

Transforming businesses with mixed reality

Shifting focus from technology to opportunity



Summary

The reality-virtuality continuum is a spectrum that has the real world at one end and the virtual realm at the other. Between these two ends are various digital experiences that use a combination of real and virtual objects to various degrees. These experiences have been enabled by technologies such as augmented reality (AR), augmented virtuality (AV) and virtual reality (VR).

After several false starts over the years, these technologies have finally become commercially viable. The most promising of all the simulated reality technologies is mixed reality (MR), which is built by using digital objects and allows interactions between the virtual and the real world. This paper discusses various use cases of MR across industries, including manufacturing, utilities, healthcare, and education. It also lists some of the current technologies in the market that help build MR experiences.

Embracing virtuality to solve real-world problems

In today's digital age, enterprises are experiencing a fundamental shift in the nature of their businesses. Providing a quality product to the customer in need is not enough anymore. The marketplace is transitioning toward favoring convenience over requirement and satisfying experience over order fulfillment. Consider the following scenarios:

Manufacturers are grappling to save costs associated with hands-on training of equipment, improve quality assurance, minimize errors in assembly of complex components and reduce machine downtime. They are looking to innovate and collaborate across functions to expedite the phases of product prototyping and designing that will help them to hit the market early.

The pandemic has triggered remote diagnosis and treatment of patients. During complex surgeries, specialized teams of doctors need to interact closely and derive insights from the tomographic images by superimposing them over patients.

In the corporate world, companies are seeking to enhance employee training, to bring in agility in employee onboarding, and improve training constructs. The idea is to save costs while providing immersive employee experiences, leading to greater satisfaction and higher retention.

In customer service, organizations are looking to improve their 'first time fix' metrics to enhance the efficiency of their in-field technicians and improve overall customer satisfaction.

Largely, more organizations are concerned about the environmental impact of their businesses and finding ways to improve their ESG (environmental, social and governance) scores and reduce their carbon footprint.

All of these new-age business problems need cutting-edge solutions. With the recent advancements in virtual technology, AR and VR seem to have solutions to several of today's business challenges. According to an IDC report, the worldwide spending on AR and VR is forecast to grow from over \$12 billion in 2020 to more than \$72 billion by 2024, at a compounded rate of around 54%.¹ The COVID-19 pandemic has accelerated the demand for AR, VR and MR, the report adds.

Leveraging the power of MR

In the reality-virtuality continuum,² MR lies right in the middle (Figure 1). The experiences on the spectrum differ on a wide range from superimposing funny filters on our faces in online chat applications to full-blown VR experiences that are completely cut off from immediate user environments. AV has minimal use of real objects in the digital environment and AR on the other hand, tends more toward reality and can annotate virtual elements on top of real objects.

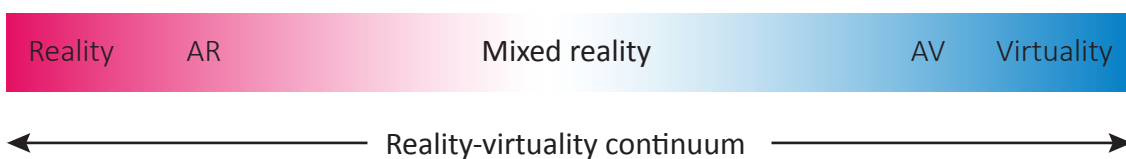


Figure 1: Reality-virtuality continuum as a spectrum

On the other hand, MR typically uses digitally created objects such as holograms, which are contextually overlaid on physical objects. Users interact with these holographic elements through MR headsets to trigger changes in real objects and vice versa. The MR experience is highly immersive and holds tremendous promise. As it is tactile users can touch and feel the icons, images, and other objects projected before them in a virtual plane. The 3D plane works like a touchscreen that can be tilted, moved, and rotated over 360 degrees. The experience is also motion-tracked—it moves according to the user's viewing angle and position.

MR technologies

Driven by exciting prospects, several technology companies are building native support for MR in their operating systems. Apple has ARKit, Android offers ARCore, and Microsoft Windows has developed the MR platform. The developer community is now amply supported with software development kits that enable them to build next-generation MR experiences using various devices. The number of head-mounted display (HMD) units available in the market is increasing by the day and contributing to the growing popularity of MR experiences. Some of the leading HMDs are Microsoft Hololens, Sony SmartEyeGlass, and Magic Leap.

[1] IDC; Worldwide Spending on Augmented and Virtual Reality report; published on November 17, 2020; <https://www.idc.com/getdoc.jsp?containerId=prUS47012020>; Accessed September 23, 2021

[2] Milgram, Paul; H. Takemura; A. Utsumi; F. Kishino (1994). "https://www.researchgate.net/publication/228537162_Augmented_reality_A_class_of_displays_on_the_reality-virtuality_continuum" Augmented Reality: A class of displays on the reality-virtuality continuum". Proceedings of SPIE - The International Society for Optical Engineering Vol. 2351

Industry use cases of MR

Given the versatility and efficiency of MR, several industries have started to test and implement solutions to solve their day-to-day problems (Figure 2). Some of the sectors that majorly benefit from MR are:

Manufacturing and utilities: Preventive and predictive maintenance on the field is a growing requirement in these sectors. With remote collaboration tools and connected worker experience, MR can provide contextual overlays to get insightful information of real-world devices and machines. This helps remote workers to visualize complex circuitry or workings of machines to fix issues in the first attempt. Features including video calling and annotating offered over mobile devices enable remote collaboration that is effective and inexpensive. HMDs enhance this interaction by giving technicians an immersive experience. They can fix faulty equipment while talking to remote experts and simultaneously pulling up related documentation, viewing relevant help videos, and accessing troubleshooting manuals.

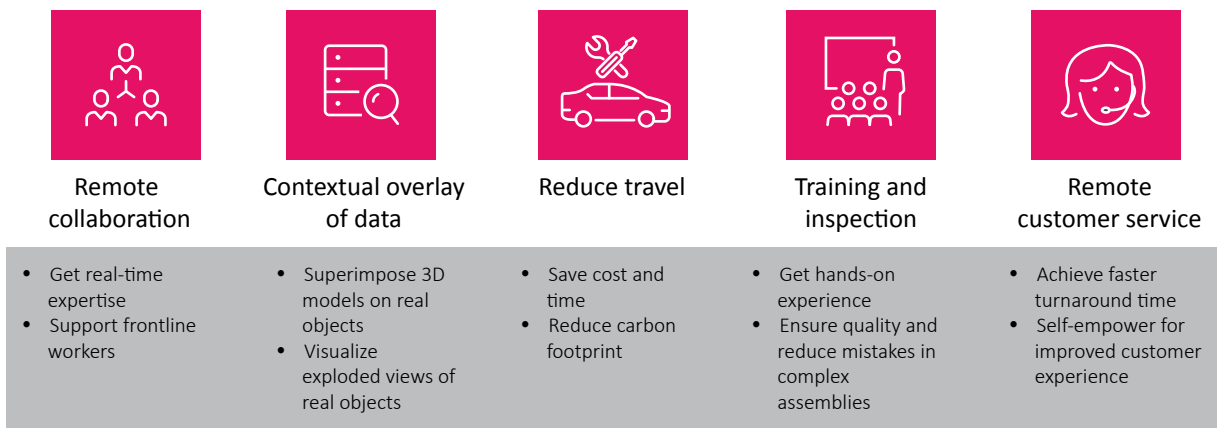


Figure 2: MR business value themes

In recent times, various MR themes including remote collaboration and contextual overlays are being used to design and prototype complex machines, structures, and contrivances. Organizations are using MR to simulate and test complex assemblies of components. Innovative factory, store, and warehouse layouts are being realized with MR to effectively use available space.

Healthcare

Telemedicine gained momentum in patient care during the COVID-19 pandemic. The methodology enables doctors to triage, diagnose, and treat patients remotely through mobile devices. MR in healthcare takes this experience to the next level. Medical teams comprising specialized doctors, clinical staff, and administrators, who are physically located across multiple hospitals and other locations, can collaborate seamlessly, exchange ideas, and recommend treatments. Before or during surgery, specialist doctors can superimpose 3D views of MRI or CT scans on HMDs or mobile devices to better understand the case and improve precision, thus reducing unnecessary interventions. Contextualized conversations can help the performing surgeons to take informed decisions. Patients in rural and semi-rural areas will then be able to get quality healthcare services closer to where they live, thereby reducing costs, saving time, and speeding overall recovery.

Education

MR is all set to change the very definition of classroom in the education sector. Remote collaboration among teachers, industry experts, researchers, and students will improve the aspects of experiential learning. 3D content with contextual overlay helps to better understand complex topics such as human anatomy, machine design and prototyping, and space exploration. Virtual study tours will help students visit ancient sites and study artefacts without venturing out to the actual places. Practical and hands-on training can make students job-ready at a faster pace.

Banking, finance, and insurance

MR offers a better alternative to filling reams of paper-based or online forms, in-person verifications, cumbersome workflows, and impersonal problem solving offered through chat bots. Mobile-based MR apps assist customers to easily navigate through complex procedures with real-time guidance from personal bankers. The relationship executives handhold users with annotations, markers, and relevant documents to complete the otherwise tedious processes.

Similarly, using MR apps, insurance assessors can remotely guide customers and gauge damages caused to properties, thus eliminating the need for physical site visits, and ensuring faster claims processing.

MR can transform the way personal wealth of high worth individuals (HNIs) is managed. HNIs can contact wealth managers from anywhere and get an immersive experience from holographic dashboards. They can get insightful and actionable information to make timely decisions regarding their investments.

Ensuring customer loyalty through user engagement

Enterprises have only managed to scratch the surface of opportunities that MR offers. They have started to engage customers with attention-grabbing experiences to stand out from the competition. MR is expected to be a catalyst in converting customer engagement into loyalty. Businesses have hence started making commensurate investments in the technology. Commercial use cases that are forecast to gain the largest investments by 2024 include training (\$4.1 billion), industrial maintenance (\$4.1 billion), and retail showcasing (\$2.7 billion), states IDC. Much of the investments in AR and VR is expected to be driven by the commercial and public sectors.

As the use cases proliferate, MR experiences will be invariably present in every walk of life and devices so integral that they would extend human senses beyond the dimensions of time and space.



About the authors



Navin V. Bhise

Navin heads the Center of Excellence for Customer Engagement apps at TCS' Microsoft Business Unit – Business Applications division where he is responsible for driving the technology thought leadership, managing consulting-led assignments with customers, developing reusable industry solutions, and spearheading competency management. Navin has more than 20 years' experience working with Microsoft technologies. He has been working in Microsoft Dynamics technologies since 2010 and has successfully architected several implementations.



Pranav Shroti

Pranav is a solution architect at the Center of Excellence for Customer Engagement apps and Power Platform in the Microsoft Business Unit – Business Applications division. He has over 17 years of experience and is currently focused on architecting complex Microsoft Dynamics implementations, and solutioning reusable industry offerings. He actively contributes to Microsoft communities by authoring blogs and publishing reusable components. He is also a distinguished speaker at several Dynamics 365 events.

Awards and accolades



TOP 3 IT SERVICES BRAND



FASTEST GROWING IT SERVICES BRAND FOR THE DECADE 2010 - 2020



Contact

Visit the [Microsoft Business Unit](https://www.tcs.com) page on <https://www.tcs.com>

Email: BusinessAndTechnologyServices.Marketing@tcs.com

About Tata Consultancy Services Ltd (TCS)

Tata Consultancy Services is a purpose-led transformation partner to many of the world's largest businesses. For more than 50 years, it has been collaborating with clients and communities to build a greater future through innovation and collective knowledge. TCS offers an integrated portfolio of cognitive powered business, technology, and engineering services and solutions. The company's 500,000 consultants in 46 countries help empower individuals, enterprises, and societies to build on belief.

Visit www.tcs.com and follow TCS news [@TCS](https://twitter.com/TCS).

All content/information present here is the exclusive property of Tata Consultancy Services Limited (TCS). The content/information contained here is correct at the time of publishing. No material from here may be copied, modified, reproduced, republished, uploaded, transmitted, posted or distributed in any form without prior written permission from TCS. Unauthorized use of the content/information appearing here may violate copyright, trademark and other applicable laws, and could result in criminal or civil penalties.

Copyright © 2021 Tata Consultancy Services Limited