure, and fast way to transfer value for little to no cost.



Has no physical form as it exists only on the immutable blockchain.



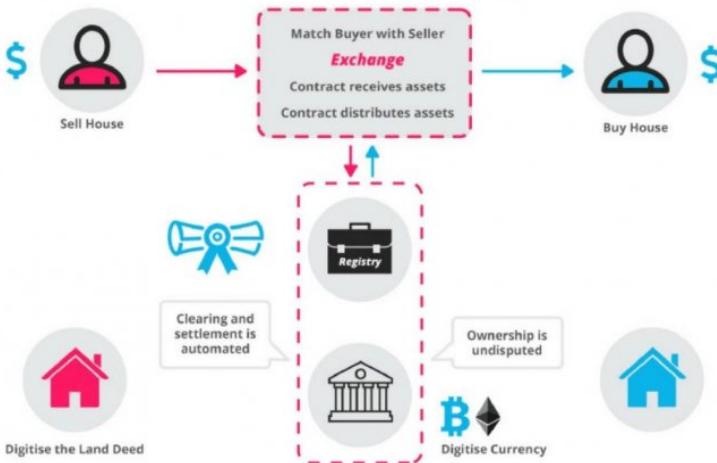
The attributes of a cryptocurrency, such as its total supply, are decided upon by the majority of the members of its decentralized network instead of a central bank.

 Investopedia

Smart Contracts

Di-Fi stands for decentralized finance which is a blockchain-based form of finance where all finance-based transactions can be done online with no intermediaries and use smart contracts to make this possible. Some possibilities with this technology are businesses set up online, with no physical contact and intermediaries necessary.

How Smart Contracts Works



DeFi Deeper Knowledge Assignments

1. Practical: Join a DAO and ask a question (on Discord)!
2. Defining DeFi (Research Papers)
 - a. DeFi-ning DeFi: Challenges & Pathway
 - b. SoK: Decentralized Finance (DeFi)
 - c. CeFi vs. DeFi — Comparing Centralized to Decentralized Finance
 - d. Systematic Literature Overview and Research Directions
 - e. Visualize the “DeFi stack” in a nice slide: What are the elements and layers of DeFi and how are they related to each other?
3. Which stablecoin are you most likely to use to park your funds and why?
 - a. What are the top 5 stablecoins by market capitalization?
 - b. What are the different methods for how stablecoins achieve their stability?
 - c. What are the risks associated with the different methods?
 - d. Why are APYs on stablecoins so high on lending platforms?
 - e. Does a stablecoin pegged to the official currency of your country exist yet?
4. What is the significance of NFTs? Use-cases beyond art?

Non-Fungible Tokens (NFT)

The NFT Beeple sold for around \$69.3 million last March.
But what's the Hype around them for?



DEFINITION

One of the first and most important things about NFTs you need to understand is the difference between non-fungible and fungible. Non-fungible is a term used in economics to explain something that is not interchangeable with other items because of their unique properties. In simple terms, the value of the object comes from its uniqueness. Some examples of this are furniture, song files, computers, and art. In comparison, Fungible is something that can be exchanged because their value defines them rather than their unique value. Simply, this means the main price is determined by the object's bare value, in which uniqueness doesn't affect the value. An example of this is any type of currency such as ETH or USD, because 1 ETH/USD can be exchangeable with another USD/ETH. This is important to understand because it helps one grasp the concept behind an NFT. an NFT stands for a Non Fungible token, in which it is uniquely preserved even in an online setting in which the security and credibility of certain items are not proper and original.

BENEFITS OF NTfS

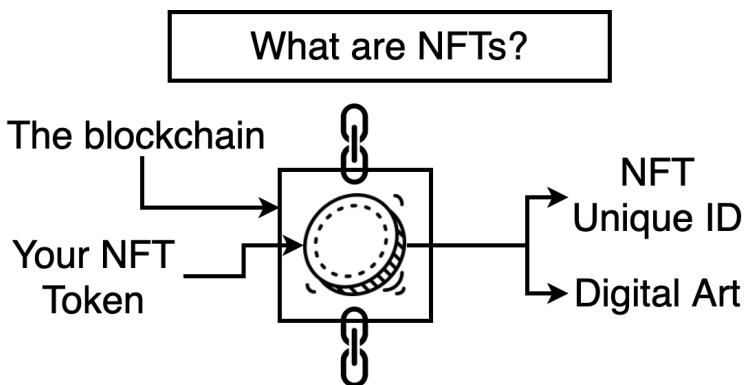
The main problem that an NFT solves is related to the issue with the lack of properties of physical items like scarcity, uniqueness, and proof of ownership. To solve this problem, NFTs are digitally unique, are compatible with anything built using Ethereum, are accessible, and have royalties/ownerships. To start they are digitally unique because each and every NFT is provided with a Token that proves originality and authenticity, therefore no two NFTs are the same, and neither are the tokens. Secondly, because NFTs are compatible with anything built using Ethereum, it is convenient and easy to use and their availability is at its peak. Royalties and ownerships are a big part of NFTs because this allows NFTs to be monetized. Every time the NFT is traded, a certain amount of commission (ETH) is given to the creator, allowing the creator to continuously make a profit. Additionally, they are easy to sell and therefore the owner can easily sell and buy the NFL's for profit. In Conclusion, NFT's main focus is to maintain originality and digital assets.

NFT's can be a variety of things such as digital artwork, sneakers, in-game items, essays, digital collectibles, domain names, tickets that give you access to an event or a coupon, and more.

Main types of NFTs:

- Digital Art:
 - GIFs
 - Collectibles
 - Music
 - Videos
- Real-World Items:
 - Deeds to a car
 - Tickets to a real-world event
 - Tokenized invoices
 - Legal documents
 - Signatures
- Lots and lots more options to get creative with!

So to conclude what gives NFTs its value is originality, Digital Scarcity, Functional value, Provenance, and Bragging rights. NFT guarantees originality through tokens that provide authentication to the NFT. Secondly, Digital Scarcity occurs because of the limited amount of a specific NFT increasing the value of the NFT. Due to the fact that some NFT's have functional value and contain benefits/extras, the value increases. Lastly, the NFT's history also plays a major part in determining the value of blockchain.



Gaming Industry

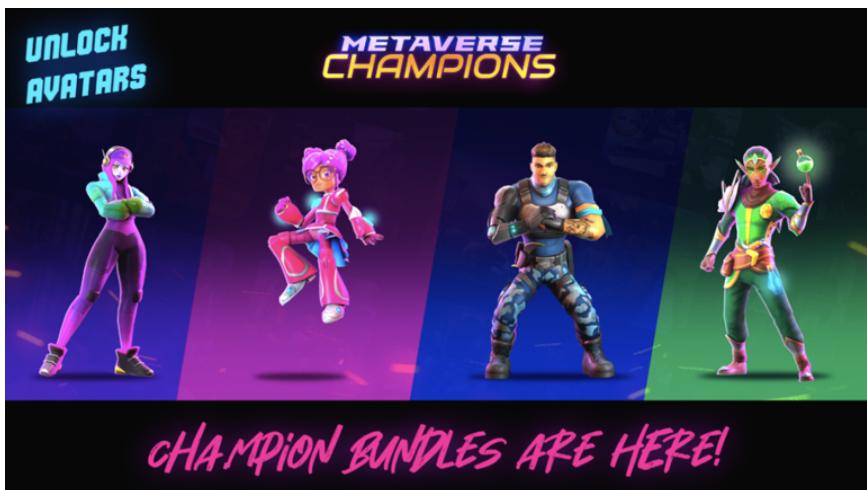
One of the main use cases is the use of making in-game assets into NFT's. And the use of NFTs to buy and sell in the games. Essentially through the game players would be able to make real money that could be used in the metaverse.

Additionally, since NFT's is unchangeable and unique this means each asset is unique having its own value. Then the assets could be stored in a wallet and be used in other games. This means that essentially a good found in Call of Duty can be used in the Fortnite.



Metaverse

From the dictionary, “a metaverse is a virtual-reality space in which users can interact with a computer-generated environment and other users.” (Oxford language). In short, there is no specific on what the metaverse is and how it works. Instead, it's the idea of a different way of communication through the internet. And therefore the sky's the limit as the metaverse is a concept that can be expanded greatly. But in general, it is a method of communicating and working with people around the world through a virtual world in a real-time, infinite, self-sustaining, interoperable, and decentralized way. A well-known example of this is a company called decentraland. Some main companies that are investing in the Metaverse are Roblox.



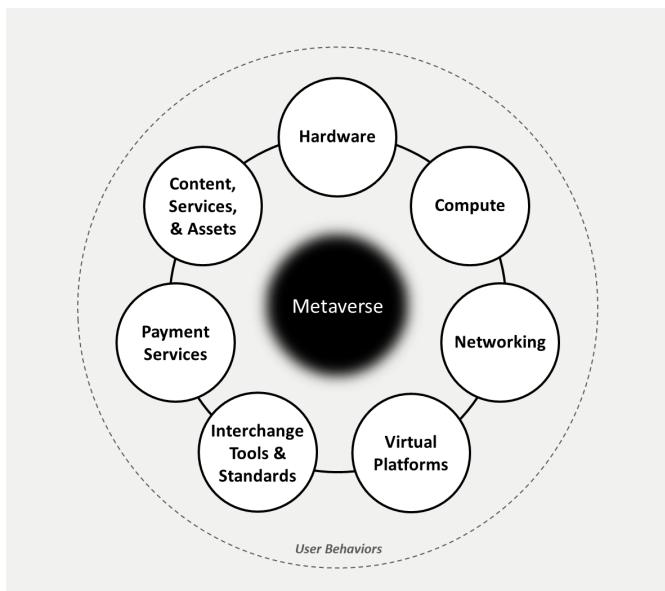
METAVERSE'S RELATION TO BLOCKCHAIN

1. Decentralization

And metaverses like the blockchain both naturally share a similar trait for the need for decentralization. A metaverse is meant to be almost like another world that people could escape to, use, and more. In such a world, a central authority would defeat the purpose of a free 3d world. This would also be important in the use of cryptocurrencies in the metaverse. Therefore it is crucial for the Metaverse to be decentralized.

2. Immutability

In a metaverse, the setting, location, character, and more are important to remain the same. With ongoing updates and changes, using immutability will help maintain stability.



METAVERSE USE-CASE'S

Some of the main uses start with the:

- Gaming Industry
- Virtual work and learning spaces
- Virtual businesses and markets
- Expansion of social media platforms

Gaming Industry

Like how NFT's can be used in gaming, in a metaverse this NFT aspect can be used in order to allow an economic incentive to metaverse gaming.

In addition to this, games could be played in a virtual world where the technology is so developed that participants would see, feel, smell, and be able to touch the virtual world. Essentially Feeling like you're in the specific place itself.

Education and work Industry

Through the metaverse students all around the world would be able to meet together and "Virtually" interact with each other. Revolutionizing the reach for education. This would also make expanding quality education to underdeveloped places easier. And overall take virtual learning to another stage where virtual learning feels almost exactly like physical learning except with the comforts of one's house and surroundings. Vlse- verse with working.

Business and markets Industry

Imagine being able to walk into a store, look for clothes, try them on, see how they look on you, feel them, and then buy them, but all online. Through the metaverse, one could virtually travel to another store/location and get the exact same experience of being in person while being online.

This would revolutionize the business industry and how we now market, we are able to achieve physical connections and interactions while being miles away from each other.

Expansion of social media platforms

Through the metaverse instead of looking at physical pictures or videos like we see today on the social media platforms like TikTok and Instagram, with the metaverse one would be able to enter the picture and videos and see, visit and look at the location virtually. Although this seems thoroughly cool, it is truly something that's scary, since it exponentially exemplifies the effect of social media in pros and cons. It's really important to keep in mind that all technology can be used for good and bad and it is your responsibility to try to maintain peace and use these tools for the good of you and society

Metaverse Deeper Knowledge Assignments

- Read the NFT's and gaming blog on Sadhana WIX website
- Research facebooks (META) POV on Metaverse and future of it.
- Look into different Metavers companies and understand what they do
 - A good start would be Decentraland (MANA)

JOB FORECAST

Job Description

Blockchain focuses on the development of a decentralized database where no single person oversees what happens. Blockchain can be utilized in many different careers to stop problems such as corruption. Most Blockchain jobs solve a problem in identity theft, banking, asset transfer, contracts, supply chain, crowdfunding, healthcare, government management, voting, and more. Blockchain uses nodes and blocks to make a secure decentralized database. Blockchain is currently being most used in finance: to make transactions quicker, easier, and more secure(company: Gemini). It is also being used to implement smart contracts, which make contracts more secure-unchangeable and accurate, solving issues everywhere (company: ethereum). Blockchain can revolutionize many fields as it stops misunderstanding, lost items/money, corruption and allows everyone to be on the same page at all times.

Education, Training, and Certifications

Most blockchain jobs recommend you to have a degree in Information Technologies, Information security, and/or computer science. It is also recommended to have an understanding in

- **Ledgers**
 - Database Blockchain Uses
- **Cryptography**
 - “Cryptography is the mathematical and computational practice of encoding and decoding data”(Investopedia)
 - Used for security and the whole blockchain, node, block algorithm)
- **Data Structures**
 - How data is stored- especially important as blockchain has a unique way of storing its data using blocks and nodes connected by chains(“Block-chain”).
- **Decentralized applications (DApp)**
 - Some companies: NEO, Etherium, EOS
- **Cybersecurity**
 - Security of the Blockchain
- Fluency in several computer languages
- Management skills
- You can also get certification in blockchain technologies.

Related Areas

Some related areas to blockchain are computer science, Cybersecurity, Information technologies, networking, etc. Information technology is “responding to hardware problems, updating system software and tracking the data and communications used on their network.”-indeed. Computer science is using coding to develop new software(blockchain development). Cybersecurity is the protection of intellectual

property and the internet(also needed in blockchain to make sure the database is safe).

National and Local Professional Organizations

Some national professional organizations for blockchain are BAFT - Financial Technology and Innovation Initiative, Bitcoin Foundation, BLOC (Blockchain Labs for Open Collaboration), Blockchain Alliance, Blockchain Trust Accelerator, and Digital Currency Council.

- Financial Technology and Innovation Initiative(BAFT) - Promotes international transaction banking in blockchain technology(think center)
- BLOC (Blockchain Labs for Open Collaboration)- An area where you can research and learn about any topic in blockchain technology while collaborating with others.
- Blockchain Alliance -” forum for open dialogue between industry and law enforcement and regulatory agencies, to help combat criminal activity on the blockchain.”
- Blockchain Trust Accelerator -” The Blockchain Trust Accelerator is committed to advancing Blockchain technology through responsible, innovative, and cutting edge pilot projects that address civic engagement, governance challenges, social good and more. “ an accelerator where you can create, develop and test your own blockchain company.

- Digital Currency Council- “The DCC is a professional association for lawyers, accountants, and financial professionals in the digital currency economy, providing training, certification, and ongoing support to professionals building their practices in or around digital currencies. “ You are given the opportunity to work with professionals and gain knowledge in Digital currencies in the blockchain.

Salary

The average salary for a career in the blockchain is around \$125,000+, but this number can vary based on the success of the business. In addition, the market is expected to grow by 84.2% by 2028, going from 3.67 billion in 2020 to 394.60 billion in 2028.

Career Outlook

Although blockchain is still very new, it has a very promising future. Blockchain is a concept of having information readily available, decentralized, immutable, and transparent. This is done by using a ledger that uses blocks, nodes, and miners to interconnect all the information. Thus because of this broad concept blockchain can be implemented in a wide variety of careers and be used to make day-to-day life easier for society, for example in healthcare, banking, the music industry, etc. In addition, the market is expected to grow by 84.2% by 2028, going from 3.67 billion in 2020 to 394.60 billion in 2028. Blockchain is a disruptive technology that will revolutionize the world because of the many benefits it holds.

Conclusion

In Conclusion Blockchain Technology is one of the future, a technology that has the capability to change the way the world works. Although the book provides just the basics behind blockchain technology, it is strongly recommended to research the topic on your own. Be the change in the world, Start with Blockchain!