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## Using AR (Augmented Reality) and VR (Virtual Reality) For Immersive Training Experiences and Fan Experiences

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**Abstract:** The study investigates the effective potential of Augmented Reality (AR) and Virtual Reality (VR) in increasing fan engagement and immersive training experiences. Conventional training methods besides fan engagement strategies face different limitations such as lack of interactivity, limited accessibility and higher costs. Both VR and AR technologies mitigate these issues by providing a realistic, personalized and interactive experience. Their application would provide a significant benefit to sports entertainment, professional training and educational regions. Hence, the aim of this study is to assess the impacts of AR and VR on immersive training services and fan experiences.

**Keywords:** Augmented Reality (AR), Virtual Reality (VR), STEAM education.

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### Introduction

#### a) Project specification

Augmented Reality (AR) significantly augments an individual's surroundings by adding digital elements to the real world, often by utilizing a camera on a smartphone. The primary role of AR is how elements of the digital world combine within a person's perceptions regarding the real world. Virtual Reality (VR) is a simulated experience that can display objects as if they were in the real world [1]. In recent times, technological advancement has been fast, and different technological innovations in different fields have been carried out effectively. In this regard, having access to this technology assists in connecting the students to learning in a more meaningful and authentic way. Users can engage with AR and VR technology to get multiple opportunities [2]. AR could be developed for learning media which could not be done directly. Then by utilizing VR technology user can enhance their learning experience. The application of these technologies can help to display the information and data contained in the book in a virtual form such as videos, images, and even in 3D shapes. Both augmented reality (AR) and virtual reality (VR) technology help the user interact with an atmosphere that is simulated by a computer system.

#### b) Aims and objectives

**Aims:** This study aims to assess the impacts of AR and VR on immersive training services and fan experiences.

**Objectives:**

- To evaluate the effectiveness of augmented reality (AR) and virtual reality (VR) through comparative analysis.
- To identify the limitations in conventional fan engagement strategies.
- To recognize the factors influencing the integration of AR and VR technology.

#### c) Research questions

**RQ1:** How do traditional training methods compare with Augmented Reality (AR) and Virtual Reality (VR) technologies in terms of effectiveness for skills acquisition and retention in high-stakes industries such as the sports sector?



**RQ2:** What are the main limitations of conventional fan engagement strategies, and how do AR and VR technologies in the sports and entertainment industries?

**RQ3:** What factors influence the adoption and integration of AR and VR technologies in both training and fan engagement?

#### **d) Research rationale**

Several existing technologies significantly fail to develop a specific level of engagement which is required for effective fan experience and training. Therefore, industries and organizations are seeking innovative solutions that could overcome this limitation and give realistic and enhanced experiences. Hence, addressing these issues is vital to improve the training outcomes and increase fan engagement. Both AR and VR technology provide promising solutions, yet their full potential still has not been adopted widely. Hence, this study focused on assessing the effectiveness of AR and VR for immersive training services and fan experiences.

### **Literature Review**

#### **a) Research background**

Conventional training methods and fan engagement strategies face multiple challenges in the recent technology and first-paced world. In training, the traditional approaches significantly involve various levels of engagement. Limited accessibility and higher costs. These methods could involve on-the-job training, workshops and classroom sessions could be time-consuming and might be effective for simulating real-world scenarios [3]. This can lead to poor skills retention and acquisition, specifically in high-stakes environments such as sports, the military and healthcare. However, these traditional training methods often lack efficiency in providing adaptive and personalized learning experiences. It is crucial for addressing individual learning preferences and needs. On the contrary, fan engagement specifically in entertainment and sports had become significantly challenging.

#### **b) Critical assessment**

In recent times, fans are demanding more immersive and interactive experiences, yet conventional methods such as broadcasts and live events sometimes fall short [4]. The limitation of passive becoming experiences, geographic constraints, and physical attendance could result in reduced fan engagement and loyalty. However, in the recent time's global pandemic had effectively highlighted the disadvantage of fan engagement service since in-person events and large gathering events were effectively restricted. Despite online platforms and digital media advancements, there is still a lack of interactive and immersive tools that can significantly fill the gap between virtual and physical experiences.

#### **c) Linkage to Aim**

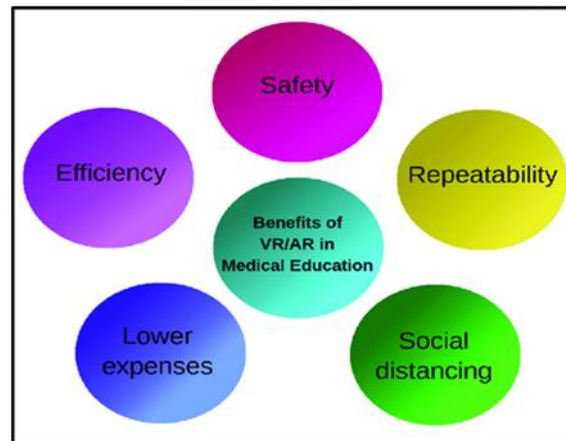
The article [5] examines the AR and VR technologies to provide realistic, interactive, and personalized experiences that address the limitations of traditional training methods and fan engagement strategies. A study shows that the utilization of Augmented reality in sports broadcasts has led to a 15% increment in user engagement and a 20% rise in viewer retention in the period of broadcasting any significant sports events. In addition to AR and VR technology, different kinds of social media platforms play a vital role in enhancing sports viewing experiences within the USA. Fans could effectively access the real-time updates, and highlights and can get engaged in the discussion of platforms such as Instagram and Twitter.

#### **d) Encapsulation of applications**

In recent times, both AR and VR technologies have revolutionized education and training at both professional and academic levels. These immersive technologies have opened several numbers of opportunities for engaging learners within an interactive learning experience. One of the most notable use cases of AR and VR technology in education is the prime ability to provide students with an interactive and hands-on learning experience [5]. For example, medical students could practice surgeries within a virtual environment even performing on real patients. Another significant aspect involves history students can effectively visit ancient civilizations through virtual tours making learning history more memorable and engaging. Similarly, AR and VR technology significantly enable the entire deployment of immersive experiences regarding security officers in a way that would replace field training in an unsafe and harsh atmosphere. Aside from this, one more use case of AR and VR could be found in science education. In this concern, students could explore different complex scientific concepts through immersive simulation that can assist in capturing the concept in a better way. For instance,



chemistry students could visualize the chemical reaction within a 3D space which can effectively increase the understanding of molecular structures.



*Figure 1: Advantages of AR and VR [5]*

#### e) Theoretical framework

Constructivist learning theory emphasizes learning as an active, constructive process where learners build on their prior knowledge through experiences. The technology acceptance model (TAM) explains the impact of factors influencing the adoption of AR and VR technologies in training and fan engagement [7].

#### f) Literature gap

There is limited information about the effectiveness related to traditional methods and immersive technologies for training in high-property cases. There is a need for more empirical evidence on how AR and VR technologies specifically impact learning outcomes, skill retention, and engagement across various fields.

### Methodology

#### a) Research Philosophy

The study will involve the interpretivism philosophy to emphasize the perspectives of the research. Interpretivism encompasses social theories and perspectives that embrace a view of reality as socially constructed.

#### b) Research Approach

This study will include the deductive approach to evaluate the efficacy of AR and VR technologies in training and fan engagement by using previous explanations from several scholars.

#### c) Research design

To collect and analyze the data about the performance of AR and VR for sports industry purposes, the secondary qualitative method is used.

#### d) Data collection method

The data collection will be practiced through peer review of previously published scholarly articles, and journals accessed through Google Scholar and PubMed.

#### e) Ethical considerations

In this study, the maintenance of the ethical perspectives is one of the most significant sections. Firstly, privacy and permission laws must be followed when using confidential information about sports events.

### Results

#### a) Critical Analysis

In this recent time, AR has been a powerful tool for delivering effective and communicative sports events. Major and vast sports networks such as Fox Sports and ESPN have integrated AR components within their broadcasts. For instance, the utilization of AR graphics for displaying the immersive player, real-time data and player statistics has become common. The incorporation of AR in live sports broadcasting significantly improves the understanding of viewers of the game and makes it much more manageable [6]. According to [7], 72% of sports fans in the USA implement social media to follow their favorite athletes and teams showing the



rapid landscape regarding sports consumption. This technological advancement had effectively extended the reach of major sports content yet further dependent on fan engagement, developing the sports experiences more interactive and immersive compared to the conventional sports industry.

#### **b) Finding and Discussion**

##### **Theme 1: Comparative analysis between traditional training methods and immersive technologies**

The advanced AR and VR technology had the potential for immersive learning with VR and AR. Immersive learning with AR and VR has the significant potential to transform conventional educational practices. By providing the learners with a simulated environment, this technology provides a better interactive and engaging learning experience, students are no longer passive recipients of the information but active participants in the learning procedure. This interactive nature of AR and VR significantly enables the students to explore composite concepts through hands-on experiences [8]. This form of experimental and efficient learning increases comprehension and retention by making learning more efficient. Both VR and AR are revolutionizing the domain of immersive learning by providing more effective learning, and interactive and engaging environments. This technology provides a sense of immersion and presence which conventional teaching strategies could not match. In this concern, students can communicate with the manipulated simulations, and virtual objects and collaborate with their peers within a virtual space that would increase the overall learning experience.

##### **Theme 2: Innovative solutions to increase fan engagement**

In the e-learning sector, both AR and VR have become a key element of the learning platforms. Immersive technologies have been increasingly incorporated within an e-learning course to enable educators to develop more interactive and engaging content. For instance, language learners could practice conversational skills with the virtual avatars. On the other hand, engineering students could explore the complex machinery in the interactive 3D models. In professional training and learning contexts, immersive learning has become a necessary tool for reskilling and upskilling employees. AR and VR technology simulation can give a real-time experience that could decrease the risk associated with on-the-job training [9]. Augmented reality overspreads digital information within the real-world atmosphere, which is specifically observed by AR glasses, AR interfaces and smartphone cameras. While this technology was strategically employed, it had the power to transform fan involvement and sports entertainment. Broadcasters, federations and clubs are developing innovative AR applications to amplify real-life game excitement, regardless of whether viewers are at an event or watching from home [10].

In popular sports such as soccer, tennis, basketball, and football, AR can enable the audience to view the virtual presentations of player profiles and team lineups. Analysts can utilize overlays to describe the potential strategies for displaying the 3D animations of players through different angles. Through underlying interactive content of the 3D graphics within a live feed, broadcasters could increase engagement levels rapidly. However, for the fan experience, both VR and AR would significantly revolutionize how the audience would communicate with entertainment and classrooms to support continuous learning. Additionally, AR is significantly beneficial and has several numbers of advantages for activity-centered STEAM education as it could secure learning center activity and help the learner understand concepts and obtain scientific knowledge.

##### **Theme 3: Adoption and integration of AR and VR technologies**

Broadcasters utilize AR to increase viewership by increasing the information value and entertainment level of their sports broadcasting. Hence, integrating AR technology in sports broadcasters leads to 15% much higher viewer engagement. In the period of sporting broadcasting, it significantly resulted in a 20% enhancement in viewer retention [11]. STEAM education, which encompasses multiple courses, has gained popularity due to the rapid advancement of AR and VR technologies. STEAM is commonly defined as encompassing the fields of science, technology, engineering, art, and mathematics. Augmented reality (AR) is being incorporated into STEM (science, technology, engineering, art, and mathematics) curricula using advanced technology. This integration aims to enhance students' interest and excitement in science, while also providing practical applications in the training strategies which is available to a wider audience.

#### **c) Evaluation**

The changing landscapes of fan expectations besides the relevant financial rewards are the main reasons for football to embrace the VR and AR technologies. For instance, Barcelona had significantly acknowledged the



significance of futureproofing for their club which had significantly integrated tech-driven advancement within the redesign of Camp Nou stadium. A start-up company 'ARound' had effectively introduced multiple AR projects in the United States had placed a strong significance on wearable revolution in the upcoming strategy [12]. Their shared vision of AR by the wearable device significantly aligns with the direction in which global technology is heading. Since, younger fans adapt to gaming, and seek active participation, AR technology significantly provides an opportunity for transforming smartphones within a live event of gaming controllers. The combination of the digital and physical world would be the upcoming nature of the younger generation by making them an enthusiastic participant in this new period of fan engagement.

### **Recommendations**

Fans would be able to experience different sports events such as they are physically preserved regardless of their location by the AR application and VR. This technology would enable new forms of engagement such as interactive game components which would increase the live viewing experiences and virtual meets with the athletes. The incorporation of VR and AR with other emerging technologies such as 5G and AI would effectively increase the capabilities by providing real-time data and streamlined interactions.

### **Future Scope**

The future scope of VR and AR technology in fan experiences and immersive training is promising and vast. In a professional and educational manner, both VR and AR would enable a better, adaptive, personalized beside immersive learning atmosphere. This technology could stimulate a composite real-world scenario and would allow the learner to increase and practice the skills within controlled and safe settings. Since AR and VR technology have become much more accessible and affordable. Their adoption in different educational sectors would increase and make them more advanced in sports.

### **Conclusion**

In summary, both AR and VR technology are advanced technologies that assure revolutionizing in training strategies and fan engagement methodologies by mitigating the limitations of conventional approaches. These technologies provide personalized, interactive, and immersive experiences that effectively increase retention and learning in different fields such as education, sports, military and healthcare. Through simulating real-world scenarios, both VR and AR give hands-on experience without an associated risk making it more engaging and effective. From the study, it was observed that by providing the learners with a simulated environment, this technology provides a better interactive and engaging learning experience. Besides, students are no longer passive recipients of the information but active participants in the learning procedure. The integration of these technologies with digital media has significantly shown effective improvements in viewer retention and engagement.

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