



WEB 3.0

EVOLUTION OF COMMUNICATION TECHNOLOGY TO Web3.0 FOR NextGen DIGITAL TRANSFORMATION



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Introduction

Communication is one of the major contributors to human civilisation. It is an overwhelming experience to conduct research on this subject which is so fundamental yet essential for daily life. It's methods and processes had metamorphosed from primitive to ancient to modern and to the present digital era. There were hundreds of improvisations in the preindustrial revolution 1.0 era, and inventions of technologies and their innovative applications in all four industrial revolutions. Thus, it continued to evolve with applications of technologies and passed through different media and modes yielding benefits to humanity.

In this ongoing decade web-based applications are going through its third major iteration to refine existing methods and meeting latent demands of business, government, and society. In the contemporary era of pervasive digital transformation, communication amongst groups of people, bonded by certain common purposes and interests, takes place in a defined network created by Blockchain synonymously known as distributed ledger technology.

Since the advent of computerised automation, including use of wire connected local area network, collectively the technology used to be called as information technology or IT. Thereafter came the revolution in telecommunication technology and computerisation got its much-needed accelerator. Now information and communication technologies are used as a combined phenomenon and inseparably known as ICT because computing services are now performed and delivered through telecommunication networks to the handheld devices of users. The last mile of such wide area network is wireless. Again, wireless technology is by itself morphing from 4th generation to 5G.

Objective

Communication is a subject of oceanic dimensions. Applications of digital technologies have further added and multiplied its dimensions in an all-pervasive manner with advancements for worldwide usage. Keeping this in view the limited objective of this paper is to briefly understand

Image Source: <https://ultcoin365.com/will-we-even-notice-the-transition-from-web2-to-web3/>

the path through which the processes of communication evolved since the primitive era of human civilisation to present day Web3.0. What seeds are there in the womb of foreseeable future would also briefly be mentioned. The ancient era has been included to understand how mankind kept on learning and improvising the manner, media and mode of communication and how previous knowledge and experience helped innovating the subsequent advanced versions. Efforts have been made to also understand how NextGen applications are being developed using enabling features of Web3.0 for the benefits of mankind.

Evolution of Communication to Internet

Ancient men used variations in sounds of mouth and objects to communicate. Historians are divided in estimating period for commencement of communication in such crude form varying from 5,00,000 BCE to 50,000 BCE. Mankind used fire lighted on burning objects and high-pitched sound of mouth as distance signalling system during day and night. However, there is consensus about use of gestures and postures right from the onset of some sense of civilisation which continued to evolve.

Ancient people were forced to be more creative because they had no option but to generate a common meaning and understanding of every single gesture and posture. This is what has finally evolved as the present-day sign language. Post discovery of archery different types of arrows were in use with each pattern of arrow conveying different meanings and messages. The evolution continued.

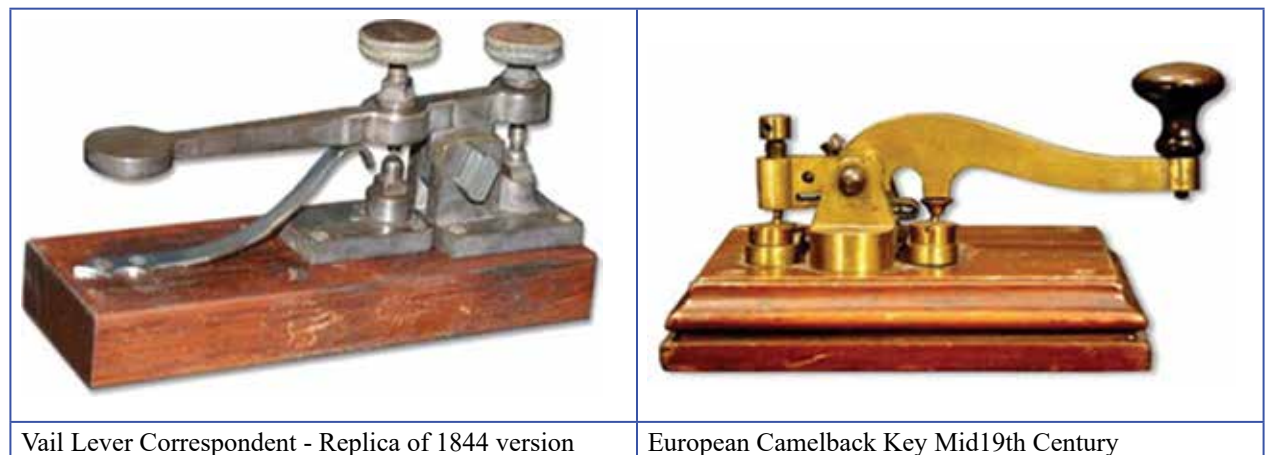
When ancient people started staying in caves walls of those started being painted with pictograms, icons, and images ideated from nature. That was also a medium of communication for visitors and passers-by. May Clare Novac¹, a content marketing specialist of USA, is of the view that *“Communication for ancient man*

became more complex as variations of cave paintings evolved into pictograms.... Later, ideograms were created and used to communicate concepts”. As per Oxford dictionary ‘Pictographs’ are known as the earliest form of communication found in Mesopotamia and Egypt from 3000 BC. Hoisting some large objects on tall pole like items were used for long distance communication. Thus, hand drawn images and pictures also became a medium of communication. In course of time came photography using films and now digital photography is in prevalence.

Improved versions of still photographs and videos, have returned as a major medium of communication in contemporary digital era. Advanced applications of the same are augmented reality and virtual reality (AR & VR) mixed with sounds of nature and music and recited verses. Through the process of evolution came hand-written communication which was complemented by printing press. Its ideation and evolution started from the 9th to 14th century mainly in Chinese and Egyptian civilisation. Johannes Gutenberg of Germany first crafted its modern non-automated version in 1446. Around 1690 newspapers started being printed for mass communication.

Communication Technology - Telegraphy to Cell Phone

Long distance written communication started with discovery of electrical telegraphy machine. In 1837 Sir William Fothergill Cooke and Sir Charles Wheatstone contributed to mankind a patented telegraph system. It consisted of *“... six wires and an actuator with five needle pointers attached to five galvanoscopes at the receiver”*. Such an English worded message transmitting and receiving equipment used to be popularly known as *‘Tore Takka’* machine by Indians of earlier generations, because it makes such sound while in operations. The author has seen the second one in picture in a post office during his school days of late 1960s.



Images of Telegraph Equipment: <http://www.sparkmuseum.com/TELEGRAPH.HTM>

Thereafter came the voice-based communication system transmitted through electrical wires which is obviously language agnostic. The real-life story of 1876 for discovery of voice-based communication is like this. Thomas A. Watson,

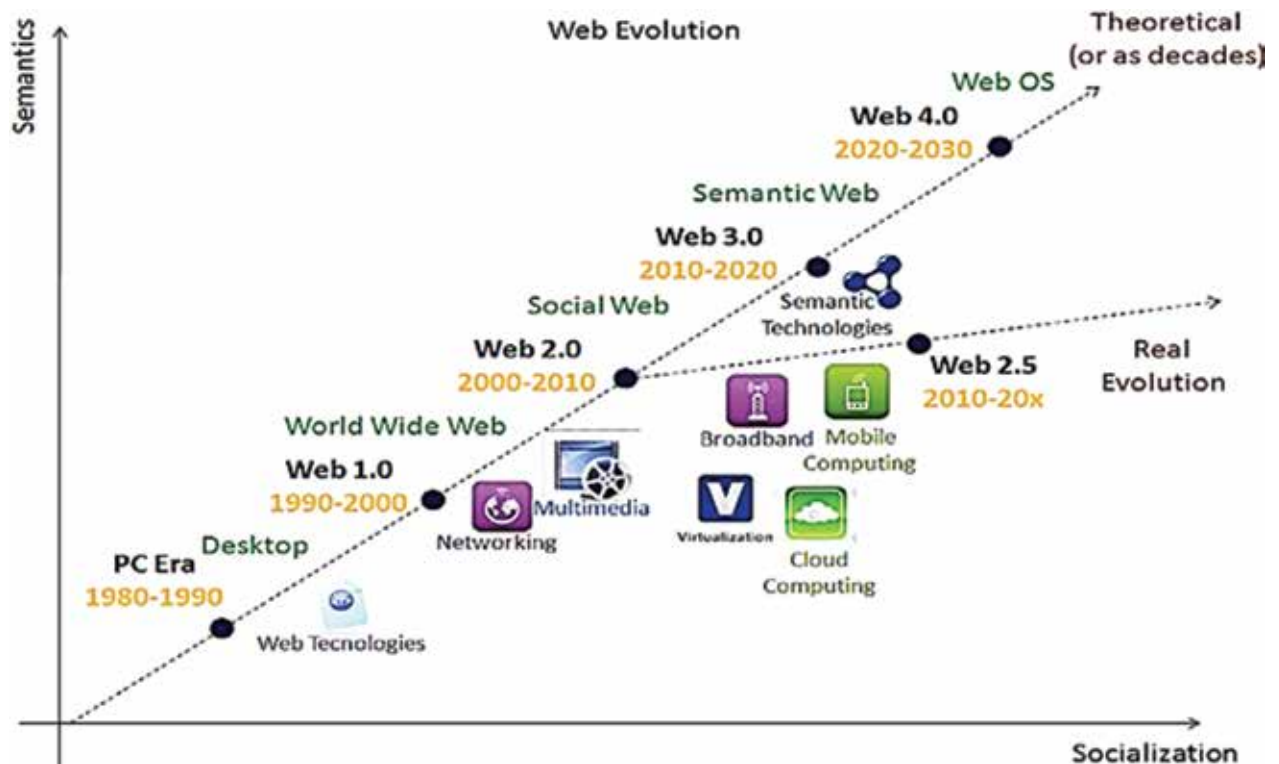
one of Alexander Graham Bell’s assistants, was struggling to reactivate a telegraph transmitter. He was trying to set right a method for transmitting multiple messages on a single wire. Then Mr. Bell² “... heard the sound of a plucked spring along 60 feet of wire. Hearing the sound, Bell believed that he could solve the problem of sending a human voice over a wire. He figured out how to transmit a simple current first. Five days later, he transmitted actual speech. Sitting in one room, he spoke into the phone to his assistant in another room, saying the now famous words: «Mr. Watson, come here. I need you.»

Subsequent inventions and innovations replaced electrical cables by optical fibre cable to accelerate carriage of packeted pulses of infrared light signals in a wired network. Till around 1970s computers were immobile. Communication and computation on the move were made possible by using telecommunication technology. When the last mile of network connection in a telecommunication network was replaced by wireless technology till the point of hand-held device of users, communication became mobile. All these multiplied users of internet several

hundred folds and the present era is the era of ICT.

Internet to Web3.0

Government researchers of the USA started using locally connected computers in 1960s for sharing confidential research related information. As a reported new items of The Economic Times³ “Albeit Ray Tomlinson is universally credited as the creator of email as part of a program for ARPANET in 1971 a 14-year-old (American boy of Indian origin), Shiva Ayyadurai began his work on an email system for the University of Medicine and Dentistry of New Jersey. His task was to emulate the paper-based interoffice mail system electronically and in 1982, he copyrighted his software, called “EMAIL”. However, the first formalised version of Internet, is reported to be established on January 1, 1983, when the first version of Transfer control Protocol and Internetwork Protocol (TCP/IP) were established facilitate different types of computers using different networks. Since then, many developments and innovations took place. The following is a calendarized history of Web developments:



Source: https://www.mdpi.com/futureinternet/futureinternet-04-00852/article_deploy/html/images/futureinternet-04-00852-g001.png

Web1.0

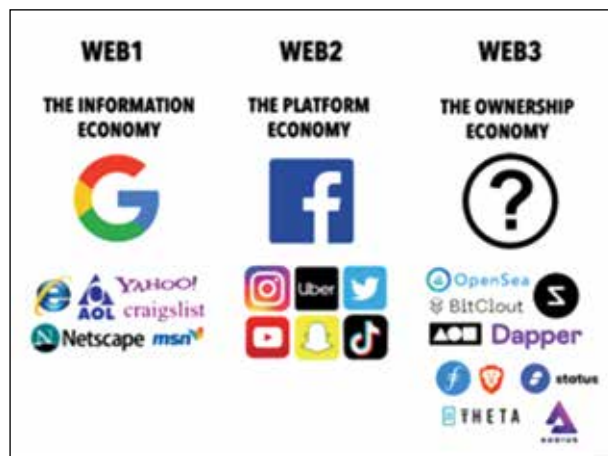
Web1.0 was predominantly an information sharing and read only version of internet. Its contents could not dynamically be changed by users. The major three functional features of this were ‘Search Engine’, ‘Web Address’ and static HTML

pages presented through internet which could not be modified or added with more unlike what we see in present day web pages/platforms of banking or eCommerce sites where a user can, fill up forms, type in blank pages, insert information, etc. and submit. Limitation of Web1.0 was limited to a carrier of written communication only between two users without any possibility of change. Commercial use of Web1.0 could be found in the form of Encyclopaedia, Britannica, and Yellow Pages, etc.

Web2.0

This second version of Web brought in many dynamic features enabling internet users to interact with the web page provider and connect with more than two users. It provided facilities to navigate between two or more web pages because of being compatible for different types of computers, including mobile phone handsets, and interoperability. As opposed to Web1.0, which could only be operated between two computers, this version facilitated interactions amongst many. For example, after circulation of research questionnaires through Google Form the target audience can fill up the questions and submit. Again opinions/comments can be exchanged between two users underneath one post in LinkedIn on which others can also comment under their disclosed individual identities with photographs. This version facilitated operations using cloud computing with centralised control.

Web Iterations and Giant Users



Source: <https://ertano.com/web-3/>

Platforms and websites created using Web2.0 enabled users to add contents like users of facebook LinkedIn, Instagram etc. do. That is why most of the social media used Web2.0 as a powerful and user-friendly technology for attracting corporates and generating advertisement revenue. Web2.0 enabled establishment of virtual or cyber marketplace which facilitated eCommerce with improvised business and revenue models. Reader may be using some of the Web2.0 based websites as shown in the above illustrative graphic. One can fill up forms in Google Docs, read a news item at the website

of Economic Times and then share through LinkedIn. Even the websites provide icons of other websites like LinkedIn Twitter, for sharing information etc.

Because of the above features Web2.0 is also known as participative web with facilities for interoperability. Most of corporate entities, government agencies and various other types of organisations adopted and migrated to Web2.0 around mid of the first decade of 2000. However, one of its major handicaps is inability to handle virtual objects and elements, as we experience today like digital assets. It also functions completely in a centralised mode under permissioned and supervised environment. The process of working is not democratic and quite vulnerable for cyber security threats involving data privacy, security and safety of users' identities and personal/official resources.

Web3.0

The old axiom, necessity is the mother of inventions, once again proved itself in case of world wide web technology. The above discussions on Web 2.0 reveals that it could not get rid of several shortcomings and handicaps particularly ownership of contents and vulnerabilities related to security, safety, and privacy. Again, digital solution designers also innovatively thought through for advanced utilisation of the power of web based technologies by integrating with it a few other technologies.

The world thus saw advent of the third iteration of Web in 2010 which aims at setting up a decentralised online network by using DApps or decentralised applications. It enables users to own and control the contents and the assets they create. If need be, the reach of network can be extended to global users. This version establishes a peer-to-peer network using Blockchain which provides all benefits that this technology provides. This technology also enables 'Distributed Data Storage Management System' (DDSM) Readers may read about blockchain technology in Chapter 9 of the author's book⁴.

Vivek Madurai⁵ is of the view that Web3.0 can also be described as "... *Semantic Web or read-write-execute which refers to the future of web.... can interpret information like humans via Artificial Intelligence and Machine Learning. Which help to intelligently generate and distribute useful content tailored to a particular need of a user.*" Its objective is to understand "People, Place, Events, Companies, Products, Movies, etc." The platform operates with a set of Smart Contracts as its driving and guiding force the terms and contracts of which are embedded in the script of the software that runs the platform.

Web3.0 has also integrated cognitive intelligence technologies, viz., AI, ML to the blockchain based platform for analyses of transactional data generated by the platform. This in turn helps users to draw inferences, identify gaps, ideate shape of things to come, predict and formulate strategies for future. For the benefit of better appreciation of this third iterations of web applications in terms of major

features and capabilities readers may further reflect on the following tables. Readers interested to know more about

Web3 Taxonomy may refer the related article of Curve Lab⁶.

Comparative Analysis of Major Features of Web Iterations

	Web 1.0	Web 2.0	Web 3.0
INTERACTION	Read	Read-Write	Read-Write-Own
USER DATA	Cookies	3 rd Party Controlled	Portable and Personal
MEDIUM	Static Text	Interactive Content	Virtual Economies
ORGANIZATION	Companies	Platforms	Communities
INFRASTRUCTURE	Personals Computers	Cloud & Mobile	Blockchain Cloud
CONTROL	Centralized	Centralized	Decentralized
AD-SPENT	Page Views	Cost Per Click	User Engagement

Source: Adopted from Grayscale Metaverse Research Report

Source: <https://crosstower.com/wp-content/uploads/2021/12/Indias-1-Trillion-Digital-Asset-Opportunity.pdf>

From the above narratives readers might have appreciated that *“Web3’s endgame must be to forge an entirely new culture and institutions for market-based, regenerative, and glocally-collaborative conservation.”* Web3.0 seems have to a large extent fulfilled the vision⁷ of Sir T. J. Berners-Lee, known as the creator of world wide web, as enshrined in these words, *“no permission is needed from a central authority to post anything ... there is no central controlling node, and so no single point of failure ... and no “kill switch”!*

NextGen Applications of Web3.0

Various enabling features of this third iteration, as delineated above, by themselves are indicators of various purpose and objectives for which Web 3.0 is being used for safe administration of economic values and rendering services with participations of all in a digitally created decentralised democratic environment. The author has attempted to summarise various next generation applications and use cases using Web3.0 in the following bulleted points:

- ⊙ **Decentralised Applications:** Decentralised finance, Virtual digital assets, Cross-chain applications ensuring hassle-free interoperability.
- ⊙ **Metaspaces and Metaverse:** Three dimensional immersive spaces for organising celebration events like marriage, birthdays etc., Near real or virtual marketplaces with applications of AR, VR and mixed realities.
- ⊙ **Decentralised Finance and Virtual Digital Assets:** Multichain and interoperable financial solutions involving different types of CBDCs, Non-fungible Tokens, Virtual digital assets (VDAs), Crowd funding, etc.

- ⊙ **Advanced Gaming:** Qualitatively elevating gaming industry from gaming for entertainment to newer heights of gaming with mind and brain, Play to earn and play to own games, etc.
- ⊙ **Advanced Data Management Privacy, Safety and Security:** Cryptography with advanced algorithms, Zero-knowledge proofs that are ensured by blockchain technology.
- ⊙ **Advanced Social Media Applications:** Decentralised applications, Simultaneous applications of private key and public key to mask identity of users, Wallet based access
- ⊙ **Virtual Real Estate:** Non-fungible tokenised real-life assets for participative ownership, digitised documentation for establishing digital proof of ownership, and Virtual marketplace for real estate with application of 3D technology
- ⊙ **Work from Anywhere:** Creation of workspaces away from offices with 3D, Creating virtual avatars, Enabling facilities for conducting virtual meetings and creating of Avatars with integration of robotic process automation,
- ⊙ **Advanced Non-fungible Tokens:** Creating and maintaining records for immutable non-fungible tokens, Funding for decentralised autonomous organisations (DAO) by trading NFTs against fiat currency and allowing proportionate ownership and voting power.

The above is an illustrative list of innovative applications of Web3 and in no way an exhaustive list of what more applications have been and are being implemented.

Web4.0

Past trends in development and evolution of different digital technologies forces one think that even before exhausting capabilities of Web3.0 the next iteration will arrive. It is being said that the next Web version will not entirely be new avatar but will arrive with major additions of capabilities to Web3.0, e. g., variety, vector, intelligent knowledge distribution, personalized content. According to Slava Blagirev⁸ “*Web 4.0 is the Web Internet available on mobile devices as it is now through the prism of an event-driven approach, within which you, as an ordinary user, do not feel boundaries.*” Web4.0 is expected to use vector graphics which with highly scalable relatively smaller sizes. Presently when any picture is expanded or zoomed, the image pixelates, i. e., divides into pixels and its beauty gets distorted. Vector graphics are expected resolve this problem. Going forward Web5.0 is expected to create an extra decentralised web. As of now it is not clear what shape of things would emerge.

Conclusion

An author is never satisfied with what she/he writes. Such a sense of dissatisfaction deepens when prior efforts involve substantial research and assimilations. Efforts of any author always aim at making such a paper on technologies more informative and simpler for readers to go through in search of knowledge with fair understanding of what is being read. So is the state of mind of the author of this article. His efforts will meet some semblance of serving the purpose if readers get to know about evolutions of world wide web (www) technologies and their innovative applications. This will help them to appreciate how overwhelming impacts are created on the way of a common man’s living daily life and conducting business activities.

Hopefully readers from the world of academia and

research would get some seeds of thoughts to formulate problem statements for their future research. It would be the author’s privilege to participate in such research in search of excellence. **MA**

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