

# Virtual Reality Applications in Vocational Training Technology in Vietnam and the World

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**ABSTRACT:** Virtual reality is an environment that simulates the real world and is simulated by humans and in that environment all images and mechanisms of action directly affect human senses, allowing operations such as forward, backward, left, and right to get the most realistic views, bringing an impressive virtual reality experience

The application of VR technology gives students a much more practical, understandable, rich, and engaging approach than that offered through books, websites, or even videos. The lessons become more vivid and specific, and learners will be able to interact and access the virtual environment to explore deeply, and better understand them, which helps learners feel both interested and easier to understand and remember more deeply

Virtual lab deployments have many advantages over real lab installations, as there will be limitations on real equipment for practice. In addition, the Virtual Lab will not have the unintended risks posed by real equipment as real practice

**Keywords:** Virtual Reality, VR, Virtual Reality, VR Technology, Virtual La

## I. INTRODUCTION

Training using virtual reality (VR) technology is commonly known as the learning process in a simulated or artificial environment. This technology is applied to improve the quality of education and training because of its advantages, especially in the fields of health, engineering, military, culture, tourism, scientific research, space, and space...

Providing students with a learning environment through practice is necessary to fully develop practical skills, which is a major challenge for the education system, especially for programs that require the use of laboratories.

As an inevitable trend in the context of strong technology, educators are starting to rely on

VR simulations to develop learning experiences. Applying VR technology in teaching in general, and teaching techniques in particular provides learners with a new and more effective learning platform than traditional teaching methods.

Virtual reality technology has been around since the late 60s of the twentieth century and is known by many names such as synthetic environment, cyberspace, and artificial reality. These technologies are fundamental to the development of today's virtual reality technology.

Virtual Reality (VR) technology is a type of technology that integrates multimedia content to transmit information content, it allows users to interact with content components. VR uses computer graphics to create a "lifelike" world in three dimensions, participants can interact with that virtual environment. Moreover, this "artificial" world is not static, but changes according to the user's will to interact (signal in) (thanks to actions, words,...). This defines a key characteristic of VR, which is real-time interactivity.

Virtual reality (VR) is an environment that simulates the real world. It is simulated by humans and in that environment all images and operating mechanisms directly affect human senses, allowing operations such as forward, backward, left, and right to get the most realistic views, bringing impressive virtual reality experiences. The application of virtual reality in education is a breakthrough in teaching methods, and new approaches for learners and teachers, instead of vegetarian learning, the theory will switch to practical learning, practical experience through 3D simulation, and LAB rooms, so lessons, knowledge will be practical, detailed, quickly understood, easy to remember to attract learners, many times more effective than the old way. Imagine, how the lessons will be more interesting, vivid, and effective. Teachers use VR technology to explain historical events, science subjects, and

biology. Making any passive, boring events and knowledge more vivid, and interesting or seeing how they work in detail... Schools are being digitized and can use computers and mobile apps for their lessons.

As an inevitable trend in the context of strong technology, educators are starting to rely on VR simulations to develop learning experiences. The application of VR technology in teaching provides learners with a new and more effective learning platform than traditional teaching methods.

Virtual reality is a computer-generated environment that allows users to role-play in the virtual world through multimedia graphics simulation applications [1]. The purpose of this is to create a virtual world that is alive and similar to the real world at the same time that the user feels like part of that environment [2]. Therefore, these aspects can be done through optical devices, electronics, and computer simulations to create visual products with hand simulation to realize different tasks inside the virtual environment such as picking up, placing, changing, and ordering objects taking into account the position and movement of the hands [3].

Virtual worlds can be created through software deployments; however, the development of digital human models requires hardware capable of acting as an interface between computer systems and users. Optical devices such as deep vision cameras (Leap Motion Controller™, Leap Motion Inc., San Francisco, CA, USA, Kinect™, Microsoft, WA, USA, Oculus Rift, Oculus VR™ LLC, San Francisco, CA, USA), infrared cameras, pressure sensors, motion sensors, joysticks, and accelerometers, complement the perception of the simulated environment. Virtual reality applications have evolved, making this technology a useful tool to meet current needs in several areas of knowledge such as education [4–7], industry [2,8], music [9], medicine [10,11], architecture [12] and Virtual Labs [13,14], where it is possible to reproduce the conditions of a real environment with visual, tactile and audited stimuli [15,16].

The areas of application of virtual reality are different and to a certain extent due to the emergence of Industry 4.0, but the main approach of these technologies is based on modular learning and training. For automotive technology training, there are immersive virtual reality applications, some examples include driving simulation software, car design, and virtual car dynamics.



**Fig.1. Virtual reality applications in the automotive industry**

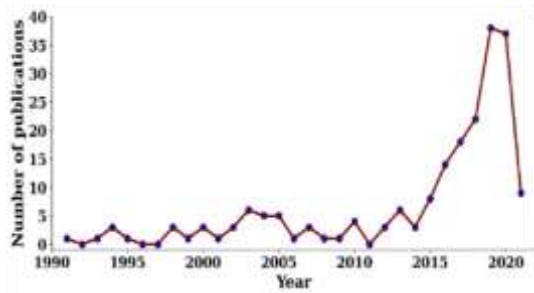
(Unity Software Inc., San Francisco, CA, USA) and Oculus Rift S virtual reality headset. Furthermore, there is a previous work from this research team where an augmented reality mobile application in the Android™ operating system has been developed. The application, combined with a device with a camera, allows users to visualize 3D models of the main parts of four-stroke engines, in addition to obtaining additional information about their operation through the Otto thermodynamic cycle.

For that reason, the Virtual Lab can be considered a cost-effective and completely controllable educational tool, allowing for more repetitive and in-form practice, resulting in students learning on their own, becoming capable of overcoming real-life challenges and developing technical skills; As a result, virtual experiments become interesting and attract the attention and participation of students.

## **II. APPLICATION OF VIRTUAL REALITY IN EDUCATION AND TRAINING IN THE AUTOMOTIVE INDUSTRY**

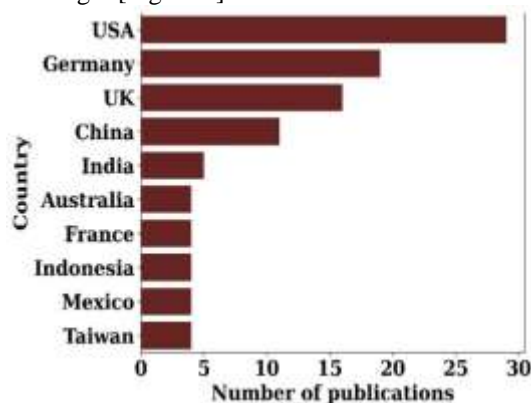
### **2.1. Overview of virtual reality and the automotive industry**

In the data, no clear trends were found in the publication of documents from about 1991 to 2012, with a small growth from 2003 to 2005, in which works related to 3D simulators for training in virtual environments were presented to drive cars or work on assembly lines in the automotive industry. Bowling and Aeronautics, and training for astronauts, began in 2013–2014, and significant growth in the publication of materials began, with the peak of publications in 2019 with 38 documents. In Figure 1, the trend of publications over time is shown.



**Fig.2. Distribute published materials over time on the use of Virtual Reality in education and training in the automotive industry.**

According to statistics, the country with the highest number of publications is the United States with a total of 29, followed by Germany with a total of 19, and in third place is the United Kingdom with 16 documents. It is important to note that these countries have a very developed automotive industry, so the search for new techniques for education or training in this field is no stranger [Figure 2]



**Fig.3. Distribute the number of documentary publications on the use of Virtual Reality in education and training of the automotive industry.**

## 2.2. Some virtual reality application modules in training

### 2.2.1. Vehicle assembly training

Traditional training provides a solid theoretical basis but does not allow assembly line personnel to master their manual operations. Therefore, new employees need additional support during adjustment periods. As a result, many automotive companies, including Volkswagen and BMW, use virtual reality to train workers on their automotive assembly lines. With the help of virtual reality, automakers create a controlled, safe learning environment and increase training efficiency. Virtual reality applications train assembly line workers to make safe and convenient movements. Therefore, VR training helps reduce

occupational injuries. Ford, for example, reduced injuries by 70 percent, analyzed VR training data, and made tailored improvements during assembly.



**Fig. 4. Virtual reality application to train assembly line workers**

### 2.2.2. Training for logistics personnel

The logistics process for car manufacturers is becoming more complex because of the variety of models and the introduction of global supply systems. However, many processes in the logistics sector are not automated. And businesses suffer losses due to the fault of logistics staff. As a result, Audi has designed a VR training system to increase focus and motivation for logistics workers. The Audi VR training course has successfully passed the test and has been actively used to optimize the packaging process at all Audi factories. Practitioners find themselves in a virtual environment simulating a real Logistics Center. The program gives suggestions on who to interact with and how to do it. Practitioners interact with objects using controllers in their hands. VR training is built in the way of step-by-step gameplay with constant complexity. After passing each level, students receive feedback. Practitioners can repeat levels until their actions become confident. With the help of VR training, Audi has reduced the need for space and physical equipment for the training of logistics personnel. At the same time, increase the interest of employees in their work and implement the required quality standards.

### 2.2.3. Training of sales staff

Virtual reality is not only suitable for teaching mechanical skills but also for developing soft skills. By simulating interactive scenarios in virtual reality applications, employees of automotive companies learn how to meet customer needs to increase sales. In 2017, Audi launched a virtual reality training program for dealers. The program consists of several educational modules that train agents on how to better sell using modern sales techniques, how to provide the best possible customer service, and how to manage customer

feedback. In virtual reality terminals, trainees communicate with real-life characters: customers, colleagues, and supervisors. During the conversation, students can observe the customer's mood scale. Customer satisfaction determines the success of the interaction. Students collect points for successful communication. Each student's score is included in the composite table. As a result, employees can compare their results with other Audi dealerships across Germany.



**Fig 5. Training sales staff to apply virtual reality at AUDI Motor Company**

### **2.3. Advantages of VR application for training institutions:**

Students in VR applications are isolated from the real world and, therefore, more focused on learning materials. VR reduces training time and improves maintainability.

Virtual reality training is ideal for mastering the hands-on manipulations of students. In VR applications, students can practice the skills as many times as needed. So the actions will be remembered in memory without the use of any operating equipment and materials.

VR training combines visual, audio, verbal, and physical interactions. So, it is suitable for different learning styles.

With the help of virtual reality, you can simulate different situations in a risk-free environment. For example, in virtual reality, students can perform actions in unusual situations.

You can use the standard VR training program in all training institutions, regardless of their location. VR training increases student engagement.

Students are trained in virtual reality because the learning process is like games. It also forms the passion for the research of students.

In VR training applications, it is easy to estimate student performance, track bottlenecks, and reveal insights to improve the operating procedures of the training institution.

### **III. THE DEVELOPMENT OF VIRTUAL REALITY TECHNOLOGY IN VIETNAM TODAY**

We all have to recognize that virtual reality technology has brought people interesting and new experiences that are not always available. In advanced countries, VR has been widely applied in the fields of military, education, architecture, and medicine ... serves human needs and purposes very well,

What about virtual reality technology in Vietnam today? Our country is still on the verge of grasping the latest technology trends to keep up with the development of the world. Because there are still many limitations on highly specialized human resources as well as formal training programs in virtual reality, we have not created great achievements. However, Vietnam is making new developments, thanks to the spirit of inquisitiveness, a skillful combination of human knowledge, and national wisdom to create Vietnamese VR products, to serve the Vietnamese people.

Specifically, in 2020, based on the development of Ho Chi Minh City's tourism industry and the development of VR technology in the world, the Ho Chi Minh City Department of Tourism has proposed to build a virtual reality tourism map in Ho Chi Minh City to improve the promotion of tourism in Ho Chi Minh City. At the same time, affirming the development of the city through the application of high technologies in tourism promotion and promotion.

Historical relics, museums, and tourist attractions of the city such as Independence Palace, Nha Rong Wharf, and War Remnants Museum have been selected by some companies with beautiful angles to shoot, and synthesize attractive content than process and digitize 3D to show the space environment. imaginary.

Virtual reality technology in Vietnam is also applied in the field of production and business when many factories and industrial parks take advantage of this technology to monitor, manage, improve labor efficiency and promote brands and products closer to consumers.

#### **3.1. Some barriers**

Although the development potential of virtual reality is huge. Bringing this technology to popularity or commercialization in Vietnam still faces the following barriers:

##### **3.1.1. High-quality human resources**

VR technology requires high-quality human resources and intensive training programs.



And this is an obstacle to developing this technology in Vietnam. Staffing shortages lead to difficulties in delving into research. Or hinder the development of engaging content for users.

### 3.1.2. Customer needs

In developing countries, people have middle incomes. The demand for technological products is not great. Customers include individuals or organizations that do not have a comprehensive view of virtual reality technology. Plus, the cost for them to own this technology is quite high. This makes it difficult to connect supply and demand.

Besides, this technology has not been focused on investment and development. So it looks deep into the realms of life. Access to new technology in the world still costs a lot of money and time.

### 3.1.3. Virtual reality technology in Vietnam in the future

With the great amenities and experiences that people have been receiving, we fully believe that virtual reality technology in the future will go further and develop further, not only Vietnam but also developing or underdeveloped countries can widely disseminate any technology throughout activities. of life.

The smartphone you are using will be a great device for you to access 3D virtual reality technology because they have the advantages of compactness, beautiful screen, high resolution, and true colors ... At the moment, many phone companies have focused on developing VR applications on smartphones so that users can comfortably use at home for free.

Although there are still many difficulties and certain barriers in terms of personnel and budget, we can hope that virtual reality technology in the future will go further and develop and innovate more because basically, we have businesses that are serious and invest a lot of brainpower in this field.

## IV. CONCLUSIONS

The application of VR technology gives students a much more practical, easy-to-understand, rich and engaging approach than that offered through books, websites, or even videos. The lessons become more vivid and specific, and learners will be able to interact and access the virtual environment to explore deeply, and better understand them, which helps learners feel both interested and easier to understand and remember more deeply.

The progress in the development of new technologies has tremendous potential in the field of education and its connection to Industry 4.0. Education must gradually adapt to the health conditions we are experiencing due to the COVID-19 pandemic to improve and facilitate student learning and ensure their adaptation to the work environment. The development and implementation of VR technology during academic training for automotive engineering students will allow them to be directed toward what they will find in their specialization at the experimental level, where virtual reality plays a very important role in the design, of autonomous cars, training, and driving.

It can be seen that the application of virtual reality in the education industry has brought many completely new, intuitive, and vivid training methods to make learning much more interesting, while also saving costs and improving the learning quality of students and students.

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