

VR and AR Devices Undergo Further Transformation to Shape a New Vision for Virtual-Real Integration



Just as generative AI is revolutionizing industries worldwide today by creating new opportunities, the concept of the Metaverse in 2021 was similarly embraced by technology giants as a strategic goal and vision for the future of the entire tech sector. Microsoft, for instance, targeted the corporate segment of the Metaverse, showcasing the use of its mixed reality (MR) device, HoloLens 2, in manufacturing operations. NVIDIA introduced the Omniverse platform for image simulation, thereby facilitating the development of virtual environments within the Metaverse. There were also rumors about Google and Apple launching new virtual reality (VR) head-mounted devices. Perhaps most notably, Facebook's name change to Meta was a clear indication of its commitment to this emerging field.

As Hype Fades, More Hardware and Content Are Needed to Strengthen the Foundation of the Metaverse

Despite initial market optimism, the reality was that wearable technology had not reached maturity, and the quality of virtual content experiences fell short of expectations. As a result, there was insufficient momentum to drive the Metaverse forward in subsequent market developments. Many tech companies established departments dedicated to the Metaverse, but due to lackluster results and issues with resource allocation, these departments often faced workforce reductions, downsizing, or even complete dissolution. Declining enthusiasm for the Metaverse primarily stems not from a flaw in the idea of blending virtual and real worlds, but from the grandiosity of its

concept. The essence of Industry 4.0, after all, revolves around enhancing production efficiency through the data-driven integration of physical and digital realms. This is a proven approach. Nevertheless, the challenge with the Metaverse lies in its ambitious scale. Without adequate software and hardware support, efforts to expand and implement it often fall short, yielding minimal benefits and, thus, diminishing its commercial appeal. Essentially, the widespread adoption of technologies like head-mounted devices and a rich content library are vital for industry growth. In response, companies that develop VR and augmented reality (AR) in recent years have pivoted their focus from the broader

environmental framework towards improving wearable devices and creating engaging content. In doing so, they aim to boost the practical value of adopting VR and AR.

From Virtual Interaction to Spatial Computing, the Scope of Applications for Head-mounted Devices Continues to Expand

In 2023, according to TrendForce's analysis, Meta's Quest series dominated the global VR and MR device market, securing nearly 70% of total device shipments. This significant market share places Meta at the forefront, with Sony's PS VR series ranking second, followed by other manufacturers like PICO and HTC. Entering the fray in 2024, Apple introduced its Vision Pro, which is expected to claim a 6% share of the global market.

Meta's latest offering, the Quest 3, has adopted pancake lenses that enhance image clarity while slimming down the device's profile. It is powered by the Qualcomm Snapdragon XR2 Gen 2, a (SoC) tailored for head-mounted devices that significantly boosts GPU and AI processing capabilities. The Quest 3 marks a pivotal shift for Meta from VR to MR. Equipped with dual front-facing RGB cameras and advanced features like depth projection and room mapping, the Quest 3, alongside the higher-end Quest Pro, supports a range of MR applications. Additionally, the tracking capabilities of the Quest 3 are augmented by computer vision and machine learning technologies. With Meta's ongoing collaboration with LG on new product development, the focus is now on extended reality (XR) applications linked with the television ecosystem.

Apple's Vision Pro, which was launched in February 2024, has reignited market interest in VR. This device fills a previously unaddressed gap in Apple's portfolio by offering a VR head-mounted device that integrates seamlessly with iPhones, iPads, and other devices within Apple's ecosystem, thereby enabling functions like image and video projection onto larger screens. The introduction of the Vision Pro brought the concept

of spatial computing into the limelight, enabling users to interact with virtual objects in a natural and intuitive way and thus infusing fresh perspectives into the industry.

Moreover, at CES 2024, Sony unveiled an XR head-mounted device dubbed a "spatial content creation system." Like the Apple Vision Pro, this device leverages the advantages of spatial computing. It's designed as a commercial tool for developing 3D content, offering users precise and intuitive control over virtual objects, thereby simplifying the process of creating 3D models. From Taiwan, ASUS has recently introduced its first AR glasses, the AirVision M1. These glasses are designed to function as a secondary screen, ideal for use outdoors or in situations where extra screens are necessary at home.

Taiwan-based Companies Expand into the Supply Chain for Headsets, Focusing on Optics, Chips, and Assembly

TrendForce analyst P. K. Tseng said that a critical aspect of the transformation for VR head-mounted devices is the increasing need for key components that are lighter and more compact, particularly pancake lenses, which are gaining importance due to their contribution to volume reduction. However, the technological complexity and higher cost of manufacturing these advanced optical components mean that suppliers, such as GSEO and Young Optics, are relatively limited.



2023 COMPUTEX Forum invited numerous technology giants to share the latest trends

This presents a blue ocean market opportunity, likely attracting more manufacturers to develop pancake lens components.

Furthermore, the trend is expected to drive demand for smaller-sized panels. While mainstream LCD panels continue to be widely used, the advent of devices like the Apple Vision Pro is anticipated to increase the adoption rate of Micro OLED panels. Additionally, as standalone virtual devices become more mainstream in product design, and as the need for processing large volumes of image and sensor data independently by SoCs grows, demand will rise for dedicated chips used in VR and AR devices. For instance, MediaTek is rumored to be developing an exclusive AR chip for Meta.

System or device assembly is a key area of focus for Taiwan-based companies, particularly evident in the efforts of major ODMs like Quanta and Foxconn. These companies are enhancing their VR and AR hardware manufacturing through various strategies, including partnerships, mergers and acquisitions, and investment initiatives. In the VR device supply chain, the strength of system assemblers lies in their ability to offer comprehensive product solutions, which expands the options available to prospective clients. The assembly of VR and AR devices presents unique challenges due to the necessity for high-quality image rendering and real-time motion capture. Numerous components are involved in the process. Not all VR and AR device brands can develop head-mounted devices completely in-house, as demonstrated by companies like Meta and Sony. For newer market entrants, securing a comprehensive product solution that allows for future customization is a more desirable strategy. This demands that system assemblers have significant expertise in relevant technologies and ODM capabilities. As such, as opportunities in the VR and AR market continue to emerge, these assemblers are well-prepared to offer solutions for head-mounted devices.

Integration of AI into Smart Grids Will Massively Boost Efficiency in Electricity Usage

Beyond hardware, the focus on creating more content and valuable applications will be a major topic in the next phase of VR industry's development, with generative AI poised to play a pivotal role. Taking gaming as an example, VR game development is known to be exceedingly time-consuming, requiring developers to dedicate substantial amounts of time to coding. As a result, the games often lack diversity, customization, and meaningful game mechanics. However, leveraging generative AI can expedite the game development process without sacrificing quality or increasing costs. Recent market analyses suggest that the adoption of generative AI could significantly reduce the time required to create XR learning modules from the 5-10 days typically seen in 2021 to less than 30 minutes today.

Consequently, major game engine providers like Unity are seizing this business opportunity. In mid-2023, Unity introduced a suite of generative AI development solutions tailored for VR game production. These solutions can be employed to create characters, objects, assets, and sound effects, thus significantly reducing development costs.

According to TrendForce's research, global shipments of VR head-mounted devices are projected to register a slight year-on-year drop of 1.8%, but the annual total is still expected to surpass 9.3 million units. Furthermore, with the releases of many new products ranging from chips and peripherals to complete systems, many of which were showcased at this year's CES and MWC, there is strong bullish sentiment regarding the development of the VR industry. The strategies of major manufacturers for VR and AR devices also demonstrate intense efforts to explore new use cases beyond existing applications, or to expand into other commercial sectors such as remote assistance, virtual learning, and simulation training.

Additionally, in many countries, VR and AR are now being incorporated into medical treatments, such as

psychological therapy and physical rehabilitation. Although the progress in promoting VR and AR technologies still depends on factors like pricing, specifications, and user experience, the expansion into new application markets is a positive development, particularly given the current shortage of content. Therefore, the added-value provided by new applications will be a key determinant of the VR market's growth momentum. Furthermore, the efficiency of using generative AI in content production holds the potential to propel device manufacturers into the next technological generation.

COMPUTEX 2024 is scheduled to take place from **June 4th to 7th at the Taipei Nangang Exhibition Center Halls 1 and 2**. With the theme "Connecting AI," this year's exhibition will focus on showcasing the latest global AI technologies and industry trends. The event is expected to attract **1,500** international and local exhibitors, utilizing **4,500** booths across six major areas: AI Computing, Advanced Connectivity, Future Mobility, Immersive Reality, Sustainability, and Innovations. International **visitor registration opens in March**. Visitors from all industries are welcome to participate and experience Taiwan's exceptional AI strength.



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