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VISIONIAS
INSPIRING INNOVATION

WEB 3.0

A revolution in the making

INTRODUCTION

Imagine, while driving, you can ask your automotive assistant a question: "I would like to watch a romantic movie and eat Japanese food." The search engine embedded in the car assistant provides you with a personalized response that considers your location, suggesting the closest cinema that matches your request and a good Japanese restaurant by automatically consulting the reviews on social media. Then it presents a 3D menu from the restaurant on the display. This is a classic example of how Web 3.0 ecosystem would function.

The idea behind Web 3.0 is to provide people with a web framework which is secure, people-oriented, seamless, and highly interconnected. But before we delve into Web 3.0 further, it is important to understand-

What is Web 3.0? What are the defining features of Web 3.0? How can Web 3.0 transform the digital era? What are the challenges in adoption of Web 3.0? Where does India stand? And how can India become ready for the next internet revolution? In this edition, we will attempt to answer these questions.

What is Web 3.0?

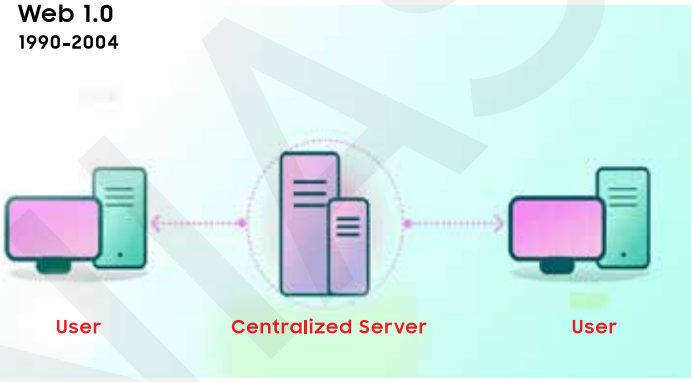
Web or World Wide Web is the foundational layer for how the internet is used, providing website and application services. Web 3.0 can be understood as a possible future version of the internet, which is user- centric, user- driven, and user- controlled.

It will be a successor to the current version i.e., Web 2.0 and its predecessor Web 1.0. Web 3.0 envisages to be fundamentally different from its predecessors-

Web 1.0 - The read-only Web

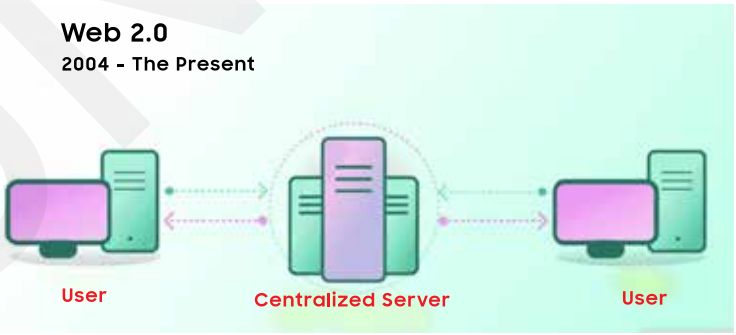
It consisted of a **few people creating web pages and content for a large group of readers,** allowing them to access facts, information, and content from the sources.

The idea behind this version of internet was to enable people to **find information easily.**



Web 2.0 - The read-write Web

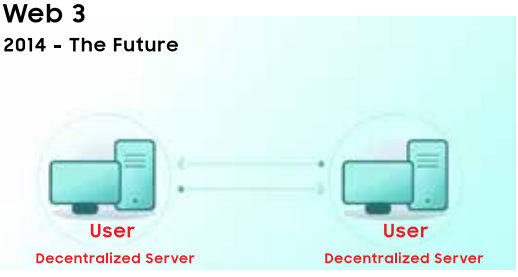
This Internet form emphasizes **User-Generated Content (UGC),** ease of use, interactivity, and improved compatibility with other systems and devices. Web 2.0 is all about the end **user's experience.**



This Web form was responsible for creating communities, collaborations, and dialogue. As a result, Web 2.0 is considered as the primary form of web interaction for most of today's users.Innovations such as smartphones, mobile internet access, and social networks have further driven the exponential growth of Web 2.0.

Web 3.0 - The read-write-execute web

This Web interaction and utilization stage moves users **away from centralized platforms** like Facebook, Google, or Twitter and towards decentralized, nearly anonymous platforms.Web 3.0 ultimately lets **users interact, exchange information,** and securely conduct **financial transactions without a centralized authority or coordinator.** As a result, each user becomes a **content owner** (by taking control of the server and consequently his/her data) **instead of just a content user.**



To use an analogy from the movies, if Web 1.0 represented the black-and-white movie era, Web 2.0 would be the age of color/basic 3D, while Web 3.0 would be immersive experiences in the metaverse!

At this point of time, Web 3.0 ecosystem is still taking shape and hence there is no single definition or standard set of principles capturing the idea. But overtime, keeping the vision of a user-centric, user-driven, and user-controlled internet in mind, some features have become a part of Web 3.0's core philosophy.

What are the defining features and associated technologies of Web 3.0?

- **Decentralized:** Decentralized data networks store data within a peer-to-peer interconnection using blockchain. Users maintain ownership over their data and digital assets and are able to log in securely over the internet without being tracked.
- **Trustless:** The Web 3.0 network will allow participants to interact directly without going through a trusted intermediary (such as Meta, Google etc.) The onus of ensuring the privacy and security of the user will be on the blockchain ecosystem.
- **Permissionless:** Web 3.0 will allow everyone to participate on the platform without authorization from a governing body or a central authority.
- **Semantic Web:** The Semantic Web improves the abilities of web technologies to generate, share and connect content through search and analysis by understanding the meaning of words rather than by keywords or numbers. The same is done with **Natural Language Processing techniques** employed by Artificial Intelligence and Machine Learning.
  - This will make Internet searches significantly faster, easier, and more efficient. Some examples of evolving semantic web are Google Assistant, Siri etc.
- **Ubiquitous:** It refers to the concept of existing or being present in multiple places simultaneously, i.e., omnipresence. The internet will no longer be limited to desktops or smartphones, as it was with Web 2.0. As most things around us will be connected online (via Internet of Things and Edge Computing), Web 3.0 could be accessed from anywhere with anything.
- **3D graphics:** Web 3.0 websites and services make considerable use of three-dimensional design using technologies like Mixed Reality. It therefore offers a more realistic cyberworld instead of a simple two-dimensional web at present.

What is Semantic Web?

- Semantics is the **study of the 'meaning' in language.** For instance, considering "I love India" and "I ❤ India", the syntax of the two phrases differs but the semantics of the two are similar. (Syntax refers to the order or arrangement of words and phrases to form proper sentences.)
- The semantic web would be able to see past the syntax and understand the underlying meaning. This would **enable seamless natural communication between humans and computer systems.**

Is Metaverse same as Web 3.0?

- **Metaverse is a 3D virtual world** where you can interact with 3D friends, objects, places. For example, you can play games with your friends from the creator's ground.
  - It uses technologies like Mixed Reality, Blockchain, Non-Fungible Tokens (NFTs) etc.
- On the other hand, **Web 3.0 is basically decentralized internet** which uses technologies like Blockchain, Mixed Reality, Internet of Things (IoT) etc.
- Both Metaverse and Web 3.0 **use similar technologies** in their structure and consequently have some intersection in usage, description etc. But they are different entities with different objectives i.e., **Metaverse is a virtual world and Web 3.0 is the next iteration of internet.**

Techno Insights

Blockchain

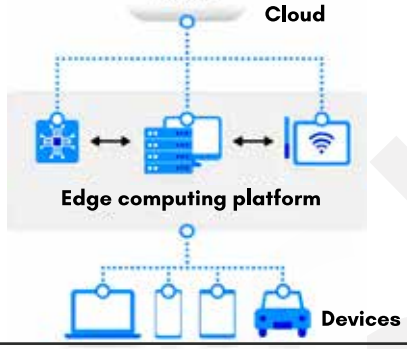
A blockchain is a distributed database or ledger that is shared among the nodes of a computer network.

Artificial intelligence (AI)

AI refers to the simulation of human intelligence in machines that are programmed to think like humans and mimic their actions. The term may also be applied to any machine that exhibits traits associated with a human mind such as learning and problem-solving.

Internet of Things

It is the concept of connecting any device (so long as it has an on/off switch) to the Internet and to other connected devices. The IoT is a giant network of connected things and people.

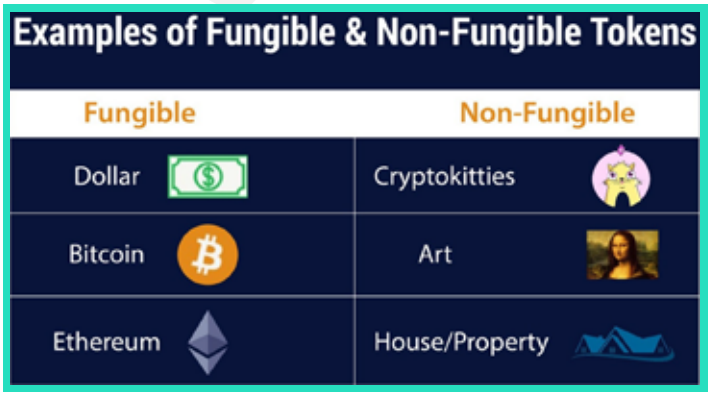


Edge computing

Edge computing is the practice of capturing, processing, and analyzing data near to where it is created instead of doing the same on a centralized server.
It enables processing at greater speeds and volumes, leading to greater action-led results in real time.

Mixed Reality

Mixed Reality is a combination of Augmented and Virtual Reality. Augmented reality (AR) augments your surroundings by adding digital elements to a live view, often by using the camera on a smartphone.
Virtual reality (VR) is a completely immersive experience that replaces a real-life environment with a simulated one.



Non-fungible Token (NFT)

"Non-fungible" means that it's unique and can't be replaced with something else. For example, a bitcoin is fungible — trade one for another bitcoin, and you'll have exactly the same thing but a one-of-a-kind trading card, however, is non-fungible.
NFTs are tokens that we can use to represent ownership of unique items. They let us tokenise things like art, collectibles, even real estate.
They can only have one official owner at a time and they're secured by the blockchain.

An amalgamation of these features and technologies along with many more which will come along the way are creating Web 3.0. But how and where will Web 3.0 help?

How can Web 3.0 transform the digital era?

The features of Web 3.0 would help create a faster, richer, more secure, and more robust internet. This would transform the way we engage in the digital world in following ways-

- **Eliminating middlemen and intermediaries:** Web 3.0 will enable us to interact with any individual or machine in the world, without having to pass through fee-charging middlemen. Societies can become more efficient by **disintermediating industries, reducing rent-seeking third parties,** and returning this value directly back to the users and suppliers in a network.
  - This shift could enable a whole new wave of previously unimaginable businesses and business models. For example, creating large digital marketplaces like Amazon but which are "open to all" and "owned by all" for selling and buying.
- **Users gaining control over their data:** Currently, the platform intermediaries like Meta and Google collect data from web users without their consent or compensation. Web 3.0 would break down the massive databases currently held by them and hand control of the user data to users.
  - This may help **limit the practice of data mining and extraction** and curb the exploitative advertising and marketing practices.
- **Ensured privacy and security of the user:** There is no central authority which can potentially extract the data along with the cryptographic security provided by the blockchain ecosystem. This collectively ensures that user data and activities remain private and secure.
  - In this context, humans, enterprises, and machines can share more data as there are more privacy & security assurances.
- **Individualized and richer user experience:** The combination of semantic web, higher degrees of connectivity via internet of things, mixed reality, and faster computing speeds will significantly enhance the user experience on Web 3.0.
  - Also, there will be more extensive datasets as more products become connected to the internet. This will allow algorithms to deliver more accurate information that is tailored to the individual user's demands.
- **Providing a new dimension to businesses:** With Web 3.0, businesses will have to increase and improve their presence in the digital world. This will create new opportunities, new economic roles (such as Chief Digital Officer) and new revenue streams.
  - For example, the Web 3.0 capabilities will enable computers to produce faster and more relevant results in a host of areas like drug development and new materials.
- **Removing platform dependence and control:** The Web 3.0 platforms gives users ownership of their digital assets by enabling migration of digital identity to another platform or collectively owning the platform.
  - For example, say you're playing a web2.0 game. If you purchase an in-game item, it is tied directly to your account. If the game creators delete your account, you will lose these items. Web3.0 allows for direct ownership where even the game's creators cannot take away your ownership.
  - Also, as the user data will no longer be controlled, the likelihood of government or corporate censorship, as well as the effectiveness of denial-of-service (DoS) attacks is minimal.

Blossoming of a New Creator Economy

- In the current ecosystem, creators and artists are **dependent on big corporations or media companies** to market and monetize the content. With Web 3.0 technology, the future of content creation is decentralized i.e., the platform is not owned by anyone.
- The new economy will be **based on user engagement and attention as opposed to advertising revenue models,** which have been used in the past to fund content creation and distribution.

- Imagine an ad-free version of YouTube, where whenever **you view, share or download the song, the money directly goes to its creators.**

- **Creating local networks:** The user-driven architecture of Web 3.0 enables groups or communities to create local networks. For example, in Villages, local digital networks like local social media platforms or smaller variants of eBay can be created without the need of a central authority.

Digital Identity

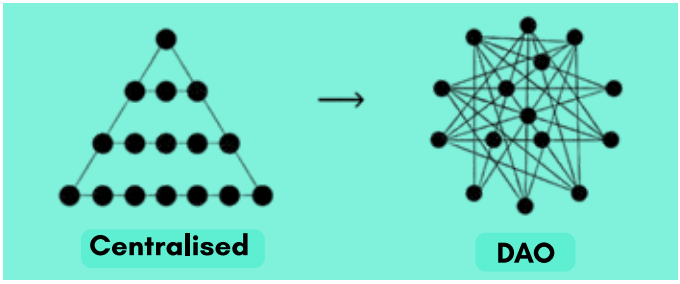
- Web 3.0 enables you to create a single digital identity which is interoperable on all platforms and devices. This digital avatar remains secure, censorship-resistant, and anonymous.

Decentralized Apps (DApps): The App framework of Web 3.0

A decentralized application is similar to an App, but it uses blockchain technology to keep users' data out of the hands of the companies behind it. DApps are decentralized apps, just like cryptocurrency is decentralized money.

Emerging DApps that could bring a paradigm shift are-

- **Decentralized finance, often known as DeFi:** It entails executing real-world financial transactions on the blockchain without the help of banks or the government.
- **Decentralized Autonomous Organizations (DAOs):** These are corporate versions of Web 3.0, i.e., they use digital tokens to distribute ownership and decision-making authority more evenly.
  - As these organizational structures become more popular, they can be applied to different contexts of democratic decision making. DAOs can enable easier execution of democratic tools like referendum.



"In Conversation"

Web 2.0 vs. Web 3.0

Vini: *Hey Vinay ! Yesterday I was going through an article on futuristic gadgets. Since then, I have encountered hundreds of ads on futuristic gadgets. Isn't It strange?*

Vinay: *Not really. The article you read, became a part of your browsing history. Big corporations like Google, Amazon, and Facebook use this data for personalized ad recommendations.*

Vini: *That is a violation of my privacy. I did not give them permission to use my private data.*

Vinay: *You are right. This is one of the biggest issues of Web 2.0.*

Vini: *What is Web 2.0?*

Vinay: *Web 2.0 describes the current state of the internet. Its next iteration is currently developing- Web 3.0.*

Vini: *How is Web 3.0 better than Web 2.0? Does it address the user privacy issue?*

Vinay: *It does to an extent. Unlike Web 2.0, Web 3.0 gives the user complete control over their data. Also, Web 3.0 would be more intelligent, open and, permissionless.*

Vini: *That sounds great. I guess more intelligence comes from development in areas like Artificial Intelligence. But what do you mean by open and permissionless?*

Vinay: *Web 3.0 would be decentralized, meaning that it would be collectively controlled by its users. As a result, you would not need permission of a central authority to participate on a platform.*

Vini: *That is revolutionary. It is like a digital version of global democracy. Can you suggest me any Web 3.0 applications to try out?*

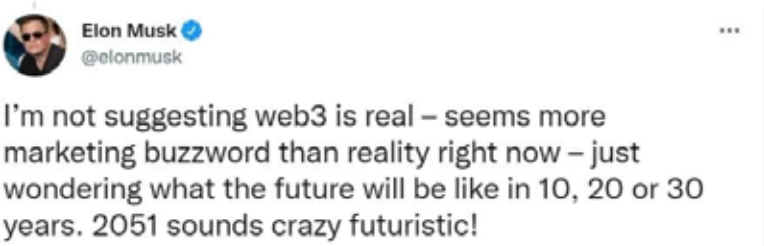
Vinay: *You can experiment with MetaMask. It is a decentralized browsing app. It is still developing but will give you a glimpse of Web 3.0.*

Vini: *Thanks Vinay!*

Although Web 3.0 significantly reduces the Web 2.0 challenges associated with privacy, security, control, and efficiency, it does not eliminate them. Web 3.0 presents these challenges in some other forms, albeit to a lesser degree.

What are the challenges in adoption of Web 3.0?

- **Difficult to regulate:** Decentralization may lead to difficulties in monitoring and managing Web 3.0. This could lead to a rise in **cybercrimes, hate speech, and misinformation** that are already difficult to police. For example, several women have complained about harassment and molestation of their digital avatar in the Metaverse.
  - Also, a decentralized web would also make enforcement of laws very difficult; for example, which country's laws would apply to a specific website whose content is hosted in numerous nations globally?
- **Limited Accessibility due to higher usage costs:** It will require the user to have a high-end device such as Internet-of-Things (IoT) connectable devices to use and reap the benefits of Web 3.0, thereby raising the entry barriers for users.
- **Potential environmental implications:** Decentralized networks require a complex infrastructure and the implementation of consensus protocols, which in some cases have high energy consumption.
  - For instance, Bitcoin currently consumes around 110 Terawatt Hours per year roughly equivalent to the annual energy draw of small countries like Malaysia.
- **Slow adoption process:** The technical barrier to entry to using Web 3.0 is currently too high. Users must comprehend security concerns, understand complex technical documentation, and navigate unintuitive user interfaces. As a result, some experts believe that Web 3.0 is still a nascent idea.



- **Scalability of Blockchain and DApps:** Blockchain technology can handle only around 15 transactions per second. It is challenging for public blockchains to scale to the point where they can be used by giants like Facebook or Uber, let alone provide bandwidth for everyone in the world.
- **Existing websites will need an upgrade:** As Web 3.0 based websites and applications become popular, digital businesses will be under increasing pressure to upgrade their digital offerings, so that they do not lose their captured market.
- **High dependence on the Centralized infrastructure:** The Web 3.0 ecosystem is young and quickly evolving but building high-quality, reliable infrastructure takes time. As a result, it currently depends mainly on centralized infrastructure (GitHub, Twitter, Discord, etc.).
- **Limited Global collaboration due to rising Techno-geopolitics:** Techno-geopolitics refers to the geopolitical tussle to gain control and supremacy in emerging technologies like 5G, Web 3.0, Quantum Technology etc. Rapid growth of Web 3.0 is triggering similar reactions by countries.

Why technology control is becoming a significant part of geopolitics?

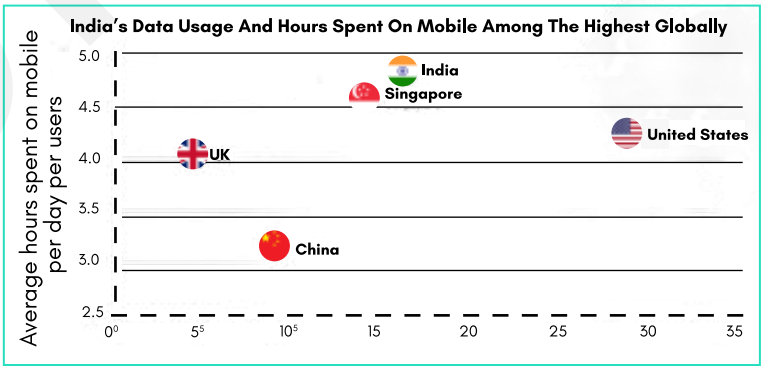
- **Network proximity is now on par with physical geography,** and basic geopolitical assumptions about citizenship, migration, power projection, and the use of force need to be rethought for the digital world.
- **National currencies will face digital monetary competition** with cryptocurrencies because individuals and institutions hold digital wallets filled with various assets that can be traded against one another.
- **The remote economy has created a talent market for citizens** which is not controlled by immigration philosophies or diktats of any state.
- **Cloud-based regulators are outcompeting state-based regulators** i.e., rules of tech companies hold more sway in the life of citizens compared to policies created by the government.
- **Companies, cities, currencies, communities, and countries are all becoming dependent on networks.** Controlling these networks would imply control over the flow in the network.
- **Power is decentralizing away from the United States and China** as technological penetration is acting as a global equalizer, especially in economic and security domains.

Putting all these pieces together, estimates suggest that rather than a unipolar or a bipolar world, the future will be a decentralized race to the top as countries, cities, companies, and communities—physical and virtual—compete to attract talent and capital.

Despite these challenges, Web 3.0 is being touted as the next big thing. Entities from Governments to corporations to innovators, everyone is exploring the opportunities ahead.

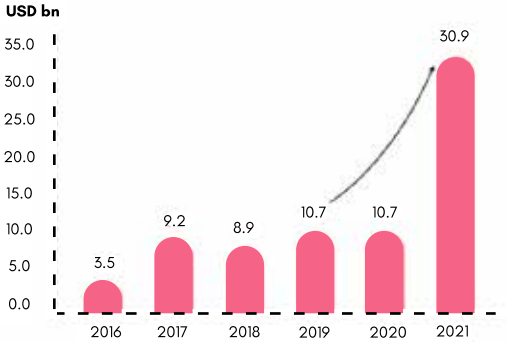
What does India stand to gain from Web 3.0?

It is projected that, if implemented at large scale, Web 3.0 has the potential to contribute US$ 1.1 trillion to India's GDP by 2031. This projection gets further traction when viewed in the context of India's success in the Information Technology Enabled Services (ITES) sector.
Following are the factors that are expected to drive this growth-



- **Large and growing digital user-base:** India has one of the highest number of **internet users** in the world. This digital base is rapidly growing both in numbers and in consumption.
  - Also, the **adoption rate of digital assets** (as reflected by accounts opened on centralized cryptocurrency exchanges) is growing nearly twice as fast as that of the Internet.
- **Availability of a large developer community:** India has been a leader in software development for more than a decade. This has created a large pool of skilled workers who can transition to or have transitioned to the Web 3.0 ecosystem.
  - The crypto-tech industry employs nearly 50,000 professionals in India and has seen a growth of 39 percent in the past five years.
- **Growing entrepreneurship climate:** The growth of tech-driven entrepreneurship climate is already tapping the available Web 3.0 opportunities.
  - Presently, blockchain-related job openings in India, accounts for 4.5% of the total active job openings in the country.

India Internet Startup Funding Up - 3X In 2021



- **Development of new and emerging sectors:** Web 3.0 is providing a fillip to technology-driven sectors like FinTech Industry and Gaming Industry. E.g., the growing popularity of blockchain based peer-to-peer lending networks.
- **Efforts have already started:** Several corporations, institutions and governments have started building the Web 3.0 capabilities and ecosystem.
  - For example, Telangana government is supporting Web 2.0 and Web 3.0 blockchain start-ups under **the India Blockchain Accelerator Program.**

The opportunities that India has are transformative, but they come with their own set of challenges.

Challenges that India faces

In addition to the universal challenges to Web 3.0, the Indian context can encounter some specific challenges such as-

Aggravating the prevalent Digital Divide: It is feared that the additional cost and technical know-how required to transition to Web 3.0 could further increase the already prevalent digital divide.	**Low Domain Penetration:** There is a low domain penetration in India (0.6%) meanwhile, the USA has 43%. (It is calculated by the number of domains owned by a country divided by the number of internet users.)
Prevalence of uncertainty and risk-aversion in policymaking: The experience of policy flip-flop with regard to cryptocurrency regulation generates skepticism vis-à-vis policy development in emerging technologies.	**Signs of brain drain:** Indian Web 3.0 entrepreneurs have already started moving to Dubai and Singapore which offer better regulatory space to setup and scale such ventures.

How can India become ready for the next internet revolution?

- **Dedicated and integrated program:** Web 3.0 is not a single technology but an amalgamation of several emerging technologies. To enable its growth, a dedicated institutional mechanism (on lines of National Supercomputing Mission) can be created which provides financial support and enables national-level coordination for Web 3.0.
- **Technological and infrastructural base:** Growth of Web 3.0 is contingent upon development and reach of base services like reliable electricity connection, internet connectivity, electronics availability etc. Additional effort via flagship initiatives like Saubhagya Mission, BharatNet Mission and Electronics Development Fund can help in creation of this base.
- **Regulatory Sandbox approach to policymaking:** The rapid technological evolution warrants creation of a policy environment which is effective but at the same time, is responsive to changing technical environment. This can be done by emulating the Regulatory Sandbox approach taken by RBI with regard to development of FinTech products.
- **Creating conducive conditions:** The primary agents of development of Web 3.0 will be entrepreneurs and users. Efforts can be made to support innovation through supportive policies, creation of clusters, competitions, incubators among others.
- **Active engagement at global level:** India should initiate global conversations and participate in setting Web 3.0 standards and policy framework for its regulations. A pro-active approach to Web 3.0 leadership would ensure that India does not fall in the trap of digital colonialism.

Universal Health Coverage and Web 3.0

- Web 3.0 can revolutionize the Indian healthcare business by allowing for the **rapid and painless retrieval of a patient's health-related information from medical records** and medical transaction history.
- It might provide patients and healthcare professionals with a variety of clinical and non-clinical support services. Web 3.0 technologies, according to research, have shown early promise in the automated identification of illnesses and clinical procedures.

- **Development of India-centric solutions:** The nature of Web 3.0 is such that it encourages creation of tailor-made solutions. For example, in areas where internet connections are weak, an automatic low-data option can be created.
  - India has shown social innovation in using technology for the past many years, be it Aadhaar, Jan Dhan, UPI, CoWin for vaccination, or the Digital Health Mission, India has built low-cost, high-impact tech-for-better-life innovation.
- **Education and awareness initiatives:** Web 3.0 isn't difficult, but it is different. Educational initiatives would be required to ensure faster adoption and smooth transition of users from Web 2.0 to Web 3.0 systems.
  - This includes generating familiarity with principles such as decentralization, ubiquity etc. and tools such as DApps, new browsing ecosystems, new protocols etc.

Conclusion

Web 3.0 promises democratization of the internet. With the technological tools that aid Web 3.0, this promise is not completely unfounded. But effecting such a revolution requires collaboration, transparency, reliance, trust, and most importantly a joint endeavor that ultimately links humanity. Can the dream of Web 3.0 bring all this to table, it remains to be seen.

TOPIC AT A GLANCE

Web 3.0: A revolution in the making

Web 3.0 can be understood as a **possible future version of the internet, which is user- centric, user- driven, and user- controlled.** Following are the key features of Web 3.0-

Decentralized data networks for storing data within a peer-to-peer interconnection using blockchain.	**Trustless** i.e., Web 3.0 network will allow participants to interact directly without going through a trusted intermediary.	**Permissionless** as Web 3.0 will allow everyone to participate on the platform without authorization from an authority.
Semantic Web i.e., search and analysis by understanding the meaning of words rather than by keywords or numbers.	**Ubiquitous** as Web 3.0 could be accessed from anywhere with anything.	Web 3.0 websites use **three-dimensional (3D) design** using technologies like Mixed Reality.

Potential of Web 3.0

- **Eliminating middlemen and intermediaries** by enabling users to directly interact with any individual or machine in the world.
- **Users gaining control over their data.** This may help limit the practice of data mining and extraction.
- **Ensured privacy and security of the user** with absence of central authority and cryptographic security respectively.
- **Richer user experience** with combination of semantic web, higher degrees of connectivity, mixed reality, and faster computing speeds.
- **Providing a new dimension to businesses** with a digital world creating new occupations and new roles.
- **Removing platform dependence and control** by making digital activity platform transferable.
- **Creating local networks,** basing its architecture on local context and needs.

Opportunities and Challenges for India

- **Opportunities:**
  - Large and growing **digital user-base** with one of the highest number of interest users.
  - Availability of a large **developer community** as India is already a software hub.
  - Growing technological **entrepreneurship climate.**
  - Development of **new and emerging economic sectors** like FinTech and Gaming Industry.
- **Challenges:**
  - Fear of **aggravation of already prevalent Digital Divide.**
  - **Low domain penetration** in India (0.6%).
  - Prevalence of **uncertainty and risk-aversion in policymaking.**
  - **Signs of brain drain** as Indian Web 3.0 entrepreneurs have already started moving to Dubai and Singapore.

Challenges with Web 3.0

- **Difficult to regulate** due to decentralized structure. It could lead to a rise in issues like cybercrimes, hate speech, and misinformation.
- **Limited Accessibility due to higher usage costs** and other entry barriers like technical know-how.
- **Potential environmental implications** like high energy consumption, excessive mining etc.
- **Slow adoption process** as users must comprehend security concerns, understand complex technical documentation, and navigate unintuitive user interfaces.
- **Scalability** issue as Blockchain technology can handle only around 15 transactions per second.
- **Existing websites will need an upgrade.**
- **High dependence on the Centralized infrastructure** as Web 3.0 infrastructure is still developing.
- **Limited Global collaboration due to rising Techno-geopolitics.**

Way forward for India

- **Dedicated and integrated program** which provides financial support and enables national-level coordination.
- Creating a **technological and infrastructural base** with reliable electricity connection, internet connectivity etc.
- **Regulatory Sandbox approach to policymaking** to ensure effective yet nimble policymaking.
- **Creating conducive conditions** to encourage and support innovation via promoting Ease of Doing Business (EoDB), incentives etc.
- **Development of India-centric solutions** on the lines of Aadhaar, Jan Dhan, UPI, CoWin etc.
- **Educational and awareness initiatives** would be required to ensure faster adoption and smooth transition of users.