



A THOUGHT PIECE ON

# WEB3

CONSIDERATIONS AND SCENARIOS



**United Nations**  
Office of Information and  
Communications Technology

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# Introduction

The emergence of Web1, also known as the read-only era, was marked by the development of HTML and URLs, which enabled users to navigate between static pages. During this era, the web was populated by flat web pages and governed by open technical rules put together by standards bodies.

In the late 1990s and early 2000s, the emergence of dedicated servers that stored data that could be manipulated marked the beginning of the Web2 era. This era enabled users to coordinate and manipulate data through read/write capabilities, meaning that data could be added but made it challenging to delete existing data. The increase in online products and services meant that more individual users were contributing to the growing databases of information, necessitating the development of identity access management systems (IAMs) to organize and secure access to this data. The growth of IAMs led to the emergence of tech giants such as Alphabet and Meta, which built huge, centralized databases of user information to capitalize on the new digital economy.

**Web3 aims to decentralize power structures and empower users to own their data and digital assets**

Web3, described as the next iteration of the internet, a read/write/own era that aims to decentralize power structures and empower users to own their data and digital assets as well as participate in peer-to-peer cooperation, giving communities the ability to govern themselves. This emerging period is marked by the development of blockchain-based decentralized technologies that disintermediate and remove the centralized players that dominated in Web2. These technologies allow traditional revenue streams to accrue to users, further enhancing their value proposition compared to Web2 equivalents.

While there is no denying the potential of Web3 technologies, it is important to recognize the risks and challenges that come with them. As noted by Banerjee et al. (2022), many users may not fully understand the risks associated with decentralized technologies and may expect the same level of protection and regulation as they receive from centralized entities.

Given these high stakes, the potential impact of Web3 is enormous, potentially ushering in a new era of decentralization that benefits all users, rather than just a select few. The United Nations Emerging Technologies Team recognizes the importance of Web3 and its potential to decentralize power structures. This thought piece on Web3 covers the core drivers underpinning excitement surrounding this technology, while proposing a set of considerations for the UN to reflect on. As an emerging technology, Web3's promise and potential impact must be understood to shape the future of the internet in the next five to ten years.

**Note:** This work, particularly its first four sections, was externally reviewed by Web3 experts for accuracy and quality assurance purposes. The possible futures and UN scenarios reflect the view of OICT Emerging Technologies.

“This paper provides an overview of Web3 as a technology, assessing its promise and constraints, discussing the possible role the UN can play with its wider adoption. The piece is intended for general consumption for an audience with a UN focus.”

# Primer: What is Web3?

Web3 is a term coined to describe a group of technologies which support the development of a decentralized web, including Blockchain, Tokens, Smart Contracts and Decentralized Autonomous Organizations (DAO). It is a complex, evolving space spanning various disciplines and technologies, promising to bring about seismic changes to the web. This emerging ecosystem is known as the 'read, write, own' internet, which supersedes our current Web 2.0 and the more static first-generation internet.

Web 1.0	Web 2.0	Web 3.0
<b>Read</b> <ul style="list-style-type: none"> <li>Static</li> <li>Consumers able to read webpages</li> <li>Data stored in academic and governmental servers</li> <li>"Information economy"</li> </ul>	<b>Read/Write</b> <ul style="list-style-type: none"> <li>Dynamic</li> <li>Consumers able to create and post on webpages</li> <li>Data stored in private company servers</li> <li>"Platform economy"</li> </ul>	<b>Read/Write/Own</b> <ul style="list-style-type: none"> <li>Experiential</li> <li>Consumers communally run and own whole entities, data and protocols</li> <li>Data stored on a public blockchain</li> <li>"Token economy"</li> </ul>

**Evolution of the Internet** →

Rather than relying on large technology companies to provide free communication and exchange platforms at the expense of profiting from user data – as is common under current business models – the objective with a decentralized web is to shift power back to users through cryptography, open standards and open protocols. To achieve this, Web3 leverages blockchain's distributed data structure and associated infrastructures and applications, such as smart contracts, digital assets and decentralized autonomous organizations (DAOs) to create a "decentralized, peer-to-peer, self-sovereign" web.

## Core Concepts

### Building Blocks of Web3

Blockchain	Smart Contracts	Digital Assets
A distributed database that records transactions on multiple servers, rather than on a central server. Each transaction is recorded and verified by multiple parties in the network.	Code or programmes stored on a blockchain that self-execute when predetermined conditions are met. They hold the terms of agreement between parties.	Type of intangible asset that holds value and can be owned. Digital currencies are examples of digital assets.

### Web3 Applications and Infrastructure

Decentralized Applications (dapps)	Decentralized autonomous organizations (DAOs)
Applications or programmes that exist and run on a blockchain or on open networks that enable financial, social and other activities without a centralized company managing them.	A form of collective and distributed governance that leverage tokens and a collective transparent treasury management to make decisions.

**Web3** is a set of software and technologies that enable the development of decentralized web applications. It is a group of decentralized technologies that are interoperable, upon which applications can be built (Azhar, 2021). The core infrastructure of Web3 is blockchain, which is a distributed database that records transactions on multiple servers, rather than on a central server. Blockchains allow for unalterable records of transactions on multiple computers, making it difficult for an actor to exercise control or cause the system to fail.

**Blockchains** are the backbone of Web3, providing a secure and transparent platform for transactions and interactions. It enables a trustless environment, where parties can transact with each other without relying on intermediaries such as banks, payment processors, or social media platforms.

**Decentralization** is a core concept of Web3. It refers to the distribution of power and control among the nodes of the network, rather than a single entity or authority. Decentralization is a proxy for fairness, transparency, accessibility, and self-governance (Narula, 2022). It ensures that no single party has too much control over the network and prevents the abuse of power or collusion.

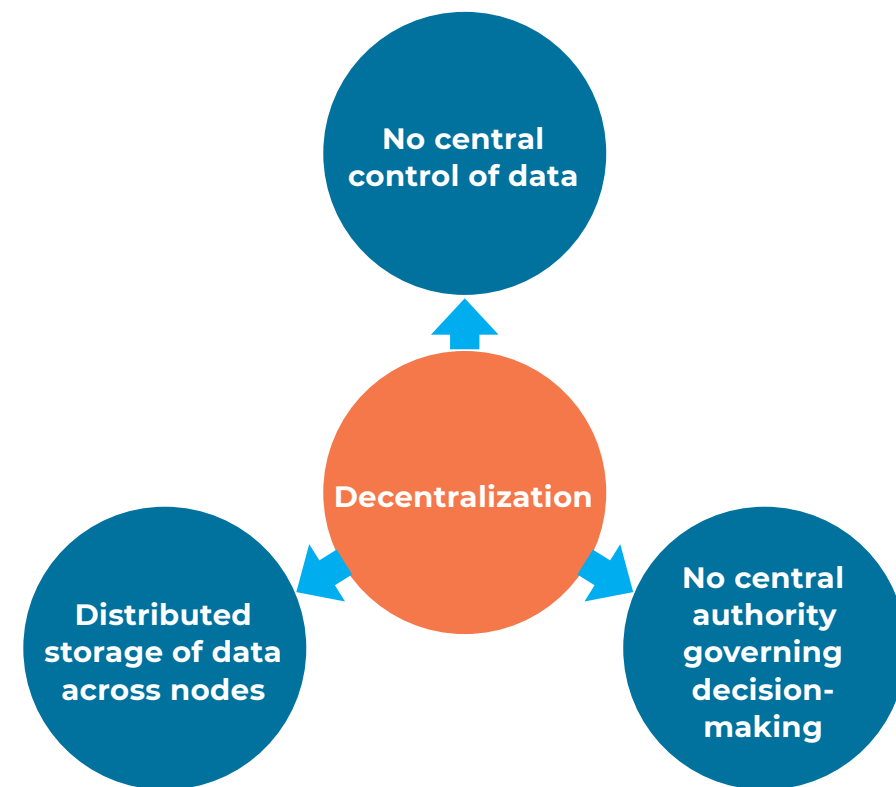


Figure 1: Decentralization in Web3

Web3 enables individuals to **own** and **control** their own data and assets, instead of relying on centralized entities to manage them. This means that users can control who has access to their data and how it is used, providing greater privacy and security.

Web3 aims to disintermediate, leading to increased efficiency, and reducing the need for trust in third parties. This is achieved through blockchain technology and smart contracts, which automate the execution of agreements and eliminate the need for intermediaries.

**Smart contracts** are self-executing programs that run on the blockchain, automating the execution of agreements between parties. Think of an ‘if-then’ statement: if wallet holder X is verified as identity X, then transfer 10 tokens to X’s digital wallet. They are tamper-proof and transparent, ensuring that all parties can verify the terms of the agreement and its execution (Banerjee et al., 2022). Smart contracts are a critical component of Web3, enabling the creation of decentralized applications that run on a trustless platform.

**Decentralized applications or dApps**, are a type of software application that operate on a decentralized blockchain network. Unlike traditional applications that rely on a central server, dApps connect to a peer-to-peer network and use smart contracts to manage their application logic. This removes the need for intermediaries or central authorities, giving users greater control and ownership over their data and digital assets. DApps have the potential to build sophisticated, multiparty applications that depend on smart contracts within distributed ledgers. This provides a layer of computation that is intricately linked to blockchain smart contracts, facilitating trustworthy and transparent interactions between various parties (Litan et al., 2022). For instance, a dApp version of Twitter could provide users with private keys, granting them complete control over their data and digital identity. Its decentralized nature would minimize the likelihood of censorship and

manipulation, promoting transparency and accountability in the content moderation process. Smart contracts could be utilized to establish acceptable content rules and criteria, and community members could partake in moderation through token staking or voting. Additionally, smart contracts would be crucial in creating a token economy, allowing users to earn tokens for creating quality content or interacting with others on the platform.

**Decentralized autonomous organizations (DAOs)** are a form of decentralized governance that enable groups of individuals to work together towards shared objectives without relying on hierarchical leadership. Transparency is ensured through blockchain recording of all voting, while the collective treasury is stored in wallets where cryptocurrency is visible to all members. Essentially, a DAO is a digital entity that can engage in business interactions with other DAOs, digital and human agents, and corporations. DAOs rely on software consensus mechanisms and smart contracts for governance, enabling them to define and program the rules of commercial engagements in decentralized contexts (Litan et al., 2022). For example, a DAO can integrate with a smart contract to automate the outcome of a governance process – say, after a majority of votes have been cast for an option, a DAO can automatically trigger the actions codified in a smart contract after the threshold of votes is reached. In practice, however, it should be noted that achieving consensus in a DAO is mostly a human-driven process.

**Decentralized Identifiers (DIDs)** are an improvement over email-based identifiers used in Web2. They provide a universal addressing system that is permanent, persistent, and non-reassignable, which represents a significant upgrade to online identity. Users can obtain and own their unique DIDs without the need for a central registration authority, and they can associate them with various records, such as medical or academic records. DIDs can be used for legal, financial, or democratic purposes. It is also possible for a user to own multiple DIDs, which can be managed through a digital wallet.

**Digital assets** are a type of intangible asset that holds value and can be owned (Banerjee et al., 2022). They can represent a variety of items, such as digital currencies or tokenized real-world assets. Cryptocurrencies like Bitcoin are a prime example of a digital asset that has gained widespread adoption and acceptance as a means of value transfer. This technology enables near-instant cross-border payments and eliminates the need for intermediaries, leading to faster, cheaper, and more efficient transactions. Digital assets have become increasingly important as they provide a new way to manage and transfer value securely and efficiently, with the potential to transform the way we conduct transactions and exchange value.

**Non-fungible tokens (NFTs)** are unique digital assets that are recorded on the blockchain. They represent proof-of-ownership of digital or physical assets that are tokenized (Banerjee et al., 2022). NFTs are a key innovation of Web3, enabling the creation and ownership of unique digital assets, such as digital art, collectibles, and virtual real estate. However, it’s worth noting that NFTs also have the potential to represent physical assets and other assets like identity and credentials.

**Digital wallets** are essentially ledger accounts on the blockchain that serve as a user’s Web3 identity, holding both their currency and data in a secure and decentralized manner (Ginsburg, 2022). They act as “unified bank accounts and digital passports that have the potential to change how users connect with applications by offering universal sign-in capabilities.” (Olsen et al., 2022). Digital wallets can hold and transport digital goods across platforms, share verifiable credentials, granting access to various services and applications.



## Value Proposition

Proponents of the decentralized web maintain that this stack of technologies will reconfigure how individuals participate in digital – and even, in physical – spheres, bringing about systemic change and **enabling new business and social models**. From shattering monopolies and a meaningful course correction to a giant speculative economy that is self-referential in the extreme, discussions regarding Web3’s value proposition are full of debate and uncertainties. Below, we explore contrasting views on these technologies’ promise, highlighting many interwoven features at the core of its value proposition, including **decentralization**, **ownership** and, **control** and **disintermediation**.

Web3 presents a compelling value proposition that aims to address some of the shortcomings of Web2, essentially at the intersection of privacy, trust and distribution of value. Central to Web3’s technical and sociopolitical ethos is **decentralization**, which promotes the transfer of authority, control, and responsibility to more nodes in the system. **Decentralization** reduces the possibility of single points of failure and enables a more equitable distribution of power and control, potentially reducing the influence of centralized authorities and intermediaries and increasing opportunities for participation. Web3 could introduce tamper-proof and transparent systems that lead to greater accuracy and accountability across financial and governance systems. For the UN, this could imply adopting Web3 infrastructure to further its agenda and work. Web3 could bring about a less “zero-sum” game, where more actors across the network benefit economically, potentially boosting development objectives.

In addition, Web3 enables users to **control their own identity and data**, including distributed governance, through a decentralized ownership facilitated by blockchain, which provides verifiable and traceable means to ensure the authenticity of items and assets. In Web3, ownership and power will be shifted away from Big Tech to individuals. Users will own and control their content, data, and digital assets, empowering them with self-sovereignty.

Web3 systems enable **peer-to-peer transactions** without the need for centralized platforms, reducing the need to trust or rely on the approval of third parties, such as banks. This would effectively eliminate traditional actors across some services, potentially leading to new actors performing services, as well as increased access for users at the margin of traditional infrastructures. However, removing institutions from the key service provision – like regulatory compliance, risk management, and customer protection – could introduce a suite of vulnerabilities to end-users. This **disintermediation** may lead to reduced security and oversight, thus negatively impacting customers and potentially introducing instability to the global economy and monetary sovereignty. With a shift in power away from traditional institutions, regulators, and even governments, it becomes urgent to ensure the protection of the rule of law and equal protection of the law across the internet. Web3 generates uncertainties over some of the adjudicating roles of the UN, including those of its international institutions and bodies.

Web3 introduces a **new form of collective governance**, with implications for digital sovereignty, which is self-determining control in digital spaces. This new form of governance has the potential to disrupt the current version of the internet, which has been plagued by issues such as data breaches, online harassment, and the spread of misinformation. By building decentralized networks that prioritize security and privacy, Web3 could offer a more open and secure internet that is better

suited to the needs of individuals and communities. It also introduces disintermediation and new ways to interact and transact, promoting increased user choice, as assets would be portable across borders, platforms, and dApps. **Interoperability** in the Web3 ecosystem will play a critical role in the emergence of new firms, applications, and modes of thinking (*Park et al., 2022*).

Web3 technologies, such as decentralized finance (DeFi) and non-fungible tokens (NFTs), provide the building blocks for the **Metaverse**, enabling users to buy, sell, and trade digital assets in a decentralized manner. As the Metaverse grows, Web3 technologies will continue to play a central role in enabling self-sovereignty, ownership, and control for users in a virtual environment. However, Web3’s public nature raises privacy and education concerns, which could prevent mainstream adoption. Granting users total control over their data may also create consumer protection vulnerabilities, especially for those less digitally-literate. The open-source and interoperable nature of the technology could mean that more individuals can contribute to redefining the web.

## Use Cases

One of the most significant use cases of Web3 is in finance. **Decentralized finance** (DeFi) is a recreation of the tools available in the traditional financial world, built on Web3 infrastructure. DeFi eliminates intermediaries and supports trustless, transparent, and immutable financial transactions between pseudo-anonymous parties. It refers to smart contract apps running on a public blockchain that offer financial products and services such as peer-to-peer lending, insurance, and exchanges. Indeed, the financial-services industry has led the way in adopting Web3’s nascent digital technologies and assets, including through lending and borrowing services, such as remittances and investments. Zero-knowledge proofs (ZKPs) are also gaining popularity in various applications, particularly in the realm of authentication and transaction verification. Additional use cases for Web3 technology in finance include payment systems, custody management, anti-money laundering (AML) and know-your-customer (KYC) compliance, consumer identity and access management (IAM), age verification, and more (*Litan et al., 2022*).

Web3 technology also enables greater **transparency** and **auditability** in various sectors, such as supply chain, intellectual property, land registries, and climate markets and offsetting incentives. The technology enables the tracking and monitoring of products throughout their lifecycle, preventing fraud, and improving supply chain efficiencies. It also creates a transparent and immutable record of ownership and usage rights, ensuring the authenticity of intellectual property. Digitizing land registries on a blockchain makes them more secure and accessible while reducing the risk of fraud. For instance, despite the downturn in the cryptocurrency market, Chainalysis has revealed that the U.S. dollar amount of illegal transactions conducted on the blockchain has substantially increased in recent years. In 2022, the volume of these transactions reached an unprecedented \$20.6 billion, a staggering increase compared to the \$18 billion recorded in 2021 and the approximately \$5 billion observed in both 2017 and 2018.

**Decentralized digital identity** is another significant use case of Web3 technology. Decentralized identity (DID) systems remove the need for repeated identity proofing across services by supporting common authentication services and removing the need for multiple credentials. DID solutions rely on a blockchain as the source of truth, enabling users to receive credentials proving their identity from multiple issuers (including, for example, employers or governments) and store them within a digital wallet. These credentials can then be presented to service providers who can verify the data via the distributed ledger. With the credentials being on the user ledger, interfaces (or service providers) can read the ledger and perform identity verification without the asset leaving the user’s custody within their wallets. These systems are designed to remove the need for repeated identity proofing. Users require an identity wallet to generate and store their decentralized identifiers, associated cryptographic keys, and other cryptographic materials, including certified credentials by issuers that can be presented to service providers for verification (*Litan et al., 2023*).

Current UN Use-Cases

UN Office	Project	Sector	UN SDG
World Food Program (WFP)	Building Blocks	Food security, supply chain	SDG 2: Zero Hunger
United Nations Children's Fund (UNICEF)	CryptoFund	Humanitarian aid, donations	SDG 1: No Poverty, SDG 2: Zero Hunger
United Nations Development Program (UNDP) Accelerator Lab (India)	Digital Fortress	Financial inclusion	SDG 8: Decent Work and Economic Growth
United Nations Office on Drugs and Crime (UNODC)	GoPortofolio (GoBlockchain)	Countering terrorism financing, illicit drugs control and transnational organized crime	SDG 16: Peace, Justice and Strong Institutions
United Nations	UN Crypto Stamp	Digital Transformation	-

Prospective Use-Cases for the UN

Potential Use Case	Description	Sector	UN SDG
Collective organization DAO interexchange between offices/agencies	DAOs (Decentralized Autonomous Organizations) to create a decentralized network that allows for more efficient and transparent communication and decision-making between UN offices and agencies.	Governance	SDG 16: Peace, Justice, and Strong Institutions
Procurement and supply chain	Blockchain to create a transparent and secure procurement and supply chain system for UN offices and agencies. This can help prevent fraud and corruption and ensure that resources are distributed fairly and efficiently.	Procurement, Supply Chain	SDG 16: Peace, Justice, and Strong Institutions
Education certification	Web3 technologies to create a decentralized and tamper-proof system for education certification, which can help combat fraud and ensure the authenticity of educational qualifications.	Education	SDG 4: Quality Education
Digital Passport	Decentralized digital passport system that is secure, tamper-proof, and privacy-preserving. This can help facilitate travel and immigration processes while also protecting the privacy and security of individuals' personal information.	Travel, Immigration	SDG 16: Peace, Justice, and Strong Institutions

# State of the Technology

## Maturity Assessment

Based on the technology's current trajectory, Web3 will require significant advancements in both technology and adoption to reach maturity. This includes the development of interoperable blockchains, the creation of user-friendly and secure dApps, and the establishment of clear regulations and standards to promote trust and adoption, as well as the reduction in administrative and regulatory barriers, particularly from banks and governments. It will be important for stakeholders across industries to collaborate and invest in its development to ensure its potential is fully realized. Additionally, broader education and awareness efforts are needed to increase understanding and drive demand for Web3 solutions. As of March 2023, the maturity level of this technology was determined by ETT as midway between Working Prototypes and Diffusion.

- ☐ Hypothetical – the technology is conceptually possible
- ☐ Experimental – research and experiments are proving the technology
- ☒ Working Prototypes – working examples are being built
- ☒ Diffusion – the technology is being adopted
- ☐ Commercialization – the technology is part of mainstream solutions

Web3 technologies have been developing rapidly, but the market size may not necessarily indicate mainstream adoption. While there have been some failures in the business models of Web3 adjacent technologies, such as cryptocurrencies, Web3 itself continues to progress. However, the adoption of Web3 by enterprises is moving slower than consumer adoption (*Litan et al., 2022*). Despite this, there is still a lack of scholarly discourse about Web3 and its potential benefits and repercussions. The discourse is primarily led by those already involved in the crypto sector, with some critical commentary from consultancies and technology magazines.

High risks are associated with Web3, and there is no clear path to mainstream adoption. The path to mainstream adoption of the various puzzle pieces of Web3 is different, with some being more advanced than others. Several developments could have a significant impact on the outlook for Web3, including whether traditional centralized institutions can meet the rising demand for Web3 use-cases with non-blockchain-based solutions. Another factor is whether a use-case or area, such as DeFi, becomes mainstream and drives widespread adoption of the other parts of the ecosystem.

Regulation could also inhibit the development of Web3 technology in response to the lack of customer protection or disintermediation of strategic actions. This is especially true if more actors are allowed to define their own guard rails, keeping banks and governments out of the loop. There is also a risk that Web3 proponents and pioneers could derail the ethos of Web3 and replicate the same governance and power arrangements, leading to re-centralization in disguise.

Building applications on the blockchain through dApps is the primary method for achieving Web3's maturity at scale. DApps provide the ability to build complex, multiparty applications that rely on underlying smart contracts. They offer the potential to bring a layer of computation that ties to blockchain smart contracts, but much more technology maturity is required for that to occur. For instance, scaling Web3 requires blockchains to communicate with each other so that they can support collaboration and the transfer of digital assets, monetary value, and data, among other areas.

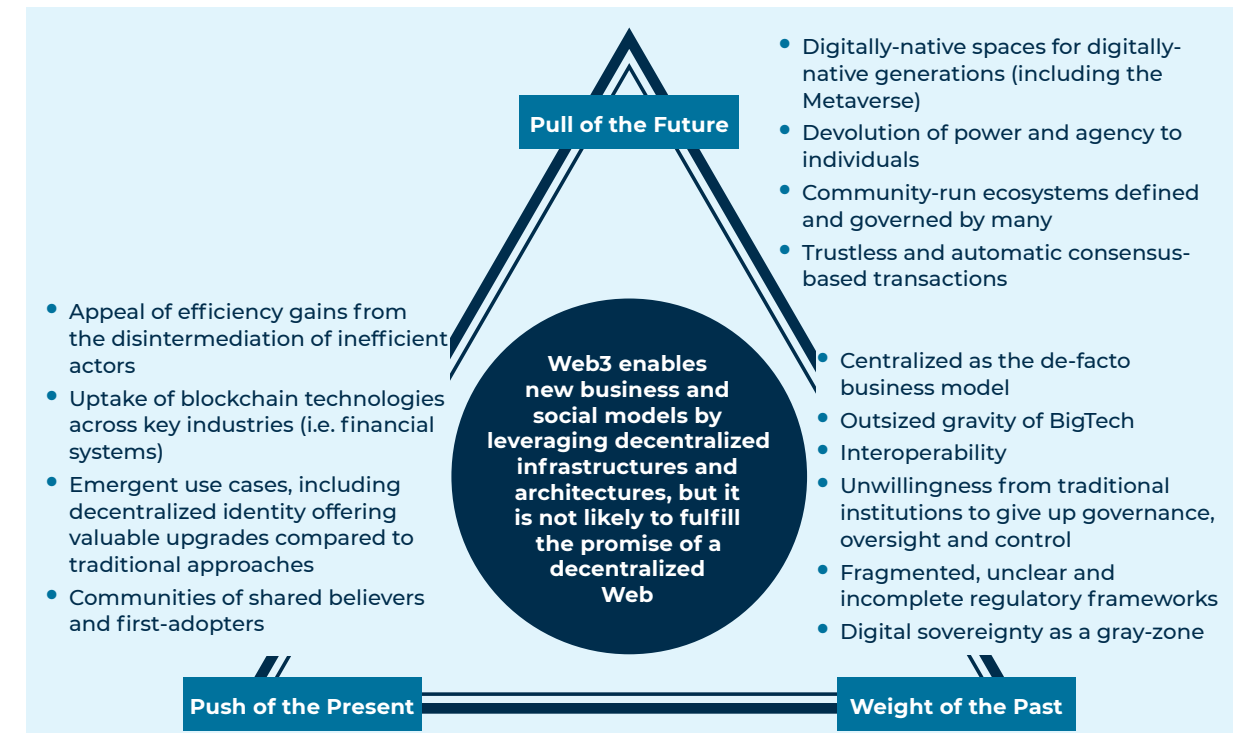


Figure 2: Web3 Futures Triangle

## Drivers

The advent of Web3 is being driven by a range of drivers, including the **uptake of blockchain**, particularly in the DeFi and gaming use cases. Venture capital (VC) investments have been instrumental in funding many of these projects. According to The Economist, the value of VC deals in the crypto sphere reached \$25 billion in 2021, up from less than \$5 billion in 2020, indicating a significant uptick in investor confidence in the sector. Furthermore, VC investments in Web3 exceeded \$18 billion in the first half of 2022, on track to exceed the full-year total VC investments of \$32.4 billion in 2021 (*Banerjee et al., 2022*). These investments have helped to fuel the development of Web3 platforms and protocols, particularly in the Metaverse.





In addition to VC investments, **emergent use cases** are driving the development of Web3, particularly in the area of decentralized identity as traditional identity and access management frameworks have struggled to meet the security and privacy needs of users (*Litan et al., 2023*). Web3 promises to liberate identity and reputation from the control of a few large tech companies, allowing for "self-sovereign" identities for communication, transaction, and governance (*Siddarth et al.*). Decentralized identity offers valuable upgrades in security, privacy, and interoperability compared to traditional approaches, making it a promising area for further development.



The **hype surrounding the Metaverse** is another driver of Web3. Decentralized social networks and “gaming nations” are emerging as key use cases in this space, which promises to create a more immersive and interactive internet experience. As more people become interested in the potential of the Metaverse, we can expect to see a further acceleration in the development of Web3 technologies and protocols.

Finally, **communities of shared believers** and first adopters are promoting this iteration of the internet. Web3 has captured the imaginations of a growing number of individuals who see it as a way to decentralize power and create a more equitable and democratic internet. These communities are working to build and promote Web3 platforms and protocols, creating a groundswell of support for the emerging technology. Open Wallet Foundation is an example of a consortium promoting the adoption of open, secure, and interoperable digital wallet solutions.

Inhibitors

Scalability, interoperability and UX/UI		<ul style="list-style-type: none"><li>Blockchain technology is not currently scalable enough for mass adoption.</li><li>Processing transactions is often inefficient and slow.</li><li>Self-custody poses a challenge to user uptake and consumer protection.</li></ul>
Absence of widespread collaboration and cross-platform cooperation		<ul style="list-style-type: none"><li>Institutions may be reluctant to give up control of the web and ownership of data.</li><li>Legacy players in BigTech stand to benefit more from the status quo than from Web3, making it unlikely that a decentralized web will take root at scale.</li><li>BigTech's resources and user base give them the ability to maintain their dominance and discourage decentralized paradigms.</li></ul>
Fragmented legal and regulatory landscape		<ul style="list-style-type: none"><li>Regulatory questions and inconsistent jurisdictional clarity pose challenges for Web3 adoption.</li><li>Legal status of cryptocurrencies varies between countries, with different approaches to regulation.</li></ul>
Web3's value proposition appeals to a niche group		<ul style="list-style-type: none"><li>Web3's value proposition remains theoretical for most users.</li><li>The Metaverse and other applications may change this dynamic in the future, especially for digitally native generations.</li></ul>

Web3 technologies face significant barriers to mainstream adoption.

One set of challenges are technical, including **scalability, interoperability, and user experience design**. For example, Web3 tools such as blockchain, are not scalable to the level required for mass uptake. Systems are “notoriously inefficient and slow”, specifically when it comes to processing transactions (*Park et al., 2022*).

Importantly, decentralized technologies are also complex and out of reach for basic internet users. Described as “devilishly difficult to use” by some, participating in DAOs or understanding the terms of a smart contract requires a relatively sophisticated understanding of these technologies (*Hosanagar and Brouard, 2022*). Calls to design a friendly user-experience abound across the sector as interfaces are often too cumbersome. Particularly, the complexity of using and interacting with decentralized systems is a barrier to entry for many. Yet, one of the most challenging obstacles to user uptake is that decentralized technologies rely on self-custody – the premise that users can handle their assets effectively and without restrictions. Decentralization in this sense also means that users are fully responsible for ensuring that their data and currency is safe (*Ginsburg, 2022*). A transaction error is impossible to recall, with little support (i.e., losing a private key) available. For instance, losing access to the private key linked to a blockchain wallet can lead to a permanent loss of access to the wallet’s assets, with no support or recourse available for recovery. It is unlikely that Web3 ecosystems provide the same level of consumer protection as Web2 systems do. However, it is worth noting that Web3 technology can offer a different form of support to users, particularly those in regions with non-functional financial systems.

However, there are socio-political challenges, including the absence of widespread collaboration and cross-platform cooperation. To an extent, the true complexity in the mass adoption of centralized technologies is not in the technical stack per se – but rather up the stack – in getting multiple institutions to collaborate in new paradigms, specifically when these institutions do not trust each other. Notably, when it comes to the vision of a decentralized web, it is unlikely that those at the helm of Web2 will cede, or alternatively, be pressed into giving up control of the web to Web3 market entrants. A decentralized web promises to upend ownership of the asset which underwrites these actor’s business models: data. Under open platforms where users own their data and elect how to monetize it, these actors lose their stronghold and their downstream value proposition. Because the “flagship principles” of a decentralized web – notably, self-determination, portability, and disintermediation – are antithetical to the structures that sustain BigTech, as long as legacy players recognize that they stand to benefit more from the status quo than from Web3, it is unlikely that a decentralized web will take root at scale (*Jin and Parrott, 2022*). Even more, BigTech has the resources and user base to maintain their dominance and to discourage decentralized paradigms that disrupt their business models.

In tandem, there are significant **regulatory questions** and **inconsistent jurisdictional clarity** when it comes to Web3 related technologies. For instance, the legal status of cryptocurrencies varies between countries, with some countries considering them legal tender while others do not. In the European Union, there is a growing push towards comprehensive regulation of cryptocurrencies, while the United States has a more piecemeal approach with different states implementing varying degrees of regulation. China, on the other hand, has taken a more stringent approach by outright banning cryptocurrency exchanges and initial coin offerings. This fragmented legal and regulatory landscape presents challenges for the adoption and mainstream use of Web3 technologies.

Finally, although the premise of regaining ownership over personal data and having a greater stake over the design of the Web is appealing to a significant number of individuals, the tradeoff in complexity is too vast for most users. Web3’s value proposition (with the current technological stack available) is not necessarily appealing to the mainstream crowd, but rather to a niche group of communities. Despite successful use cases, the ecosystem’s value proposition remains – for the vast majority of users – theoretical rather than unequivocally tangible. Of course, this could change at some point, specifically with the relevance that applications such as the Metaverse are amassing with digitally native generations.

# Possible Futures and Key Considerations

Despite its potential benefits, Web3 faces significant obstacles to mainstream adoption. Discourse regarding its value and feasibility is rife with contradictions from proponents and skeptics, with no side more convincing than the other. Based on the significant barriers from legacy structures, lack of momentum towards widespread decentralization and absence of a compelling and relatable value proposition, it seems like the vision of Web3 as the decentralized web is likely overhyped.

However, Web3 understood as an ecosystem of decentralized technologies will likely continue to grow and garner significant uptake across specific use cases. Whilst we do not expect for the adoption of these technologies to eliminate the need or predominance of centralized authorities, Web3 companies and advocates will continue introducing decentralized technologies across various web applications and specific industries, leading to a more decentralized internet.

Different parts of the ecosystem will develop prolifically, specifically applications that present a better alternative – including a better technical set-up – to processes that are inefficient and cumbersome under our current systems (e.g. identity management). Indeed, this has already happened for some gaming and DeFi applications and could, in the future, also occur for decentralized identity systems. Web3 applications will likely be embedded within Web2 in a hybrid approach, where some applications that benefit from the infrastructure and value proposition of decentralized technologies will rely on them whilst being accessible via traditional Web2 platforms.

Given that this stack of technologies is embedded in a specific socio-political philosophy, it is also likely that Web3 continues to grow within the community of shared believers it has rallied up to now. Specifically, the governance mechanisms supported by decentralized technologies such as DAOs. Although governance is “one of the trickiest aspects of Web3,” it could be an area that continues to deliver significant innovations (*Banerjee et al., 2022*).

**Based on the information available, we believe that Web3 will enable new business and social models by leveraging decentralized technologies, but it is not likely to fulfill the promise of a decentralized web, at least in the timeframe object of this thought piece<sup>1</sup>.** Under this assumption, the adoption of decentralized technologies is likely to power important applications with the potential to transform how things are done across key industries. As with most emerging technologies, the growth of this ecosystem will bring about significant direct and indirect consequences with important repercussions for the work, pillars and mandate of the UN. Below, these considerations are unpacked, paying specific attention to how some of the plausible developments could create significant value for the Organization if harnessed promptly and effectively.

<sup>1</sup> With many coining blockchain as a general-purpose technology, the next evolution of the internet may well be decentralized and blockchain-based. However, prior to this taking place there is need for a fundamental reshuffling of social, political and economic spheres, which isn't likely to occur in the next 3 to 5 years.



Figure 3: Web3 Futures Wheel

Novel (and alternative) business models	
<ul style="list-style-type: none"><li>• The growth of the Web3 ecosystem will trigger changes within the business models of existing institutions.</li><li>• Although Web3 technologies provide an on-ramp for “the financialization of everything” they also hold great potential to nudge and incentivize positive behaviors.</li></ul>	<p>Decentralized technologies will be used to drive innovation across key industries, leading to the revamping of core business models and the creation of new ones. For example, applications that build on decentralized technologies could change payment and business structures core to a transaction-based economy. A growing use case is that of royalty structures, where a combination of NFTs and smart contracts can be used to facilitate payments for creators when their work is traded in the marketplace beyond the first purchase. It introduces a technical setup that enables the creators of a good - be it a song, personal data, or digital art - to realize gains from trade across the asset’s lifecycle and not only at initial sale. An artist would not need a centralized platform—like YouTube or Spotify—to monetize their content and obtain royalties directly. A traditional user could even yield revenue from choosing who can access their data, effectively creating a data marketplace. Overall, as put forth by Esber and Kominers, it seems like “the dynamics of Web3 are less-zero-sum, which means a platform’s overall value creation opportunity can be bigger”, and bigger for more people (<i>Esber and Kominers, 2022</i>).</p> <p>On the other hand, the adoption of these technologies can reduce access barriers for individuals at the margin of current systems, notably in the financial services sector. Cryptocurrencies exemplify some of this potential, by enabling individuals in places with unstable economies to access less volatile and more reliable digital currencies. Even more, as noted by Yeoman and Sutton, “Web3 creates the ability to design and test alternative economic systems that could move society in positive new directions.” For example, the tokenization of some activities—like carbon sequestration in a carbon market—could incentivize desirable actions to drive positive impact. The tokenization of digital or physical assets does not only certify ownership. Tokenizing more abstract constructs, such as intellectual property, provides grounds for a verifiable claim that can be used to nudge desirable and sustainable actions.</p>

Innovative governance mechanisms	
<ul style="list-style-type: none"><li>• Web3 tools provide a technical set-up likely to boost innovation with and about governance</li><li>• These innovations hold potential to increase cooperation and participatory decision-making.</li></ul>	<p>The governance mechanisms designed to support a decentralized web enable individuals to have a stake in the decisions made by the networks they are a part of. These mechanisms have the capacity to “distribute authority in more diverse and inclusive ways” and remove the need for a centralized hierarchy (<i>Yeoman and Sutton, 2022</i>). The Web3 ecosystem is creating a sandbox for distributed governance experiments that benefit from the auditability and transparency of blockchain (specifically for processes like on-chain voting) and could drive significant and impactful exploration and innovation on communal and participative governance instruments.</p> <p>Additionally, innovative governance arrangements are fueling more open environments across critical disciplines. The emergence of fields like decentralized science (DeSci) illustrate how Web3 tools can reshape fields to encourage greater collaboration and cooperation. The premise of this movement is to enable scientists to raise funding, run experiments, share data, and distribute insights openly, but protecting intellectual property and attribution. A DAO for example can be created to disburse funds based on the network’s majority vote or a scientist can publish a prototype for someone to build on while retaining the claim over the original idea. Web3 tools could see an increase in cooperation across key disciplines to unlock innovations that tackle some of the world’s most pressing problems, such as the access of public services thanks to DeGov.</p>

Increased auditability of systems	
<ul style="list-style-type: none"><li>• With a technical set-up that creates greater obstacles for corruption, Web3 could usher in platforms with enhanced transaction transparency.</li></ul>	<p>A core characteristic of blockchain-based systems is that transactions records are public to all users, immutable and ‘power-proof’, meaning that a single person cannot hide or delete a transaction. These characteristics are embedded in the technical set-up of decentralized technologies – they are designed to make it very difficult for an actor to exercise control over the system and cause it to fail.</p> <p>That is not to imply that these technologies are immune to hacking—in fact, there are several instances where phishing attacks or manipulations of the protocols have led to sizeable losses. However, it is worth noting that the majority of these attacks were targeted towards companies building on top of blockchain protocols or centralized companies in the blockchain space, rather than the protocols themselves. The repercussions from these technical choices are increased obstacles and bottlenecks for corruption and enhanced transactional transparency. Increased adoption of decentralized technologies could provide a set-up that renders malfeasance more difficult both from a technical standpoint and by removing the need for intermediaries. Used by well-intentioned players, they can provide greater transparency and auditability.</p>

Disintermediation of traditional actors	
<ul style="list-style-type: none"><li>• Decentralized services disintermediate key institutions, with the potential to generate efficiencies. However, they exacerbate a suite of protection concerns for users.</li><li>• Decentralized identity systems will empower individuals to control their data and assert their identity securely, without compromising their privacy.</li></ul>	<p>Because a blockchain is immutable and transactions cannot be reversed nor deleted, concerns arise regarding data privacy and protection. In a blockchain, the right to be forgotten is technically unfeasible, and once data is added to a chain - say, containing illegal content - it'll remain on-chain forever. These systems prioritize anonymity by-design; in the case of misuse, anonymity severely hinders accountability and can even encourage abuse (<i>Stackpole, 2022</i>). Core to these heightened concerns, as mentioned above, is the fact that decentralized technologies rely on self-custody. Whilst the use of cryptocurrencies allows a person in a country with severe inflation to bypass government intervention and mismanagement, a click in the wrong place means that should they misplace their funds, they have no or limited insurance or way to recall a transaction. By disintermediating banks, users are also removing insurers, clearance houses, and others, from the equation. In addition, they are transferring several functions traditionally handled by institutions like the state to technologists and influential corporations, including those in the banking sector. This shift towards decentralization could also lead to the loss of tax revenue.</p> <p>Although the disintermediation of traditional actors generates new concerns, it also creates ample possibility to improve processes where either the number or nature of intermediaries generates redundancy or barriers to adoption. The Web3 technical stack can improve identity and credentialing systems by distributing identity verification and authentication functions. By some accounts, these technologies can “change how users connect with applications by offering universal sign-in capabilities” (<i>Stackpole, 2022</i>).</p> <p>Not only can decentralized identity systems support novel, secure and verifiable credentials for individuals, such as proof of education, employment, or certifications, but they also allow for individuals to control key data about themselves. DID systems can be configured to enable the verification of claims without actually sharing private or privileged information with service providers: “in effect, the user can assert aspects of their identity without necessarily sharing the identity data itself” (<i>Litan et al., 2023</i>).</p>



## Automation of contract-logic processes

- Automated smart contracts and decentralized applications can improve efficiency and reduce costs for organizations with administrative processes and more control over the sharing of data.

As explained earlier, the combination of smart contracts, DAOs and decentralized applications can enable agreements to be executed automatically. By executing relevant actions according to the terms established, these mechanisms could significantly speed up and reduce the operational cost to deliver services. For organizations with significant administrative processes that follow some sort of contract logic, the efficiency gains could be substantial.

Automated contract-logic processes could allow for more granular control over the sharing of personal data. Users could specify exactly which pieces of information they want to share with whom, ensuring that only the necessary data is shared and reducing the risk of data breaches.

## Scenarios: UN Involvement in the Web3 Ecosystem

To fully realize the value of decentralized technologies in support of the pillars, goals and mandate of the United Nations, a concerted and proactive approach is needed to ensure that the Organization can participate in the agenda setting process and become a critical node in the continuous development of the Web3 ecosystem. Importantly, the UN could play a pivotal role in helping shape the sector's priorities, for example by drawing attention to impactful use cases and ensuring protection concerns are duly addressed. However, the Organization's impact will depend on its chosen strategic position and the extent to which it prioritizes this emerging technology.

In this section, ETT envisions a set of scenarios that describe plausible roles for the Organization in the evolving Web3 ecosystems. Scenarios create a common framework to understand, discuss, and provoke conversations around potential outcomes and the actions required to achieve them. They help inform and steer decisions towards a desired future, whilst acknowledging the forces and tensions that exist with current trajectories.

**Why is it important to project these scenarios for the UN?** The priorities set for the ecosystem today will shape the applications, principles and safety afforded to users in the near future. Considering the decisive role that Web3 could have over the next generation of the internet – or broadly, of the digital economy – ensuring that it develops in a principled, sustainable, and human-centric way is of utmost importance. Given the rapid pace of development, we believe that it is vital to set in motion a suite of actions to ensure that our desired futures are attainable. The scenarios described below provide a set of possible roles the UN could find itself in based on the strategic decisions it makes to prioritize this technology.

In the view of ETT, the value that the UN will be able to steward will likely be defined by the balance it strikes across two axes: **technical proficiency** and **connectedness**.

Technical proficiency refers to the skillset needed to comprehensively understand decentralized technologies, including details about how its building blocks and infrastructures can converge into useful applications. Given the potential to innovate and combine different pieces of the ecosystem —say a DAO with a smart contract into a dApp—technical expertise marries broad awareness of emerging applications and specialized knowledge of enabling infrastructures. Where the Organization is situated in the technical proficiency axis will be defined by its ability to create internal knowledge and a network of partners that can build, connect, and use decentralized technologies.

Connectedness on the other hand, refers to the space that Organization carves for itself in the Web3. It includes the connections and partnerships it is able to form and foster as well as the willingness of the ecosystem's actors to engage with and prioritize the objectives and goals of the UN. In other words, it describes its proximity and importance to the network of Web3 actors.

These two axes are closely intertwined; it is likely that a more technically proficient Organization can engage with a broad set of actors, which in turn could affect the range and impact of applications it can pursue to drive wider change. The intersection of these axes creates different personas for the Organization which ETT believes present plausible scenarios that describe how much value the UN will be able to create from Web3.

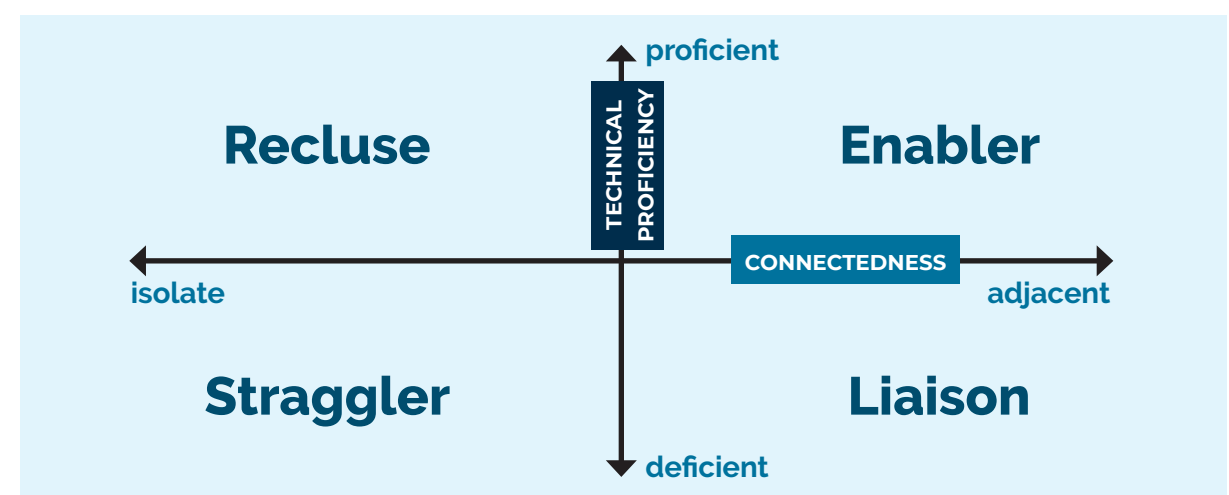


Figure 4: Web3 Scenario Matrix

### Recluse

As a recluse, the UN faces significant challenges in effecting change throughout the ecosystem. Even if well versed in the technical aspect of Web3, it isn't strategically positioned, and doesn't have the appropriate partnerships to drive change. In this scenario, the United Nations faces significant challenges in regulating the decentralized technologies. It may struggle to enforce standards and regulations in a decentralized ecosystem, leading to issues such as fraud, cyberattacks, and misuse of the technology. This scenario could result in decreased trust in Web3 technologies and hinder their adoption for global good.



Enabler	<p>As an enabler, the UN takes a leading role in promoting and developing applications that leverage decentralized technologies to address global challenges such as poverty, inequality, and climate change, driving significant and tangible progress towards its objectives. Under this scenario, the UN becomes a central node of the Web3 network. It influences and incentivizes the wider ecosystem to explore innovations across its core areas of work and moves the needle towards the impactful and human-centric use of decentralized technologies for social good.</p> <p>The UN invests in research and development of Web3 technologies, creates standards and regulations to guide their use and maximize protection, and works with Member States and other stakeholders to implement them. Furthermore, it fosters global cooperation on Web3, connecting different nodes of the network to promote trust and transparency. The Organization becomes central to cooperation efforts across DeGov, DeSci and DeFi hubs.</p> <p>Specifically, the UN adopts innovative applications to accelerate the fight against corruption by introducing Web3 systems across its own transaction-based processes. Along these lines, the UN helps governments to become federators, facilitators and regulators of decentralized digital identity systems. It shapes global DID standards through a participative and collaborative process involving Member States, leading to substantial improvements in the authentication and verification of identities. Concretely, the UN itself becomes a user of decentralized technology and a sandbox to experiment with more transparent governance mechanisms.</p> <p>In this role, the UN keeps apprised of recent innovations and is well connected to the Web3 ecosystem, enabling rapid adoption of systems and applications that reach thresholds of maturity. To preserve this role, the Organization must be supportive of innovation and tolerant to the uncertainty associated with decentralization. It must be open to experiment with alternative funding and financial set-ups for its projects, as well as for itself.</p>
Liaison	<p>As a liaison, the UN serves as a bridge across the ecosystem, becoming a facilitator of experimentation and innovation between Web3 companies and Member States and national actors. Although it can play a role in articulating the ecosystem, in this scenario, the Organization struggles to keep up with the rapid pace of technical innovation, therefore, it is less able to benefit from more complex and novel applications, leading to missed opportunities and slower progress in leveraging these technologies for global good. However, because of its centrality to the Web3 network, it can still incentivize and put at the top of the agenda important issues and play its part in facilitating global cooperation. The Organization recognizes the importance of working with Web3 innovators and entrepreneurs to leverage their expertise and ideas. As with the prior scenario, this scenario could lead to innovative solutions to global challenges and greater public trust in Web3 technologies.</p>

Straggler	<p>As a straggler, the UN has limited capacity to work with organizations that understand Web3 applications. The Organization misses out on the opportunity to create internal and external use cases and capacity is severely limited.</p>
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The value the United Nations will be able to steward from this ecosystem will be defined by the role it is able—and importantly, chooses—to adopt based on the balance it strikes across the technical proficiency and connectedness axes. Even though Web3 is still new, it is a rapidly developing ecosystem. Hence, it is critical that the Organization begins familiarizing itself quickly with decentralized technologies, how they work, and how the underlying infrastructure enable its use cases. It will also be important to generate a good level of understanding of decentralized business models and ways in which these technologies can be embedded into existing processes.

## Critical Questions

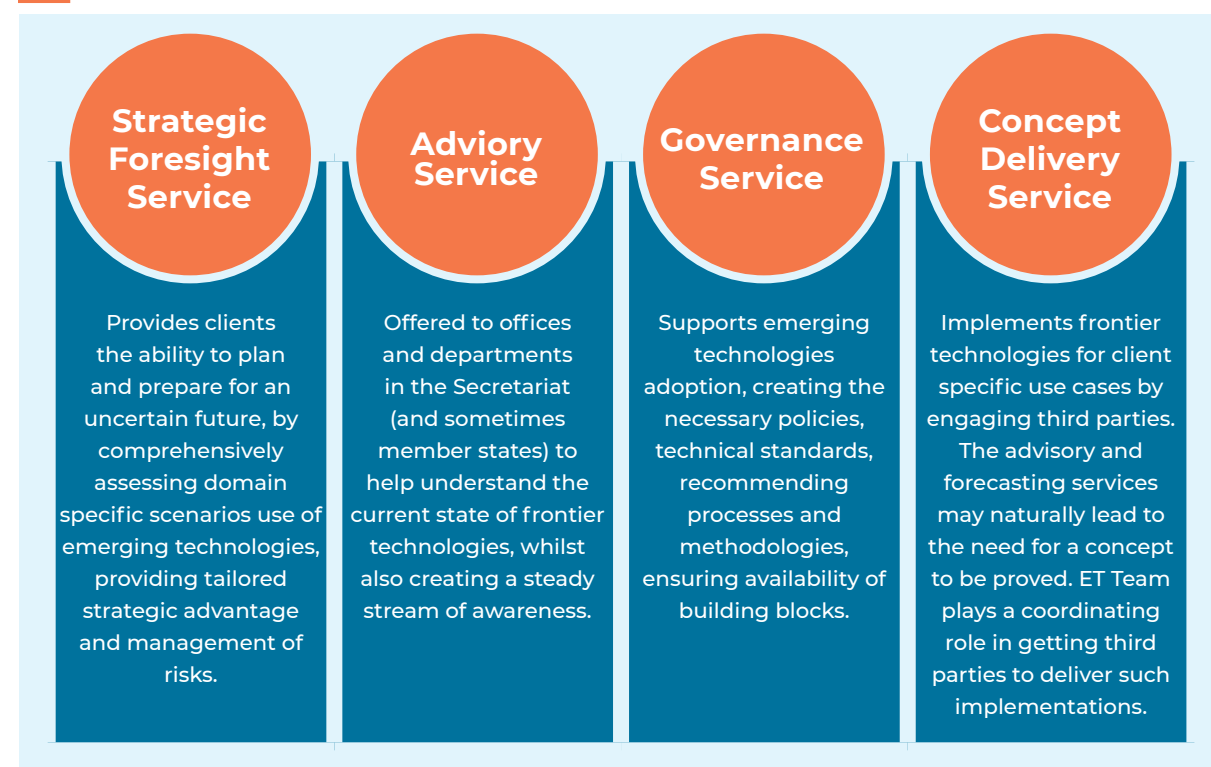
The questions below outline some of the core lines of inquiry for reflection. They may help pinpoint future-state enablers, as well as scope a strategic action plan for the UN.

<ul style="list-style-type: none"><li>» <b>How can public sector infrastructures work together effectively with private-sector, decentralized infrastructures?</b></li><li>» <b>In which ways could the UN use Web3 infrastructures to create applications that incentivize, reward and keep track of social impact?</b></li><li>» <b>Could the UN leverage alternative financing sources, say via cryptocurrencies, responsibly, and at-scale to boost and meet funding demands?</b></li><li>» <b>Is there room for the UN to become embedded and adjacent to the Web3 ecosystem as to positively influence the sector’s development pathway?</b></li><li>» <b>Could the UN implement and introduce decentralized technologies to experiment with participatory and innovative governance mechanisms?</b></li><li>» <b>How can the UN motivate its vast network of stakeholders to cooperate and collaborate on open (scientific, technological, governance) networks?</b></li><li>» <b>Specifically, given the breadth of the nodes under the UN network umbrella, the diversity of areas of focus and distinct incentives, is it possible for the Organization to adopt tamper-proof systems across its operations to enhance transparency and facilitate collaboration across parties?</b></li></ul>
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# About Emerging Technologies Team

The Emerging Technologies Team expedites the adoption of frontier technologies across the UN Secretariat. It leverages emerging technologies to generate greater efficiencies and to enhance the organization's ability to respond to an ever-evolving technological landscape, whilst providing appropriate safeguards through the careful identification and evaluation of adoption-related risks. ET Team supports its clients and partners by providing insights, advice, support, and guidance on emerging technologies across four main services: Strategic Foresight, Advisory, Governance and Concept Delivery.

## About ET Team's Strategic Foresight Service



The ET Team Strategic Foresight service develops long-term plans for new technology paradigms impacting the work of the United Nations. The service equips the offices, programs and departments within the UN Secretariat with the information and processes needed to anticipate, understand and plan for the use of emerging technologies to advance their mandate and mission, providing strategic advantage and management of risks. Interested in working with us? Find out more at [Emerging Technologies webpage](#).

# Glossary of Key Terms

**Decentralized applications (dApps):** Applications that connect to a decentralized blockchain peer-to-peer (P2P) network (*Litan et al., 2022*).

**Decentralized autonomous organization (DAO):** "A digital entity, running on a blockchain, that can operate without conventional human management and engage in business interactions with other DAOs, digital and human agents, as well as corporations." (*Litan et al., 2022*)

**Decentralized finance (DeFi):** Financial platforms that run entirely on code using smart contracts on a blockchain (*Erni et al., 2022*).

**Decentralized science (DeSci):** Concept that refers to a decentralized approach to scientific research and collaboration.

**Digital assets:** Assets that represent verifiable and ownable intangible digital items (NFT, real world assets, cryptocurrencies etc.) (*Banerjee et al., 2022*).

**Digital identity:** Digital representation of an individual, organization or thing that exists online, often in the form of data or attributes that are associated with a unique identifier (*ID2020, 2021*).

**Digital wallets:** Software application that enables users to store, manage, and transact various types of digital assets, including cryptocurrencies and other digital assets, in a secure and decentralized manner.

**Distributed ledger technology (DLT):** "a database hosted by a network of computers instead of a single server - that offers users an immutable and transparent way to store information." (*Stackpole, 2022*).

**Metaverse:** "A massively scaled and interoperable network of real-time rendered 3D virtual worlds which can be experienced synchronously and persistently by an effectively unlimited number of users, and with continuity of data, such as identity, history, entitlements, objects, communications and payments" (*Momtaaz, 2022*).

**NFT:** "Blockchain-enabled cryptographic assets that represent proof-of-ownership for digital objects" (*Momtaaz, 2022*).

**Smart contracts:** "Code or programs stored on a blockchain that execute when conditions are met (e.g., terms between a buyer and a seller)" (*Banerjee et al., 2022*).

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A THOUGHT PIECE ON

# WEB3

CONSIDERATIONS AND SCENARIOS

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