SEE INSTITUTE

Sustainability through Research & Education

Future of the Digital Economy

Contents

Course Outline

Course ID & Title:	**Future of the Digital Economy**
Semester:	December 2022
Course Format:	Hybrid
Guided learning hours:	16 guided learning hours
Duration:	4 days

Study Program	*Sustainability Leadership* – Innovation and Technology

Course Description (aims and purpose of the course)	This course is designed to equip digital startups with practical knowledge and tools they need to build in the metaverse and leverage Web3 to their benefit. After the course, company representatives will be able to come up with the best strategy for bringing their companies into the Web3 and metaverse. Throughout the course, participants will understand the core principles of Web3, its history and roots, and study examples of both successful and failed Web3 strategies within key industries such as fashion, automotive, real estate, e-commerce, finance, and others. They will also understand the value of NFTs as a new way of communication between brands and customers and the new era of a two-way conversation between involved parties. They will learn what "soul-bound" NFTs are, how they can be utilized, and how NFTs might represent real world values and ownership. Throughout this learning program, participants will learn how easy and frictionless it is to open and manage a digital wallet, how to trade or buy digital assets and how to easily create and launch digital assets such as NFTs or tokens. Students will also encounter the basic trilemma of blockchain and how to manage expectations of different blockchains. In addition, the course will cover future possibilities and different paths one company might partake in this new and exciting journey. Security, privacy, and ethics of blockchain industries and how to overcome Web2-related problems while navigating this new and unchartered territory. The VR environment will paint the future landscape of meetings, collaboration, education, and other digital and virtual aspects of metaverses of the future.

Learning Outcomes **CLOs**	On successful completion of this course a participant should be able to: • CLO1 Understand the core principles of Web3 & its history and roots; • CLO2 Study examples of both successful and failed Web3 strategies within key industries such as fashion, automotive, real estate, e-commerce, & finance; • CLO3 Understand the value of NFTs as a new way of communication between brands and customers; • CLO4 Explore the basic trilemma of blockchain and how to manage expectations of different blockchains; • CLO5 Identify the relation between speed, cost and reliability and how it impacts personal blockchain decision-making when launching Web3 products. • CLO6 Privacy, security, and ethics of blockchain industries as well as how to troubleshoot Web3-related problems while navigating this new and uncharted territory.
Topics and suggested assignments/activities and assessment	This program will be taught in person, through workshops and case studies, and via a digital environment in VR with teachers both present and remote. **Key topics**: • Brief history of Web3 • Introduction to Metaverse • How to identify Web3 aspects of your business • Creating a soundproof Web3 strategy for your brand • Building and scaling communities in Web3 • Best practices and hard-data for success in Web3 • Creative approaches to virtual worlds and metaverse • Key technology aspects of Web3 and Metaverse and their current problems • Web3 as a marketing strategy and marketing in Web3 • Key takeaways of failed Web3 strategies of big companies • Legal framework, privacy and ethics of Web3 industries • Differences between fungible, non-fungible and soulbound tokens and their applications • Real-world ownership and blockchain • Legal framework and copyright **Workshops**: • Buying your first NFT

	• Brainstorming your Web3 strategy • Journey into the Metaverse **Case-studies**: • Current State of Web3 • Choosing your blockchain: Web3 Trilemma • Real-world Value and Application of NFTs: What they are, what they are not and what they might be? • Monetizing Web3 through NFTs: Crowdfunding that works, except when it doesn't • FTX: A fall of a giant, regulatory loophole or a simple neglect
Participants	Executives of Dubai Chamber of Digital Economy start-ups
Course Contribution to UN SDGs	This course equips you with knowledge to advance the following SDGs: 4 – Quality Education 9 - Industry, Innovation and Infrastructure

Course Content/Agenda	
Day 1	• Brief Introduction to Web3 • Current State of Web3 • Ethics in Web3 • Choosing your blockchain: Web3 Trilemma
Day 2	• Introduction to NFTs • Buying your first NFT • Journey into the Metaverse • Real-world Value and Application of NFTs: What they are, what they are not and what they might be?
Day 3	• Building communities in Web3 • Monetizing Web3 through NFTs: Crowdfunding that works, except when it doesn't • Meta: 10 Reasons Why Meta Failed Brainstorming your Web3 strategy

Day 4	• FTX: A fall of a giant, regulatory loophole or a simple neglect • Privacy and Security in Web3 • Legal Framework and Copyright • Closing thoughts and goodbye

MODULE 1

Web 3

Brief Introduction to Web3

Web3 is a new way of thinking about the internet. It's a platform that restores power to the people by giving them control of their data and identities. Web3 makes it possible for users to interact directly with each other without relying on third-party intermediaries like Facebook or Google. It also enables developers to create decentralized applications (apps) that facilitate peer-to-peer interactions and provide services like financial applications, digital voting systems, and more.

Web3 is powered by blockchain technology, which makes it secure, transparent, and immutable. By using Web3 technologies such as Ethereum, users are able to do everything from transferring money to trading stocks and more. With Web3, the Internet is on its way to becoming a trustless system where users can conduct transactions without having to rely on a third-party intermediary. This has wide-reaching implications for the future of digital services and makes it possible to create new kinds of applications that weren't possible before.

Definition of Web3

Web3 is a web-based technology that enables users to interact directly with each other over the internet, bypassing third-party intermediaries like web browsers or search engines. It's powered by decentralized applications (dApps) and blockchain networks such as Ethereum, Solana, Cardano, and more, which make it secure, transparent, and immutable. Web3 allows users to conduct financial transactions and other activities without relying on a trusted third-party intermediary. This opens up new possibilities for web applications and services, including web-based payments, lending, trading, and more. Web3 is the future of the web – ushering in an era of trustless transactions, data protection, and user control.

History of Web3

The Web3 concept is a new way of thinking about the internet that restores power to the people by giving them control of their data and identities. It's powered by decentralized applications (dApps) and blockchain networks such as Ethereum, Solana, Cardano, and more, which make it secure, transparent, and immutable. Web3 allows users to conduct financial transactions and other activities without relying on a trusted third-party intermediary. This opens up new possibilities for web applications and services, including web-based payments, lending, trading, and more.

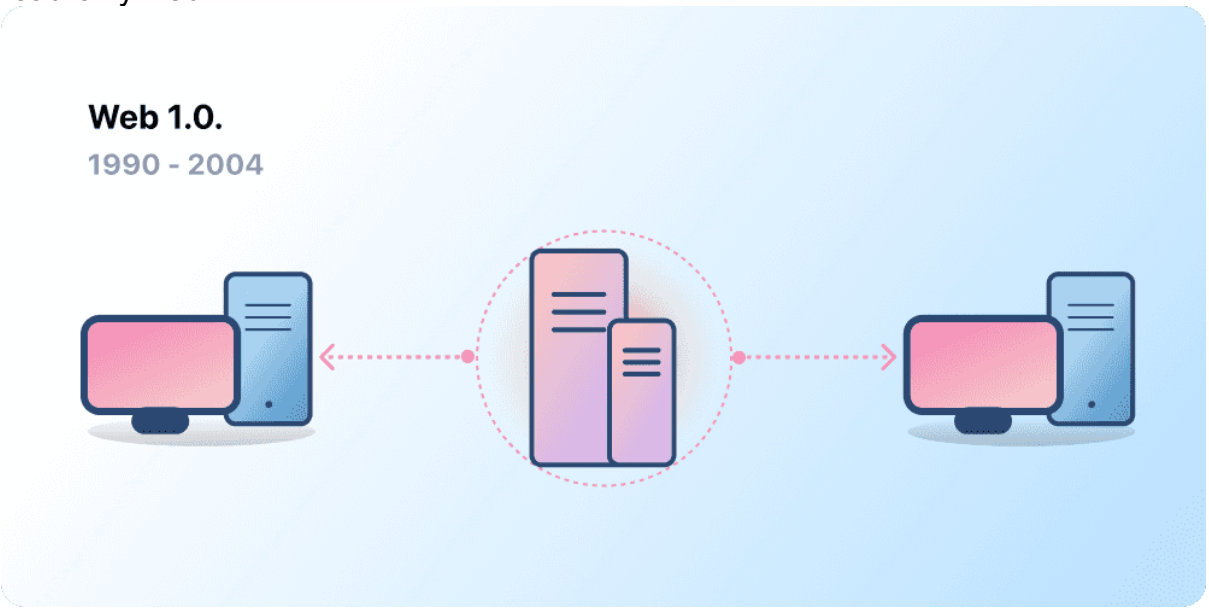
Web3 builds on the groundwork laid by earlier versions of the web – web1, web2 – but takes things to a whole new level with its innovative technologies like blockchain and dApps. While web1 was limited to static pages accessed through a web browser, web2 introduced interactivity with features like AJAX and dynamic content loading. However, both of these versions still relied on centralized servers controlled by corporations or governments.

Web3 is different in that it uses distributed ledger technology (DLT) to create a peer-to-peer network where users can interact directly with each other without relying on third-party intermediaries. This makes it possible for apps built on Web3 to be more efficient, secure, and cost-effective than traditional web applications.

Timeline

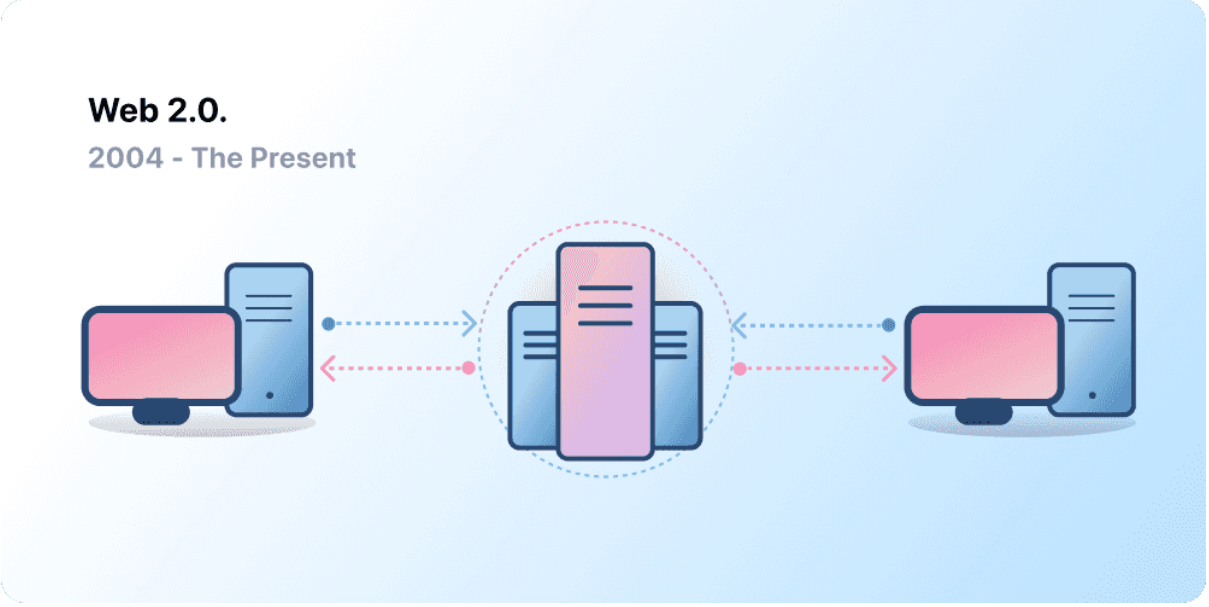
Web 1.0: Read-Only (1990-2004)

Tim Berners-Lee had the idea to develop open protocols that would allow for information sharing from any location globally. His first version of what we now know as the 'World Wide Web' was between 1990 and 2004, which he developed while working at CERN in Geneva. This early stage, referred to as 'Web 1.0', consisted mostly of static websites owned by companies instead of individuals. There wasn't much interaction or content produced by users, leading it to be called the read-only web.



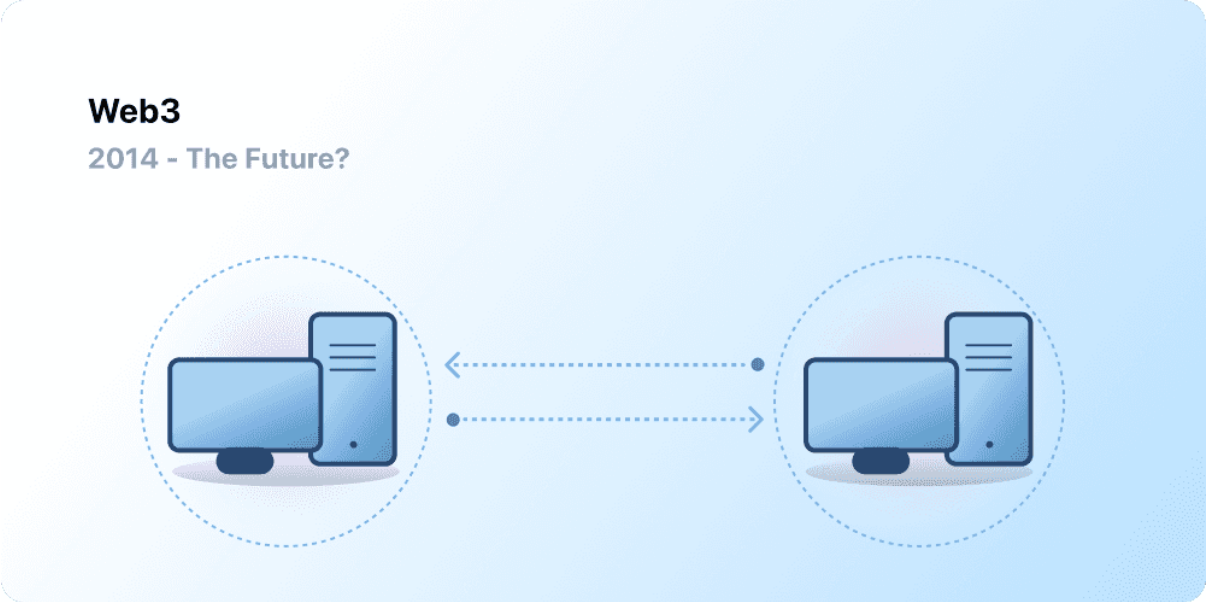
Web 2.0: Read-Write (2004-now)

2004 was the start of the Web 2.0 period, which saw social media platforms emerge. Instead of being read-only, the web evolved to become read-write. This means that instead of companies only providing content to users, they began to provide platforms too so that users could share their own generated content and interact with each other. With more people coming online, a small number of top companies began controlling most of the traffic and value on the web. The advertising-driven revenue model also came about during this time – while users could create content, they didn't have any ownership over it or benefit from its monetization in any way.



Web 3.0: Read-Write-Own

'Web 3.0' was originally an idea by Ethereum co-founder Gavin Wood a few years after Ethereum launched in 2014. He came up with a solution to fix something that many people using crypto felt: the Web needed less trust overall. In other words, most of the Internet today is run and overseen by only a few private companies instead of being more publicly accessible.



Technology behind Web3

Web3 relies on a number of key technologies that make it possible to create decentralized applications and interact with others on the web without relying on third-party intermediaries. These key technologies include blockchain technology, Ethereum, and IPFS.

Blockchain technology is what makes Web3 secure, transparent, and immutable. It enables users to transact with each other directly without having to rely on a third party. Ethereum is a blockchain platform that makes it possible to create decentralized applications and tokenized digital assets. IPFS is a peer-to-peer file-sharing system that makes it possible to store data securely and access it quickly from anywhere in the world. Together, these technologies form the backbone of the Web3 platform and enable users to interact with each other directly in a trustless environment.

Other blockchains, similar to Ethereum but with new features and better infrastructure, are starting to gain traction in the Web3 space. These blockchains include EOS, NEO, Cardano, Solana, and more, **each of which has its own unique set of features and benefits. While Ethereum is currently** the most popular blockchain platform for developing decentralized applications, there is no shortage of other options available for those looking to build on a blockchain. These other blockchains are worth exploring if you're interested in building a decentralized application and want to explore your options beyond Ethereum.

Importance of Web3

Web3 is revolutionizing the web in a number of ways. It gives users control of their data and identities, enhances privacy, and allows for peer-to-peer interactions without the need for third-

party intermediaries. This makes it possible to create new kinds of applications that weren't possible before and opens up a whole new world.

Ownership

Digital Assets Ownership on Blockchain

One of the key benefits of using blockchain technology is that it enables users to securely and transparently own digital assets. These assets can be anything from cryptocurrencies like Bitcoin and Ethereum to digital collectibles like CryptoKitties or Bored Ape Yacht Club NFTs. By using blockchain technology, users are able to control their assets and transactions without having to rely on a third party. This makes it possible to create new forms of ownership and opens up a wide range of possibilities for the future of digital asset ownership.

Non-Fungible Tokens (NFTs)

One particularly interesting application of digital asset ownership on blockchain is the use of non-fungible tokens (NFTs). NFTs are tokens that represent unique digital assets. Unlike regular fungible tokens, which can be freely exchanged and are identical to each other, NFTs are unique and cannot be replaced. This makes them ideal for representing rare or unique items like artworks, collectibles, or even real estate. NFTs are stored on blockchain platforms like Ethereum, Solana, Polygon, Cardano, and others, and allow for secure and transparent ownership of digital assets.

Other Uses

Digital asset ownership on a blockchain has many other applications as well. It can be used for securing digital rights, tracking provenance, or creating decentralized marketplaces. The possibilities are endless and only limited by the imagination of developers. If you're interested in exploring the possibilities of blockchain technology, digital asset ownership is a great place to start.

Censorship Resistance

One key aspect of Web3 is its censorship resistance. Censorship resistance is the ability of a platform to resist attempts by third-party actors to block or censor content or transactions. This is an important feature for many applications, especially those that deal with sensitive or controversial data. Blockchain platforms like Ethereum and Bitcoin are inherently censorship resistant because all transactions are stored on the blockchain and cannot be changed or removed without the consent of the majority of miners or stakers. This makes it almost impossible for anyone to censor or block content without the consent of the majority of users.

Other blockchain platforms offer similar levels of censorship resistance. EOS, NEO, Cardano, and others all have mechanisms in place that make it difficult for third-party actors to censor or block content without the consent of the majority of users. This makes them ideal platforms for building applications that need to be censorship resistant. If you're looking for a platform that can resist censorship, there is no shortage of options available in the blockchain space.

Decentralized autonomous organizations (DAOs)

Decentralized autonomous organizations (DAOs) are another type of Web3 application that is becoming increasingly popular. A DAO is a decentralized virtual organization that is managed and

operated by its members. These members can be located anywhere in the world and can interact with each other without relying on a centralized governing body or institution.

A DAO is run by a set of smart contracts that are programmed to make decisions based on the consensus of its members. This allows for greater efficiency and transparency than traditional organizations, as all members have equal say in decision-making processes and the actions taken by the DAO are quickly visible to all participants.

DAOs have already been used for a variety of applications, from decentralized exchanges to cryptocurrency lending and more. With Web3 technology becoming increasingly popular, it is likely that DAOs will become an important part of the blockchain ecosystem in the future.

Digital Identity

Identity management is another important Web3 application that is gaining traction in the blockchain space. Digital identity is becoming increasingly important as we move into a more connected and global world, but existing solutions are often centralized and vulnerable to data breaches or censorship.

Blockchain-based identity solutions can provide a secure and decentralized alternative to traditional identity solutions. By allowing users to create and securely store their digital identities on the blockchain, Web3 applications can provide a secure and resilient way of managing personal information.

Payments via Blockchain

Finally, Web3 applications are also being used for payment processing. Blockchain technology enables secure and reliable peer-to-peer payments without the need for a centralized third party. This makes Web3 payments fast and cost-effective, as well as more resilient to censorship or manipulation.

Web3 applications are revolutionizing the way we interact with the web, from censorship resistance to identity management and beyond. With Web3 technology becoming increasingly popular, it is likely that more applications will be built on top of Web3 platforms in the near future. From payments to lending, Web3 technology is poised to revolutionize the financial industry and open up possibilities for new generations of users. By leveraging Web3 technology, Web3 applications are bringing greater efficiency and transparency to the blockchain industry.

Web3 limitations

Although Web3 has various advantages in its current state, there are still numerous limitations hindering its growth.

Accessibility

Essential Web3 components, like Sign-in with Ethereum, are actively available to use at zero cost. However, the fees associated with transactions continue to block many individuals from partaking in cryptocurrency altogether. In less economically stable or developing countries, this is an even greater issue as citizens can't afford high transaction rates. Through planned network upgrades and partnering with layer 2 scaling solutions through or utilizing new and more advanced Layer 1 solutions like Solana or Cardano, we hope to bring down these rates and make Web3 more accessible for all users.

User experience

The main reason that people have not started using Web3 yet is because it requires users to have technical expertise, like knowing about security concerns and being able to read difficult documentation. Wallet providers are trying to make this process easier, but there needs to be more progress before a lot of people start using Web3.

Education

The introduction of Web3 brings with it new paradigms that require a different way of thinking than what was used in the earlier stages of the Internet. In the late 1990s, when Web1.0 was first gaining popularity, there were proponents who dedicated themselves to educating the public on how to use this new technology effectively. They did this through a variety of media outlets, from simple metaphors (the information highway, browsers, surfing the web) to television broadcasts. Similarly, those responsible for ushering in Web3 need to inform users of the differences between this version and previous ones so that its success is more likely.

Centralized infrastructure

Because the Web3 ecosystem is still in its early stages, it relies mostly on centralized infrastructure that isn't specific to web 3.0 (GitHub, Twitter, Discord, etc.). However, many companies associated with web 3.0 are working quickly to build their own reliable infrastructure.

Conclusion

In conclusion, digital asset ownership on Web3 technologies like Ethereum and other blockchains has opened a multitude of possibilities for how we use and interact with digital assets. With Web3 technologies allowing for censorship resistance, NFTs representing rare and unique items like artwork or collectibles, and DAOs allowing for decentralized autonomous decision-making, Web3 technologies are sure to revolutionize how we store and interact with digital assets in the future.

Furthermore, Web3 payments and identity management will open up new possibilities for how we store and transact with digital assets. Web3 applications are already changing the way we interact with web-based services and the financial industry as a whole, and it is likely that Web3 technologies will continue to have radical effects on our lives in the years to come.

For Web3 to succeed, however, it needs better accessibility, user experience, and education in order to truly revolutionize the way we use web-based services.

Choosing your Blockchain

When it comes to blockchain technology, businesses have a lot of choices to make. Not only do they need to decide which blockchain to use for their project, but they also have to weigh the options between speed and efficiency, centralization, and cost. Making the wrong decision could mean wasted time and money for the business. In this lesson, we will explore some of the hurdles businesses face when making this important decision.

With over a 1,000 blockchains to choose from, it's tough to decide which one is right for you. Different blockchains are better suited for different tasks, and some outperform others in other areas. In this case study, we'll help you pick the best blockchain by focusing on the leading options and determining your company or project goals.

The blockchain scalability trilemma

The blockchain scalability trilemma is one of the greatest hurdles for cryptocurrencies. It states that you can only achieve two out of three features: decentralization, scalability, or security simultaneously - but never all three. Therefore, trade-offs are inevitable. The term was originally coined by Vitalik Buterin, the founder of Ethereum (ETH), who invented it in relation to blockchain technology's scalability issues.

When deciding which blockchain platform to use, projects should consider some of the following criteria:

- Scalability and throughput of the platform
- Security and Privacy
- Blockchain functionality
- Private vs. Public Blockchains
- Adoption rate: evaluate the strength of the community
- Required development experience and costs
- Decentralization level: Concentration of power within the node network
- Power players in a Decentralized system

These next three factors aren't as important as the previous ones, but they can help you make a decision if you're having trouble choosing the right blockchain for you and your company:

- Availability of supporting developer tools to increase the developer experience.
- Structure of information: quality of documentation, structure, and availability of external tutorials or guides.
- Availability of bug bounties or incentivization programs.

Scalability and throughput of the blockchain platform

Layer 1 blockchain platforms, such as Bitcoin and Ethereum, are less scalable and have lower throughput than Layer 2 blockchain platforms. This is because Layer 1 blockchain platforms rely (mostly) on miners to verify and validate transactions, which limits the number of transactions that can be processed at a given time.

Layer 2 blockchain platforms, such as the Polygon blockchain, are more scalable and have higher throughput than Layer 1 blockchain platforms. This is because Layer 2 blockchain platforms do not rely on

miners to verify and validate transactions. Instead, they rely on a network of nodes to process transactions. As a result, Layer 2 blockchain platforms can process more transactions at a given time than Layer 1 blockchain platforms.

There are also newer Layer 1 solutions that are trying to fix this problem, Solana is an example of a Layer 1 blockchain platform with high throughput and high-cost efficiency. Solana's blockchain can process up to 10,000 (although their documentation theorizes about TPS up to 65,000 transactions per second) transactions per second, making it one of the most scalable blockchain platforms available today. However, because Solana is a Layer 1 blockchain platform, it might be less cost-efficient than other blockchain platforms in a long run.

Key Takeaways:

- If blockchain technology is used for things such as gaming or metaverse, then the blockchain platform should be able to handle a large number of transactions without any downtime.
- Financial transactions might not require high TPS but rather require higher security, thus far choosing a slower but safer blockchain might be an option for you.
- The average size of transactions is also important, if your project requires high volume transactions and high security, then TPS and cost-effectiveness are not the main focus, but if you are in for a microtransactions requirement, choosing a fast and cost-effective chain is a must.

Security and Privacy

Blockchains are created to be a very secure way of storing and sharing data, but that doesn't mean you shouldn't worry about how the platform keeps the data. In fact, you should check the security features each platform offers carefully, especially if your company handles sensitive information.

You can protect your money and information by examining the cryptographic procedures the platform employs, how network records are verified, how often the platform updates, and how to confirm user identities.

There are currently numerous cryptographic verification algorithms, some of which include Proof-of-Work (PoW), Proof-of-Stake (PoS), Proof-of-History (PoH), Proof-of-Importance (PoI), and many others. Try researching each consensus and its implications for the platform's scalability, security, cost, and efficiency. Also, if sustainability and carbon footprint are requirements for you, newer algorithms tend to be greener than, for example, original Bitcoin's PoW, which requires a massive amount of energy for confirming a single block!

The level of privacy offered by blockchain platforms also varies from one blockchain to another. Some blockchain platforms offer better privacy than others, and this may be an important factor for companies that don't want to share their data with anyone.

Blockchain Functionality

Although all blockchains utilize the same technology, their features can vary greatly. For example, Bitcoin is used primarily as a form of virtual currency while Ethereum focuses on smart contracts that automate business processes and build decentralized apps. Ripple was invented with the goal of making cross-border monetary transactions easier and more affordable - similar to SWIFT.

Because their focus is so unique, determining the best blockchain network for your business and its objectives is essential. The time it takes to process data, as well as the features they can offer differ

drastically. Obviously, this means that researching what type of blockchain network you might need becomes extremely important.

If you require Smart Contracts, for example, check that the platform you're looking into supports it before making any decisions.

Also, not all Smart Contracts are the same, check individual protocols and how they differ from chain to chain before you make your final decision. The rule of thumb is to go for a blockchain that matches your industry and your project goals. For example, Ethereum is mainly focused on dApps but even more focused on DeFi industry and security, while Solana is built from the ground up with gaming and metaverse in mind, thus far facilitating microtransactions is an easy task, while Ripple is fast and oriented for cash transfers, it doesn't support Smart contracts yet, so any project requiring them will need to pick another chain for now.

Private vs. Public Blockchains

Generally, blockchain comes in two forms: private (or enterprise) blockchain and public blockchain. Our main focus is public blockchains, but we will cover a few differences between these two types.

Private blockchains are more manageable for big companies because they can pick and choose who joins the network, what data is accessible to them, and which transactions they're able to carry out. Consequently, you need the invitation to participate in a private blockchain network. After being invited, you must be verified by either the network administrator or via pre-set criteria set down by the admins before being granted access. This makes sure that only those affiliated with the company running the ledger can read from and write on it.

Be aware that the person who owns the blockchain can also choose to edit or replace data, as well as delete any unwanted entries. This cannot be done on public chains.

Another benefit of enterprise blockchains is that they process information much quicker than public ones. With fewer users required to reach a consensus, private blockchains can validate transactions and activities very rapidly. But this comes with a much higher possibility of failure as there are not many nodes in the private blockchains, which raises security and transparency issues.

Public blockchains focus on participation and transparency. Unlike private networks, anyone can join a public blockchain and have the same rights as other users. In addition, all users can view the open-source code. Another advantage of using public blockchains is that each user is anonymous – authentication happens through cryptographic code unique to each user, known as public and private keys.

Adoption rate: evaluate the strength of the community

The blockchain industry is still in its early stages, and there are many uncertainties about its future. However, one thing that is certain is the importance of blockchain adoption rates. The success or failure of the blockchain industry will be determined by how well it is adopted by businesses and consumers.

So far, the blockchain industry has been growing very fast, especially in the last few years. The number of businesses that are using blockchain technology is growing every day, and more people are becoming aware of the benefits of blockchain technology.

Some of the most adopted blockchains to date include Bitcoin, Ethereum, and Litecoin, followed by Solana, Cardano, Polygon, Ripple, and others. These blockchains have been embraced by businesses and consumers alike and have seen widespread use. Other blockchains such as NEAR also have a high potential for adoption due to their unique features and advantages over other blockchains.

However, one of the main factors that will determine the success of the blockchain industry is its community. The blockchain community is made up of developers, entrepreneurs, investors, and others who are passionate about blockchain technology and its potential to change the world.

The strength of a particular blockchain community will be a key factor in determining the success of its technology. So far, most blockchain communities gathered around specific chains and technologies have been very supportive and helpful to each other. This spirit of cooperation and collaboration will be important for the future of the industry and for that particular project's success.

Required dev experience and costs

There are a number of blockchain programming languages that developers can use to create applications on blockchain platforms. These languages are designed to make it easy for developers to create blockchain applications.

The most popular blockchain programming languages are Java, Python, Ruby, C++, and Solidity. These languages are used by the majority of developers who create blockchain applications. They are all relatively easy to learn, and they have a large number of online tutorials and resources that can help you get started quickly.

However, there are some differences between these languages that you should be aware of.

Java is a versatile language that can be used for a variety of purposes, including developing blockchain applications. It has a large community of supporters and a large number of online resources that can help you get started quickly.

C++ is also versatile and can be used for many different types of applications. However, it is more difficult to learn than Java and has a smaller community of supporters.

Solidity is specifically designed for creating Ethereum smart contracts, so it has limited versatility compared to other languages (for other scenarios) but it's the most useful programming language in the Blockchain industry up to date. Although, it is also more difficult to learn than Java and C++.

There are some less common programming languages like Rust used on the Solana blockchain. While not as popular, since Solana is one of the largest and most useful blockchains for metaverse development, it may be worth investing in Rust developers. Another option to consider is using a cross-compiler that would enable you to program your software in C++ or another familiar language and then compile it into Rust or any other unfamiliar language; however, this does have some drawbacks.

For more in-depth reading, we suggest you go through this article:
https://www.simplilearn.com/blockchain-programming-languages-article

Developer costs and scarcity with regards to the programming language technology also include which blockchain solutions can be achieved with a specific programming language.

Language	Blockchain	Average Developer Costs	Developer Scarcity Level
Solidity	Ethereum, EMV-based-chains (like Polygon)	100k USD yearly	medium scarcity
Java	Ethereum, Hyperledger Fabric, IOTA, NEO, etc.	70k USD yearly	plenty
C++	Stellar, Ripple, Bitcoin, Solana (cross-compiled)	106k USD yearly	medium scarcity
Python	Ethereum, Hyperledger Fabric, NEO	105k USD yearly	plenty but competitive market
Ruby	Ethereum, Polkadot, etc.	126k USD yearly	medium scarcity
Rust	Solana	175k USD yearly	high scarcity

For more info about the pros and cons of individual programming languages and their use in blockchain industries and development, check SimpliLearn's article: https://www.simplilearn.com/blockchain-programming-languages-article

Decentralization level: Concentration of power within the node network

Nodes play a pivotal role in blockchain networks by ensuring network security and function. Every node (a device connected to the network) is responsible for verifying data to be entered into the blockchain and making sure all nodes uphold network rules. In other words, a larger number of nodes makes it more difficult to tamper with data within the blockchain or attack individual nodes.

The consensus between the nodes needs to be achieved for transaction confirmation, and this can take some time - especially with large networks that have thousands of nodes. Of course, these public blockchain networks are secure but their performance could be improved.

If you want a blockchain that is quick, an enterprise network is better. If you prefer one that is secure or decentralized, then a public blockchain system would be more ideal.

Although decentralization through nodes is a key feature of blockchain technology, moving away from PoW consensus and implementing PoS technology opened the way for the concentration of power. Proof-of-Stake requires massive staking pools to be assembled so the transactions can be verified, as most of the blockchains require staking pools that far exceed single user portfolio, grouping multiple users in a staking pool is a must, but as many pools are run by DAOs or exchanges, it puts a lot of power into a small number of hands. Especially when considering that many of the companies behind those staking pools are registered somewhere and adhere to a particular country or jurisdiction, forcing them to act in their government's name is not impossible scenario.

Once again, higher efficiency and lesser costs lead to a less decentralized and less secure network, thus far proving Vitalik's blockchain trilemma once again.

Power players in a Decentralized system

Since the Ethereum blockchain merge and PoS consensus implementation, there have been allegations of possible centralization. Some say that because large staking pools are necessary for transaction verification, this puts too much power into the hands of a few. Others allege that because exchanges and DAOs are often behind these staking pools, they have too much control over the blockchain. What is clear is that blockchain technology is still evolving and there are many unanswered questions about its future.

We suggest reading Decrypt's article on this topic: https://decrypt.co/111485/has-proof-of-stake-made-ethereum-more-centralized

Key Takeaways:

- PoS consensus is faster and cheaper but it sacrifices security and decentralization
- Individual companies or organizations that provide staking pool infrastructure in networks such as Ethereum are registered in some jurisdictions and thus far they must comply to the governments
- Many of the power players in the Ethereum network are based in the USA at this very moment, and most of them announced they will comply with the regulatory bodies of their jurisdiction (USA)
- Be aware of particular blockchain power players and research how it affects you and your business in the long run

Defining project goals and needs

Now that you understand most of the blockchain-related issues and possible ways to go forward, it is time to talk about the individual goals and needs of a particular project.

Before making your final decision, you should define your project, try to find all possible use cases of the blockchain in your solution and then try to match your needs with a blockchain that perfectly suits your goals and serves all your needs.

A good starting point is, as already mentioned, trying to find a blockchain that is mainly focused on your industry or niche. This shouldn't be a problem, but sometimes, projects blur the lines of industries which complicates their decision-making around blockchain choices.

A good understanding is that Ethereum is the most versatile blockchain with the highest maturity and adoption rates, and it is usually a go-to solution, especially with a Polygon network operating as a Layer 2 solution on ETH, so expanding features and cross-adopting both chains is an option.

But Ethereum, even when Polygon is considered, lacks some features and solutions that might be present in other high-level chains out there. For example, Solana is a go-to metaverse and gaming chain, but it can also serve other purposes. Ripple is a fast and effective way to go for DeFi banking, but it lacks smart contract solutions.

Cardano is good for fast and reliable transactions and NFTs, but it has a veil of institutional distrust for many reasons, and the community is smaller compared to other chains.

So, we suggest defining your goals, doing your research, and employing some consultancy experts in this field so that your choice benefits the most in a long run.

Best blockchain solutions up to date

Although the list of possible blockchain choices is much longer than this, we decided to give you the few best options out there for most of the possible case scenarios that will suit most of the companies entering the space.

Ethereum

Predating many of its competitors, Ethereum has cemented itself as a premier choice for software developers looking to create blockchain applications.

While Ethereum coins can technically be used as an alternative currency, they are more often utilized as a platform to create smart contracts and build decentralized applications. Smart contracts store code-based automation programs on Ethereum that execute a given function when conditions are met. In other words, it is exactly what it sounds like – a contract that is executed automatically rather than needing human intervention.

Polygon

Polygon is a set of protocols designed to address Ethereum's scalability issues. The Polygon network processes transactions on a separate, compatible blockchain outside of the main Ethereum network. This alleviates congestion and improves transaction speed.

By post-processing transactions off of the main Ethereum blockchain, Polygon diminishes network load without sacrificing security or decentralization. In other words, it can speed up transactions while keeping transaction costs low - less than a cent per transaction.

In other words, Polygon makes it easy for blockchain projects to build on Ethereum without worrying about scalability issues. Polygon allows users to quickly and easily interact with any decentralized application without stress or anxiety about network traffic.

Ripple

Hundreds of financial institutions rely on Ripple's blockchain platform for its transparency, fast response time, and low transaction costs. Its main purpose is to enable global, cross-border payments with minimal charges. The currency used on the Ripple platform is called "XRP" or "Ripple", which has become a popular cryptocurrency like Ether and Bitcoin.

XRP is built on advanced blockchain technology and uses a novel consensus method, so it's more scalable and faster than other blockchains. XRP transactions are confirmed in four to five seconds, which is much faster than most platforms. Ripple is also working on adding smart contract features to their platform, but this is still not supported up to date.

Solana

Solana is a purpose-built blockchain platform designed to host decentralized applications, similar to other popular dApp blockchains such as Ethereum and Cardano. It is mainly focused on NFTs, Gaming and Metaverse, but that is not it's full functionality.

This platform has become popular because it offers two features that the Ethereum blockchain does not have: faster operation and lower transaction fees. Solana uses a PoS (proof of stake) blockchain rather than a PoW (proof of work) blockchain, making it more environmentally friendly than Ethereum and Bitcoin. Even after the PoW to PoS transition of Ethereum, Solana is still beating transaction speeds and costs against Ethereum. Solana was also dubbed as the "Ethereum Killer" but that prophecy is still to be seen.

Not only is Solana one of the fastest blockchain platforms in the industry, with an average of 3000 TPS, but the Solana team claims it can reach even 65000 TPS, which would bring Solana to the speed of Visa cards.

Hyperledger Fabric

The Linux-based Hyperledger Fabric blockchain development framework is perfect for enterprises that want to develop permissioned solutions and applications. Its modular architecture lets various complex systems work together as plug-and-play components, making it possible to create very large and sophisticated blockchain solutions. There's also no need to reinvent the wheel – users can take advantage of the vast library of existing plug-and-play components that come with Fabric.

The Hyperledger fabric network is open only to verified and authenticated users in order to ensure the privacy of all participants, thus far it's considered one of the main Private blockchain solutions.

Conclusion

Blockchain technology is still in its early developmental stages and there are many unanswered questions about its future. While decentralization and security are two of blockchain's key features, they can be compromised depending on how the blockchain is implemented. It's important to be aware of particular blockchain power players and their effects on your business in the long run. Choosing the blockchain solution that works best for your project depends on your requirements and expectations between speed, efficiency, centralization, and cost.

In the end, blockchain technology is still evolving and there is much room for improvement. It's important to stay informed about blockchain developments and new research as it emerges so you can make educated decisions about blockchain implementation.
Thanks for reading! We hope you found this handout informative and helpful in your blockchain journey.
Happy blockchaining!

References:

Vitalik Buterin, “The blockchain trilemma”, Medium, 2016, https://medium.com/@VitalikButerin

Current State of Web3

The increasing transaction volume associated with DeFi protocols shows that the transformation to Web3 is well underway.

DeFi activity surged in 2021, with transaction volume peaking at nearly $4 trillion in Q2. While growth has since leveled off due to price declines for Ethereum and other assets, the number of individual transfers has stayed level or increased in some quarters, suggesting that more individual investors are still entering the ecosystem.

Web3 has only begun to show us what it's capable of, but we can already see a broad range of uses that are driving significant economic activity:

- Investing. People are using DEXs to trade and speculate, as well as staking-and-lending platforms to get more dependable, steadier profits.
- Borrowing and lending. On the other side of cryptocurrency lending contracts are borrowers who put up their existing cryptocurrency as collateral to access capital.
- Art, entertainment, and culture. NFT collectors have spent billions of dollars to own the art they love, while in the newer Web3 gaming space, users are monetizing their leisure time by playing games.
- Infrastructure. Billions are being made by protocols connecting different parts of the Web3 system and preparing for future expansion.
- DAOs. DAOs, or decentralized organizations, manage many of the processes driving the use cases highlighted earlier. These groups often receive billions in exchange for governance tokens, which are distinct from those received by the protocols themselves. However, as we'll explore later on, DAO activity may not be as decentralized as promised due to an abundance of governing token power held by a small number people. Still, in the long run, cryptocurrency adoption will increase and more users will join DAOs - making these digital organizations more democratic overall.

Key Performance Indicators

There are numerous Blockchain and Web3 KPIs, but the purpose of this lesson is to grasp a high-level understanding of the trends and current statistics of the industry as a whole. Thus far, we will measure main Web3 statistics such as total market cap and its trends, public interest in particular technologies such as DeFi or NFTs, power distribution in decentralized systems and DAOs and similar, and total volume trends on a global and local scales of the industry and its parts.

Total market cap of all Cryptocurrencies (Coinmarketcap source)

30/11/2021 until 30/11/2022

In one year time, the total market cap of the entire crypto sector plummeted a staggering 68%. Just one year ago, it was around its all-time high, which was 2.65T USD, while today on the 30th of November 2022 it is only 852B USD.

This downward trend is caused by many individual factors both macroeconomic and microeconomic, but big scandals and collapses like Terra Labs and FTX contributed greatly. War in Ukraine also played on a fear factor, but it leveled out pretty quickly in mid-April 2022.

Predictions are that the markets are probably at their lowest point, but the full unfolding of FTX drama will determine its final fate, so we are all to be tuned in the next 1-3 months and see how the entire thing plays out.

Predicted CAGR (2022 - 2030)

Although markets are pretty low, the general sentiment of the industry is that it will probably achieve 85-86% CAGR for the next 8 years, finalizing its predicted growth in 2030 with an estimated figure of 1.43T USD.

Important to mention, the blockchain/Web3 industry's worth and size are not the same as the total market cap of all cryptocurrencies. Web3 industry size refers to the value created by Web3 products, businesses, and platforms, and isn't connected to the total market cap of its financial input.

Investments are drying up, but the sector stays strong

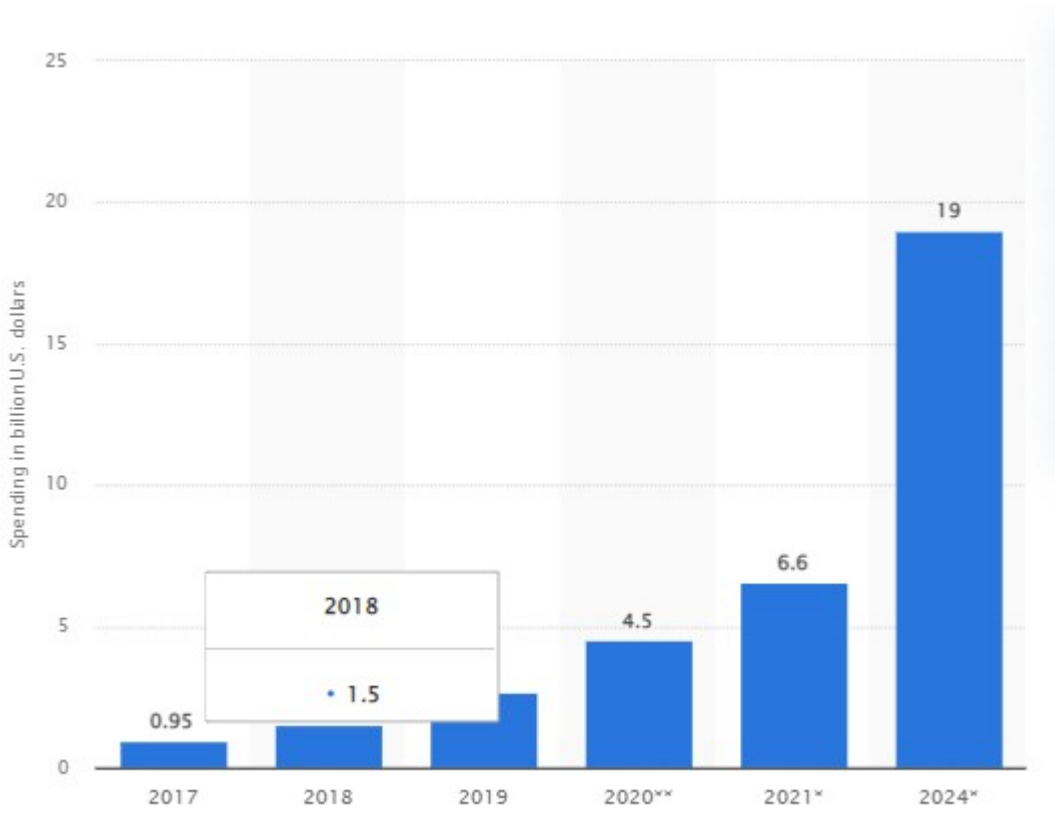
The first quarter of 2022 was marked by a continued increase in the value of cryptocurrencies. However, Second Quarter results showed a potential decrease in investment, as venture capital inflows decreased

significantly. This decline was confirmed in the Third Quarter, as there was a massive drop of over 66% in capital inflow, from over $14 billion to just under $5 billion.

Many investors are scooping up their losses and changing strategies for the new shape of the market, but investors are not fleeing, just being more cautious. There are strong indications that an upward shift in markets will probably bring investments to new all-time highs, it only remains to see when this shift might happen. Some predictions say that it will require up to 2 years, while more optimistic ones expect Q1 2023 to change it all.

Worldwide spending on blockchain solutions hit $6.6 billion in 2021

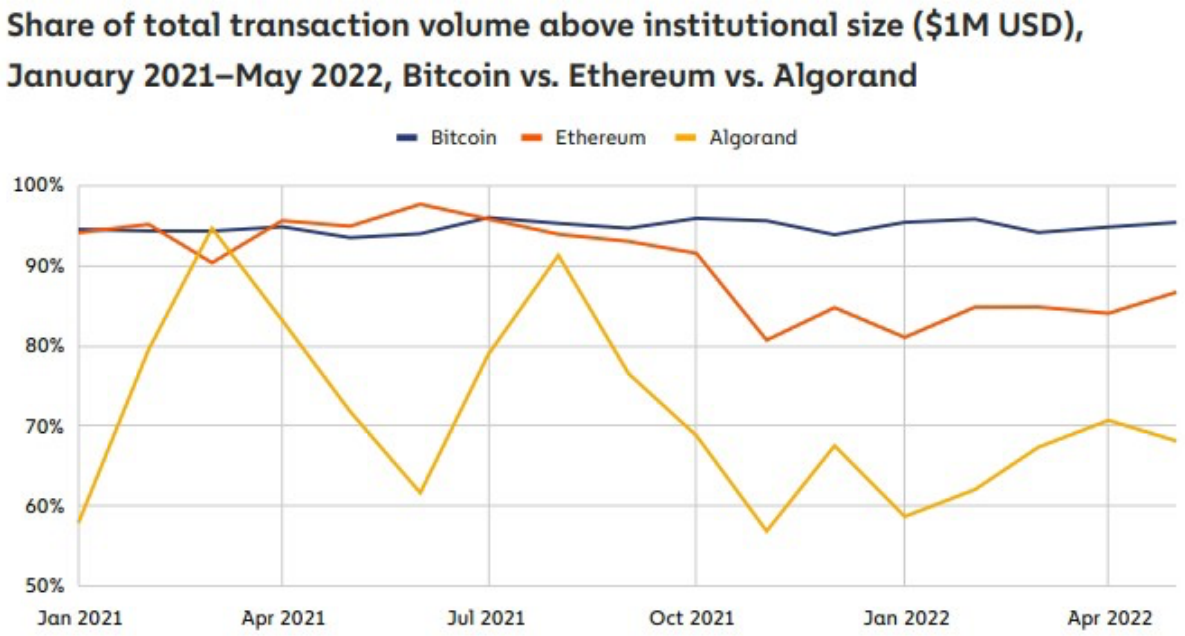
According to Statista Research Department, global spending on blockchain solutions rapidly increased from 4.5 billion to 6.6 billion in 2021. In the coming years, digitizing identities and Web 3.0 is predicted to increase demand for blockchain even more due to its secure nature.



By 2024, Blockchain spending is expected to reach around $19 billion as more businesses adopt the technology for data validation, data access, and identity protection.

Crypto is finally considered institutionally accepted

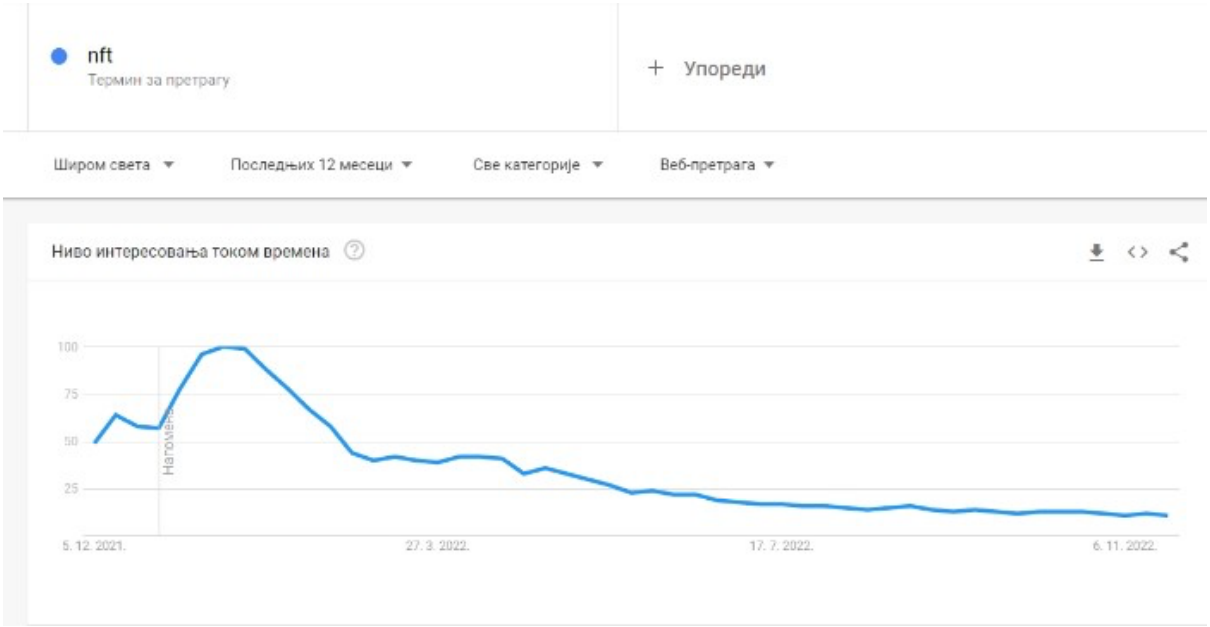
Many indicators show that the crypto industry is finally accepted institutionally. A study by Deloitte in 2021 found that around 96% of Financial Services pioneers who participated believe blockchain is a broadly scalable solution that has achieved mainstream adoption.



Out of all cryptocurrencies, Ethereum has the most institutional investors backing it. 40% of all transactions come from large institutions, compared to 30% for Bitcoin and 29% for Algorand. If we group institutional-sized transactions with large institutional ones, that figure becomes 66% for Ethereum and 64% for Bitcoin.

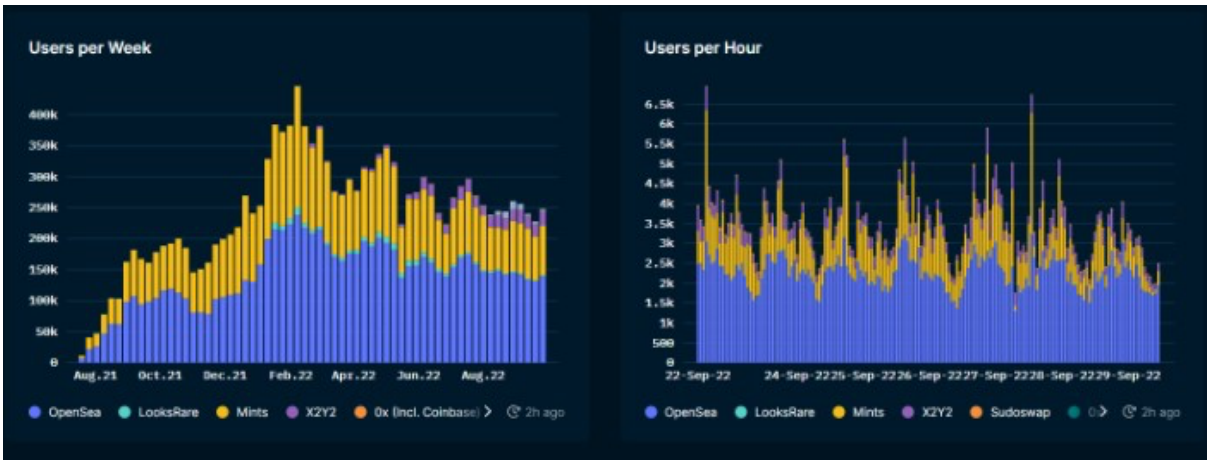
Interest in NFTs is leveling at around -80% of ATH, but still pretty strong

Although NFTs saw a massive upward swing in 2021, just to fall sharply in February 2022, they recovered until mid-April 2022 and stayed roughly flat with a slight downward trend. But what this means for the industry?



Google Trends chart about NFT searches for the last 12 months

The NFT boom happened because of its novelty and promise of quick and easy money, but as the markets started to correct themself, NFTs leveled down in their trending. This doesn't mean that NFTs are not a hot thing late 2022, just that initial hype dried out and users started demanding more utility and better quality from NFT projects.

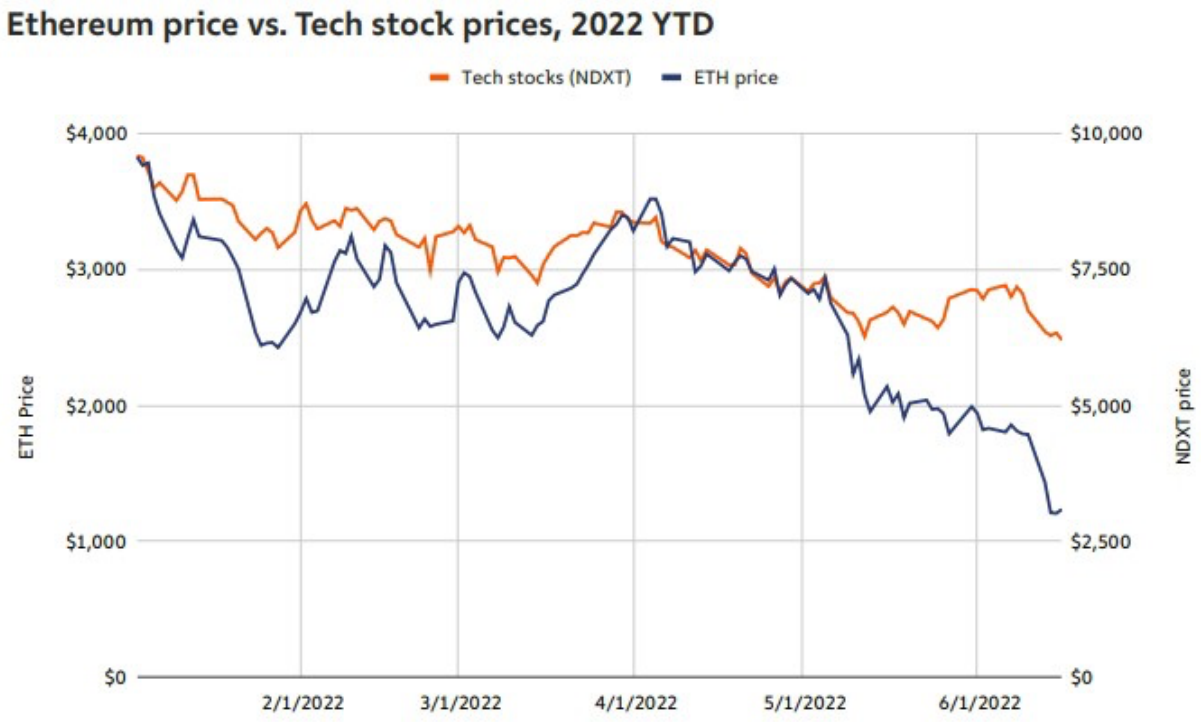


Ethereum NFT users per week and per hour, averaging around 200k users weekly, which is a fall from almost 1M users in January 2022.

We believe that NFTs will reach their glory in 2023-2024 and that this is the right market for building NFT projects that will really utilize the technology and reach their full potential.

Crypto aligned with stock markets due to a high influx of institutional investors

One of many trends this year is that crypto sectors finally started aligning with the stock exchanges and other institutional indexes. This is due to a strong influx of institutional money into crypto. In past, these two sectors were not aligned, sometimes even following opposite trends. This is uncharted territory for many crypto enthusiasts as many retail investors steered away from stocks in uncertain times and hedged their bets in crypto at those moments.



Key Trends for 2023

We are currently going through a time of transformation for Web3. The beginning of the so-called "crypto winter" at the start of this year has led to a significant decrease in crypto investments and NFT sales. Meta's financial issues have caused people to question whether its vision for the metaverse is achievable

(although it's important to keep in mind that not everyone in the Web3 community shares this same vision, it is arguably the one that has had the most influence on public understanding of what the metaverse is). Furthermore, from what we can tell, governments appear to be increasing their efforts to regulate digital assets industries.

Here are some of the key trends we might expect in 2023 and forward.

Increased sustainability mindset

A blockchain often needs a lot of energy to function, and this has been preventing wide adoption of the technology. However, we're starting to see more Web3 companies focusing on being eco-friendly in how they operate. After Ethereum successfully transitioned from a proof-of-work to a proof-of-stake model, the crypto industry was totally changed this year. This also caused its power consumption reduction by up to 99%. It's probable that in the new year, prioritize will continue focusing on a sustainability mindset in the Web3 industry.

More government oversight

The Financial Action Task Force (FATF, USA), in order to prevent finances from being funneled into unlawful activity, will start adding countries with inadequate cryptocurrency regulation policies onto a "gray list." This was reported earlier this month by Al Jazeera. The FATF is an intergovernmental organization that monitors compliance with set standards. The Financial Stability Oversight Council, which is a part of the US Treasury Department, released a 124-page report in October that advised Congress to start regulating the crypto industry. The council expressed concerned about how not regulating the industry could potentially damage the economy as a whole.

All of this will only be accelerated due to a "black swan" event caused by the fall of FTX, especially as initial investigation shows possible fraud, and at least negligible and unmonitored behavior of its leaders and directors.

Utility NFTs

So far, many NFTs have only been digital art pieces with very high prices; this lack of practicality is why some think that those selling NFTs are fraudsters and that the entire NFT industry is a huge bubble waiting to burst. Since we've seen the rise of utility NFTs or non-fungible tokens that provide access to exclusive events and physical merchandise, it seems that many people in the Web3 industry have found some truth to these claims.

Ongoing corporate involvement

More brands have become interested in Web3 and how it can enhance marketing and customer engagement, especially among young people. Even though the crypto winter and Meta's ensuing crisis have scared some brands away from Web3, other large companies still want to enter the space. Mastercard and Fidelity Investments are two examples of firms taking initiative by creating new programs that will make it simpler for select customers to begin using cryptocurrency.

The rise of augmented reality

The future of virtual reality (VR) is unclear, as exemplified by Meta's recent corporate issues. To market its new Quest Pro VR headset, Meta has been aiming it primarily at the workplace demographic; however, whether lots of working professionals will want to use the device for their jobs – not to mention shelling out $1,499 for it – remains to be seen.

Some people believe that augmented reality (AR) will be more sensible and accepted than virtual reality (VR). The richest tech company in the globe, Apple, is supposedly releasing its long-awaited AR glasses within a few years. Apple's CEO Tim Cook and Snap's Evan Spiegel discussed the power of AR, with Cook saying it will "affect everything" and Spiegel adding that it is more immersive than virtual reality.

If virtual reality (VR) continues to have a public relations (PR) crisis, an increasing number of tech companies could start investing more in augmented reality (AR).

Key Problems

The Web3 industry is currently facing a number of significant problems.

One issue is the lack of governmental oversight, which has led to concerns about fraud and unmonitored behavior among leaders and directors. Another problem is the lack of practicality for many NFTs, as they have only been used for digital art pieces with high prices. Additionally, corporate involvement in Web3 remains strong, but it is unclear whether this will be beneficial or detrimental in the long run. Finally, augmented reality may soon become more popular than virtual reality due to its increased immersiveness.

As Web3 continues to grow, it is important for industry participants and investors to be aware of these issues in order to make informed decisions. By staying on top of Web3 trends, statistics, and KPIs, they will be able to make better-informed decisions and have a better understanding of the Web3 industry as a whole.

Lack of government oversight

There is a lack of government oversight in crypto, and this has led to concerns about fraud and unmonitored behavior among leaders and directors. This lack of oversight is concerning, as it could potentially damage the economy as a whole. A stronger governmental presence is needed in order to ensure that the Web3 industry remains healthy and continues to grow.

Privacy and Security issues

Though blockchain is transparent, many experts agree that this quality may be one of its main flaws. To remedy these issues with privacy and security, the entire sector must adopt new ways of handling information. Full anonymity would theoretically solve some problems, but it creates others by hindering mechanisms designed to protect various parties in the space.

Lack of liquidity

One of the hot topics and one of the biggest current problems in crypto is definitely the lack of liquidity among many institutional-sized companies and projects in the space. Lack of government oversight and auditing led to many problems with the current cash flow in the industry. We are about to see the full extent of recent FTX's collapse and how it will change the Web3 industry forever.

Technology is lagging

A chain-agnostic approach is a key to mainstream adoption, and when paired with interoperability, it will create a positive climate for future user growth. Even though many systems are being improved, we believe that the pace of development needs to be faster. Recently, investing in infrastructure projects has been one of the biggest priorities, but there's still room for improvement. We're hopeful to see better technology emerging by 2023 that is easier to use.

Conclusion

By understanding the trends, statistics, and KPIs within Web3, those participating or investing in Web3 can make wiser decisions that will foster growth within the industry. With ongoing research and development, few doubt Web3's potential to become one of the most important industries of our time.

While we have yet to see how everything will play out, one thing is for certain: the time to build is now. With so many other industries struggling, there's a ripe opportunity for crypto and Web3 projects to disrupt new markets!

Recommended read - Chanalysis State of Web3 Report: https://go.chainalysis.com/2022-Web3-report.html