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TOTAL IMMERSION IN
A REAL WORLD INCREASINGLY

VIRTUAL REALITY

SERIE INNOVATION TRENDS

01

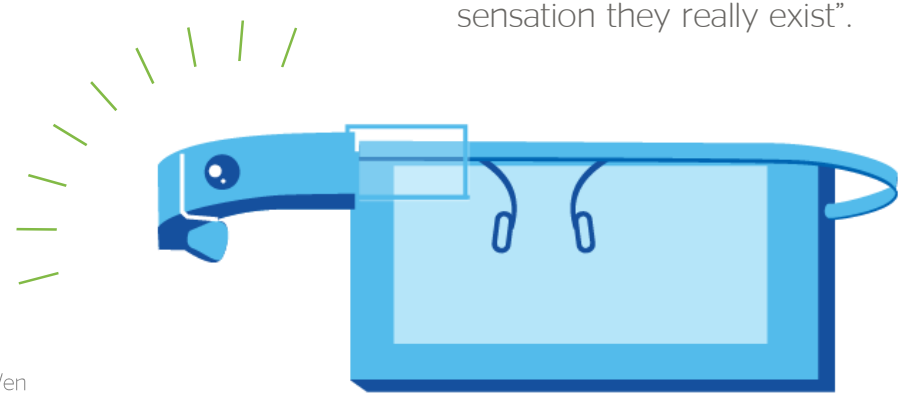
Virtual reality, or how science-fiction dreams are coming true

Major companies are now genuinely committing to this technology and have already set out to bring about what was –until a short while ago– no more than science.

February 2015. An Australian, Jason Larke, experiences the birth of his son "live". He is 4,000 kilometers away from his baby. In Chinchilla, a small town in Queensland –and wearing **Samsung's Gear VR glasses**– the engineer virtually accompanies his wife during childbirth in a hospital room in Perth.

A "miracle" according to the American newspaper The Washington Post.
For experts this "miracle" is another example of what can be achieved with virtual reality.

The dictionary of the Spanish Royal Academy defines virtual reality as "the representation of scenes or images of objects produced by a computerized system which gives the sensation they really exist".



The founder of Facebook, **Mark Zuckerberg**, **who in March 2014 shelled out 2 billion dollars for the Oculus VR glasses**, defined this technology as follows:

"The incredible thing about the technology is that you feel like you're actually present in another place with other people.. Imagine enjoying a court side seat at a game, studying in a classroom of students and teachers all over the world or consulting with a doctor face-to-face –just by putting on goggles in your home". Over half a century separates this discription by multimillionaire Zuckerberg from that of **Ivan Shutterland**, considered the father of the infograph and forerunner of virtual reality (1938, Hasting-Nebraska):

"A display connected to a digital computer gives us a chance to gain familiarity with concepts not realizable in the physical world. It is a looking glass into a mathematical wonderland. The challenge is to make that world look real, act real, sound real, feel real".

This is how Sutherland described it in his article *The Ultimate Display* in the 1960s.

He created the first program of interactive graphics, the first non-procedural programming language and the first software system oriented to objects. In 1965 – together with one of his Harvard students, Robert Sproull– he created **the first DMD interactive visualization headsets**, the Head Mounted Display, aimed at pilot training.

In the same line, the grandfather of virtual reality ( ), **Thomas Furness**, in the 1970s developed **the first aircraft cabin simulator for pilot training**, known as Visually-Coupled Airborne Systems Simulator (VCASS). This is a cabin that provided 3-D information to pilots who could control the device by means of a virtual representation of the earth with a 120° horizontal field of vision.

The advances continue apace and in **1995 Nintendo** presented the first virtual reality console called **Virtual Boy with 3D graphics**. It was a fiasco; the devices weighed far too much and the first 3-D graphics did not succeed in convincing users they were in a parallel reality. Virtual Boy was too big, and viewing it for several minutes produced headaches.

Over 20 years have elapsed before major companies have once again started believing in virtual reality (f). A study by Superdata estimates that by **2016 over 10 million users will have a vritual reality headset in** their homes. The revolution has come thanks to Oculus Rift, Project Morpheus, Samsung Gear VR and HTC Vive. And it looks like it's here to stay (in).

Software and hardware join forces to provide a technology that offers a 360° angle of vision when you turn your head and screens that no longer produce a sensation of giddiness and headache when following moving objects. **"One day this type of virtual reality will become a part of daily life for millions of people**. Virtual reality was once the dream of science fiction; but the internet was also once a dream, and so were computers and smartphones. The future is coming". These were Zuckerberg's words after purchasing Oculus VR. This future seems to have already arrived.

THE DIFFERENT VIRTUAL REALITIES

Desktop virtual reality systems	The user sees the image in the first person. A 2-D or 3-D image is shown on a computer screen instead of projecting to a HMD. The user travels in any direction within the three-dimensional world displayed on a monitor, headsets, glasses or screen (videogames).
Second person VR	"Seeing is believing". The user sees him or herself within the actual scene. He is a "visible" component of the virtual world because he sees the projection of his image in a setting or environment. This system involves real-time perception and responses to the actions of humans who are not wearing headsets, gloves, HMDs, glasses or any other type of interface.
Telepresence	Telepresence systems form the group of virtual reality applications. These are cameras, tactile and feedback devices linked to remotely controlled elements that enable the manipulation of robots or devices located at a distance while they are experienced in a virtual manner (Telemedicine, Telerobotics).
Virtual Reality Immersion Systems	They submerge the user in the virtual world using CAVE-type visual systems with position and movement sensors. The user in the virtual world responds to head movements similarly to what occurs in the real world. Immersion worlds exist in three dimensions, and the sensation of depth, perspective and dimension is enabled by sending slightly different images to each eye.

02

Virtual reality revolutionizes the world of business

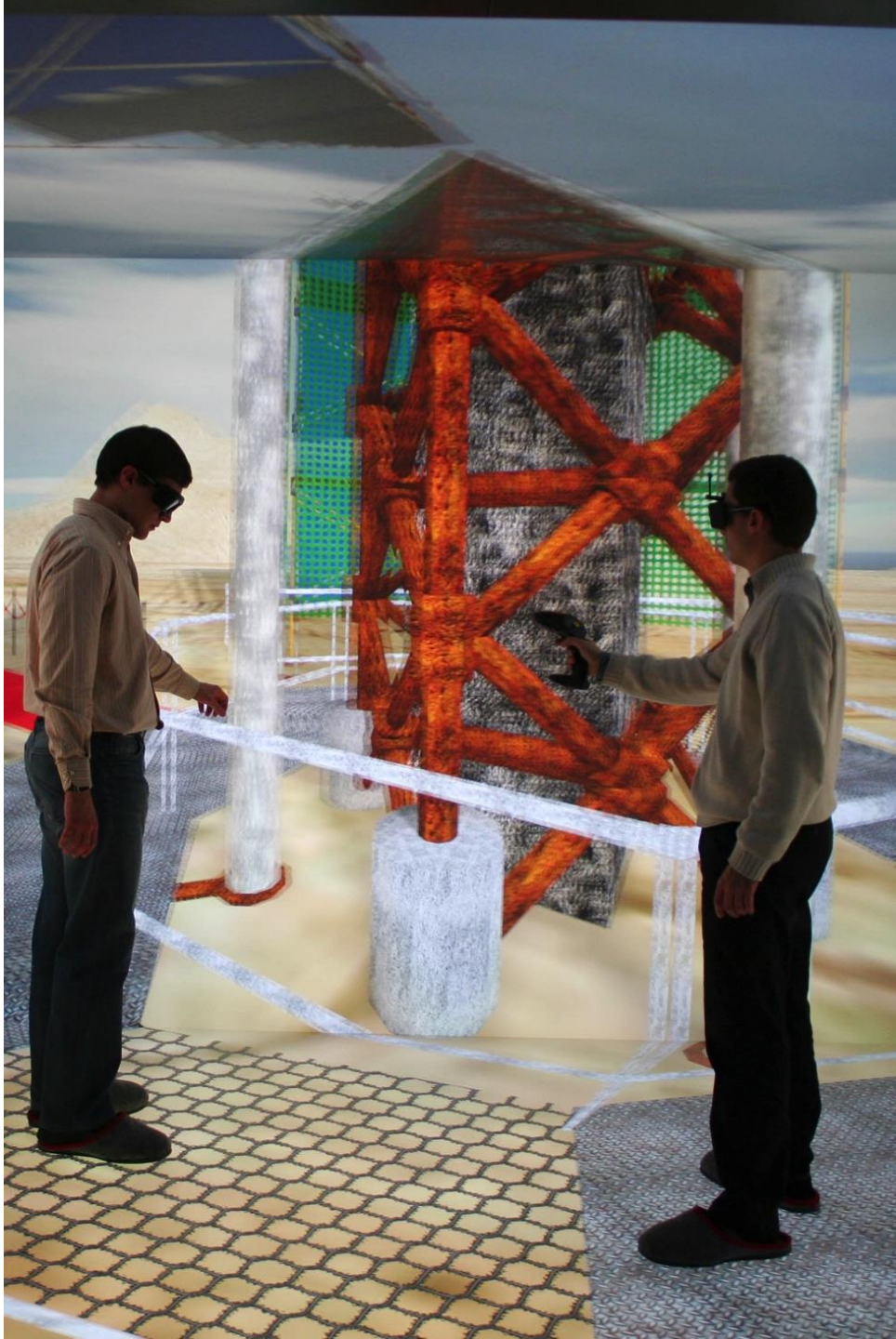
Combating phobias, experiencing the war in Syria or testing and experimenting projects before launch. Virtual reality is leaving *gaming* behind and helping to make decisions in worlds that do not exist or are very far away ( ).

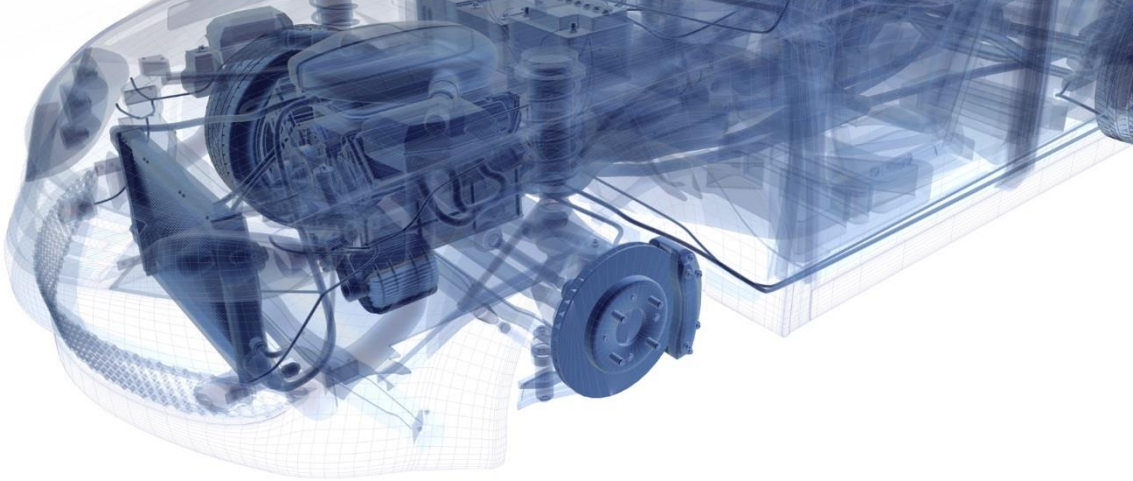
Experiencing the war in Syria from thousands of miles away, riding on a city's future subway or relaxing surrounded by fish in a gigantic aquarium.

Virtual reality is progressing in leaps and bounds. The UN has been one of the latest organizations to use virtual reality with the documentary Clouds Over Sidra

by Chris Milk that takes the viewer to the Za'atari refugee camp in Jordan where more than 80,000 people live. This is a harrowing journey led by and under the gaze of Sidra, a 12-year-old Syrian girl. Rawness in 360 degrees **to raise people's awareness** even though they are thousands of miles away from the conflict.

"You don't have to do things that there's no need to do," says Cristian Pomar, manager of the Virtual Reality unit at the company T-Systems to explain the return to power of virtual reality. **"The world of virtual reality came to a standstill**, things were represented and nothing more, there was no purpose, and the visualization became meaningless. If it's not going to be of any use, don't waste time," he says from the center of Integral Automation (CeDInt), part of the Polytechnic University of Madrid. He is surrounded by several engineers who are covered by their computer screens and are working on projects so that experiences can be viewed and **simulated and problems from real life can be anticipated** ( ).





Pomar explains some of the projects T-Systems has launched on virtual reality and augmented reality. The latter not only simulates a real scene but adds information of interest to the surrounding environment. With a simple pair of glasses we can travel on a city's subway system. "The virtual representation of a subway, for example, allows those who are not experts but are going to make the decision on whether to finance the project see the end result. The individual experiences a sense of belonging to the actual scene he or she is viewing and **gets a very real idea of the project".**

Virtual reality (in) has also achieved **costs savings** in the automotive industry in making a new prototype. "Money and a lot of time," Pomar stresses, who explains how virtual prototypes **make it possible to solve problems before the product hits the market** and there is no way back.

A simple example suffices to explain: a video shows how a worker wearing glasses tries to find the fuses in a simulated car. We see how he makes certain impossible and uncomfortable movements with his body in the vacuum to manage to find them. Very useful information: the engineer has painted where the fuses should be in an impossible place.

Thanks to virtual reality that image is not going to be real and it will save manufacturers from receiving complaints and getting headaches when the car is on the market.

"It allows humans to interact with things. It places people in a world where projects that forget the human dimension are often set in motion. **It aids decision making in a world that does not yet exist** and saves a fortune," Pomar explains.

In medicine (reconstructing faces of individuals using skeletal remains) or in cultural heritage projects (rebuilding historical heritage to make it possible to go back in time and walk around now ruined cities) are other examples of the possibilities of virtual reality. Pomar also points to the possibility of curing phobias through virtual reality. To do this we enter the CAVE (Cave Automatic Virtual Environment) of the CeDInt. We are in a cube, surrounded by huge screens with stereo projection and a 3D surround viewing system. **The illusion of immersivity is very high**, we fly thousands of meters and look at the vacuum. This is a good way to find out if you suffer from vertigo.

We leave Madrid behind and return to Syria for an experience of extreme journalism. The company Emblematic Group rebuilds the impact of a grenade in a neighborhood of Aleppo. The New York Times is also committed to projects that give readers the opportunity to experience situations besides just reading about them. At the moment the obstacle is how quickly the reader can be provided with the hardware. These projects are in their infancy even though they have multimillion-dollar investments and a blind faith as demonstrated by Facebook's acquisition of Oculus. The next frontier of Virtual Reality is coming.

03

The race to lead virtual reality

Whenever we talk about virtual reality nowadays, it is inevitable that devices like Oculus Rift, Project Morpheus, Samsung Gear VR or HTC Vive are mentioned; therefore, this analysis states the advances that each contributes to developing this technology trend ( ).

Oculus Rift

Is virtual reality returning again like in the early '90s? ¿Is it a fad or a real commitment? Dead and buried several times for its technological and commercial fiascos, **virtual reality has been resurrected, mainly, through** Oculus Ritf. And it's doing it in a big way.

Facebook's $2-billion acquisition of the virtual reality company Oculus VR in 2014 and the enthusiasm for this multi-million dollar transaction made by **Mark Zuckerberg** put virtual reality back in the sights of all technology companies.

Before the purchase by Facebook, talking about Oculus Rift meant talking about **Palmer Luckey**. Dubbed the little genius of virtual reality, he was 2 years old in 1995 when Nintendo launched Virtual Boy. The Japanese company failed with its headset. A fiasco that Luckey did not experience who, at 16 years old, managed to create a crude but functional prototype of what would be Oculus Rift.

In 2014, at 21 years old, this Californian, who collects virtual headsets, sold an improved design of Oculus Rift to Facebook. Luckey always knew that, even though he was fascinated by the concept of virtual reality, the real experience offered by all devices so far have not reached the ideal of total immersion promised by science fiction (f).

One of the great achievements of Oculus has been **overcoming initial skepticism and attracting big investors**, who quickly pulled out their checkbooks after testing the device.

“I was speechless for the 10 minutes that the demonstration lasted. You have to see and experience it or you don't understand how amazing it is," said Santo Politi, a partner at investment firm Spark Capital.

Experts from the New York Times also swept their misgivings to one side. Proof of this is the article "Virtual reality fails its way to success", that reviews the evolution of virtual reality devices. Despite the headline, Oculus Rift does not come out unfavorably. Its main asset, beyond its dazzling features or the huge investment by Facebook, is its quality, highlights the American Newspaper. "It is non-nauseating", they pointed out. Unlike other devices, "the Oculus Rift doesn’t make you vomit”.

Nintendo Virtual Boy

OCULUS RIFT FEATURES

1. It has progressed the virtual world
It has managed to recapture interest in virtual reality.

2. It breaks the view of antisocial technology
It allows sharing unique and different experiences with others. It no longer isolates the person from the reality surrounding him or her.

3. Multiple possibilities
Not only in the field of video games. Its therapeutic use stands out: virtual reality makes it possible to treat diseases and phobias. For example, for a person who is afraid of heights, experience in a virtual world of crossing a bridge between two mountains can help him or her overcome this fear.

4. It transcends virtual limits
The Norwegian army is using Oculus Rift to handle battle tanks. The device has the advantage of being able to follow the driver's head movements, which makes the cameras installed around the mobile give him a view from every angle.

Project Morpheus

The journal Techtimes published that its arrival is expected for the first half of 2016 but gamers worldwide are counting the days to get their hands on the upcoming Sony Project Morpheus. This is a virtual reality headset that promises to bring the next generation console **PlayStation 4 to a new gaming level.**

Shuhei Yoshida, President of SCE Worldwide Studios, described the new prototype using these words:
"We are one step closer to realizing our vision for making amazing virtual reality experiences, and ultimately to deliver a real sense of presence to players, as if they are within the game's scenario".

The Sony prototype **enhances the viewing experience** and allows features critical to get the feel of presence to be followed with great accuracy.

PROJECT MORPHEUS FEATURES

1. Virtual reality experience. 120Hz refresh rate (and 120 frames per second for games) and an input lag (latency in using the headset) of less than 18ms.

2. Visibility improvements lag (latency in using the headset) of less than 18ms. The screen has improved thanks to an OLED panel and a resolution of 1920x1080 that helps eliminate motion blur and persistence that the original Project Morpheus LCD panels had.

3. Screen
It has a 5.7-inch screen that offers the player a 100-degree field of vision. Furthermore, 9 LED trackers are included to support 360-degree head tracking.

Samsung Gear VR

Samsung has joined Oculus to land in the virtual reality field. It has therefore developed Gear VR glasses that are already on the market and **can only be used with the Samsung Galaxy Note 4.** They have been devised as **a mobile phone accessory** and their measurements are 90-mm high by 198-mm wide and 116-mm thick.

They have an area to connect the Samsung Galaxy Note 4, which makes its 5.7-inch high-resolution Quad HD Super AMOLED screen available to users.

It offers **a complete immersive experience through its 96-degree viewing angle**. The phone connects to the glasses via a USB port for these to boot. The virtual reality glasses offer 3D content where images are displayed in stereocopy for viewing with a light effect of depth.

Following this model, the Korean giant is still working in the field of virtual reality. Just two months ago it presented **the new Samsung Gear VR Innovator Edition for the Samsung Galaxy S6 and S6 Edge,** lighter than the previous model and can be recharged via USB while being worn.

HTC Vive

The Taiwanese giant HTC also does not want to stay out of the fight and **is strongly committed to leading the virtual race** (in). Therefore it has joined up with Steam, Valme provider, the most important distribution platform for PC software.

The company notes that HTC Vive will be available at the end of the year. Its system will be equipped with a base station that makes it possible to **track users' movement in 3D space.** The SteamVR base marks the user's position through the scenario – physical spaces of 4.5 by 4.5 meters.

The giant also announces a **specific driver**, through a set of gloves, which **allows the user to handle virtual objects**.

To avoid the dreaded dizziness, it includes about 70 sensors with a 90 Hz refresh rate.

04 Total immersion in virtual reality

Virtual reality is also defined as "multimedia immersion" for its capacity to recreate sensory experiences such as taste, smell, sound or touch. In the U.S. they are already creating contents that cause this "total immersion" applied to journalism (🐦).

In October 2014, Des Moines Register, the local newspaper in Des Moines, a rural town in Iowa, launched an interactive project called Harvest of Change, five articles whose aim was to show the forces that are driving changes in this state: culture, immigration, technology, globalization and age. In addition to the usual text and images, each article also includes the point of view of a farming family, recorded with 3D lenses and which enables **readers with an Oculus Rift headset to experience first hand the feelings in the farm**, how these five factors affect everyday life, and make decisions about the farm in the first person.

Since it is unlikely that any of the 420,000 readers of the Des Moines Register has one of the 20,000 Oculus Rift headsets distributed so far, Gannett, the developer of the project and owner of the newspaper, also developed a computer simulator. It is one of the first projects undertaken by Gannet, the owner of USA Today, which specializes in the development of **immersive contents that enable users to live the stories in the first person thanks to virtual reality.**

"Virtual reality (VR), which is often defined as 'multimedia immersion', is a technologically-simulated (f) environment that can represent the physical presence in a real or imaginary environment. VR can recreate virtual sensory experiences such as taste, smell, sound or touch". This is how Robert Hernández, professor of the Annenberg School for Communication and Journalism of the University of California, defines virtual reality.

We have heard about virtual reality since the 1980s and 1990s, when there were attempts to carry out some projects associated with the early computers, with little success. However, it is now when **this technological experience has become a present and future trend.** What has happened?

TWO VERY IMPORTANT ASPECTS:

Software and hardware:
Technology today is better than ever both to produce and to consume relevant content in 3D, thanks to the new headsets.

Content:
Although the price for generating immersive content is still high, there are many examples of generation of Virtual Reality content in areas such as gaming or journalism.

Technology

For most of the market, virtual reality returned from fiction and installed itself in the real world in 2014 when it became known that Facebook had paid 2 billion dollars for **Oculus Rift**, a virtual reality headset. **Cory Ondrejka**, co-founder of Second Life and current director of the project in the social network, pointed out in an interview with the digital publication *The Verge:*

"Today we capture our spaces in different ways. I can send you a text message, but if I send you a picture, the experience is more powerful. And if it's a video, you'll have a better idea of where I am. The next step is to capture that moment in 360º, the depth of the experience with which you are going to live what I'm feeling is absolutely deeper. This is what we're working on".

The DK2 for Oculus developers is available at an average price of $350 and although the commercial version is not yet available, nothing suggests that the price will be any lower.

At the opposite end, Google has presented the low-cost version, **Google Cardboard**, a cardboard headset that enables the use of Android phones (not iPhone) to enjoy immersive content and is available for $20.

Between these two extremes there is a wide range of headsets with different specifications, notably Sony's **Morpheus Project**, an immersive headset that goes one step beyond the PlayStation and has not yet been launched. Samsung Gear VR or HTC Vive are other options of headsets available on the market.

Content

In 2014, when the technology began to show clear signs that it was mature enough to reach the public, some companies started developing content suitable for being consumed in 3D, a generation of content that is still too costly.

Emblematic Group is one of the companies that has more rapidly excelled in the **development of content for "total immersion" applied to journalism.** The goal of most of the experiences developed by Nonny de la Peña and her team is for users to live an event in the first person.

The company digitally reconstructs the scenarios of an extreme situation and makes the user relive the entire event in the first person through a virtual reality headset. De la Peña has used this immersive content in denunciation projects such as Hunger in Los Angeles, Use of Force and Project Siria (Victoria & Albert Museum).

Along the same line, the startup **Empathetic Media** lets the user relive in the first person the events that took place in Ferguson, with a project developed for Fusion that can be viewed on a computer, but "lived" in the first person with mobile viewing in a Google Cardboard.

Gannett Media has also established itself in the generation of virtual reality content. Beyond the experience with the Des Moines Register, it has generated an immersive experience with Cincinatti's baseball team, the Cincinatti Reds, to enjoy the matches with a 360º view (in).

Sports is another area where immersive content is being generated. Widerun defines itself as Virtual Reality Fitness, and its proposition is for users to pedal on an exercise bike while their headsets make them feel they are traveling around the most incredible places.

05/INFOGRAPHIC

The future of virtual reality

After years of intensive research, virtual reality is booming. Today, virtual reality is embodied in multiple systems that enable users to artificially experience all kinds of feelings when they perform an activity.

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Chronology

1980

1980 The first virtual interactive map.

1981 Thomas Furnes develops the "Virtual Cockpit".

1985 Development of the first practical system of stereo viewfinders.

2000

2003 Creation of the famous 3D virtual world "Second life".

2004 Google buys Earth-view.

2005 LanzLaunch of Nintendo Wii.

1970

1972 General Electric develops the first computerized flight simulator.

1977 First documented Sayre Gloves.

1979 The military starts experimenting with simulation headsets.

1990

1990 Surge Sense8 is founded by Pat Gelband.

1991 W. Industries develops Virtuality, with headsets and viewing glasses.

1995 Nintendo releases "Virtual Boy".

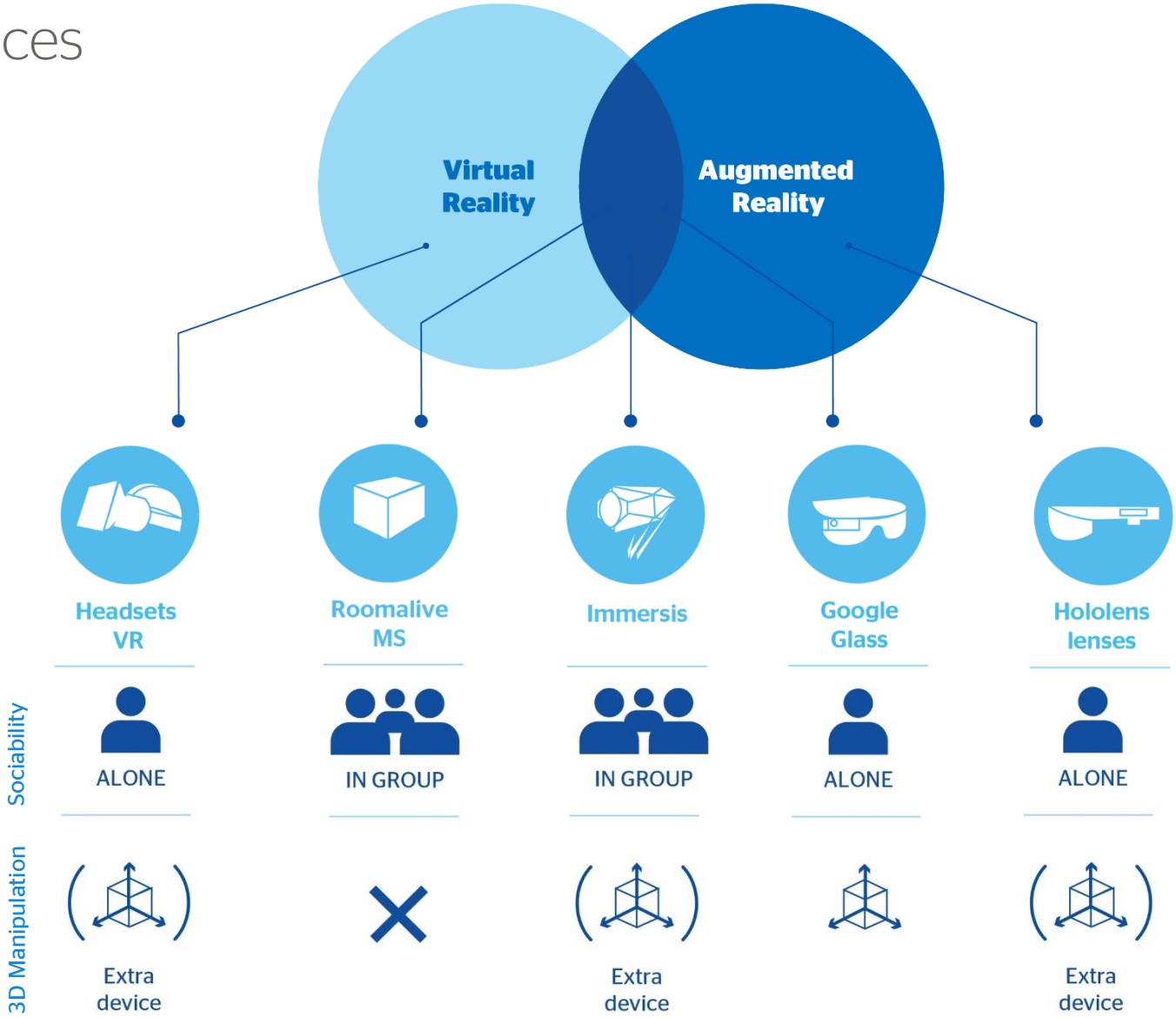
1997 Development of a device that makes it possible to experiment real motion in a cabina.

2010

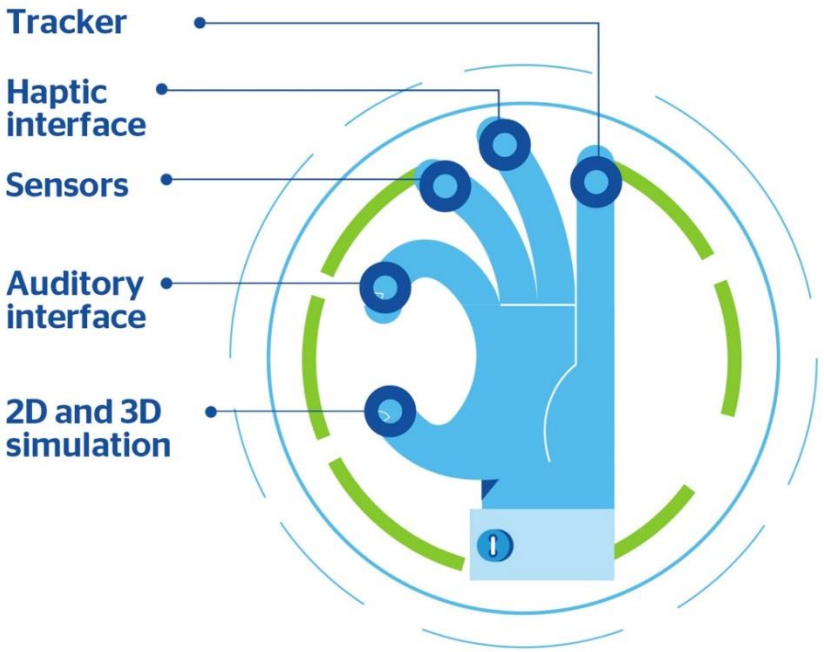
2012 Oculus Rift, a virtual reality device for both game-oriented and professional use.

2014 Sony Project Morpheus virtual reality headset.

Devices


Virtual Reality
Augmented Reality
Headsets VR
Roomalive MS
Immersis
Google Glass
Hololens lenses
Sociability
ALONE
IN GROUP
IN GROUP
ALONE
ALONE
3D Manipulation
Extra device
Extra device
Extra device

VR Factors



In 2016
10,000,000
PEOPLE WILL BE USE
VR headsets

In 2018
5,2 bilions
DOLARSWILL BE SPENT ON
VR consumption

Industrial applications

SERIE INNOVATION TRENDS

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