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Immersive Technologies in Customer Service

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ABSTRACT

Immersive technologies may be regarded as any form of technology that allows the blurring of virtual and real worlds while providing a sense of immersion. The most prominent examples of immersive technologies are augmented reality (AR) and virtual reality (VR). VR is often considered an appropriate immersive technology for the pre-planning stage, while AR is mainly used to enhance the on-trip experience with social media and is being employed for post-trip sharing, rating, and reminiscing. Immersive technologies let you experience the product before you commit to buy. The retail sector has already started to introduce various applications of immersive technologies as part of marketing and sale strategies. This paper explores how businesses can cultivate an immersive customer service experience.

KEYWORDS: *virtual reality, VR, augmented reality, AR, mixed reality, MR, extended reality, XR, immersive technologies, customer service, customer service industry.*

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INTRODUCTION

Businesses need to understand that customer service goes beyond resolving queries or troubleshooting; it is about creating memorable experiences that make customers feel valued and appreciated. Customer service is being revolutionized by immersive technologies. Instead of traditional support methods such as calls or chats, augmented reality (AR) and virtual reality (VR) are enabling more intuitive and hands-on customer service experiences.

Immersive technologies are gaining momentum in the consumer market as companies such as Facebook and Apple are announcing and executing large investments in this field. They have the potential to serve as a platform for value co-creation among customers, shaping the design and consumption of customer experiences. They open up new possibilities for brand storytelling, allowing customers to engage with a brand's narrative interactively and memorably [1].

Augmented reality (AR) and virtual reality (VR) have emerged as powerful tools to bridge the gap between physical and digital realms, offering immersive and interactive customer experiences. They restore context by bringing products into actual spaces and people into high-fidelity simulations where they can test scenarios, feel time pressure, and see outcomes, not just descriptions of outcomes. Immersive technologies have made substantial progress in recent years, becoming more accessible and sophisticated [2]. Figure 1 shows a representation of immersive technology [3].

WHAT ARE IMMERSIVE TECHNOLOGIES?

The first step in understanding how to use immersive technologies is to learn the differences between various forms. In their simplest form, immersive technologies consist in adding virtual objects to the real world. There are four types of digital realities leading to different types of immersive technologies [4,5]:

- *Augmented reality* (AR)- designed to add digital elements over real-world views with limited interaction.

- *Virtual reality* (VR)- immersive experiences helping to isolate users from the real world, usually via a headset device and headphones designed for such activities.
- *Mixed reality* (MR)- combining AR and VR elements so that digital objects can interact with the real world means businesses can design elements anchored within a real environment.
- *Extended reality* (XR)- covering all types of technologies that enhance our senses, including the three types previously mentioned.

These devices also enable new user interactions including spatially tracked 3D controllers, voice inputs, gaze tracking, and hand gesture controls.

Extended reality (XR) is the overarching term used to describe employing technology to blend real life and the digital world. It includes all the machine-human interfaces beyond the physical realm (reality) such as augmented reality (AR), mixed reality (MR), assisted reality (aR), and virtual reality (VR), as illustrated in Figure 2 [6]. Figure 3 shows the XR spectrum [7]. Immersive technologies reside along a continuous scale ranging between the completely real and the completely virtual world. At one end, the real environment refers to the actual physical space, objects, and people that exist in the tangible world around us. At the other end, the virtual environment represents a completely computer-generated and immersive digital space, distinct from the physical reality. The space in the middle is called mixed reality, which is a blend of the real and virtual environments, where digital and physical elements coexist and interact in real time. A range of devices makes up XR, and these are used by consumers and in many industries for entertainment, safety, training, or productivity purposes.

1. *VIRTUAL REALITY:* Virtual reality (VR) is XR at its most extreme. It completely immerses the user in a digital world, often using a computer-generated environment with scenes and objects that appear to be real. The term "virtual reality" essentially means "near-reality." Virtual reality is the key technology for experiencing sensations of sight, hearing, and touch of the past, present, and future. VR is a fully immersive technology where users wear a head-mounted display and experience a simulated world of imagery and sounds. VR enables active learning. The terms, "virtual reality" and "cyberspace" are often used interchangeably. A cyberspace may be regarded as a networked virtual reality. A person using virtual reality can look around an artificial world, move around it, and interact with virtual features or items. This effect is commonly created by virtual reality headsets. Head-mounted displays immerse the user in a virtual environment. Virtual reality is a simulated experience that can be similar to or different from the real world. It is a computer-generated, 3D environment that completely immerses the senses of sight, sound, and touch. The complete immersion of the senses overwhelms users engrossing them in the action. Virtual reality technology includes multiple components divided into two main groups: hardware and software components [8].

- *Hardware Components:* The hardware components include a computer workstation, sensory displays, a tracking system, wearable devices, and input devices. Sensory displays are used to display the simulated virtual worlds to the user. The most common type is the head-mounted displays (HMDs), which is used in combination with tracking systems. Head-mounted displays are shown in Figure 4 [9]. Users interact with the simulated environment through some wearable devices. VR depends on special responses such as raising hands, turning the head, or swinging the body. A wearable device is important in making these effects realistic. Special input devices are required to interact with the virtual world. These include the 3D mouse, the wired glove, motion controllers, and optical tracking sensors. These devices are used to stimulate our senses together to create the illusion of reality.
- *Software Components:* Besides the hardware, the underlying software plays an important role. It is responsible for the managing of I/O devices and time-critical applications. The software components are 3D modeling software, 2D graphics software, digital sound editing software, and VR simulation software. VR technology has been designed to ensure visual comfort and ergonomic usage.

2. *AUGMENTED REALITY:* Augmented reality (AR) is a technology that combines real-world environments with computer-generated generated information such as images, text, videos, animations, and sound. It can record and analyze the environment in real-time. In augmented reality, the user typically experiences the real world through a device such as a smartphone, tablet, smart glasses, or head-mounted display. For example, AR allows consumers to visualize a product in more detail before they purchase it. This feature enhances consumer interaction and helps them never to repurchase the wrong item. The key objective of AR is to bring computer-

generated objects into the real world and allows the user only to see them. In other words, we use AR to track the position and orientation of the user's head to enhance/augment their perception of the world. Augmented reality falls into two categories: 2D information overlays and 3D presentations, like those used with games. AR blends the virtual and real worlds by overlaying digital objects and information onto the users' view of the physical world.

To obtain a sufficiently accurate representation of reality, AR needs the following five components [10]:

- *Sensors:* AR needs suitable sensors in the environment and possibly on a user, including fine-grained geolocation and image recognition. These are activating elements that trigger the display of virtual information.
- *Image augmentation:* This requires techniques such as image processing and face recognition.
- *Head-mounted Display*: HMDs are used to view the augmented world where the virtual computer-generated information is properly aligned with the real world. Display technologies are of two types: video display and optical see-through display.
- *User Interface:* This includes technologies for input modalities that include gaze tracking, touch, and gesture. AR is a user interface technology in which a camera-recorded view of the real world is augmented with computer-generated content such as graphics, animations, and 2D or 3D models.
- *Information infrastructure:* AR requires significant computing and communications infrastructure undergirding all these technologies. The infrastructure determines what real-world components to augment, with what, and when.

3. *MIXED REALITY:* Mixed reality (MR) is a term used to describe the merging of a real-world environment and a computer-generated one. Physical and virtual objects may co-exist in mixed reality environments and interact in real time. This is an extension of AR that allows real and virtual elements to interact in an environment. MR liberates us from screen-bound experiences by offering instinctual interactions with data in our living spaces and with our friends. Online explorers, in hundreds of millions around the world, have experienced mixed reality through their handheld devices. Mixed reality is a blend of physical and digital worlds, unlocking natural and intuitive 3D human, computer, and environmental interactions, as shown in Figure 5 [11] and Figure 6 [12]. This new reality is based on advancements in computer vision, graphical processing, display technologies, input systems, and cloud computing. Mixed reality has been used in applications across fields including design, education, entertainment, military training, healthcare, product content management, and human-in-the-loop operation of robots [13].
4. *ASSISTED REALITY:* Like mixed reality, assisted reality (aR) is an extension of augmented reality, with a few notable differences to both. One of these differences is that aR is primarily hands-free through the wearing of a headset, whereas AR usually requires the holding of a device such as a mobile phone. While MR is a digital-first, real-world second reality, aR is a real-world first system. It combines software and a head-mounted display. It is best experienced using smart glasses or other wearable technology. The aR market is growing rapidly and promises to be the next great leap to boost workers' productivity. A worker wearing an aR device is shown in Figure 7 [14].
5. *EXTENDED REALITY:* The term "extended reality" (XR) has recently gained favor as an umbrella term that encompasses all of AR, VR, and MR. The primary user inputs for XR devices are described as follows. Voice interfaces are now ubiquitous thanks to mobile devices and standalone smart speakers. Apple's Siri, Amazon's Alexa, Google's Assistant, and Microsoft's Cortana are all voice-driven software interfaces that are continuously gaining new capabilities. Many XR devices enable user control with handheld controllers, which have capabilities beyond button press inputs. Both voice-driven interfaces and human-computer interactions have been developed specifically for XR devices, including gaze and gesture controls [15]. Figure 8 compares conventional computing with extended reality [15].

IMMERSIVE TECHNOLOGIES IN CUSTOMER SERVICE

The arrival of immersive technologies, including virtual reality, augmented reality, and mixed reality, marks a transformative era for reshaping how sensory-enabled service experiences. These technologies enable the generation of multisensory digital environments in which visual, auditory, haptic, olfactory, and gustatory cues interact to create rich and embodied service experiences. Using immersive technology as the communication tool and platform to extend touchpoints and increase their relevance across the customer journey is expected to further enhance and provide opportunities for co-creating value between peers and with other stakeholders.

Organizations have spent time and money investing in developing new and impressive customer experiences. The rise of immersive technologies such as virtual reality (VR), augmented reality (AR), and mixed reality (MR) are transforming how customers interact with products, services, and brands. These technologies create rich, interactive experiences that go beyond the limits of conventional marketing and customer service, revolutionizing how companies connect with their audience.

Customer service teams often face challenging interactions that require patience, empathy, and effective problem-solving. Traditional training methods often lack the depth needed to prepare agents for high-stress interactions. VR is revolutionizing complaint handling training by offering a realistic, interactive experience that enhances skill development and emotional intelligence. Immersive VR training for complaint handling offers a new solution, enabling teams to experience realistic scenarios in a controlled environment. VR simulations allow agents to experience customer emotions, helping them practice active listening, empathy, and understanding. Immersive VR training for complaint handling equips customer service teams with the skills, empathy, and confidence needed to manage difficult interactions effectively [9]. Figure 9 shows some customer service team [16].

APPLICATIONS OF IMMERSIVE TECHNOLOGIES IN CUSTOMER SERVICE

Immersive technologies are creating new avenues for businesses to showcase their products. AR applications allow customers to visualize products in their environments before purchasing. Similarly, VR-powered product demos enable customers to experience products in action. There are multiple use cases of immersive technologies within the customer service. Common applications of immersive technology in customer service include the following [2,17,18]:

- *Customer Experience Management* (CXM): In today's fast-paced digital landscape, customer experience is at the heart of business success. Customer experience is the sum of all experiences a customer has with a business during their entire lifetime relationship. These days, providing an exceptional customer experience (CX) is not just a necessity; it is a key differentiator. One powerful way to elevate CX is through immersive technologies, such as virtual reality (VR) and augmented reality (AR). Immersive technologies are redefining and revolutionizing the staging of experiences and co-creation of value, implicating the management of customer experiences. Understanding the totality of the customer experience requires an investigation of how value is created and co-created during the pre-purchase, purchase, and post-purchase stage. It is no longer sufficient to compete on product quality, service quality, or price, and companies have started to focus on the total customer experience instead. Thus, it is imperative for businesses to recognize the need to understand and manage the complete picture of the customer experience to better control for influencing factors through the engagement and collaboration of multiple stakeholders. Immersive technology will play a central role in future CXM strategies.
- *Customer Engagement:* At its core, customer experience is about building emotional connections, and immersive technologies excel at this. As brands compete to captivate audiences, traditional methods of engagement are no longer enough. Customer engagement strategies have undergone significant transformations over the past few decades, evolving from traditional one-way communication models to more interactive and personalized approaches. The advent of the Internet and social media platforms marked a shift towards digital marketing, enabling two-way communication between brands and consumers.
- *Entertainment:* Immersive technologies are transforming how customers experience events and entertainment. In the entertainment sector, immersive experiences are changing how audiences engage with content. The use of immersive technology will likely redefine entertainment, where consumers become active co-creators by using applications to create enjoyable experiences. The design of entertaining, educational, escapism, and esthetic experiences greatly influence the customer journey, both within the AR and VR context. Taking ideas from the gaming context and adding it to the retail experience, by creating entertaining, escaping, educational, and esthetic immersive experiences adds to the overall value of the business offering.
- *Remote Assistance*: Using AR glasses or a smartphone, customers can receive real-time assistance while performing simple maintenance tasks, such as changing a tyre or understanding vehicle warning lights. This immersive remote assistance reduces the need for customers to visit a service center, saving time and frustration. It also allows for a more detailed, visual form of support that can be easier to follow than written instructions. This type of immersive customer experience not only increases customer

satisfaction but also empowers customers to take control of basic maintenance tasks, improving their overall ownership experience.

BENEFITS

Interactivity, immersiveness, social presence, engagement, or social connectedness are some of the characteristics that influence the way immersive technology experiences are designed, implemented, and initiated. Customer-to-customer interaction is key in today's business environment as customers heavily depend on reviews and co-created content in order to make informed decisions prior to purchasing. Immersive technology facilitate the sharing of information through the co-creation of content and cross-stakeholder utility. Other benefits include the following [17,19]:

- *Personalized Experience:* In an age where customers are inundated with generic marketing messages, personalization can be a powerful differentiator. By understanding your customers' preferences, needs, and habits, you can tailor interactions to resonate with them on a deeper level. Customers are increasingly searching for novel, but personalized experiences, which creates an opportunity for small- and medium-sized enterprises (SMEs) to get involved. To ensure successful experiences for the customer, businesses need to fully understand intended and realized experiences, which leads to a necessity of properly designing and managing the customer journey.
- *Social Presence:* The concept of social presence makes immersive technologies such an effective tool for marketing- and business-related purposes. Presence is a subjective feeling of being in an artificial environment, although actually being located in the real-world. Potentially, the feeling could surpass reality, leading to exceptional experiences. Nowadays, customers interact with companies and other customers through various touchpoints using immersive technologies. Escapism through immersive technology allows users to momentarily forget their physical realities and related happening by fully immersing.
- *Emotional Engagement*: Emotion plays a significant role in shaping customer experiences. Customers interacting with agents will notice the difference in service, as agents who truly understand the emotional weight of the claim will be able to offer more compassionate, helpful, and accurate assistance. By tapping into your customers' emotions, you can build strong connections and drive positive associations with your brand. This involves empathizing with your customers, addressing their concerns with genuine care, and expressing gratitude for their patronage. Through VR and AR, we can create experiences that are far more engaging and build a real sense of connection.
- *Proactive Problem Solving*: Anticipating and addressing customer concerns before they escalate is a hallmark of exceptional customer service. By being proactive, businesses can demonstrate their commitment to customer satisfaction and avoid potential negative experiences.
- *Employee Empowerment:* Your employees are the face of your brand and play a crucial role in shaping customer experiences. Empower your team with the necessary tools, training, and autonomy to make decisions that positively impact customer interactions. When employees feel confident and supported, they are more likely to deliver top-notch service.
- *Continuous Improvement*: The quest for customer service excellence is an ongoing journey. Soliciting feedback, measuring performance, and identifying areas for improvement are essential to maintaining high standards and staying ahead of the competition.

CHALLENGES

A major challenge is the continuous evolvement of experiences that change over time, as customer expectations evolve and technological developments disrupt our lives. Businesses operate in a world that is increasingly competitive and customer expectations for a complete and fulfilling experience are rising. It is often challenging to sustain the motivation of all stakeholders over time, as technology becomes the norm, outdated, or simply irrelevant due to practical, social, or technological challenges. It can be challenging to involve various stakeholders in projects around emerging technologies. Other challenges include the following [17,20]:

- *Information Overload*: A key challenge is the information overload, which, in combination with occasional hardware or software errors, resulted in confusion and frustration in users.
- *Collaboration*: Collaboration should involve multiple parties with various backgrounds. It allows for a more involved platform of discussion and sharing of perspectives to facilitate inter-stakeholder communication. Collaboration among stakeholders is not merely a result of creating a potential win-win situation anymore, but a core necessity to compete in the market and manage customer experiences that are meaningful and

continuously perceived as valuable. Collaborations are often more effective and efficient by involving smaller businesses due to their flexibility toward innovation.

- *Communication:* Communication is essential to the customer service experience and resulting satisfaction. However, this can be difficult for customer service teams that work for a global customer base and are looking to consistently improve customer experiences. Customer service agents can use AI as a practical approach to general customer communications. They can use it to identify key customer touchpoints, understand customer concerns, and provide knowledgeable feedback. Companies with a limited multi-lingual workforce can use conversational AI-powered tools. These tools provide customers and agents with basic language translation and transcription services that are very accurate and efficient.
- *Integration:* Immersive technology is often used in isolation. Its integration with the existing legacy systems is vital. It needs to be integrated in reference to the entire customer journey in order to understand its value and purpose that it will create to the totality of the experience. To integrate immersive technology in customer experience management, it is crucial not to regard immersive technology as an added element in the final product, but that it needs to be managed as an integrated element in the process at different touchpoints between co-creators.
- *Training:* When it comes to customer service, it is essential that agents are well-trained in a range of soft skills. Clear communication, good listening, and empathy are just a few of many. Companies need to ensure agents have the emotional capacity and knowledge base to effectively manage any customer situation. They should also be able to diffuse customer complaints when necessary. Customer service teams should be provided with a valuable training curriculum that gives new agents the necessary information and skills to become subject matter experts. Virtual training allows leaders to ensure employees are meeting performance expectations and identify where learning gaps exist.
- *Regulatory Compliance*: Customer service leaders still need to ensure that they properly adhere to all industry standards and regulations. The standards and regulatory requirements can be specific to the communications industry. As a result, regulatory compliance becomes a more complex legal and customer service issue. This makes it necessary for agents to have a solid understanding of best practices.

CONCLUSION

In an era where customer expectations are on the rise, delivering an immersive customer service experience has become a business imperative. Immersive technologies are revolutionizing the customer experience by creating personalized, interactive, and emotionally engaging touchpoints. From a customer service perspective, immersive technologies should not merely be understood as new digital touchpoints, but rather as sensory environments that can modify the perceptual processing of service experiences and reorganize how customers engage with service systems across multiple stages of interaction. More information about immersive technologies in customer service can be found in the books [21-26].

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Figure 1 A representation of immersive technology [3].

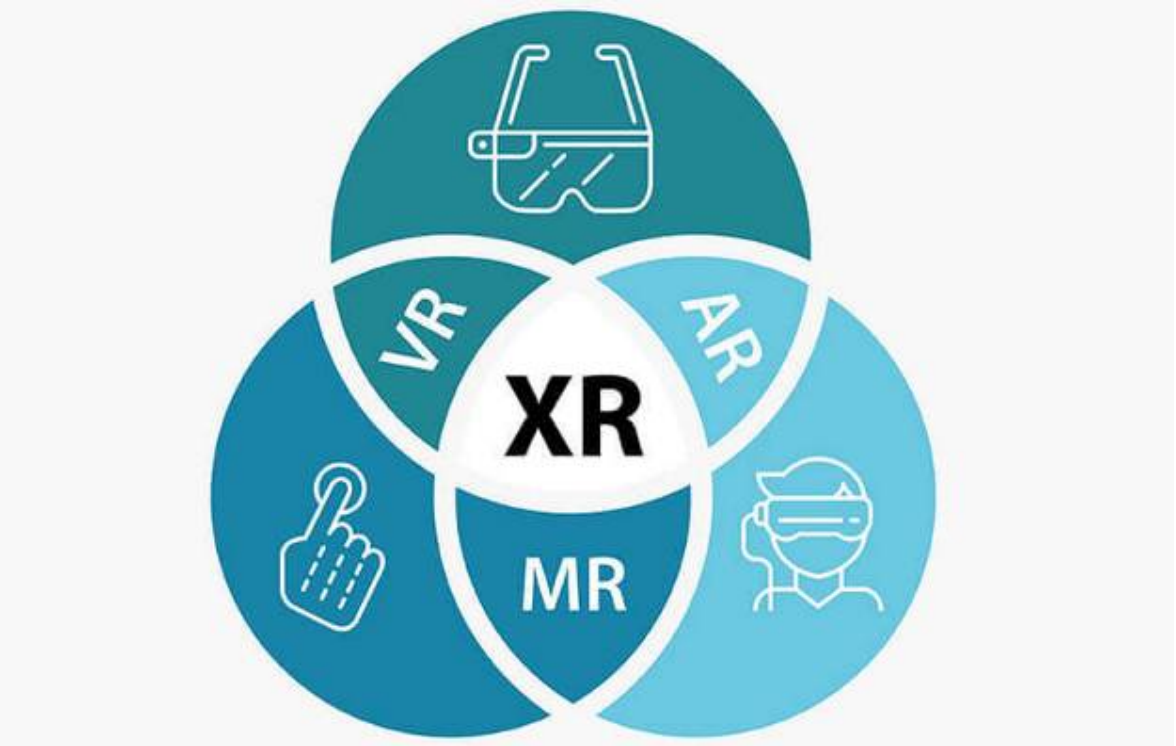

Figure 2 Extended reality (XR) includes AR, MR, and VR [6].

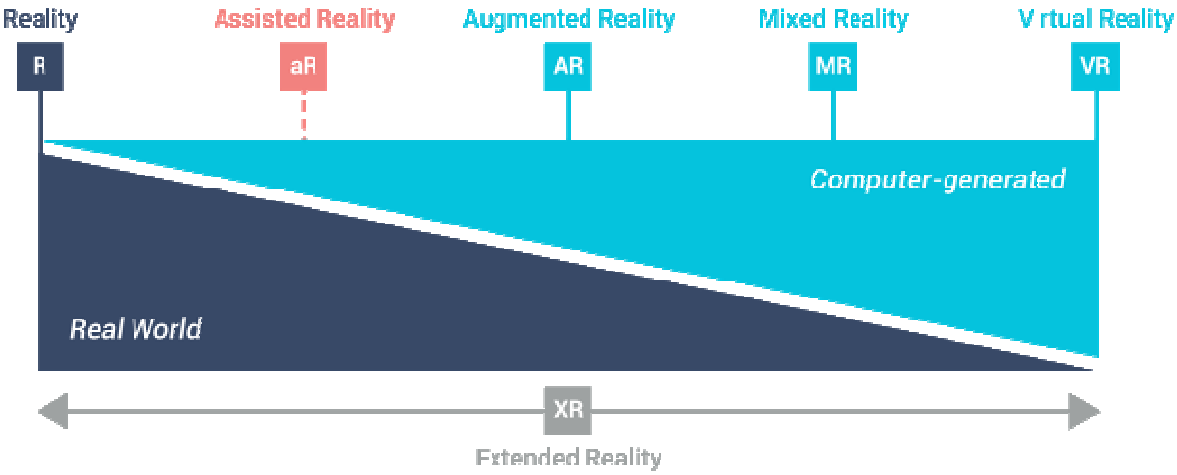

Figure 3 The XR spectrum [7].

Figure 4 Head-mounted displays [9].

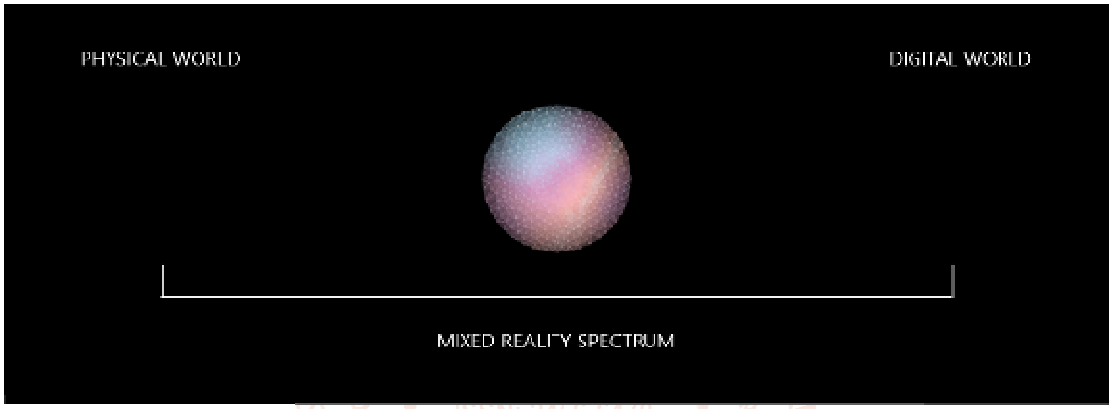

Figure 5 Mixed reality is a blend of physical and digital worlds [11].

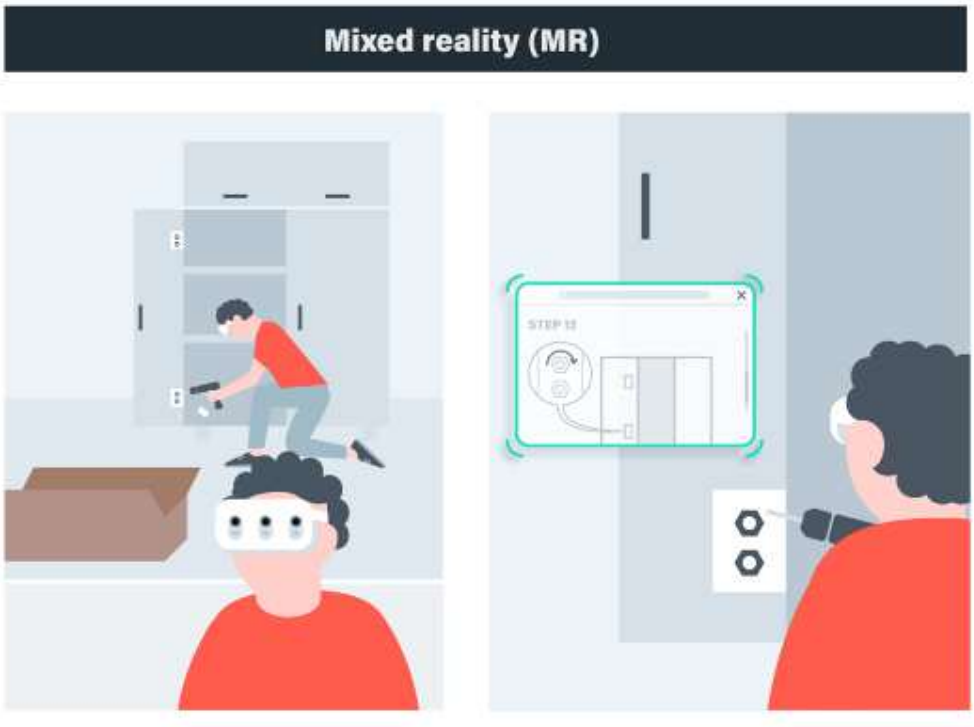

Figure 6 Mixed reality [12].

Figure 7 A worker wearing an assisted reality device [14].

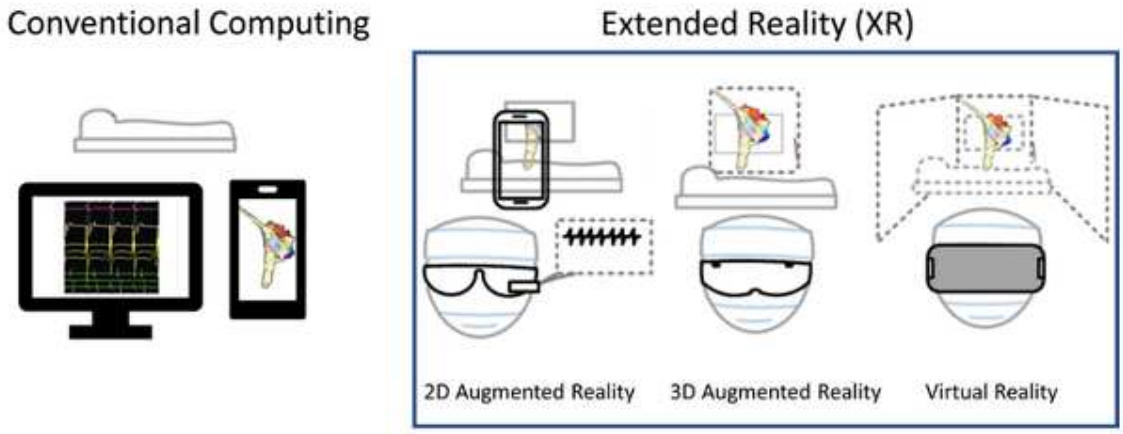

Figure 8 Comparing conventional computing with extended reality [15].

Figure 9 Some customer service team [16].