ISSN No:-2456-2165

AR & VR – Evolution and the Future

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Abstract:- In recently we have seen some massive growth of interest in public about AR & VR. Companies are investing big such as Microsoft, Facebook, HTC, Google etc, like Microsoft is working on mixed reality where they will put all the new technologies such as Artificial intelligence, Augmented reality, Virtual reality, interactive holograms etc to give best mixed reality experiences to the upcoming users. Research suggests that by improving AR & VR technology we can make difference in all the section of technology like the way we communicate, the media consumption, it will affect our life altogether in the new era of technology. In this study we are focusing on the industry evolution of this, by going through the various public website to collect the data, and all the trends we have seen in past couple of years. People are also accepting these technologies in their day-to-day life. As companies are investing big, it is evident that this technology will grow more in the future and we can expect boom in this industry in upcoming years of our life. We'll look into the new innovations in this technology domain and try to make sense from our observations.

Keywords:- *Virtual Reality, Augmented Reality, Digital Environment, Mixed Reality.*

I. INTRODUCTION

Virtual reality is a computer-generated simulation of an alternate world or reality and is principally utilized in 3D films and in computer games. Virtual reality makes recreations—intended to close out this present reality and envelope or "immerse" the viewer—utilizing computers and sensory equipment, for example, headsets and gloves. Aside from games and entertainment, virtual reality has also long been used in training, education, and science.

Unlike VR, AR is gotten to utilizing considerably more typical hardware, for example, mobile phones, and it superimposes pictures such characters on top of video or a camera viewer, which most customers as of now have, making it significantly more usable for retail, games, and films. AR combines the physical world with computer-generated virtual elements. These components are then extended over actual surfaces in reality inside individuals' field of vision, with the goal of consolidating the two to improve each other.

II. WAYS TO USE VIRTUAL REALITY (VR) AND AUGMENTED REALITY (AR)

Healthcare and Aged Care: The medical services industry has since quite a while ago looked for ways for improving wellbeing results utilizing innovation. VR and AR are the same in these respects. There have been specialists utilizing Google Glass and numerous others testing VR, (for example, here, here and here) to improve activities or techniques just as to communicate to a crowd of people. There are likewise a few matured consideration suppliers that are taking a gander at how VR may help occupants and patients. For instance, by permitting them to vivid experience occasions they will be unable to genuinely join in or to assist with diminishing the pressure that Alzheimer's patients experience. Education and training: Computerized schooling is presently a staple in most training frameworks around Asia Pacific, supplemented obviously by in person educating. Furthermore, in generally proficient and numerous novices sports the video audit of ongoing games or practice is a normal piece of preparing. Numerous in the schooling and preparing areas are currently increasing their tech game by going to VR and AR to give an improved encounter. VR for its capacity to give extraordinary and vivid points of view, for example, with the Port Adelaide Football Club in Australia, and AR due to its capacity to offer on-request data and heading to existing or recently made materials. Museums or exhibitions: VR offers displays, historical centers, and different associations that hold shows an approach to give an alternate dynamic to the face to face or advanced insight. We have seen AR additionally utilized exceptionally adequately for displays. Customer engagement: Probably the smartest utilization of VR that we have seen is by a no benefit association that required another approach to slice through with its message. Rather than attempting to move toward guests to a shopping center or strip mall to draw in them, the association made a VR experience that accomplished the work for them. The normal time went through with an individual thusly went from a couple of moments to 5 to 10 minutes. There have likewise been numerous associations identified with the movement and the travel industry that have made their own VR recordings which caused them alot.

In the current serious competitive market and manufacturing environment, every year we are experiencing massive change in the Technical Industry. Every year we get new product which was never made before, in this list now AR, VR is making big marks on our life. It is expected that it is the technology of future, companies are investing big and making new advancement in this new technology.

ISSN No:-2456-2165

Product improvement measures are getting progressively more difficult as items become more flexible and complex. An imaginative and effective solution for overcome these issues is the utilization of virtual reality (VR) and Augmented reality (AR) innovations to reproduce and improve these manufacturing measures before they are completed. Research on the manufacturing of VR and AR is a solid and developing area. The test is to plan and execute integrated VR and AR manufacturing frameworks that could upgrade producing measures, just as item and decrease expenses and improve quality. A definitive objective is to make a framework that is in the same class as the real world, if worse and more effective. And in this study, we will find out the accepting rate in which the users are consuming these technologies.

Table of Content

III. LITERATURE REVIEW

Augmented reality (AR) and virtual reality (VR) are frequently discussed at the same time -–and that make sense, state, estimating the market for these connected abilities. Be that as it may, AR and VR today are two different things – more like cousins than twins.

Since AR and VR are not very much the same, they require business experts to devise various procedures for executing these technologies in their organizations.

We will compare AR and VR with other technologies which are one of the market biggest competences. But first we will discuss the advantages and disadvantages of AR and VR.

IV. AUGMENTED REALITY

➢ *Advantages:*

- AR systems are very interactive in nature and work in conjunction with real time environments.
- Reduced Reducing the boundary between the real and virtual worlds.
- Improve perception and interaction with the real world.
- Due to their use in the medical industry, patients' lives have become safer. Assist in the effective diagnosis and early detection of disease.
- Can be used by anyone according to the application.
- He can save money by testing critical situations to ensure success without real-time performance. Once proven, it can be used in the real world.
- This can be used by the military without risking their lives by simulating the real pre-war battlefield. It will also help them make important decisions in real war.

➢ *Disadvantages:*

- It is expensive to develop and maintain a project based on AR technology. Additionally, AR-based devices are expensive to manufacture.
- Lack of privacy is a problem in AR-based applications.
- In AR, people miss important moments.
- Poor performance is an issue that needs to be addressed during the testing process.
- Requires basic training to use AR compatible devices effectively.

V. VIRTUAL REALITY

➢ *Advantages:*

- Virtual reality creates a realistic world
- Allows users to explore places.
- Virtual reality allows users to experiment with artificial environments.
- Virtual reality makes education easier and more comfortable.

➢ *Disadvantages*

- Coupons used in virtual reality are very expensive.
- Consists of complex technology.
- In a virtual reality environment, we cannot move alone, like in the real world.

ISSN No:-2456-2165

AI	BLOCKCHAIN	CLOUD COMPUTING	DEVOPS	IOT	BIG DATA	RPA	DATA SCIENCE
Reduction in Human Error	Process Integrity	Easy implementation	Continuous software delivery	New business opportunities	cuts your costs	Reduced cost	Abundar of Position
Takes risks instead of Humans	Traceability	Accessibility	Less complexity to manage	New capabilities to predict and act	increases your efficiency	Better customer experience	A Highly Paid Career
Available 24x7	Security	No hardware required	Faster resolution of problems	Improve monitoring	improves your pricing	Lower operational risk	Data Science Versatil
Helping in Repetitive Jobs	Faster processing	Cost per head	Faster delivery of features	Increase customer dialog	You can compete with big businesses	Improved internal processes	Data Science Makes Data Better
Digital Assistance	Stability	Flexibility for growth	Higher employee engagement	Fine tune services and products	Allows you to focus on local preferences	It does not replace existing IT systems	Data Scientist are High Prestigi
Faster Decisions	Trustless system	Efficient recovery	More stable operating environments	New revenue streams	helps you increase sales and loyalty		No More Boring Tasks

Fig 1: Now we will see the Positive points of the leading technologies in the market.

We have seen the pros of the technologies like Artificial intelligence, Cloud Computing, Big data, etc. And now we will discuss the cons of these technologies.

A. Commercial Feasibility

	COMPANIES	INFRASTRUCTURE	PLANT LOCATION
AR AND VR	Facebook	CemtrexLabs	China
AI	Nvidia	Tempus	U.S
Blockchain	IBM	Gemini	Australia
Cloud	Microsoft	Microsoft Azure	Germany
DevOps	Amazon	AWS	Canada
IoT	GrubHub	Thingworx 8	Sweden

Fig 2: Commercial Feasibility (where we check the company which are using the technologies and the infrastructure they need and their head location information)

B. Financial Feasibility

	TESTING	INSPECTION	MAINTENANCE	CAPITAL
AR & VR	$16.8 B	$14.2 B	$15 B	$45 B
AI	$58 B	$12 B	$300K	$75 B
BLOCKCHAIN	20%	7%	25 %	-
CLOUD COMPUTING	15%	5%	17 %	-
DEVOPS	$500K	$100K	$150K	$2 M
IoT	$12 M	$2.5 M	$5.6 M	$18.75 M
BIG DATA	$20.56 B	$5.5 M	$10.23 M	$50 M
RPA	$5K	$3.5K	$4K	$60K
DATA SCIENCE	$1 M	$0.53 M	$0.67 M	$6.23 M

Fig 3: Financial Feasibility (where we test, inspect, maintain and capital of technologies)

VI. COMPARITIVE ANALYSIS

So far, we have discussed what is AR and VR, their pros and cons and we have also discussed the advantages and disadvantages of the leading company too. It's time to compare AR and VR with other leading technologies.

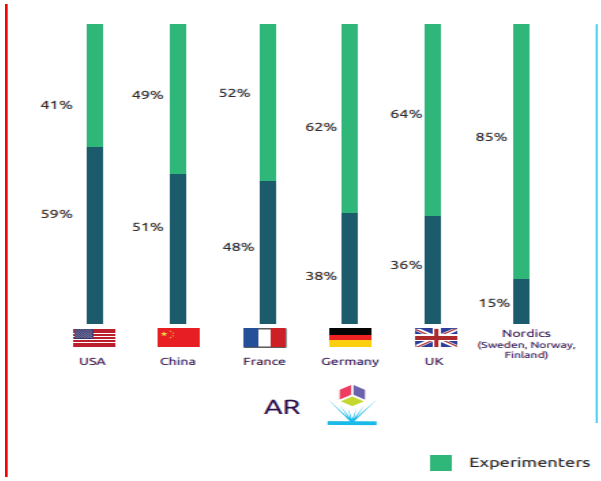

Fig 4: comparison between AR and VR with other leading technologies.

VII. FEASIBILITY ANALYSIS

The number of users in the US using VR is expected to reach 57.1 million in 2021 from about 43.0 million users today, and when it comes to AR it is expected that 85 million users will be in US by 2021 according to eMarketer. In India it is expected that AR will see a prominent push in next 3-5 years and most schools would be using this tool according to

ISSN No:-2456-2165

founders of Edtech Start-ups. AR/VR will see faster adoption in higher education given in the already present situation.

A. Mobile AR is rapidly growing its installed base

When Apple's ARKit and Google's ARCore software development kits (SDKs) introduced in 2017 they standardized the development tools and democratised the creation of AR app creation and bought more than double.

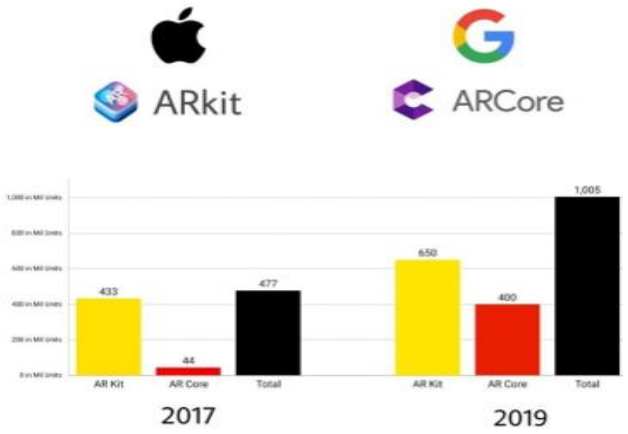

Fig 5

All the major phone manufacturers are expecting that there will be boast in the adoption rate as new phones continue to hit this market.

the amount AR-enabled devices and tripled the number of active users. Based on the data in 2017 the total platform devices which supports these technologies was 477 Millions and in 2019 the figure was 1.05 Billions devices.

B. Sales figure of AR/VR devices of Major Companies

➢ *Sony*

In the past couple of years Sony sold the greatest number of devices 1.7 Million devices in 2017 to 2.2 Million devices in 2019. Sony PSVR is the all-time most selling VR headset till date. It is expected that Sony will sell strong 5 Million devices in 2020 alone.

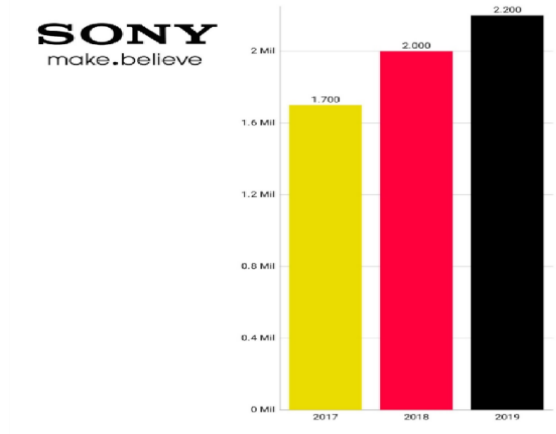

Fig. 6. The sales figure of Sony AR/VR devices

➢ *Facebook*

Oculus, from Facebook is also one of the most successful VR headsets sold till date. Company investing big in past couple of years and also getting the results now. Facebook sold near 0.7 Million devices in 2017 to 1.7 Million devices in 2019.

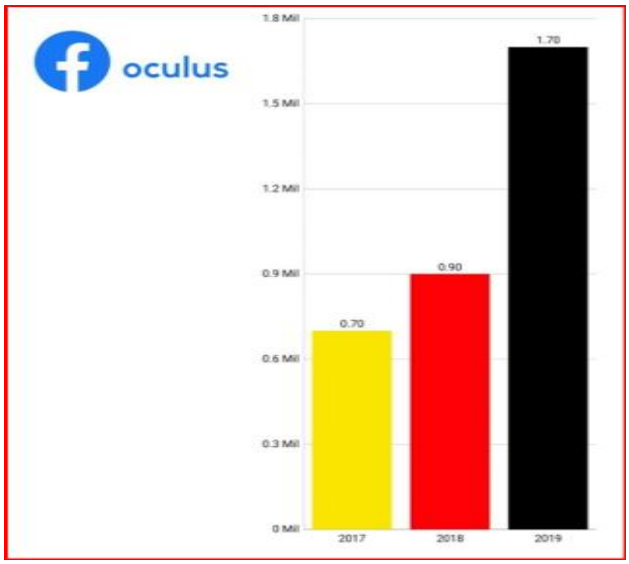

Fig. 7. Sales figure of Facebook AR/VR devices

➢ *HTC*

Company investing big in VR headset in past couple of years. HTC is also selling handsome number of devices, as data suggests HTC sold near 0.5 Million VIVE branded devices in 2017 to 0.8 Million devices in 2019.

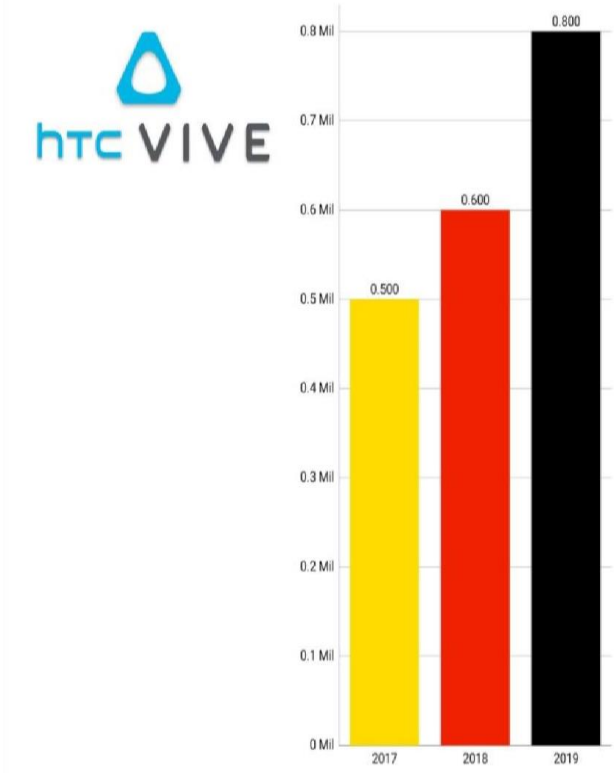

Fig. 8: Sales figure of HTC AR/VR devices

➢ *Other brands*

There are many players in this VR/AR industry such as Boeing, TRMUA, Ford, Microsoft, Google etc. Research suggests they have sold 0.8 Million devices in 2017 to 2.1 Million in 2019.

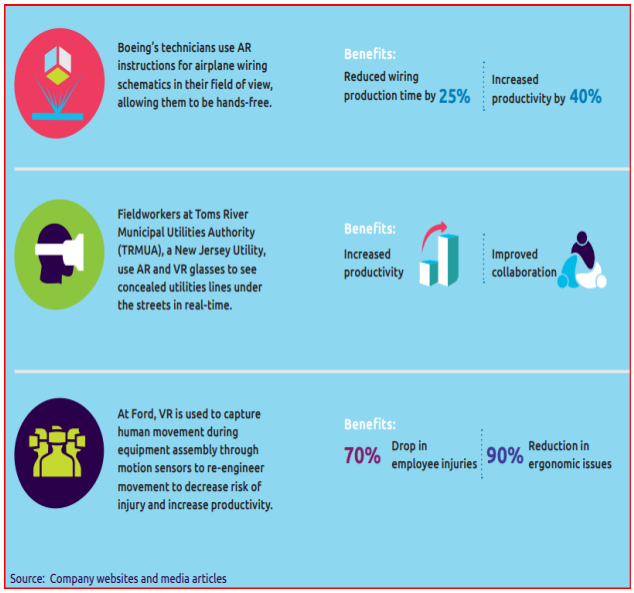

Fig.9: The figure for increased productivity and benefits of AR/VR devices in the manufacturing field.

C. Revenue of VR Worldwide

VR industry is biggest domain in this industry. Data shows VR industry expected to increase its worth from 2.6 Billion in 2018 to 5.7 Billions in 2023.

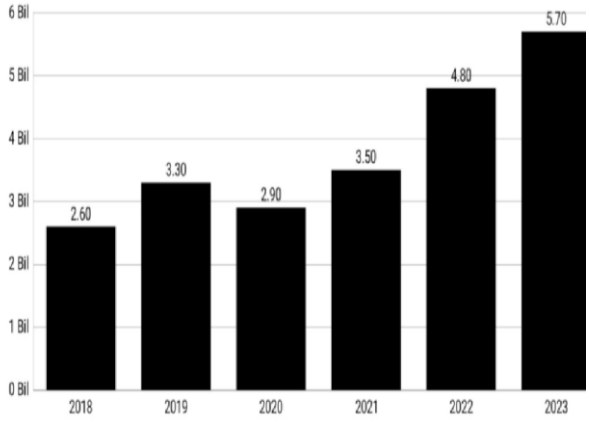

Fig. 10: Revenue generated by VR

VIII. MOBILE AR

This industry is supposed to increase from 0.8 Billion in 2018 to 2.7 Billions in 2023. Many big tech giants have shown interest in this industry and There are major players in mobile AR platform it seems obvious by the looks of growth of ARKit, ARCore these all have seen growth then it industry is obvious it will generate more revenue data shows Mobile AR expected to increase its worth from 1.6 Billion in 2018 to 2.9 Billions in 2023.

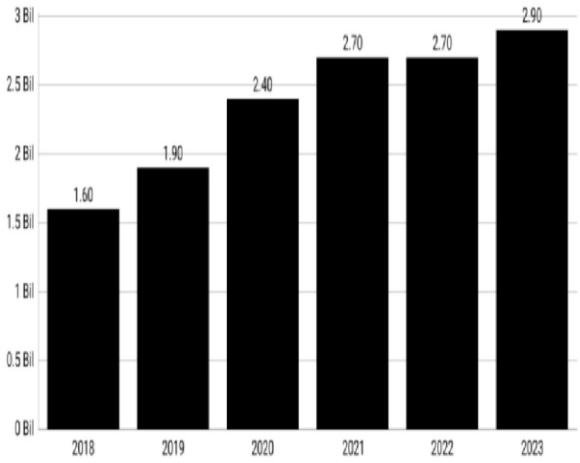

Fig.12: Revenue generated by Mobile AR

IX. TOTAL REVENUE EXPECTED TO GENERATE BY AR/VR

It is evident that this industry only going to grow more and it's expected to increase its revenue from 5.0 Billions in 2018 to 11.3 Billions in 2023.

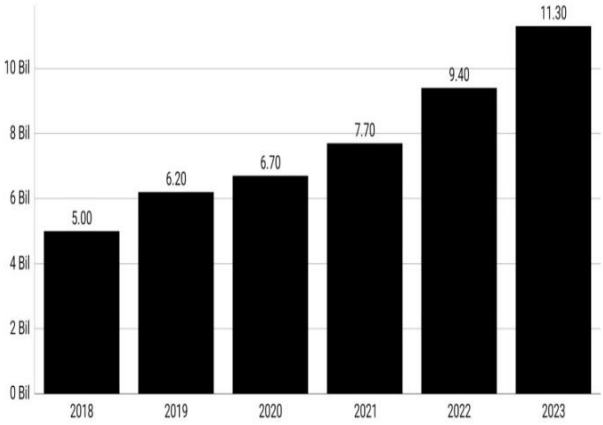

Fig. 13: Total Revenue generated

➢ *Future of AR/VR industry*

AR/VR industry is going to become big in upcoming years. It is also expanding in different areas of industry; it is expected that it will be used in almost every domain by 2025. Here is the expected revenue by this industry by 2025. This graph shows the involvement of AR/VR in every domain of industry.

ISSN No:-2456-2165

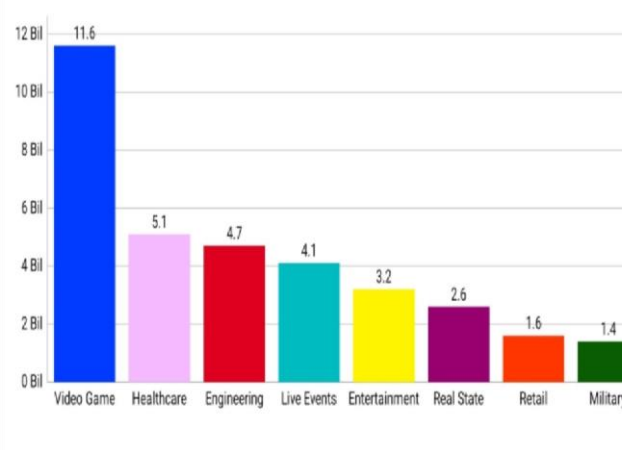

Fig. 14: Expected revenue by this industry by 2025

X. RESULTS

- As we have discussed about the ARKit from Apple and ARCore from Google are working on the mobile platform usability of these technologies the growth of the capable device is also evident as in 2017 the total platform devices which supports these technologies was 477 Millions and in 2019 the figure was 1.05 Billions devices which shows the growth of around 130% in 2 years which is huge.
- Unit Shipments of Virtual Reality Devices by the biggest of Companies around the world between 2017-2019 shows that the totals number of shares grown by in 2017 it sold 3.7 Million devices to in 2019 it sold 6.0 Million devices it recorded 62.16% growth in just 2 years.
- We have the Unit Shipments growth of these devices it also helps generating more money by selling these devices. A study predicts the revenue generated by selling these devices in 2018 was 5.0 Billions US Dollars and is expected to generate 11.3 Billions US Dollars by 2023, which shows 126% growth in 6 years.

XI. CONCLUSION

As we can observe from our research about the AR and VR industry, It is evident that in the future this industry is only going to grow more with this amount of money is being spent by the biggest of Companies around the world. Microsoft, Boeing, Ford, Apple, Google, Facebook, Sony, HTC and all tech giants are in head-to-head battle in this industry. In the end of the day it is only consumers who are going to get benefited by this as the price would be competitive and will get the best value for money product. As the research suggests, we can hope we all be having some AR, VR products in day-to-day life by 2025, and it shows how important and productive this industry is going to be for the humans in upcoming time.

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