II. PRIMITIVE METAVERSE TO ORIGIN OF THE MODERN METAVERSE

The metaverse history begins with a 30-year-old dystopian sci-fi book titled Snow Crash, written by Neal Stephenson [25]. Metaverse technologies are not necessarily new. Their origins trace back centuries to rudimentary sensory illusions and, more recently, to advancements in computing in the late 20th century. For decades, XR and 3D technologies have contributed to advancements in medicine, chemistry, and engineering, among other fields. Back then, these technologies were incredibly expensive, bulky, and served an industry-specific purpose. Today, with the availability of high-resolution mobile screens, accurate motion sensing devices, and highly efficient mobile processors, XR is poised to make the jump from industry laboratories to our living rooms, offices, and classrooms [26]. Metaverse is a compound word combined with "meta-" (beyond; transcending) and "verse" (the root of "universe," cosmos; the whole world), which denotes a new virtual universe created beyond the real world. The term "metaverse" was first coined in the 1992 cyberpunk science fiction novel Snow Crash written by American novelist Neal Stephenson (Stephenson, 1992; Joshua, 2017).

The novel depicts people using virtual reality technology and digital avatars of themselves to explore an online, digital world. In this world, the characters can walk down the street, and visit shops, offices, amusement parks, and other forms of entertainment. Events in the metaverse can sometimes impact people in the real world of the novel. For the metaverse to even be possible, there must be virtual reality (VR) technology. As such, the history of this technology plays a role in metaverse history too.

Over the next three decades, the metaverse concept was more vividly depicted in science fiction movies, such as ready player one, lucy, and the matrix. At that time, the metaverse envisioned by films, could not come into being. In this decade, the rapid progress of emerging technologies, such as wearable devices and three-dimensional (3D) photography, has helped people to get access to the virtual world. In March 2021, the sandbox game roblox was listed in New York under the halo of "the first stock of the metaverse"; in October, Facebook proclaimed it rebrand scheme and changed its name to "Meta." Since then, extensive efforts have gradually been carried out by countries across the world to make it a reality. This sleeping "lion" was truly awakened [16].

III. *METAVERSE TECHNIQUES*

The Metaverse contains elements of all four scenarios. In the same way, as a mirror world map inside a virtual world, a heads-up display AR system, or an object or user lifelog inside a mirror or virtual world, their technologies substantially overlap [27]. There are also more general overlaps between the scenarios. **Error! Reference source not found.** shows the technological roadmap of Metaverse.

A. Communication Computing Infrastructure

The manufacturing field has been evolving rapidly with the help of IoT Technology and metaverse core-stream also working as an IoT device. Fig. 2 shows the IoT and Internet for Metaverse. According to our study, 43% of manufacturing companies reveal that VR will become mainstream in their organization within the next two to three years, with AR also working on industrial applications rather than consumer software. Metaverse is the next version of the internet and most companies already using 5G and 6G for developing their infrastructure.

Internet

The foundation for connectivity is the Internet. Although the internet is currently making progress very rapidly,

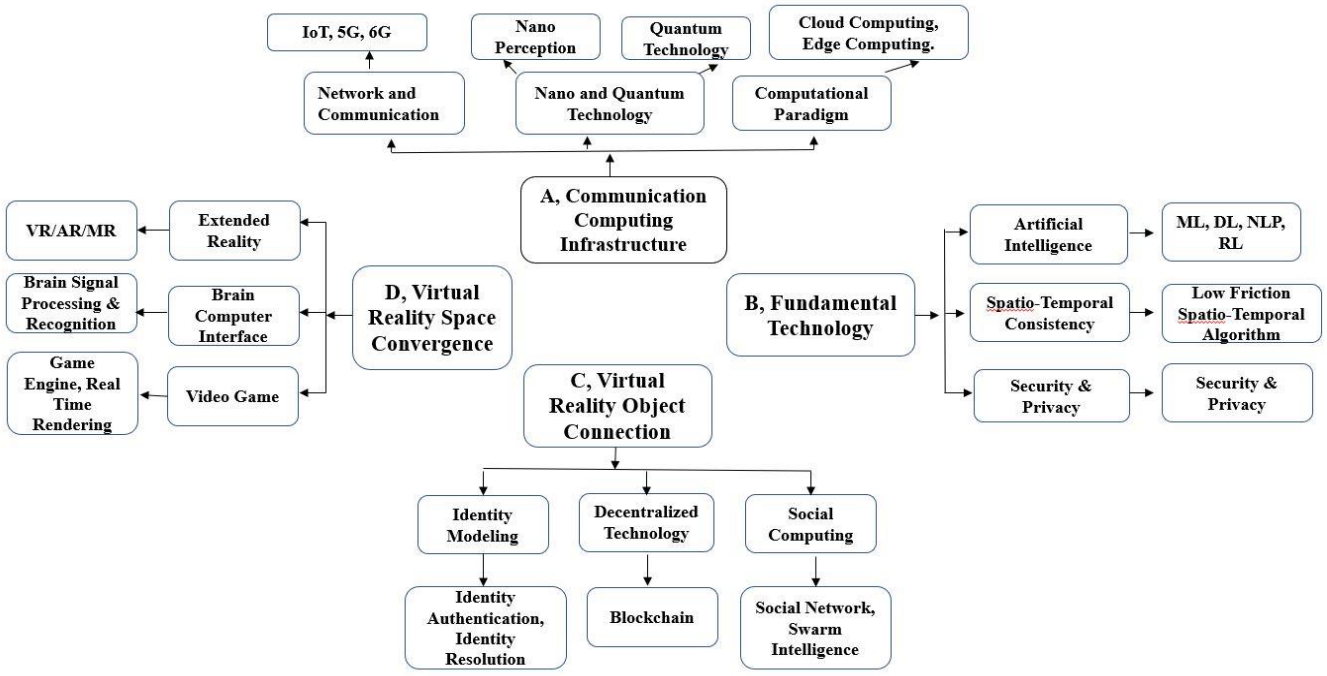

Fig. 1. A Complete Technological Roadmap of Metaverse

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