

The Immersive Learning - Role of Augmented Reality and Virtual Reality in Employee Training

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Abstract: *Virtual Reality (VR) and Augmented Reality (AR) [2] are two immersive techniques that vary greatly. AR enhances the real world with digital overlays, while VR fully produces synthetic environments. VR completely immerses users, usually for games and simulation, while AR enhances the actual environment with useful information for navigation, education and business duties. Both technologies are developing, in which VR is emphasizing realism and merging smoothly into daily devices. These technologies will be co-existence in the future, enriching human connections with both digital and physical worlds. The fields of enriched reality (AR) and virtual reality (VR) are bringing revolution in HR training. These innovations provide realistic simulation of real-world conditions in an immersive, interactive learning environment. When using AR, digital information is charged on the real world, while VR immerses the audience into a computer-borne environment. Both strategies promote employee learning by overcoming regional borders and providing safe, pleasant practice of difficult jobs. Issues of initial investment and integration are difficult. In this paper the efforts have been made through literature of review and the survey of employees, VR and AR adoption and employee training. A survey was conducted using Google forms and their personal point of view on the AR VR training, collecting reactions from employees in various industries to understand their experiences, challenges and perception of AR/VR-based training. The collected data provides insight into the effectiveness of these technologies in skill development, employee engagement and organizational efficiency, and the number of employees who have an idea about the AR VR training. The findings will help organizations identify the potential benefits and obstacles in implementing AR/VR to the workforce.*

Keywords: Virtual Reality

I. INTRODUCTION

Virtual Reality (VR) and Augmented Reality (AR) have emerged as groundbreaking technologies [1] that are revolutionizing employee training methodologies. In an era where industries are constantly evolving, organizations are seeking innovative ways to enhance the efficiency and effectiveness of their training programs. Traditional training methods often fall short in providing immersive, engaging, and practical learning experiences that cater to the ever-evolving demands of the modern workforce. VR and AR offer a dynamic paradigm shift in this regard. The spatial computing capabilities of VR and AR are poised to transform how employees acquire, retain, and apply knowledge. This paper delves into the multifaceted realm of VR and AR for employee training. These technologies offer a hands-on, experiential approach, allowing for customized learning experiences. The content and difficulty level of training modules can be adjusted to cater to the individual needs and skill levels of employees. Additionally, the real-time tracking and monitoring capabilities of these technologies enable supervisors and trainers to assess each employee's progress and adjust the training accordingly. Incorporating VR and AR into employee training programs can also yield significant cost savings in the long run and offer a virtual, digital alternative, reducing the need for physical infrastructure and minimizing travel expenses. Furthermore, the scalability of VR and AR allows organizations to extend training programs to a global workforce, providing consistency in training delivery across different locations. Furthermore, the gamification and interactivity aspects of VR and AR can significantly enhance employee engagement by turning learning into an enjoyable and challenging experience by creating a positive, enjoyable learning culture



within the organization. This active learning approach promotes better knowledge retention and the development of critical thinking and problem-solving skills, anticipate, and react to real-world challenges, leading to better preparedness and also reduces the need for lengthy on-the-job training periods, ultimately increasing workplace productivity. The research pattern for this paper is Qualitative, whereby analysed information and data was gathered from classic and current literature in the fields of Virtual Reality (VR) and Augmented Reality (AR), whereby through the examination of literature the researchers and survey sort to make sense of or interpret concepts or phenomena, whereby a content driven Desk research was undertaken.

II. LITERATURE REVIEW

(Gavish et al., 2015) The purpose of the current study was to assess the effectiveness of training for industrial maintenance and assembly (IMA) jobs using virtual reality (VR) and augmented reality (AR) platforms created as part of the SKILLS Integrated Project. Nowadays, VR and AR technologies are viewed as viable teaching tools for difficult and complex IMA tasks. However, to compare them to conventional training methods, empirical evaluations of their efficacy and efficiency are required. In an electronic actuator assembly task, 40 expert technicians were randomly assigned to one of four training groups: VR (using the VR platform twice), Control-VR (watching a video demonstration twice), AR (using the AR platform once), and Control-AR (using a real actuator and a video demonstration once). Performance in a post-training exam reviewed.

(He et al., 2019) The literature review in the abstract examines the historical development and present state of the virtual reality (VR) and augmented reality (AR) industries and forecasts its future developments, with a particular emphasis on holographic display technologies. It analyses studies on the potential of holographic displays for VR/AR, highlighting innovations in high-resolution uses while also examining the difficulties that such technology encounters in the VR/AR space.

(Farshid et al., 2018) The literature review emphasizes how managers frequently misunderstand IT-based concepts like augmented reality and virtual reality, which are frequently used interchangeably. Six separate categories of reality and virtual reality are introduced, with their differences made clear along a continuum. Each type's business applications are described, making it easier to comprehend and use these technologies to their full potential.

(Yeh et al., 2018) An examination of the consequences of induced anxiety in the context of treating claustrophobia using virtual reality (VR) and augmented reality (AR) is highlighted in the literature review in the abstract. 34 participants participated in the study, which examined physiological markers and subjective anxiety levels using AR and VR scenarios. The results showed that while both AR and VR caused anxiety, there was no discernible difference between their effects, indicating that AR would be more economically advantageous for treating claustrophobia.

(Hilty et al., 2020) A thorough scoping analysis of the literature on telepresence (TP), virtual reality (VR), and augmented reality (AR) applications in clinical care was done for the abstract. It included analysis of data from numerous databases and idea domains, revealing a variety of definitions and uses in a range of disciplines, including medicine, psychology, and behavioral health. To fully utilize the promise of these technologies in healthcare, the evaluation focused on the need for standardized interventions, ethical considerations, and improved reimbursement methods.

(Cannavo & Lamberti, 2021) The convergence of the initially separate virtual reality (VR), augmented reality (AR), and blockchain technologies is explored in the literature review in the abstract. It showcases new use cases that show how these technologies work well together across a variety of areas. The potential for these technologies to combine, allowing room for more breakthroughs, is discussed in the article.

(Kohli et al., 2022) The intersection of Extended Reality (XR), which includes Virtual Reality (VR), Augmented Reality (AR), and Mixed Reality (MR), and Brain Computer Interfaces (BCIs) is examined in this literature study. It examines each person's background and applications, underlining how their combination holds promise in fields including robotics, entertainment, navigation, and the development of smart cities, and it offers insights into potential future uses.

(Li et al., 2021) The design of 3D micro gestures for commands in Virtual Reality (VR) and Augmented Reality (AR) systems is examined in this article. It underlines how crucial user input design is to the effectiveness, comfort, and



adoption of interactive systems. The study compares 33 micro gestures to 20 popular AR/VR commands and suggests a set of micro gestures that are both comfortable and easy to use.

III. METHODOLOGY

Research methods are the strategies, processes or techniques utilized in the collection of data or evidence for analysis in order to uncover new information or create better understanding of a topic. To understand research methods, we first need to know the different types of data in a research. These are as follows:-

- Quantitative Data refers to information that appears in numerical form, i.e. data that is easily quantifiable.
- Qualitative Data refers to information that appears in written, visual or audio form, such as transcripts of interviews, newspapers and websites.
- Secondary Data is data that has been collected by previous researchers or organisations such as the government. Quantitative sources of secondary data include official government statistics and qualitative sources are very numerous including government reports, newspapers, personal documents such as diaries as well as the staggering amount of audio-visual content available online.
- Primary Data is data collected first hand by the researcher herself. If a researcher is conducting their own unique research, they will normally have specific research questions that they want answered and thus tailor their research methods to get the data they want.

There are different research methods for conducting studies. The most popular ones include the following:-

1. The Case Study Method
2. The In-Depth Method Study Method
3. The Experiment Method
4. The Observation Method
5. The Survey Method
6. The Interview Method

With respect to this study, titled ‘IMMERSIVE LEARNING : THE ROLE OF AUGMENTED REALITY AND VIRTUAL REALITY IN EMPLOYEE TRAINING’ I have employed one of the above mentioned methods- the Survey Method.

- The Survey Method: A ‘survey’ is a research method used for collecting data from a predefined group of respondents in order to gain information and insights into a range of topics. The process of this method involves asking people for information or opinions through a standardized questionnaire which can be online or offline in person.

Objectives of this study :-

- To explore the benefits of AR and VR in Training
- To compare traditional and immersive training methods
- To understand the application across industries
- To highlights technological features and advantages
- To identify challenges and limitations
- To promote workforce readiness productivity
- Future outlook and trends
- To encourage data-driven decision making

survey responses from 105 individuals were collected to understand the broader perception of AR and VR in training. The participants were all individuals aged 18–25 years, ensuring representation. The survey was conducted through an online questionnaire using ‘Google Forms.’ It comprised 10 mandatory questions—10 multiple-choice and added 4 others for their perception on training. The data was analyzed using pie charts and drawing meaningful conclusions.

The research offered critical insights into the effectiveness, engagement, numbers of employees who are aware about the AR VR training and challenges associated with immersive learning technologies in employee training. Despite uncovering valuable findings, it also highlighted challenges such as technical limitations, accessibility issues, and cost considerations, paving the way for further exploration in this dynamic field.



IV. DATA COLLECTION

Questions for EMPLOYEES (Survey):

1. What is their age group?
2. What industry do you work in?
3. Have you used AR/VR based training before?
4. How engaging the AR/VR training would be compared to traditional methods?
5. What do you think the training will improve your ability to perform tasks more accurately?
6. Do you think AR/VR training helped in better knowledge retention?
7. What challenges did you face while using AR/VR training? OR what challenges would be faced while using AR/VR training?
8. Would you prefer AR/VR based learning over traditional training in the future?
9. What improvements would be like to see in AR/VR learning?
10. How often do you think AR/VR training should be integrated into employee learning programs?

V. DATA ANALYSIS

Survey: In this research paper I recorded responses from 105 individuals. Most of them belonged to the age group of 18-25 followed by the age group 26-35. From this research paper I can conclude that the majority of the respondents haven't used AR/VR training in their HR training. They seem to have mixed views when asked whether AR/VR Learning would be helpful for them to improve their ability to perform tasks, better knowledge retention, the challenges they would face while training and what improvements they think should be made in the AR/VR learning. Out of the total responses 73.3% respondents think AR/VR learning would be helpful for them and more engaging also 75.2% respondents will prefer AR/VR learning to exist collaterally with the traditional training method. The main challenges faced in the AR/VR training would be the high cost of the devices.

Question-wise analysis

1. Most of the respondents are between the ages of 18 to 25 followed by 26 to 35.
2. 22.9% of them are from other industries, 8.6% are from manufacturing and 51.4% are from the IT industry.
3. 74.3% respondents are not aware of AR/VR based training, 18.1% are aware While the remaining 7.6% are unsure about their answer.
4. This question was about how engaging AR/VR learning would be compared to traditional methods, While the Majority 73.3% of respondents think AR/VR will be more engaging than traditional methods. The remaining 24.8% think it would be equally engaging.
5. 67.6% of the respondents are in favour supporting the Training will improve the ability to perform tasks while the remaining 31.4% are unsure.
6. While 62.9% of the respondents agree with the better knowledge retention by AR/VR training, Rest of 35.5% are unsure.
7. 82.9% of the respondents have answered the high cost of devices about the challenges they faced or would be faced with AR/VR training, 1% motion sickness, 7.6% technical issues, 1.9% lack of content, 5.7% resistance to new technology and The rest 1% Technical issues, High Cost and Barrier.
8. 75.2% of the respondents are unsure about whether they prefer AR/VR over traditional methods, 21.9% are sure, 1.9% disagree and while 1% Will prefer a proper blend of AR learning and traditional methods..
9. Regarding what respondents feel is better for improvements in AR/VR training 50.5% respondents would like better hardware i.e. lighter devices and less expensive, 36.2% for more interactive content while 13.3% feel more real-world applications would be better.
10. 57.1% respondents believe that AR/VR training should be integrated into employee learning programs Frequently, 31.4% are with occasionally, 4.8% are with always (AR/VR should replace traditional methods) and the rest 6.7% are with traditional methods only.



SCOPE OF AR VR TRAINING

The use of augmented reality (AR) and virtual reality (VR) in employee training has revolutionized learning by increasing engagement, retention and practical skill development. These technologies create an immersive environment that simulates real -world experiences, allowing employees to practice and learn without risks associated with traditional training methods. The scope of AR and VR in employee training is huge and continues to expand in industries.[3]

1. Industry application Manufacturing and engineering: Workers can learn to operate complex machinery in a fake environment, reduce errors and increase efficiency. Healthcare and Medicine: Medical professionals can practice surgery, diagnostics and patient interactions through VR simulation, improving skills before the application of real life. Retail and customer service: Employees can be trained in handling customers, conflict solutions and product knowledge in a controlled virtual setting. Aviation and defense: Pilots, military and security personnel can engage in VR simulation for training in high -risk conditions without real -world dangers. Corporate and soft skills training: Leading, communication and teamwork can be practiced in AR/VR settings to decide and improve mutual skills. Education and e-learning: Teachers and students can use immersive tools to increase engagement, which can make learning interactive and practical.

2. Benefits of AR and VR in employee training Risk-free teaching: Employees can practice tasks in a virtual environment without real world results. High retention and engagement: Immersive training increases knowledge retention compared to traditional learning methods. Cost-evidence: During training reduces the need for physical resources, travel and damage to equipment. Remote learning opportunities: Employees at various places can use high quality training without physical appearance. Adaptation and scalability: Training modules can be sewn to various roles and can be easily scored in organizations.

3. Future scope and development AI-Interested VR simulation, haptic feedback, and real-time analytics, AR and VR will become even more interactive and effective with progress in training. Future trends include the individual learning experiences, integrations with equipment weed for experience, AI-attached landscape and more spontaneous training experience.

4. Continuous Professional Development: AR platforms can be easily updated. This helps employees stay current with new processes and technologies.

5. Remote and Scalable Solutions: Using virtual reality (VR), large businesses can provide employees at different places with coherent, scalable training, which reduces overall costs and logical challenges.

6. Data-powered insights: VR training provides quick response and detailed analysis to each participant's performance, supporting individual teaching paths and better results.

SUGGESTIONS

Some suggestions that I would like to propose according to the data as follows:

1. Conduct Introductory workshops and demo session to showcase AR/VR learning benefits
2. Provide trial access to AR/VR training modules for employees to explore
3. According to the survey Top challenge identified- High cost of AR/VR devices the suggestion would be -
 - To consider shared AR/VR learning stations at workplaces to reduce individual investments.
 - Partner with Tech firms offering affordable and cost effective training solutions. 12

VI. CONCLUSION

The study shows that in AR/VR training there is a great possibility of improving employee learning, making it more attractive, increasing knowledge retention and helping employees develop the necessary skills. However, companies need to remove challenges such as high cost, technical difficulties and lack of employee awareness through high cost planned implementation. By introducing cheap AR/VR solutions, by making training easily accessible, and by handing the employees with hands, businesses can bridge the gap between traditional and immersive learning methods. As a result, there will be more efficient, confident and productive employees, eventually running business development and innovation. Further discovery can see how AR/VR training affects the development of long-term careers, how it



compares AI-based learning methods, and the real-world examples of industries that are successfully used. If organizations invest in practical and durable AR/VR training strategies, they can change the way they learn, making the training more interactive, skilled and prepared for the future.

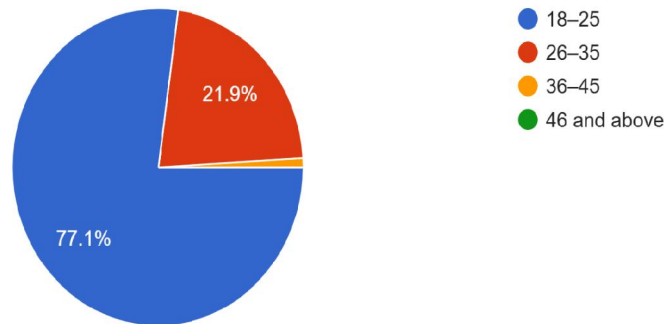
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- [1] <https://www.sciencedirect.com/science/article/pii/S2590291123001377#sec3>
- [2] <https://www.researchgate.net/publication/385739930> The role of virtual reality in employee training and development Mediating role of engagement and immersion moderating role of organizational culture
- [3] <https://www.techtarget.com/searchhrsoftware/tip/VR-in-HR-How-human-resources-can-use-VR-and-AR-technology>

APPENDIX

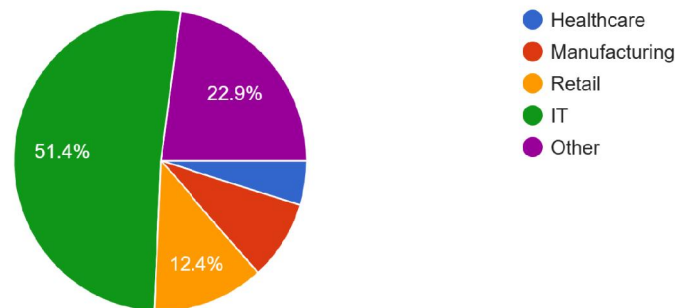
1. What is your age group?

105 responses



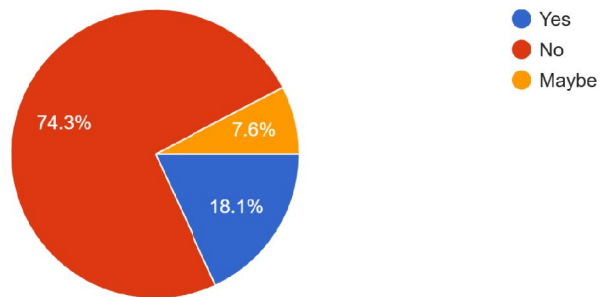
2. What industry do you work in?

105 responses



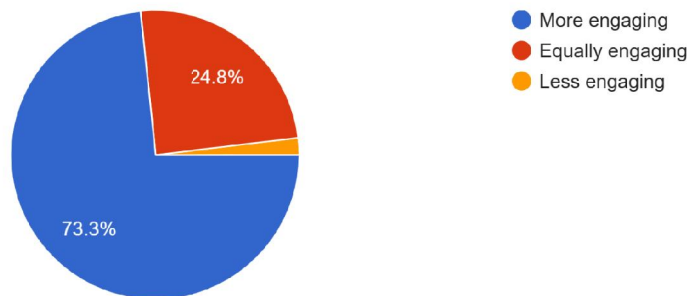
3. Have you used AR/VR-based training before?

105 responses



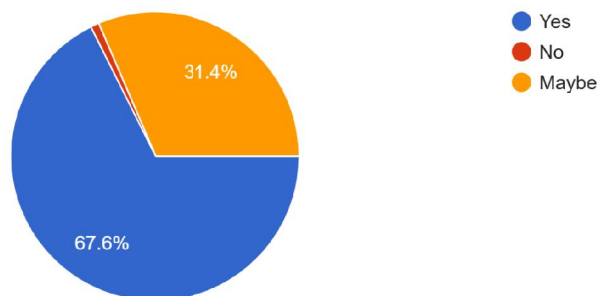
4. How engaging the AR/VR training would be compared to traditional methods?

105 responses



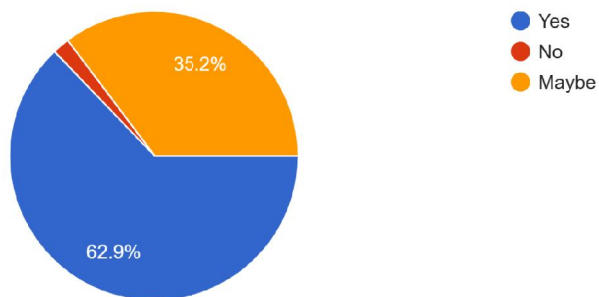
5. what do you think the training will improve your ability to perform tasks more accurately?

105 responses



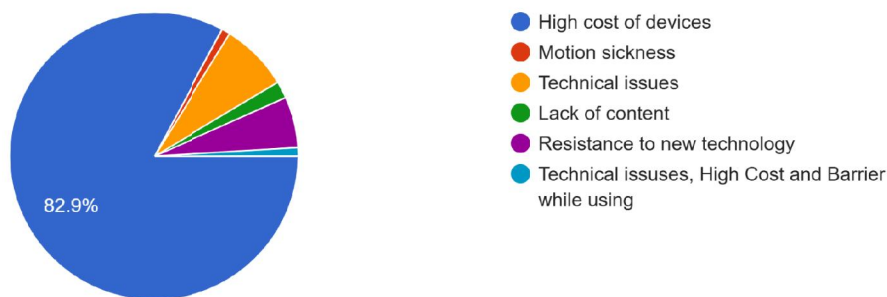
6. Do you think AR/VR training helped in better knowledge retention?

105 responses



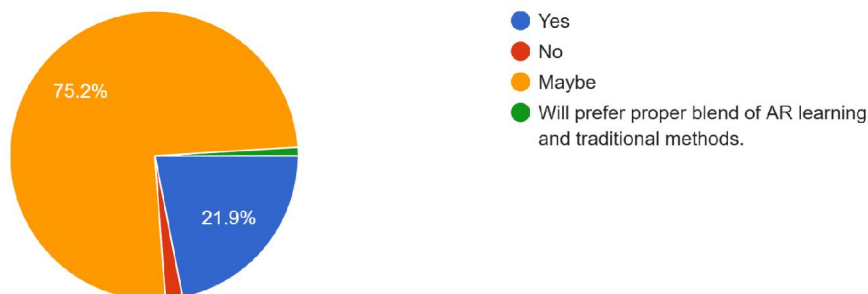
7. What challenges did you face while using AR/VR training? OR What challenges would be face while using AR/VR training?

105 responses



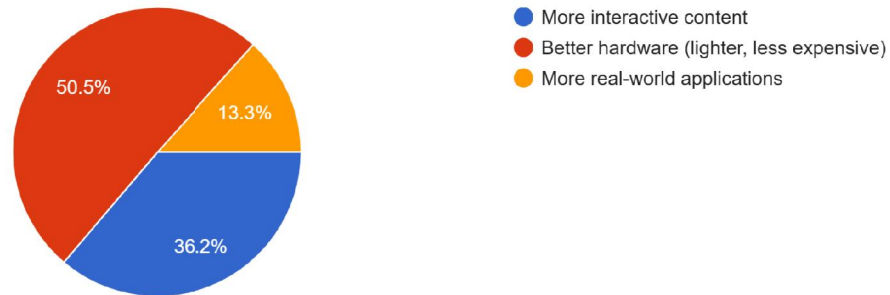
8. Would you prefer AR/VR-based learning over traditional training in the future?

105 responses



9. What improvements would you like to see in AR/VR learning?

105 responses



10. How often do you think AR/VR training should be integrated into employee learning programs?

105 responses

