# Web 3.0: A Review and its Future

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## ABSTRACT

Web 3.0, commonly referred to as the semantic web or the decentralized web. The article presents a summary of Web 3.0's current state, including its background, evolution, and important technologies including blockchain, artificial intelligence (AI), and decentralized apps (DApps). The evaluation of the decentralized web is also covered in the study, along with improvements to data privacy and security, the removal of middlemen, and more effective and transparent processes. The study concludes by discussing Web 3.0's future and its potential effects on several sectors, including e-commerce, social media, finance, and healthcare. The paper concludes that while there are still challenges that need to be addressed, the decentralized web is likely to continue to evolve and play an increasingly important role in the future of the internet.

## Keywords
Web 1.0, web 2.0, Web 3.0, Blockchain, AI, Decentralization, Metaverse, Semantic Web, Future of Internet

## 1. INTRODUCTION

Web 3.0 is commonly referred to as the "Semantic Web" because it aims to create a smarter Web by integrating meaning and context into the structure of the Web. [1] This would allow machines to understand web content and make it more searchable and accessible to users.

One of the key technologies that is expected to play a major role in the development of Web 3.0 is blockchain, which can be used to create decentralized systems that give users more control over their online data and identities. Decentralized applications and smart contracts can also be built on top of the blockchain to enable new types of online interactions and transactions. Another important technology for Web 3.0 is artificial intelligence (AI), which can be used to create personalized and intelligent web experiences. With the use of AI, Web 3.0 can enable machines to understand natural language, personalize content to individual preferences, and provide more accurate search results. Web 3.0 is built on a foundation of technologies that includes artificial intelligence, machine learning, blockchain, and other emerging technologies. This new architecture enables the creation of decentralized applications (DApps) that are secure, transparent, and free from central control. One of the key features of Web 3.0 is the use of linked data. This technology allows for the creation of a web of interconnected data that is easy to navigate and understand. It also enables the creation of intelligent agents that can perform tasks on behalf of users, such as personalized recommendations and automated transactions. Web 3.0 represents a significant step forward in the evolution of the internet, promising to make it more intelligent, intuitive, and user-friendly. Its potential applications are vast, ranging from personalized healthcare to decentralized finance and beyond.

Web 3.0 is an evolution of the Internet that aims to create a smarter, connected and personalized Web experience. This is driven by the integration of advanced technologies such as blockchain, AI and the Semantic Web etc., which enable more decentralized systems, better data security and more personalized experiences. The future of Web 3.0 has the potential to impact our daily lives in numerous ways. Here are a few examples: Enhanced privacy and security, Decentralized finance (DeFi), Smart homes and IoT devices, Digital ownership, Decentralized social media, Personalized healthcare, Enhanced education, Sustainable living, Decentralized governance, etc.

## 2. WHAT IS WEB 3.0

Web 3.0 is the next evolution of the World Wide Web, where data can be linked and understood by computers, resulting in more intelligent and intuitive applications. The transition from Web 2.0 to Web 3.0 is a gradual process that involves the development and adoption of new technologies, standards, and protocols. The emergence of Web 3.0 is driven by several factors, including the increasing amounts of data being generated by users and devices, the need for more efficient data processing and management, and the desire for more privacy and security. To facilitate these goals, Web 3.0 incorporates technologies such as artificial intelligence, machine learning, blockchain, and decentralized protocols.

[2] Web 3.0, data is no longer siloed and scattered across the internet, but rather is interconnected and structured in a way that machines can easily understand and use. This allows for more personalized and intelligent applications that can learn from user behavior and preferences, making the web experience more seamless and efficient. Web 3.0 is the natural evolution of the World Wide Web, driven by technological advancements and the need for more efficient data processing and management. Its development and adoption will continue to be a gradual process, but it holds great promise for the future of the internet and its applications.

### 2.1 Evaluation of Web 3.0

Web 3.0, also known as the decentralized web or the semantic web, is the next evolution of the internet that incorporates decentralized and peer-to-peer technologies for more secure and trustless transactions, as well as improved privacy. It builds on the first version of the web, which was primarily a collection of static websites, and the second version, which introduced dynamic, user-generated content and social networking. The concept of Web 3.0 has been in development for many years, and key technologies and concepts associated with it include blockchain, decentralized applications, smart contracts, interoperability, decentralized identity, and decentralized finance (DeFi). Web 3.0 is still in development, with new technologies, platforms, and applications emerging regularly, and has the potential to transform the internet as we know it, creating a more secure, private, and user-centric online experience.

Web 1.0, also known as the "read-only web," was the first generation of the World Wide Web. It was primarily a static web of HTML pages where users could only read and access information, and there was little to no interaction with the website. Web 2.0, on the other hand, brought dynamic content, user-generated content, and interactive features to the web. Social media platforms, blogging, and online collaboration tools became more common, and users could contribute and participate in the creation of content. Web 3.0, or the "Semantic Web," is the next step in the evolution of the web. It aims to make the web more intelligent and intuitive by creating a more interconnected and personalized experience. Web 3.0 uses advanced technologies such as Artificial Intelligence, Machine Learning, and the Internet of Things (IoT) to make the web more intelligent and contextual.
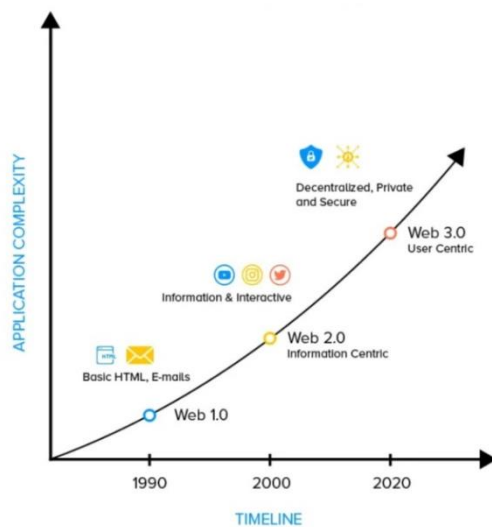


**Figure 1: The history of the web**

Accessed from: https://appinventiv.com/blog/web-3-0-blockchain-impact-on-businesses/ on 19/04/23

Web 3.0 seeks to create a web that understands natural language queries and can provide personalized results based on a user's location, preferences, and history. It also aims to make the web more secure and private by implementing decentralized technologies such as blockchain.

**Table 1: comparison table of Web 1.0, Web 2.0, and Web 3.0:**

| Aspect | Web 1.0 | Web 2.0 | Web 3.0 |
|---|---|---|---|
| Content | Static | Dynamic | Intelligent |
| User Role | Passive | Active | Collaborative |
| Interaction | One-way | Two-way | Multi-way |
| Data | HTML | XML, JSON, AJAX | Semantic Web |
| Focus | Company | Community | Individual |

## 3. Literature Review

Web 3.0 is the next generation of the World Wide Web that aims to create a more intelligent, decentralized, and secure web. It is a proposed evolution of the current web that seeks to address some of the limitations of the current web, such as limited interactivity, poor data interoperability, and centralized control. Crypto, on the other hand, refers to a group of technologies and assets that use cryptography to secure and validate transactions and to control the creation of new units of value. The most well-known crypto asset is Bitcoin, but there are many others, such as Ethereum, Litecoin, and Dogecoin. Crypto assets can be used for a variety of purposes, such as storing value, making payments, and executing smart contracts. Crypto and Web 3.0 are related because many of the decentralized technologies that are used in Web 3.0, such as blockchain, rely on cryptography to secure and validate transactions. Crypto assets are also a key part of many Web 3.0 applications, such as decentralized finance (DeFi) platforms, which allow users to lend, borrow, and trade crypto assets without the need for intermediaries.

[1] proposes the concept of Web 3.0 as a vision for the future of the web, in which the focus is on personalized and decentralized content. The authors argue that the next generation of the web should be based on intelligent agents that can understand and process user preferences and provide personalized services accordingly. The paper also discusses the importance of semantic web technologies for achieving this vision. [2] explores the emergence of Web 3.0 as a new paradigm for decentralized computing, enabled by blockchain technology. The author argues that Web 3.0 represents a shift from centralized, siloed platforms to decentralized networks that enable peer-to-peer interactions and value exchange. Author discusses the potential implications of Web 3.0 for various industries, including finance, healthcare, and media.[3] provides an overview of the key concepts and technologies that underpin Web 3.0. The authors discuss the importance of decentralization, interoperability, and semantic technologies for achieving the vision of Web 3.0. Author provides a survey of the current state of Web 3.0 research and development, including projects such as Ethereum and IPFS.[4] proposes a definition of Web 3.0 based on a survey of existing literature and technologies. The author argues that Web 3.0 should be defined by its ability to enable decentralized, trustless interactions between users and systems, enabled by blockchain and other distributed ledger technologies. Author discusses the potential implications of Web 3.0 for privacy, security, and governance.[5] explores the future of the web in the context of Web 3.0, focusing on three key themes: decentralization, interoperability, and intelligence. The author argues that Web 3.0 represents a paradigm shift from the centralized, profit-driven models of Web 2.0 to a more open, collaborative, and user-centric web including issues related to governance, regulation, and sustainability. [6] discusses the role of machine intelligence in the development of Web 3.0. The authors argue that Web 3.0 will be characterized by intelligent agents that can understand and process vast amounts of data, enabling more personalized and efficient services, impact of Web 3.0 on industries such as finance, healthcare, and transportation.

[7] discusses the evolution of the web from Web 1.0 to Web 3.0, with a focus on the role of blockchain technology. The authors argue that Web 3.0 represents a paradigm shift from centralized, closed systems to decentralized, open systems that enable peer-to-peer interactions and value exchange. [8] discusses the potential impact of Web 3.0 on social networks, focusing on the themes of decentralization, interoperability, and user empowerment. The authors argue that Web 3.0 has the potential to transform social networks into more open, democratic, and user-centric systems that enable peer-to-peer interactions and value exchange. The article also discusses the challenges and opportunities of Web 3.0 for social network design, including issues related to privacy, security, and user control.[9] discusses the potential impact of Web 3.0 on e-

commerce, focusing on the themes of decentralization, interoperability, and trust. The authors argue that Web 3.0 has the potential to transform e-commerce into more decentralized, open, and trustworthy systems that enable peer-to-peer interactions and value exchange. [10] provides an overview of Web 3.0, discussing its key characteristics, technologies, and applications. The authors argue that Web 3.0 represents a shift from a web of documents to a web of data and applications, enabled by technologies such as blockchain, AI, and IoT. [11, 25, 38] discusses decentralized applications (dApps) to drive the development of Web 3.0. The authors argue that dApps, which are built on blockchain and other decentralized technologies, have the potential to transform various industries and enable new forms of peer-to-peer interaction and value exchange. [12] discusses the potential impact of Web 3.0 on the media industry, focusing on the themes of decentralization, interoperability, and user empowerment. The author argues that Web 3.0 has the potential to transform media into more open, democratic, and user-centric systems that enable new forms of content creation, distribution, and monetization.[13] Web 3.0 to enable a more decentralized and equitable internet. The authors argue that Web 3.0 represents a shift from centralized platforms to decentralized protocols, which can enable new forms of governance, ownership, and participation. [14] provides an overview of Web 3.0 and its relationship with blockchain technology. The author argues that Web 3.0 represents a new phase of the internet that is characterized by decentralization, open data, and trustless, enabled by blockchain and other distributed ledger technologies. [15] provides an overview of Web 3.0 and its potential impact on the internet and society. The authors argue that Web 3.0 represents a shift from centralized platforms to decentralized networks, enabled by technologies such as blockchain, IPFS, and smart contracts. [16] provides a survey and analysis of the evolving landscape of Web 3.0, focusing on its key characteristics, technologies, and applications. The author argues that Web 3.0 represents a new era of the internet that is characterized by decentralization, privacy, and user empowerment, enabled by technologies such as blockchain, IPFS, and decentralized identity.[17] proposes a new internet architecture for Web 3.0 that is based on the principles of decentralization, open data, and trustless. The authors argue that Web 3.0 requires a new architecture that can support distributed applications, services, and data, enabled by technologies such as blockchain, IPFS, and peer-to-peer networking. 18] outlines a vision for Web 3.0 as a decentralized, distributed system that puts users in control of

their data and online identities. The paper discusses the need for standards and protocols that enable interoperability and portability across different applications and platforms, as well as the importance of privacy, security, and user empowerment in the design of Web 3.0.[19] provides a comprehensive review of Web 3.0, covering its architecture, applications, and challenges. The authors discuss the key technologies and standards that enable Web 3.0, including blockchain, IPFS, and decentralized identity. They also examine the potential applications of Web 3.0 in various domains, such as finance, healthcare, and social media. Finally, the paper discusses the challenges and limitations of Web 3.0, including issues related to scalability, governance, and adoption.[20] provides an overview of Web 3.0 and its potential impact on various industries, such as finance, healthcare, and education. The authors argue that Web 3.0 represents a new era of the internet that is characterized by decentralization, privacy, and user control, enabled by technologies such as blockchain, smart contracts, and decentralized storage.[21] provides a survey of Web 3.0, focusing on its architecture, applications, and challenges. The authors discuss the key technologies and standards that enable Web 3.0, including blockchain, IPFS, and decentralized identity. They also examine the potential applications of Web 3.0 in various domains, such as finance, healthcare, and supply chain management. [22] provides a comprehensive review of blockchain technology, which is a key component of Web 3.0. The authors discuss the architecture and consensus mechanisms of blockchain, as well as its potential applications in various domains, such as finance, supply chain management, and healthcare.[23] provides a review of decentralized identity management systems, which are a key component of Web 3.0. The authors discuss the advantages of decentralized identity, such as increased privacy and security, and examine various blockchain-based solutions that enable decentralized identity management. [24] provides a review of the Inter Planetary File System (IPFS), which is a key technology for decentralized storage and content distribution in Web 3.0. The authors discuss the architecture and features of IPFS, as well as its potential applications in various domains, such as media, e-commerce, and social networking. [26] This paper provides an overview and analysis of key issues related to Web 3.0, including its architecture, applications, and challenges. The authors discuss the characteristics and potential benefits of Web 3.0, as well as the technologies and standards that enable its development. Below tables shows the important evolution of Web 3.0

**Table 2: important evolution of Web 3.0**

| Author(s) | Title | Journal/Conference | Year | Focus |
|---|---|---|---|---|
| **Berners-Lee, J. [27]** | Web 3.0: A New Web for A New Century | Scientific American | 2001 | Overview of Semantic Web and its potential |
| **Shadbolt, N., et al. [28]** | The Semantic Web Revisited | IEEE Intelligent Systems | 2006 | Review of progress in Semantic Web and potential for Web 3.0 |
| **Greaves, M. [29]** | Web 3.0 - The Way Forward? | Communications of the ACM | 2009 | Analysis of Web 3.0 technologies and their potential impact |
| **Hendler, J. [30]** | Web 3.0 Emerging | Computer | 2010 | Review of Semantic Web technologies and their potential |
| **Oh, J., et al. [31]** | A Vision of Web 3.0: Context-Awareness by Exploitation of Web | Journal of Web Engineering | 2011 | Proposal for a context-aware Web 3.0 |

| | Resources | | | |
|---|---|---|---|---|
| **Jovanovic, M., et al. [32]** | Web 3.0 - An Overview of the Future Web | Journal of Computing and Information Technology | 2014 | Overview of Web 3.0 technologies and their potential impact |
| **Madsen, C. B., et al. [33]** | Blockchain Technology for Democracy, Governance and Transparency | IT Professional | 2018 | Analysis of blockchain technology and its potential for Web 3.0 |
| **Swan, M. [34]** | Blockchain: Blueprint for a New Economy | O'Reilly Media | 2018 | Analysis of blockchain technology and its potential impact on Web 3.0 |
| **Tapscott, D., Tapscott, A. [35]** | Blockchain Revolution: How the Technology Behind Bitcoin Is Changing Money, Business, and the World | Penguin | 2019 | Analysis of blockchain technology and its potential for Web 3.0 |
| **De Filippi, P., Hassan, S. [36]** | Blockchain and the Law: The Rule of Code | Harvard University Press | 2020 | Analysis of blockchain technology and its potential impact on legal systems in the context of Web 3.0 |
| **Pradeep Kumar Misra, Rupam Kumar Thakur [37]** | Web 3.0: An Overview | International Journal of Scientific Research and Engineering Development (IJSRED) | 2018 | Provides an overview of Web 3.0 and its key features, including decentralization, semantic web, artificial intelligence, and machine learning. Discusses potential applications of Web 3.0 in various fields, such as healthcare, finance, and education. |

## 4. FEATURE OF WEB 3.0

Web 3.0 is the next generation of the internet, which is expected to bring significant improvements and changes to the way we interact with technology. Some of the features of Web 3.0 are:

**Decentralization**: Web 3.0 is expected to be more decentralized than its predecessor, with blockchain technology and distributed ledgers allowing for peer-to-peer transactions without the need for intermediaries.

**Interoperability**: Web 3.0 is designed to allow different systems to communicate with each other seamlessly, regardless of their underlying technology or platform.

**Personalization**: Web 3.0 is expected to provide more personalized experiences for users, with tailored content and services that take into account individual preferences and behaviors.

**Enhanced security:** Web 3.0 will feature improved security measures, including encryption, authentication, and decentralized identity management, to protect users' data and privacy.

**Artificial intelligence:** Web 3.0 will integrate artificial intelligence (AI) and machine learning (ML) capabilities to enable more intelligent decision-making and automation of tasks.

**Internet of Things (IoT):** Web 3.0 will expand the scope of the internet to include a wide range of connected devices, from home appliances to industrial machinery, which will be able to communicate and exchange data seamlessly.

**Semantic web: Web 3.0** is expected to be a "semantic web", where data is organized in a structured way that allows machines to understand and interpret it. This will enable more sophisticated search capabilities, as well as the ability to automate tasks and decision-making.

**Transparency:** Web 3.0 will feature greater transparency, with the ability to track the history and provenance of data and transactions on the blockchain. This will enable greater accountability and trust in online interactions.

**Incentivization:** Web 3.0 will introduce new ways to incentivize users to participate in online communities, such as through the use of cryptocurrencies and token economics.

**Content monetization**: Web 3.0 will enable new ways for creators to monetize their content, such as through micropayments, crowdfunding, and the use of smart contracts.

**Openness:** Web 3.0 will prioritize openness and interoperability, with the ability for developers to build on top of existing systems and platforms to create new and innovative applications.

**User control:** Web 3.0 will give users greater control over their data and online identities, with the ability to selectively share information and control access to their personal data.

## 5. CONCLUSION

Web 3.0, also known as the decentralized web or the semantic web, is an evolving concept that envisions a more decentralized, open, and interconnected web. It builds on the foundations of Web 1.0 and Web 2.0 and aims to create a web

that is not controlled by a single entity or group but rather by a decentralized network of users and nodes. While the decentralized web is still in its early stages, it has the potential to revolutionize many industries by improving data privacy and security, eliminating middlemen, and creating more transparent and efficient systems. However, there are still challenges that need to be addressed for the decentralized web to become mainstream, including issues of scalability, interoperability, and user adoption. Despite these challenges, the decentralized web is likely to continue to evolve and play an increasingly important role in the future of the internet. As more developers and users embrace this technology, we can expect to see new use cases and applications emerge, creating a more open and interconnected digital world. Overall, the future of Web 3.0 is promising, and it will be interesting to see how it develops and impacts various industries in the years to come. As researchers and practitioners, it is important to continue to explore and address the challenges and opportunities presented by this exciting new technology.

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