International Journal of Trend in Research and Development, Volume 13(1), ISSN: 2394-9333
www.ijtrd.com

Immersive Technologies in Logistics

[1]Matthew N. O. Sadiku and [2]Janet O. Sadiku,
[1]Roy G. Perry College of Engineering, Prairie View A&M University, Prairie View, TX, USA
[2]Juliana King University, Houston, TX, USA

***Abstract*:** The logistics industry plays a vital role in managing global trade and commerce, encompassing the movements of resources, services, goods, and information across various sectors. As its name would suggest, immersive technology blurs the lines between the physical and virtual worlds, creating a sense of immersion and enhancing the realism of virtual experiences. Immersive technologies like augmented reality (AR) and virtual reality (VR) are transforming logistics by enhancing warehouse efficiency, worker training, and operational visibility. AR provides real-time visual guidance for tasks, while VR offers risk-free training environments and layout planning, boosting accuracy and productivity across the supply chain. These immersive technologies are revolutionizing the way logistics companies do business. This paper examines the role of immersive technology in the logistics industry.

Keywords: *Virtual Reality, VR, Augmented Reality, AR, Mixed Reality, MR, Extended Reality, XR, Immersive Technologies, Logistics, Supply Chain, Transportation*

I. INTRODUCTION

We are in a time when shipping and logistics are more important than ever, thanks to an increasingly global economy and booming ecommerce. Gone are the days when logistics businesses tracked their shipments using traditional phone call-based reporting. The logistics industry now requires a consistently connected ecosystem to effectively manage shipments. The changes have positively impacted its growth and market share.

The logistics industry is undergoing a significant transformation with the integration of such technologies as augmented reality (AR) and virtual reality (VR). They provide immersive experiences that can enhance warehouse operations, order picking and transportation management, while also improving efficiency and accuracy. Due to augmented and real reality solutions logistics processes are much faster and more efficient. VR and AR technologies enable logistics companies to create highly realistic and immersive learning environments. By utilizing VR and AR, logistics companies can effectively develop and refine critical skills among their workforces. Harnessing the power of immersive technology in logistics is key to staying competitive in today's rapidly changing world.

Figure 1: A representation of immersive technology [3].

Immersive technologies have the potential to transform the economy and streamline business operations. With the right implementation, immersive technologies can have a significant impact on the logistics process and help operators take their operations to the next level [1,2]. Figure 1 shows a representation of immersive technology [3].

II. 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.

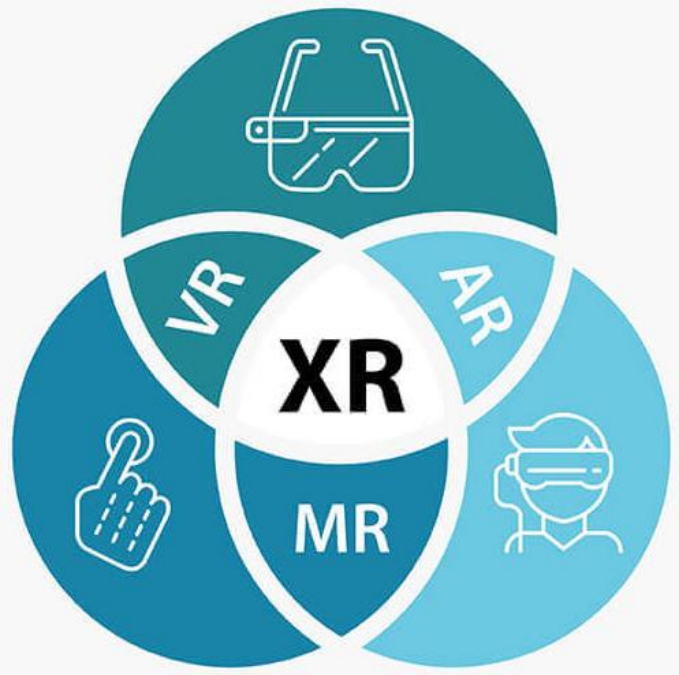

Figure 2: Extended reality (XR) includes AR, MR, and VR [6].

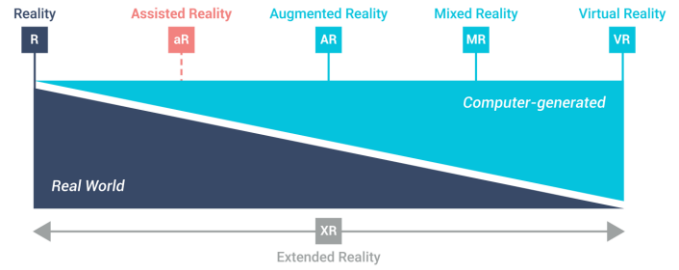

Figure 3: The XR spectrum [7].

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.

Figure 4: Head-mounted displays [9].

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].

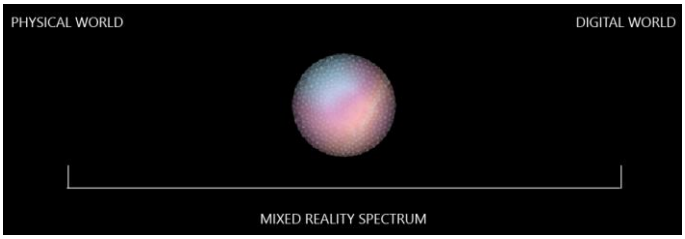

Figure 5: Mixed reality is a blend of physical and digital worlds [11].

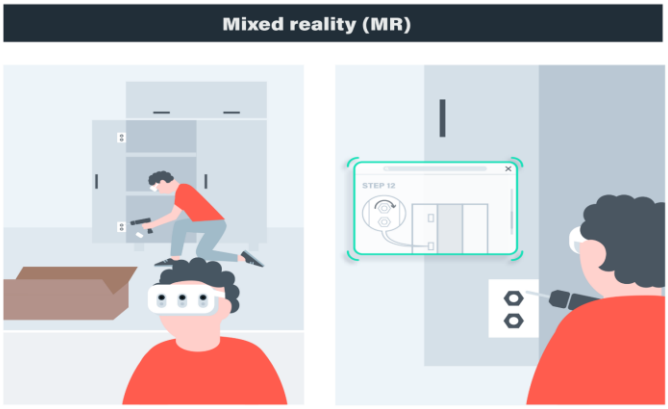

Figure 6: Mixed reality [12].

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].

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

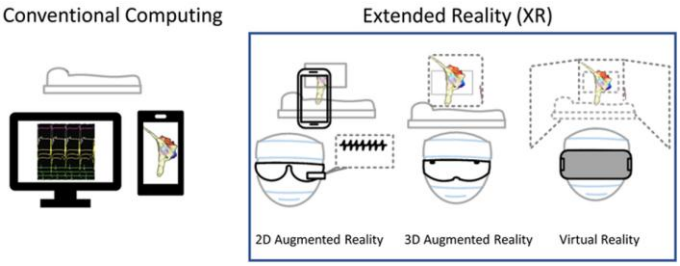

Figure 8: Comparing conventional computing with extended reality [15].

III. IMMERSIVE TECHNOLOGY IN LOGISTICS

As international trade continues to grow, there is an increasing need for information technology in logistics businesses specifically, logistics software solutions to manage complex supply chains and ensure the timely delivery of goods across vast distances. In today's fast-paced world, the logistics sector is constantly evolving. As companies strive for efficiency and effectiveness, innovative training methods are becoming essential. One such method is virtual reality (VR), which has the potential to transform how employees are trained in these critical areas. Virtual reality is a powerful tool that can be tailored to meet the specific needs of various industries within the supply chain and logistics sectors.

The incorporation of augmented reality in the logistics industry has the capacity to revolutionize the procedures related to the transportation, supervision, and control of goods. The integration offers a wide array of substantial business advantages, transforming traditional practices and elevating overall efficiency. With the advent of virtual reality and augmented reality, industries are finding innovative ways to revolutionize training, streamline processes, and enhance overall performance. Figure 9 shows virtual and augmented reality in logistics [16].

Figure 9: Virtual and augmented reality in logistics [16].

IV. APPLICATIONS OF IMMERSIVE TECHNOLOGY IN LOGISTICS

Augmented reality in logistics has found application in the management and organization of workflows and has been radically transforming the industry as we know it. The applications for AR in logistics range from order picking and fulfillment to collaborative decision making. They deliver real-time, context-sensitive information to workers, optimizing task execution and reducing time spent searching for items or navigating the warehouse. From warehousing to transportation, VR applications can enhance training programs significantly. Common applications of immersive technologies include the following [17,18]:

- *Warehousing*: In warehousing, VR can simulate the environment where employees will work, allowing them to practice picking and packing without the risk of errors that could occur in a real setting. This hands-on experience is invaluable, as it prepares employees for actual job scenarios while minimizing the learning curve. VR can also be used to simulate order picking scenarios, allowing employees to train and familiarize themselves with warehouse layouts and procedures in a virtual environment. In warehouses, AR enables workers to overlay digital information onto their real-world view, providing them with real-time guidance and information. This reduces errors, minimizes training time for new employees, and optimizes warehouse layout and organization. Figure 10 shows the use of immersive technology in a warehouse [19].
- *Transportation:* In transportation, VR can be used to train drivers on route navigation, safety protocols, and emergency response techniques. AR and VR technologies are changing how drivers and pilots train. They can navigate new routes, adapt to various weather conditions, respond to emergencies, and familiarize themselves with different vehicle types. By immersing trainees in realistic driving simulations, they can develop critical skills without the dangers associated with real-world driving. AR has a significant impact on fleet management and last-mile delivery optimization. For example, FedEx has made investments in delivery solutions driven by augmented reality that work with its AI-powered route optimization systems.
- *Inventory Management:* VR technology can be applied in inventory management, where employees can learn to track stock levels and manage supply chain logistics effectively. By visualizing inventory in a virtual space, workers can better understand the flow of goods and the importance of maintaining optimal stock levels. Logistics company DHL was among the first to incorporate AR in its inventory management. Figure 11 shows an inventory [2].
- *Employee Training:* In a world where efficiency and effectiveness are paramount, VR training is not just a trend; it is a strategic investment in the future of supply chain and logistics operations. AR software can be used to provide a more immersive experience for training new employees. New workers can quickly grasp complex procedures through interactive simulations, shortening the learning curve and enhancing workforce productivity. Organizations that have implemented VR training have reported a significant reduction in onboarding time for new employees. By providing immersive experiences, companies can accelerate the learning process, allowing new hires to become productive members of the team more quickly. Organizations need to assess their current training methods and identify areas where VR can add value.
- *Manufacturing:* VR and AR technologies are changing manufacturing. They are shortening the product development cycle in manufacturing. By enabling highly realistic and interactive simulations, teams can design, test, and iterate on prototypes with unprecedented speed and efficiency. Virtual technology is also being implemented for factory floor planning, construction, and manufacturing trade events. While VR's impact on the manufacturing industry is noticeable, not all companies have made the leap. This is partly due to the hardware required. Figure 12 shows how the immersive technologies are transforming manufacturing [20].
- *Military Logistics:* Immersive technologies are successfully being used to train professionals across a wide range of disciplines. For combat and training enhancements, the military is always leading the way with emerging technological advancements. Immersive tech is no exception to this rule. Creative innovations like immersive technologies lead to better military training, improved military operations, and much more. The military uses AR technologies for fighter planes. Both VR and AR technologies help the military save money. Figure 13 shows the military use of immersive tech [21].
- *Gamification:* Immersive technology can also enhance training and learning by incorporating it into gamification, which is the process of extracting motivating and engaging elements from games and applying them to educational activities. This is a popular way to try to make learning fun, and it can be taken to the next level by adding immersive technology.

Figure 10: Use of immersive technology in a warehouse [19].

Figure 11: An inventory [2].

Figure 12: How the immersive technologies are transforming manufacturing [20].

Figure 13: Military use of immersive tech [21].

V. BENEFITS

Implementing VR in supply chain and logistics training offers a myriad of benefits. From revolutionizing operations to improving employee engagement and retention, the potential of VR is vast. VR offers a solution by providing immersive, true-to-life simulations without the need for expensive equipment or physical instructors. Virtual reality and augmented reality are transforming the logistics industry by revolutionizing training methodologies, optimizing warehouse operations, and enhancing overall efficiency. Other benefits include [22,23]:

- *Cost Reduction:* Immersive technologies reduce the need for physical prototypes, saving on materials and the logistics of handling and displaying these models. AR uses in logistics include training solutions that can reduce the need for physical training resources, leading to cost savings in the long run. Employees can access interactive training modules on devices, minimizing the need for dedicated trainers and physical training facilities.
- *Inventory Control:* Applying AR for warehouse management facilitates the immediate tracking of inventory, guaranteeing precise stock level monitoring, and minimizing the possibility of stockouts or excess stock scenarios. This contributes to improved inventory management and enhanced cost efficiency.
- *Security:* AR applications in logistics include overlaying safety guidelines and compliance protocols directly onto warehouse environments helping prevent accidents and ensuring that workers adhere to safety regulations. AR can be used to improve security in the logistics process. For example, AR-enabled devices can track and monitor shipments, ensuring they are delivered safely and securely.
- *Remote Instructions:* Experts can provide remote assistance to on-site workers by superimposing instructions and annotations on their view. This capability is especially valuable in troubleshooting and repairs, minimizing downtime, and increasing equipment lifespan.
- *Data Analytics:* Real-time data visualization allows managers to access current performance metrics, analyze trends, and make informed decisions, helping in pinpointing bottlenecks, optimizing workflows, and achieving continuous improvement.
- *Enhanced Collaboration:* VR can facilitate remote collaboration among teams spread across different locations. It can also facilitate team-building exercises that enhance collaboration among employees. AR facilitates real-time communication among team members. Employees can share information and collaborate on tasks, regardless of their physical location, leading to better coordination and problem resolution. Collaboration between training and development teams is essential to ensure that VR content aligns with organizational goals. By working together, teams can create immersive experiences that resonate with employees and enhance their learning journey.
- *Competitive Advantage*: Early adoption of AR in warehouse management can provide businesses with a competitive edge. Implementing innovative tech demonstrates a commitment to efficiency and customer satisfaction, potentially attracting more clients and partners.

- *Maintenance:* AR can be used to provide remote assistance to technicians in the field. AR can be used to provide real-time guidance and troubleshooting for maintenance and repair tasks. This can reduce the time and resources needed to complete tasks, and can improve the safety and accuracy of the maintenance process.
- *Customer Engagement:* The immersive and interactive nature of virtual experiences boosts consumer interest and interaction, improving engagement and satisfaction. In retail, this leads to higher conversion rates as customers can better visualize products in their intended environment.

VI. CHALLENGES

Implementing AR and VR in logistics requires careful planning and execution. The immersive technologies are still relatively new and can be difficult to implement correctly. Integration with existing systems and processes may require careful planning and customization. Training employees in logistics often involves high-risk scenarios and complex equipment handling. One significant challenge in VR training is accurately tracking the user's movements within the virtual environment. Other challenges of immersive technology in logistics include the following [24]:

- *Cost of Implementation:* Although AR hardware and software can require a substantial initial investment, expenditures can be justified with staggered deployment and pilot projects. The cost of acquiring and maintaining the necessary hardware and software can be significant.
- *Integration:* The integration of existing systems requires custom development because numerous logistics companies use older systems that lack AR and VR capabilities.
- *Change Resistance:* The unfamiliarity of AR leads employees to hold resistance but dedicated onboarding and experience-based training helps employees accept its adoption.
- *Data Security:* Because AR systems gather data in real-time from warehouse activities, sensitive data must be protected by strong cybersecurity methods. Data security, privacy, and connectivity issues should also be addressed to safeguard sensitive information. VR technologies can be crucial to maintain a competitive advantage and ensure efficiency by defining its role in logistics safety and the safety of professionals.
- *Skill Shortage*: The employees involved in logistics operations lack the necessary knowledge about immersive technology, which makes both employee skill development and collaboration with specialists essential.
- *Lack of Resources:* Cloud-based AR solutions represent an affordable option that benefits small logistics companies because they lack existing IT infrastructure or financial resources for the direct implementation of AR.
- *Collaboration:* VR can make communication and collaboration significantly easier and more effective, particularly for companies working across multiple locations. For example, team members can join virtual environments and interact with products or designs in real time. This helps them gain a shared understanding and make more informed decisions.

CONCLUSION

Logistics is essential for commerce. It involves moving goods from manufacturers to customers quickly and accurately. The logistics industry is undergoing a rapid transformation driven by emerging technologies such as virtual reality and augmented reality. Virtual reality and augmented reality are transforming the logistics industry by revolutionizing training methodologies, optimizing warehouse operations, and enhancing overall efficiency. They are now key tools actively shaping the logistics industry by improving training, navigation, and inventory management. VR training offers immersive and interactive learning that prepares workers for real-world challenges. It is used in many areas of logistics training, including warehouse management and customer service. AR adds digital information to the real-world using devices like smart glasses or mobile phones. It can scan and verify items automatically, lowering manual inventory errors and saving time [25].

These immersive technologies are poised to shape the future of logistics, creating more intelligent, safer, and more agile supply chains. Their successful adoption in logistics and the supply chain depends on the orientation of technology value controllers with the applications of the company, operating needs, and organizational preparation. To stay competitive, business leaders must recognize the transformational power of XR and integrate it into their strategic planning. As we move forward, embracing this technology will be crucial for staying competitive and delivering exceptional experiences [22]. The future promises more advancements in immersive technology, further streamlining operations and enhancing efficiency. More information about immersive technologies in logistics can be found in the books [26-29].

References

[1] "Revolutionizing logistics training: The power of VR and AR in enhancing learning and performance," June 2023, https://logisticsmgepsupv.wordpress.com/2023/06/02/revolutionizing-logistics-training-the-power-of-vr-and-ar-in-enhancing-learning-and-performance/

[2] "Harness the power of augmented reality in logistics," https://dfreight.org/blog/the-power-of-augmented-reality-in-logistics/

[3] "Wrap technologies, expands virtual reality law enforcement training with new immersive scenarios," August 2023, https://cioinfluence.com/virtual-reality-technology/wrap-technologies-expands-virtual-reality-law-enforcement-training-with-new-immersive-scenarios/

[4] M. N. O. Sadiku, C. M. M. Kotteti, and S. M. Musa, "Augmented reality: A primer," *International Journal of Trend in Research and Development*, vol. 7, no. 3, 2020.

[5] "What is augmented reality or AR?" https://dynamics.microsoft.com/en-us/mixed-reality/guides/what-is-augmented-reality-ar/

[6] L. van Heerden, "What is extended reality?" August 2021, https://journeyapps.com/blog/what-is-extended-reality/

[7] A. Xperteye, "What is assisted reality? Here is what you need to know," March 2022, https://blog.amaxperteye.com/what-is-assisted-reality-here-is-what-you-need-to-know

[8] M. O. Onyesolu and F. U. Eze, "Understanding virtual reality technology: Advances and applications," *Advances in Computer Science and Engineering*, March 2011, pp. 53-70.

[9] "Exploring the future of immersive technology," July 2023, https://www.talespin.com/reading/exploring-the-future-of-immersive-technology
[10] M. Singh and M. P. Singh, "Augmented reality interfaces," *IEEE Internet Computing*, November/December 2013, pp. 66-70.
[11] "What is mixed reality?" January 2023, https://learn.microsoft.com/en-us/windows/mixed-reality/discover/mixed-reality
[12] C. Rincon and J. Perez, "What are immersive technologies?" March 2025, https://www.adalovelaceinstitute.org/resource/immersive-technologies-explainer/
[13] "Mixed reality," *Wikipedia*, the free encyclopedia, https://en.wikipedia.org/wiki/Mixed_reality
[14] "What is assisted reality? Here is what you need to know," March 2022, https://blog.amaxperteye.com/what-is-assisted-reality-here-is-what-you-need-to-know
[15] C. Andrews et al., "Extended reality in medical practice*," Current Treat Options Cardiovasc Medicine*, vol. 21, no. 4, March 2019.
[16] "Navigating the future with RFID: Virtual and augmented reality in logistics," https://www.rfidreadernews.com/2024/06/04/navigating-the-future-with-rfid-virtual-and-augmented-reality-in-logistics/
[17] "VR in supply chain & logistics training," https://synergyxr.com/resources/learn/blogs/vr-in-logistics/
[18] C. de Brabandt, "Enhancing logistics, warehousing and transportation with AR and VR," November 2023, https://www.ismworld.org/supply-management-news-and-reports/news-publications/inside-supply-management-magazine/blog/2023/2023-11/enhancing-logistics-warehousing-and-transportation-with-ar-and-vr/
[19] "VR in supply chain logistics training: Implementation," https://hyperspace.mv/vr-in-supply-chain-logistics-training-implementation/
[20] D. Fallon-O'Leary, "How virtual reality technology is changing manufacturing," December 2025, https://www.business.com/articles/virtual-reality-changing-manufacturing/
[21] M. D. Crowder, "Immersive technology," August 2021, https://www.jagreporter.af.mil/Post/Article-View-Post/Article/2737139/immersive-technology/
[22] "The rise of AR and VR across industries," July 2024, https://unity.com/resources/rise-of-ar-vr-across-industries
[23] N. Soni, "How technology is redefining the logistics business landscape," https://www.mindinventory.com/blog/how-technology-transformed-the-logistics-industry/
[24] A. Kelly, "Augmented reality (AR) in logistics," April 2025, https://euphoriaxr.com/augmented-reality-in-logistics/
[25] "Enhancing logistics operations: How augmented reality (AR) and virtual reality (V) change training and inventory management," August 2025, https://www.quickmovetech.com/enhancing-logistics-operations-how-augmented-reality-ar-and-virtual-reality-vr-change-training-and-inventory-management/
[26] M. N. O. Sadiku, *Immersive (AR/VR) Technologies and Their Applications*. Tallahassee, FL: John & Johnna Publishers, 2025.
[27] I. Parsons, *Virtual Reality in Logistics and Supply Chain Management: Increasing Efficiency*. Independently Published, 2023.
[28] J. A. V. Romero, *Virtual Reality in Logistics With MATLAB.* LL, 2008.
[29] G. Chung and M. Kückelhaus, *Augmented Reality in Logistics Changing the Way We See Logistics - a DHL Perspective.* DHL Customer Solutions & Innovations, 2014.

ABOUT THE AUTHORS

Matthew N.O. Sadiku is a professor emeritus in the Department of Electrical and Computer Engineering at Prairie View A&M University, Prairie View, Texas. He is the author of several books and papers. His areas of research interest include computational electromagnetics, computer networks, and marriage counseling. He is a Life Fellow of IEEE.

Janet O. Sadiku holds bachelor degree in Nursing Science in 1980 at the University of Ife, now known as Obafemi Awolowo University, Nigeria and doctoral degree from Juliana King University, Houston, TX in December 2023. She has worked as a nurse, educator, and church minister in Nigeria, United Kingdom, Canada, and United States. She is a co-author of some papers and books.