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AR/VR/3D Technologies: Enabling Future Business Growth and Scale-Up

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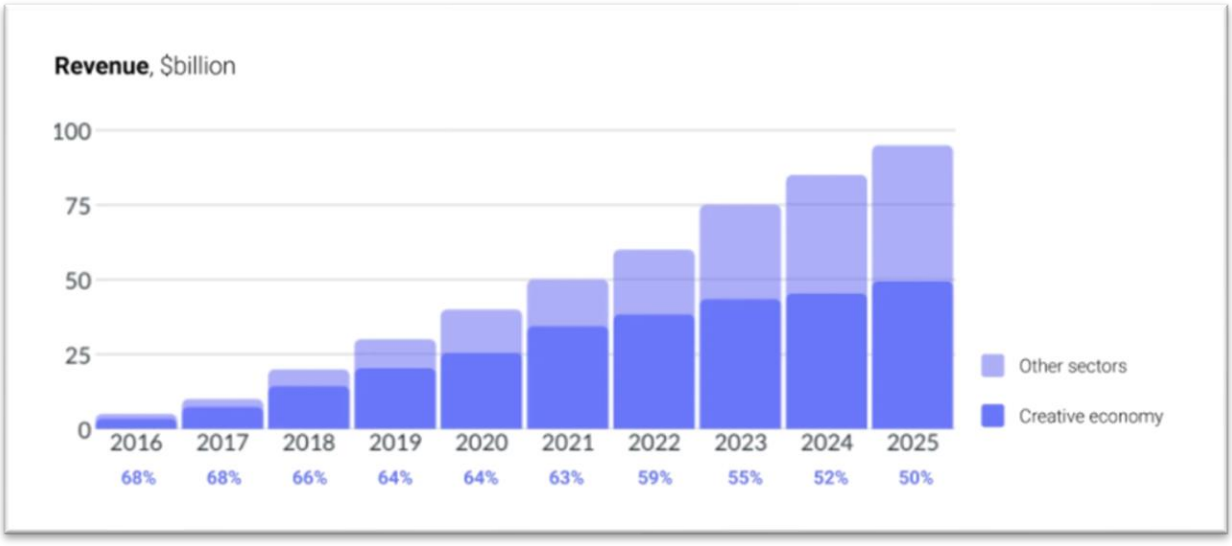
Abstract

Augmented Reality and Virtual Reality (AR/VR) technologies have been in existence for some time, but recent advancements in hardware, storage, graphics processing, and high-resolution displays have made them more accessible and practical. As a result, an increasing number of organizations are exploring these immersive technologies for various purposes. This research focuses on organizations that have already initiated their AR/VR/3D journey, either through experimentation or implementation, and aims to answer the following questions.

- How is AR/VR/3D being employed today?
- What are the latest trends in AR/VR/3D technology?
- How can firms either begin or evolve their initiatives by implementing AR/VR/3D tech?

Introduction

In recent years, web development has experienced a significant shift with the emergence of innovative technologies such as augmented reality (AR) and virtual reality (VR). These technologies are transforming the internet and have the potential to revolutionize the way websites cater to user demands. With the increasing accessibility of desktops, tablets, and smartphones, AR/VR applications are being used across various industries. This presents an opportunity for businesses to digitally transform their product sales. By 2025, the AR/VR market is expected to grow into a $95 billion industry, according to Goldman Sachs estimates.



Growth of AR/VR (blog.csssr.com)

In addition to AR/VR, web developers now have access to various 3D technologies that can greatly benefit businesses. These technologies have the potential to create impressive visuals and engaging user experiences, making them an invaluable tool for digital marketing.

AR for the Web

AR technology adds digital elements to the real world, allowing users to see virtual objects overlaid onto the physical environment through their smartphones or webcams. This creates a bridge between the user and the virtual world, enabling them to interact with digital content in their current location. The increasing accessibility of AR has resulted in the creation of various web-based applications such as React-360, which allows web developers to upload panoramic pictures and videos to their websites.

JavaScript is the predominant programming language used for AR development, owing to its extensive feature set that enables web developers to create new AR applications or add AR functionality to existing ones. A notable example of AR in web development is the 2017 launch of Wayfair's AR-powered furniture visualization app, which enables customers to view how furniture would look in their homes before making a purchase

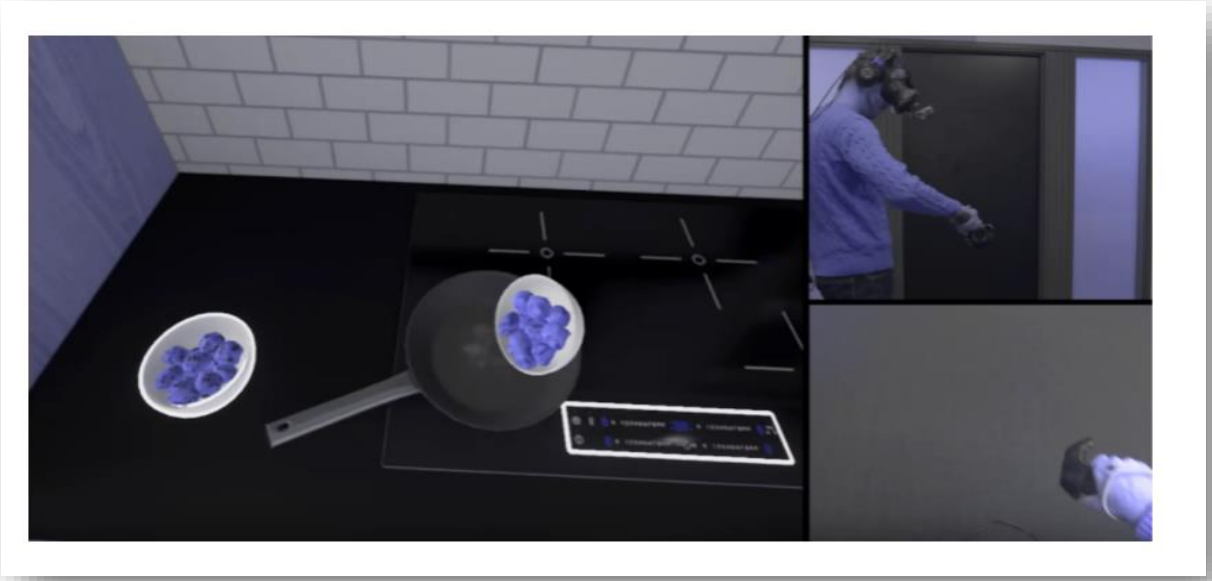
Example of AR Technology

VR for the Web:

Virtual reality is rapidly transforming the web development industry. Unlike AR, VR typically requires specialized equipment, such as a headset, and provides users with a fully immersive experience that disconnects them from the physical world. This allows them to interact with a completely fictional environment as they would in the real world.

Web developers can leverage VR technology to create virtual showrooms that highlight specific product features, as well as offer users the ability to test products, significantly reducing shopping time. The most used framework for building VR websites is WebVR, an industry-standard API based on JavaScript that provides support for VR devices in a browser. WebVR leverages key technologies such as React 360,

Three.js, and A-Frame, to deliver the best VR experiences to users



Example of VR technology

3D for the Web:

This 3D-style web design exudes a majestic and impressive appearance. Not only that, but customers will also enjoy the experience of observing a product from the comfort of their own home. This level of engagement can significantly impact customers' behavioural and decision-making patterns. Three.js is among the most popular frameworks for constructing 3D web applications

Example of 3d Technology (https://listacross.ouiwill.com/)

Aim:

The objective is to study, analyse, and evaluate how various AR/VR/3D-enabled web technologies can be integrated into different businesses to achieve more promising results, enabling them to scale up quickly and more prominently

Literature Review:

- The research paper [INSPEC Accession Number: 20324125] demonstrates the creation and implementation of AR/VR technology in education, resulting in improved learning outcomes for students who used it compared to those who only received frontal lectures.
- The research paper [Electronic ISSN: 1558-1756] provides an overview of the state of the art, important achievements, and future research opportunities in the field of virtual reality and augmented reality technologies, with three original articles included.

The research paper [INSPEC Accession Number: 18636291] focuses on pushing the boundaries of AR/VR technology in terms of hardware and software. Despite significant efforts by major companies and startups, a killer app that appeals to large audiences has yet to be developed, and current 3D content primarily emphasizes gaming and holographic demos

Research Methodology

The data collected is secondary data obtained from various reference blogs, e-books, and research journals, with their references cited in the REFERENCES section.

Analysis of data

After analysing the data, we can infer several insights, including:

- **Superimpose step by step instructions** (Adoption Rate : 29%)
  Technicians at Boeing are leveraging augmented reality (AR) technology to access wiring schematics for aircrafts directly in their field of view. This innovative approach enables technicians to perform their tasks completely hands-free, resulting in a significant reduction in wiring production time by 25% and zero error rates.

- Early design of concept fully created in VR (Adoption Rate : 29%)
  At BMW, engineers and designers are utilizing virtual reality (VR) technology to simulate the assembly of different car components without the need for physical prototyping. This approach significantly reduces the cost of engineering and other related processes, allowing them to test different design configurations more efficiently.

- Virtual walk through of the site (Adoption Rate : 22%)
  Pacific Gas and Electric (PG&E) is utilizing virtual reality (VR) technology and plant data to provide a faster and safer option for workers to inspect equipment, while also reducing the risk of technicians getting hurt. This approach allows them to perform inspections remotely, without having to physically access the equipment, which increases efficiency and safety measures.

- Visualize equipment in production for final product (Adoption Rate : 27%)

VR is used at ***Airbus*** to imbibe digital mock-ups into production environments, giving workers access to complete 3D models of the aircplanes under production, decreasing time required to inspect by 86%.

- Remote collaboration (Adoption Rate : 27%)

At ***Ford*** designers collaborate with each other across huge geographic distances to virtually tour a new vehicle with the engineering team. This avoids incurring travel costs.

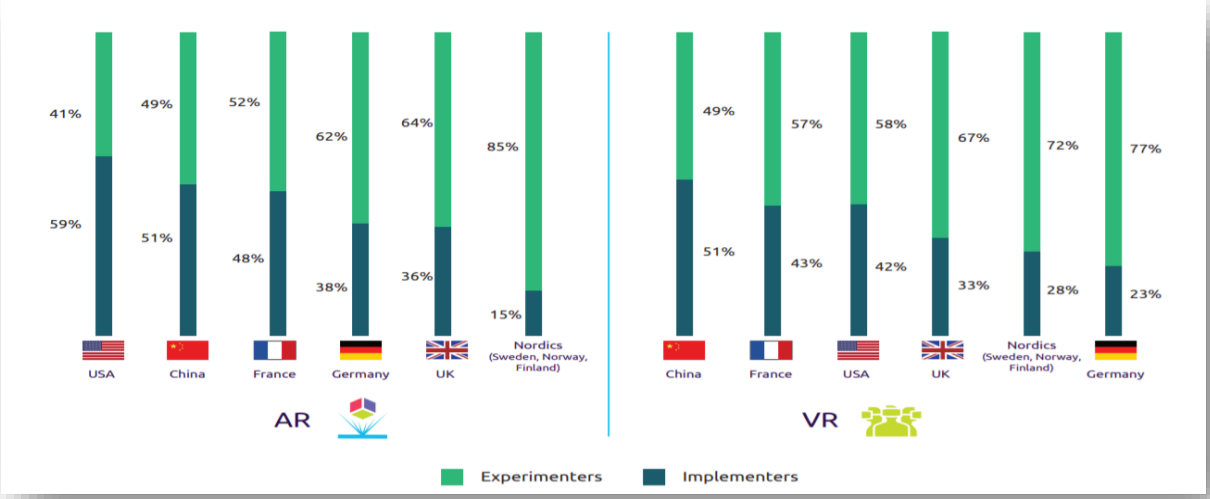


Fig. Out of companies deploying AR/VR, implementation levels by country

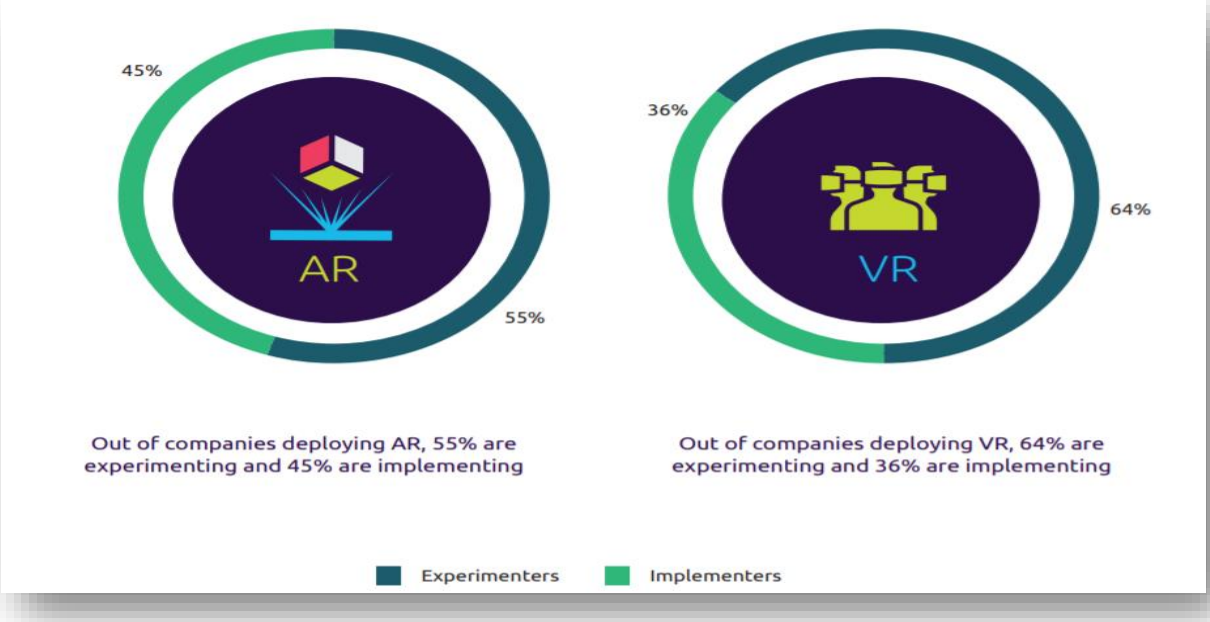


Fig. Out of companies deploying AR/VR, implementation levels by organization category

Results and Discussion

Looking at the above study and analysis, there are lots of application domains where we can implement AR/VR/3D technologies for the optimum growth of companies.

Here are number of the domains which can be highly created impact upon:

- **Business Marketing:**

  AR markers engraved on product packaging with a companion app might offer us additional info about the product, testimonials, or media marketing aspects to augment the product. AR business cards are a way to show out to the world how tech-freak you are.

- **Education:**

  Older students learning a lot of serious subjects find more augmentation of their educational textbooks and media resources, bringing more immersive and interactive content to the syllabus.

- **Industrial training:**
  AR-based how-to-fix-it apps have been presented to enhance technical training and scale down mistakes. Instructional videos go a bit further. With AR/VR, we can have the pros of more interactive 3D graphics, personal mentoring, and hands-on-tutorials.

- **Retail:**
  Online furniture store is one of the most effective examples to implement AR/VR/3D to the retail sector.

Future Enhancement:

We have already looked at the implementation methodologies and implementation levels by different countries and companies deploying AR/VR.

We can enhance our study by “Must-do” and “Need-to-do” use case examples. It also leads to the inference that on average, early achievers derive higher benefits as compared to the rest. Hence, efficiency increase, safety increase, productivity increase and complexity reduction can all be studied thoroughly.

Conclusion

- Technology has made remarkable progress within a relatively short period of time and will continue to evolve in the future. However, there are some major challenges that organizations face when trying to adopt new technologies such as augmented reality (AR) and virtual reality (VR). These challenges include integrating the technology with existing systems, preparing data, identifying use cases, finding talent, and creating general awareness about the technology.

- Despite these challenges, the long-term growth potential of AR/VR technology is substantial, and many organizations are planning to adopt it within the next few years. To initiate or advance their AR/VR journey, organizations should establish a centralized governance structure and focus on the most valuable use cases. It is also crucial to have internal key influencers who can champion the technology and create awareness of its potential benefits within the organization.

- In conclusion, although there are challenges to adopting new technologies like AR/VR, the potential benefits make it worth the effort. By focusing on key use cases, establishing a governance structure, and building awareness among key stakeholders, organizations can successfully incorporate this technology into their operations and stay ahead of the curve.

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