



# MARKET PULSE REPORT AR & VR

**INDIA**

**Discover Key Trends &  
Insights on Disruptive  
Technology Sectors and  
Innovations**

## About GrowthEnabler

GrowthEnabler delivers data & intelligence on disruptive technologies & digital innovations from the startup economy, to global brands, business leaders, startups and entrepreneurs, to gain insights, get connected and grow faster through the GrowthEnabler Personalised Intelligence Interface (Pii) platform.

Write to us at [info@growthenabler.com](mailto:info@growthenabler.com)

## Research Methodology

GrowthEnabler uses its proprietary research methodologies to analyse the business impact of disruptive technologies and digital innovations on the future growth of large corporations and their industries. GrowthEnabler applies its deep-data analysis tools, scoring logic and algorithms to create intelligence that enables senior executives to make informed business growth decisions. The GrowthEnabler Personalised Intelligence Interface (Pii) is an interactive platform that provides corporates the ability to Find, Select, Connect and Manage global Startups based on their business priorities and problems. Refer to the GrowthEnabler Research Methodology Section

## Disclaimer

This document is the result of research performed by GrowthEnabler. GrowthEnabler's methodologies provide for objective fact-based research, secondary cited research and represent the best analysis available at the time of publication. Unless otherwise noted, the entire contents of this publication are copyrighted by GrowthEnabler and may not be reproduced, distributed, archived, or transmitted in any form or by any means without prior written consent by GrowthEnabler.

*This report intends to inform key decision makers, investors and industry influencers on how disruptive technologies and digital innovations will impact the future of their business, industry and sector of interest.*

# CONTENTS

---

Executive Summary	4
Market Overview	7
Augmented Reality	10
Virtual Reality	12
AR & VR ecosystem in Bangalore:	14
Market opportunities for AR:	16
Market opportunities for VR:	18
AR & VR Challenges	22
AR & VR Growth Factors	24
AR & VR Investment Trends	25
Recommendations	27
Top AR & VR startups in India	28
GrowthEnabler Research Methodology	32

# EXECUTIVE SUMMARY

## THE AUGMENTED REALITY & VIRTUAL REALITY (AR & VR) MARKET: INDIA

The India AR & VR market is expected to grow at a CAGR of 76% over the next six years, (2017 to 2022) and will be driven by a surge in demand from business and consumer sectors. The defence, education and automotive verticals will see an increase in adoption in AR & VR. And on the consumer front, gaming and entertainment will be a major demand and growth creator. This report will provide an objective lens into the practical use-cases of AR & VR across key industry verticals, highlighting the opportunities and risks of this technology. Moreover, the report provides an in-depth analysis on the emerging and fast-growing tech innovators and Startups in AR & VR.

### WHY NOW?

At the Worldwide Developers Conference, Apple revealed ARKit, a software development kit that enables developers to tap into the camera and processing power of an iPhone to perform function of Augmented Reality technology. With the release of iOS 11, Apple turned up the heat, becoming one of the leading AR development platforms in the world. But what does it mean to the developer/consumer world? Turns out, there are many creative applications for AR - measuring objects just by pointing a mobile, virtual trial of a table in the kitchen, immersive training and skills development in manufacturing houses, even reduce wait times at airports during check-ins!

On the other hand, Virtual Reality is enabling a transformation of storytelling by media & entertainment firms apart from finding a multitude of use-cases across gaming, healthcare, and TV broadcast industries. Virtual Reality can also redefine the medium of movies and the way we interact with live sporting events. With the continuing development of VR technology and all the hardware aspects related, it will turn out to be a very attractive investment for the entertainment industry. v

## KEY FINDINGS

- Despite industry and consumer adoption of AR and VR, AR has potential to grow faster over the next 5 years.
- The top industries adopting AR & VR technologies include, education, healthcare, retail, gaming, real estate and automotive
- Edutainment kits for kids' learning, home decor applications for a virtual showcase of furniture and interior designs, data visualization of machinery in manufacturing plants for skill training and machine analysis, gesture based interaction with virtual elements (integrating haptic technology) are few of the rising use-cases of Augmented Reality in India.
- Inorganic growth through acquisitions is the preferred method of gaining competitive advantage. Tech giants Google and Apple have been active in the AR space; Google acquired Eyefluence, Quest Visual, Apple acquired Meta.io. Prior to being acquired by Facebook, Oculus acquired NimbleVR, SurrealVision and The Eye Tribe. Intel has acquired VR companies including Movidius & Voke.
- 900+ VR companies are established across the globe, and over 300 companies have raised funds in the last 5 years. Display device manufacturing companies, industry application Startups and content creation studios have received the most investment.
- 600+ AR companies are established globally, with more than 120 companies receiving investment in the last 5 years. Display medium manufacturers and industry applications based Startups have received the highest investment.
- Hardware limitations for processing AR & VR graphics, incompatible designs of existing mobile camera lens for depth sensing (a feature required for content capture for AR & VR compatibility), high cost of AR & VR devices and the risk factor associated with implementing these technologies, i.e. no defined ROI for enterprises are amongst the key factors hindering the exponential growth of AR and VR.
- Emerging business models in Virtual Reality include VR arcades for outdoor consumer entertainment, lifestyle coaching applications, social networking, education content delivery platform and real-estate visualization opportunities.

Touted to be the next big computing platform, the AR & VR market is at an inflection point globally and is likely to witness a strong growth over the forecast period. This is due in part to the significant investments being made in this technology by leading tier 1 vendors such as Samsung, Sony, Apple and Google and also an equal measure of participation being provided by a growing list of Startups in this segment that are investing in platforms, tools and services. As per the GrowthEnabler personalized intelligence platform there are close to 1500 Startups within the AR & VR segment globally. Within these, the United States accounting for nearly 45% of Startups followed by the United Kingdom, Israel and Canada.



## MARKET OVERVIEW

Contrary to popular belief AR & VR is not new and was conceptualized in the 1930s with the Link Trainer, a commercial flight simulator introduced by the US Army. The years following saw many new product launches that focused on niche applications and use cases. The first VR device for gaming was a commercial success and was introduced by Nintendo in 1990's. What followed over the next decade was innovation by a limited number of companies in the form of Virtual gaming machines, motion sensing gaming devices and VR viewers that continued to fuel user interest in this technology.

In May 2014, Facebook paid \$2 bn to acquire Oculus, a hardware technology development company that focuses on Virtual Reality head mounted devices. The ripple effect led to a surge in the number of Startups that have sprung up in the Virtual Reality space across the globe. Since that deal was announced, venture capital deals and total dollars invested in VR and AR saw a three-fold jump. The fourth quarter of 2014 witnessed a \$542 mn funding of Magic Leap, a lightweight wearable device manufacturer providing augmented reality experience to a collective audience. These acquisitions validated the future of AR and VR, instilling confidence in the market and giving reassurance to hopeful developers and investors. Companies such as Sony surfed the euphoria of this emerging technology, releasing their own headset PlayStation VR in 2016.

Early adopters focussed on customer experience, creating global market hype, however the high cost of VR devices, sub optimal user experience coupled with low processing power of many AR and VR devices contributed to a limited growth. In summary, the market is nascent. Large corporations are at the early stages of AR & VR adoption, with many at the initial stage of proof of concept and ROI justification. While opportunities seem promising with mushrooming use cases, the precise value of ROI for businesses is still being determined and questions remain in terms of business models, partnerships, pricing and content

### AR & VR LANDSCAPE:

The enterprise segment will be a strong proponent of the AR & VR market, driven by use cases that focus on process efficiency, customer engagement, and vertical specific solutions, such as remote expertise in the case of engineering services companies or architectural renderings for construction companies. With the emergence of many more AR & VR use cases, organisations must focus on identifying the most relevant usage scenarios, having the right integrations and arriving at a solution that delivers on a promised business solution.

### DEFINITIONS

**Augmented Reality (AR)** superimposes computer generated images and contextual data on a real world environment or scene, viewed via a display medium or device, to create a new and interactive reality view. Augmentation techniques are performed in real-time and in a semantic context with environmental elements, such as overlaying supplemental information like scores over a live video feed or a sporting event.

**Virtual Reality (VR)** is the creation of a virtual world where users can interact and engage with one another using computer-generated simulation of a three-dimensional environment (3D) through head mounted displays and multiple sensors embedded in wearable objects like gloves. Virtual Reality changes reality by placing the user in a 360-degree imaginary world, created using interactive software and hardware, and experienced or controlled by movement of the body, entirely eliminating the real-world.

Mike Rothenberg, owner of the investor firm Rothenberg Ventures who has done 30+ investments in Augmented Reality & Virtual Reality has claimed:

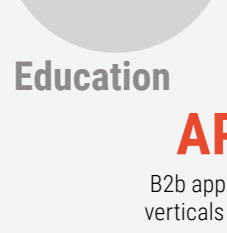
*“The number of companies that we saw before late 2014 was very limited. If Oculus is acquired and now you know it has the backing of Facebook and it's definitely going to come to market, that definitely de-risks [potential investments]. You want to know the ecosystem is happening”*



Real Estate



Healthcare



Education

### INDUSTRY APPLICATIONS

B2b application of Virtual Reality in industry verticals such as Education, Healthcare, Real Estate among others



Advertising



Entertainment



Retail



Video Stitching



Depth Sensors



Sound recording



Cameras



Audio Processing

## THE VIRTUAL REALITY MARKET

Companies which are developing cameras and other peripheral devices to capture content compatible for virtual reality devices

### CONTENT CAPTURE

PC/Console



Cardboard



### DISPLAY HARDWARE

Comprises of segments like integrated head mounted displays and wireless mobile VR headsets



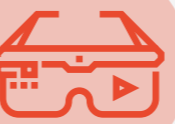
Head mounted hardware



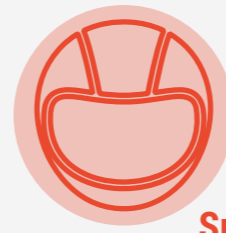
Developer Tools



Modelling Tools



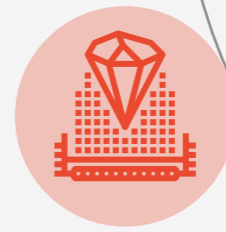
Smart Glasses



Smart Helmets

### DISPLAY MEDIUM

Developers of AR display devices such as smart glasses, smart helmets and projection based heads-up displays



Projection-based Heads Up Displays

## THE AUGMENTED REALITY MARKET

### DEVELOPER TOOLS

Just like in the case of virtual reality, this segment comprises of business models like depth sensors and content creation tools

Medical



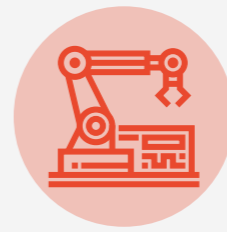
### INDUSTRY APPLICATIONS

AR finds applications in multiple segments such as Healthcare, Heavy Machinery Industries, Education, Retail, Real Estate, Entertainment & Gaming

Education



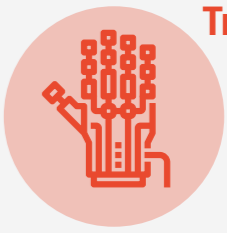
Heavy Machine Industries



Gaming



Hand Gesture Tracking



Eye Tracking Software



### AR INTERACTIVITY ENABLERS

Comprises of segments such as hand gesture tracking and eye tracking software developing companies which aid in improving user experience of device consumers

# AUGMENTED REALITY

## GLOBAL OUTLOOK

As per GrowthEnabler projections the Augmented Reality (AR) market is set to be \$151 bn by 2022. Furthermore, the hardware segment is expected to witness growth at a CAGR of nearly 94% by 2022. There are three basic hardware components in AR systems: sensors, processors, and displays. Innovations in hardware are expected to induce major growth prospects for hardware equipment in the future, such as the evolution of smart contact lenses and advanced HMDs equipped with AR processors.

Increasing adoption across the e-commerce and retail space will spur global demand for augmented reality over the forecast period. AR offers retailers the opportunity to enhance the overall shopping experience by bringing to life; an image, product label or shopping window, greatly improving the degree of customer - product interaction. With the rise in consumer interest for AR devices and AR enabled smartphones, the need for compatible AR chips has led to an accelerated AR hardware development - such as the Qualcomm Snapdragon 835 for Android and expected announcements from AMD and Intel.

A geographical distribution of demand indicates that Europe is estimated to grow at a CAGR of nearly 75% over the forecast period and will be driven by an increase in investments in countries such as Germany and the UK. Within Asia Pacific, China is expected to be a significant contributor to regional growth with increasing investments in AR devices and software. Rise in the usage of smartphones is currently driving the AR market in China. Local vendors such as Renren, Tencent and Baidu have invested in the technology.

## INDIA OUTLOOK

The slow pace of adoption within the Indian market has had a ripple effect on the number of Startups in this segment and the amount of investments received by them. As per the GrowthEnabler personalised intelligence platform, there are under 100 AR Startups in total of which only 5% of them have received any form of capital investment. Constraints to the adoption of AR & VR technology in India include the high cost of specialised software which are used to produce such campaigns. Furthermore, the talent for creating AR and VR creatives is scarce in India and the limited available resources are expensive.

A few notable Startups include Smartivity Labs in Education & Training, and Whodat – Augmented Reality R&D and infrastructure development company that aids in development of AR apps across verticals like Retail, Real Estate and Gaming.

The future for Augmented Reality looks promising as a number of large corporations from multiple verticals are beginning to harness the power of AR and VR to improve the customer experience offered by them. Axis bank is using AR for its mobile application. Car manufacturer Renault used VR to showcase its new hatchback in a virtual overlay of the car's features. Tata Motors introduced its car Tiago through virtual reality. It featured a Do-It-Yourself VR headset, carried in select editions of newspapers, giving consumers a feel of the car at a basic level. And, fashion brand Maybelline created a 360 degree film for Amazon India Fashion Week.

Nonetheless, the market for AR & VR is here to stay and will be one of the important consumption models of the future. The ecosystem of smartphones, display mediums, bandwidth and platforms will come together to deliver exciting customer experiences and serve as a great medium of entertainment.

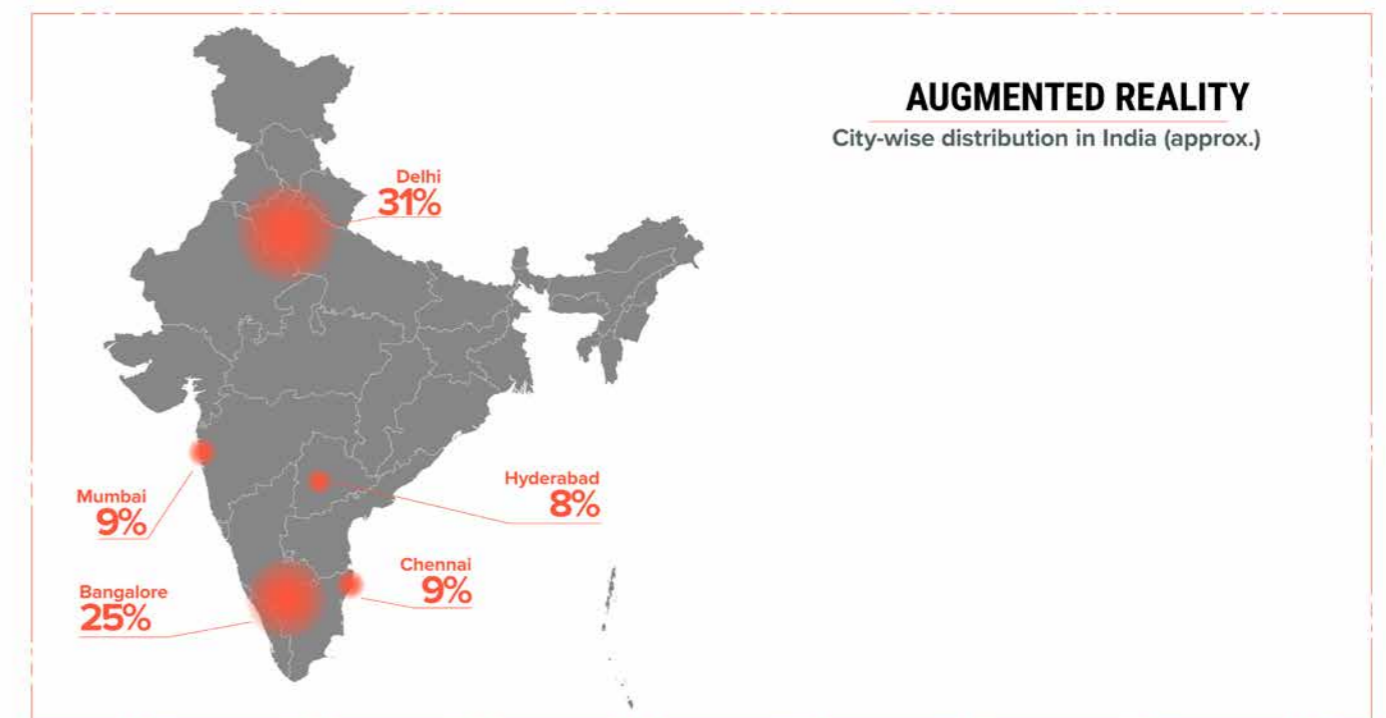
# AUGMENTED REALITY: STATE OF THE MARKET

## Technology trends

- High penetration of smartphones in the market is a major driving factor for the adoption of augmented reality technology. However, the under-developed user interface of AR enabled applications, and the low processing power of smartphones is limiting the impending adoption.
- The AR market is segmented on the basis of hardware (display medium, semiconductors, sensors) and software (mobile applications, developer platform tools). Many companies are working to enhance the quality of sensors and processors used in AR devices.
- Progress and development in optics will aid in creating systems for higher-resolution immersive experiences, enhancing the AR experience.
- Hardware development in depth-sensing cameras of high-end smartphones, e.g.. Apple iPhoneX, Samsung Galaxy line & Google Pixel, will improve and enhance AR experiences

## Market trends

- Use cases for AR are found in segments such as aerospace, retail, manufacturing, gaming, advertising, education, and healthcare. Each vertical has its own set of skills for product development that cannot be replicated or applied in other verticals, leading to fragmentation of the Augmented Reality market.
- Some of the leading players identified in the global augmented reality market include Qualcomm, Inc. (U.S.), Google, Inc. (U.S.), Microsoft Corporation (U.S.), Blippar.com Ltd (U.K.), Wikitude GmbH (Austria), Daqri LLC (U.S.), Sony Corporation (Japan), Samsung Electronics, Co. Ltd. (South Korea), Magic Leap, Inc. (U.S.), and Infinity Augmented Reality Inc. (U.S.).
- Increased digitization means the information demands of workers in the field are rising and starting to match those of deskbound workers. AR offers potential benefits to field service, maintenance, marketing, customer support, and other functions.
- Based on the potential market and advancement of technology, AR is experiencing higher levels of adoption. The AR market is much larger and more familiar to end consumers, particularly with applications through smartphones. The growth of AR developers in the past 2 years has been steadily increasing and this demand will only grow in the coming years with market expansion.
- The market is trending towards AR for the masses, as it is more accessible in terms of consumers use case as compared to strapping a VR headset which cuts out the real environment completely from the viewpoint.
- Apple iOS released Augmented Reality SDK with its new iPhone model and is now accessible to developers, opening doors to powerful iOS AR apps in development from 2017.



# VIRTUAL REALITY

Globally, there are 900+ Startups in the Virtual reality space and together they represent nearly 68% of the overall number for AR & VR Startups combined. Startups in USA make up 72.5% of the market, followed by the United Kingdom, Israel, Canada and India, representing the top five geographies for VR Startups.

The growth for Virtual reality devices was slower than expected in 2017<sup>1</sup> and much of the shipments in this segment was seen at the low end of the market where users experienced VR through their smartphones such as Samsung Gear VR. Premium devices such as the Oculus Rift, HTC Vive, and Sony PlayStation VR account for a majority of revenues within the VR space, however their combined share of units shipped still accounts for less than 15% of the market. VR shipments will create a \$2.8 bn hardware market by 2020.

Thanks to VR, workers need not be physically present in their work environments requiring hands-on tasks - in industries such as healthcare & manufacturing. For example, 3D rendering of patient images in health industry, product designs and factory layouts in manufacturing industry can be remotely monitored and discussed about in real time by experts.

## INDIA OUTLOOK – VIRTUAL REALITY

The high penetration of smart phones coupled with new product launches in this space, e.g. Daydream VR from Google, has done well to pique consumer interest in this relatively new technology. It is important to note that there are no VR device manufacturers in India, however, there is an increasing list of Startups that are building software capabilities that offer platform services to their customers using hardware from global device manufacturers like SmartVizX using Oculus headsets for creating virtual environments and Infurnia providing virtual environment development tools for interior designers. India has close to 70 Startups operating in the Virtual Reality space and only a handful of companies have raised any seed/angel stage capital from venture funds.

India needs to catch up with the other mature economies in the region that are seeing significant growth in AR & VR adoption. For example, according to 2016 Bloomberg report, China's VR market will be \$8.5 bn by 2020 and noted that there are 200+ Startups in VR industry in China.

Examples of Virtual Reality applications in Indian market include in-store technology providers for furniture retailers, virtual fitting trials in offline shopping spaces, manufacturing and real-estate applications and even end-consumer offerings integrated with cycling equipment. One such example is Hyderabad-based Startup, LoopReality which uses indoor cycling, Virtual Reality and IoT to create LoopFit. The company offers fully immersive cycling experience which syncs with all wearable devices that track a user's vitals. VR lounges in partnership with HP are opening up at PVR cinemas to deliver experience to moviegoers. They deliver a library of fascinating immersive and interactive content curated around genres like drama, science fiction, horror, action among others.

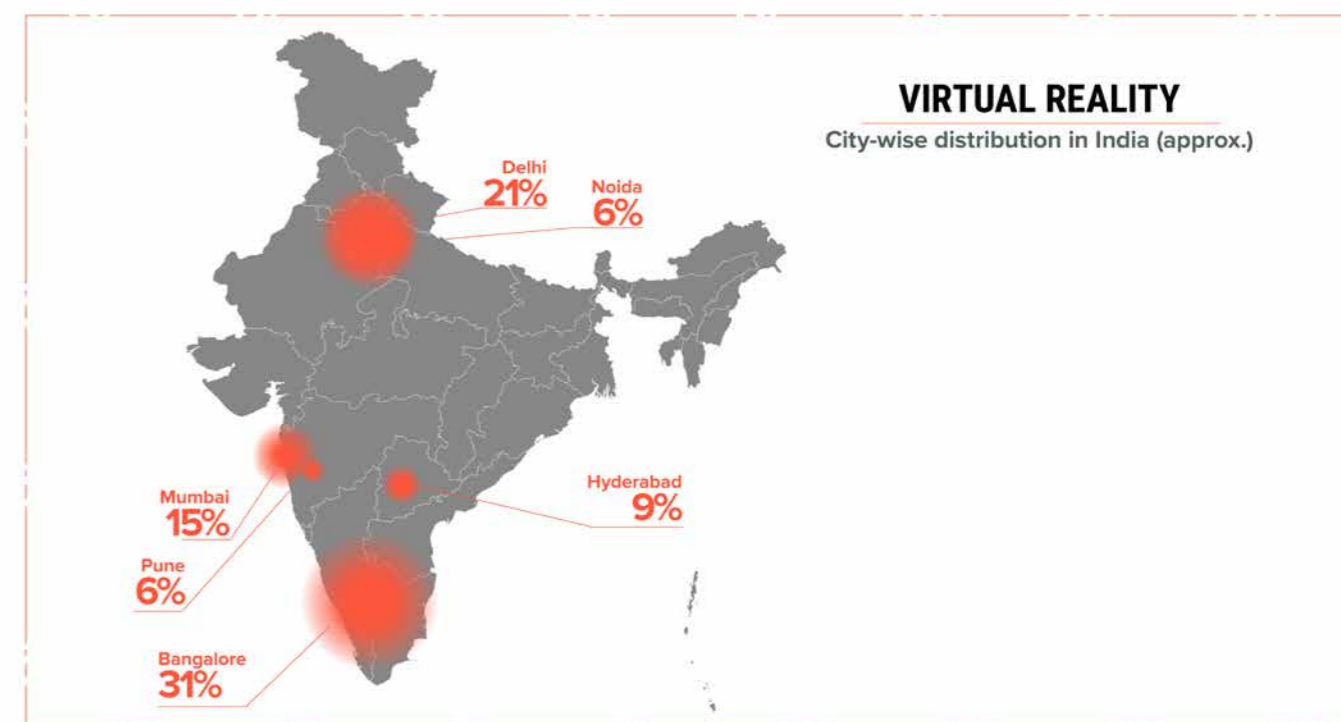
A lack of virtual reality content makers, access to technology for content creation and consumer awareness are among the growth barriers of virtual reality in India.

## Virtual Reality: Technology trends

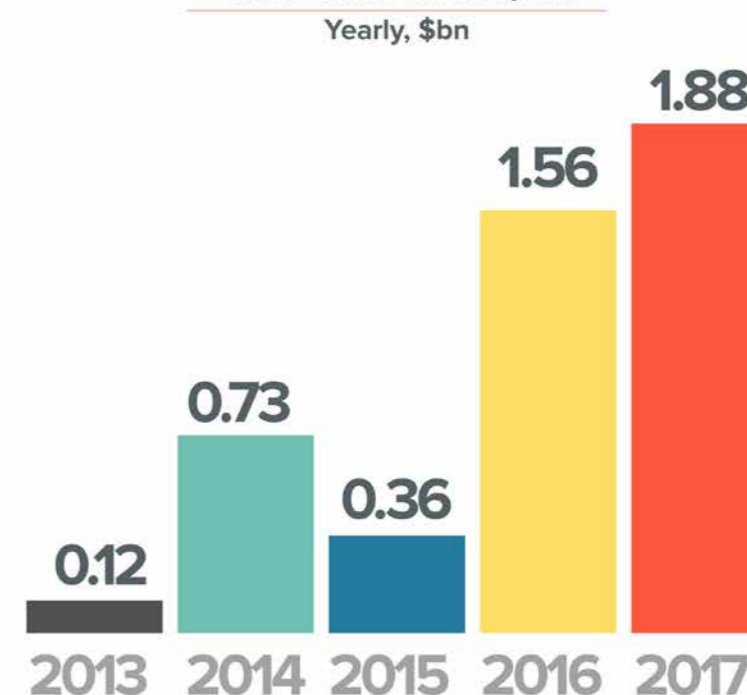
- The introduction of new hardware platforms from PC and laptop manufacturers will accelerate the development and availability of affordable and PC/laptop ready virtual reality devices. This will lead to broader reach of devices, increased usability, and will also drive the market growth for the future opportunity of console/TV based VR headsets to become mainstream. These aspects of technology improvements are at a nascent stage.
- Advancements in Bluetooth standards in 2017 led to the introduction of a new wireless Virtual Reality headset. The current generation of hardware has the user connected to a powerful PC via cables. HTC has recently partnered with TPCAST to make its current HTC VIVE device wireless, a first to the market with a fully wireless HMD (head-mounted device)
- For a foreseeable future, PC attached VR headsets will continue to play an important role in providing high-quality VR due to limitations with wireless headsets needing more processing power, battery capacity and the problem of devices heating up quickly.

## Virtual Reality: Market trends

- A bulk of the VR headsets being shipped globally are Google Cardboards which offer a basic VR functionality.
- The future is bright for VR - from a hardware and content perspective, as both improve, so will people's desire for VR based content consumption. Advancements in software, add-on technology services and VR enabled content development are a few factors that will play a crucial role in the growth of this market.
- Amsterdam opened up the first VR cinema last year and HTC has recently launched a 'VR for Netflix'. Across the world, VR based cinema experience is getting introduced at movie theatres. Virtual Reality has strong growth potential in entertainment B2B space; i.e. VR experiences for consumers at malls and theatres.
- Microsoft HoloLens is working with the NFL to change the way fans experience the games in real-time and its advertisers and sponsors.



## FUNDING IN AR/VR



<sup>1</sup> (<https://www.wsj.com/articles/pricey-virtual-reality-headsets-slow-to-catch-on-1487077201>)



## AR & VR ECOSYSTEM IN BANGALORE:

Though the Bangalore AR & VR ecosystem is at a nascent stage, with most of the companies in proof-of-concept or product development stage, we are seeing a great push for the development and applications of these technologies. More than 40 companies have been established in Bangalore since 2014, spanning across use-cases in verticals like fashion, consumer media, education, home improvement & real-estate.

In the enterprise community, AR & VR are finding their applications in Tier-1 real-estate firms in Bangalore for virtual showcase of model apartments. Real estate startup CommonFloor in India is one of the startups who ventured into AR space using Google Cardboard to provide 'live-in-tours' to their customers. AR based educational products for kids aged 2-10 where immersive content is delivered through smartphone applications are in development by startups like PlayShifu, whose app has nearly 50k+ downloads on Google Play with an average rating of 4.5

Online glasses retail startup Lenskart has been offering an AR based glasses trial feature, allowing potential buyers to try on the spectacles virtually on their laptop/desktop screens before they purchase and this enhance consumer experience.

## ACTIVITY HAPPENING FROM MARKET / INVESTMENT COMMUNITY PERSPECTIVE:

- - Venture Capitalist firms Axilor and IDG Ventures have come together to launch the Frontier Tech Innovators Program to invest in startups specialising in technologies such as Virtual Reality, Augmented Reality, Internet of Things, etc.
- - "VR Rooms" and offline gaming clubs are springing up at multiple malls and entertainment spaces in Bangalore like Smaaash centre in MG Road - Bangalore's first VR gaming centre.
- - UrbanLadder has partnered with HomeLane, a home interiors startup, through which Urban Ladder's furniture and home decor items will be available to customers through HomeLane catalogue. Comes with an additional integration of HomeLane owned model apartments and experience centres through a VR based room-planner called Spacecraft. HomeLane experience centres are currently located in Mumbai, Chennai, Hyderabad & Bangalore.
- - Real estate developers of Brigade Group & Prestige in Bangalore have the opportunity to go big on reality technologies for enhanced customer experience and sales, save time and money using the application of virtual model apartments.
- - In Bengaluru's Indiranagar neighbourhood, online fashion retailer and brand Myntra has taken its baby steps into brick & mortar. Company launched a store for its private label Roadster. To drive sales, the venture is embracing Virtual Reality by creating VR Zone to provide better customer engagement
- - Virtual Reality solutions are getting a push from Highir Technologies (highir.com) to the Karnataka State Tourism Department for virtual revisiting of majestic temples of Belur or Halebidu through VR headsets. The startup is among the eight firms recently funded by the Karnataka Startup Cell. The company has partnered with multiple tourism providers, to provide virtual tours of those locations to end consumers

A few notable startups in Bangalore developing products in AR & VR space include:

**TeleportCall** - Virtual Reality over VoIP call

**Kalpnik** - Provides virtual experience of remote places & events. Yet to launch its application 'VRDevotee' on Android, iOS & GearVR. Raised \$500k investment in November 2017 from a group of angel investors and incubation platform Venture Catalysts

**Flippar** - Technology startups providing better customer experiences using AR technology for various brands. This company was part of NUMA Bangalore accelerator and even secured an investment from NUMAWorld. West Indian cricketer Chris Gayle has picked up a minority stake in this company

**ChymeraVR** - VR based advertising network for global brands.

**Whodat** - Developing ORIGIN SDK to provide markerless AR technology platform for developers, which minimizes developer's efforts to a great extent as compared to the norm of AR technology - a paper marker that identifies the area projections

**Getvu** - Augmented Reality software offering for supply chain management in warehousing industry. The company was part of Rothenberg River accelerator's Fall '15 batch.

**GridRaster** - California/Bangalore based AR & VR company, aiding to increasing the adoption levels of VR/AR technologies by improving the reach of AR & VR based content to the masses. The company raised \$2M investment from the likes of Exfinity Ventures, Lumia Capital, Pipeline Capital, NexStar Partners, Unshackled Ventures in October 2017

**GoodWorkLabs** - Technology services firm which provides access to game developers in Augmented Reality & Virtual Reality space

**Avataar.me** - Deeptech 3D AR platform to deliver personalized fashion discovery experience to users on mobile devices.



# MARKET OPPORTUNITIES FOR AR:

Augmented reality has a high growth potential compared to Virtual Reality. Unlike VR's fully immersive experience, AR allows the user to see the surroundings when wearing an AR headset or when using an AR mobile app. The physical environment is augmented with a digital overlay of information, allowing users to continue everyday activities with an enhanced experience of their surroundings.

A rudimentary form of augmented reality is a heads-up display, or HUD, such as the original Google Glass, which simply displays information on a small screen near the user's eyes. HoloLens by Microsoft represents a more advanced version of Augmented Reality enabler (referred to as Mixed Reality), in which the technology places digital objects into user's field of view which can be manipulated through haptics integration (control). Such a feature would completely transform industrial training across verticals like manufacturing, automobile, healthcare, education.

## VERTICALS TO WITNESS THIS INNOVATION:

### Healthcare:

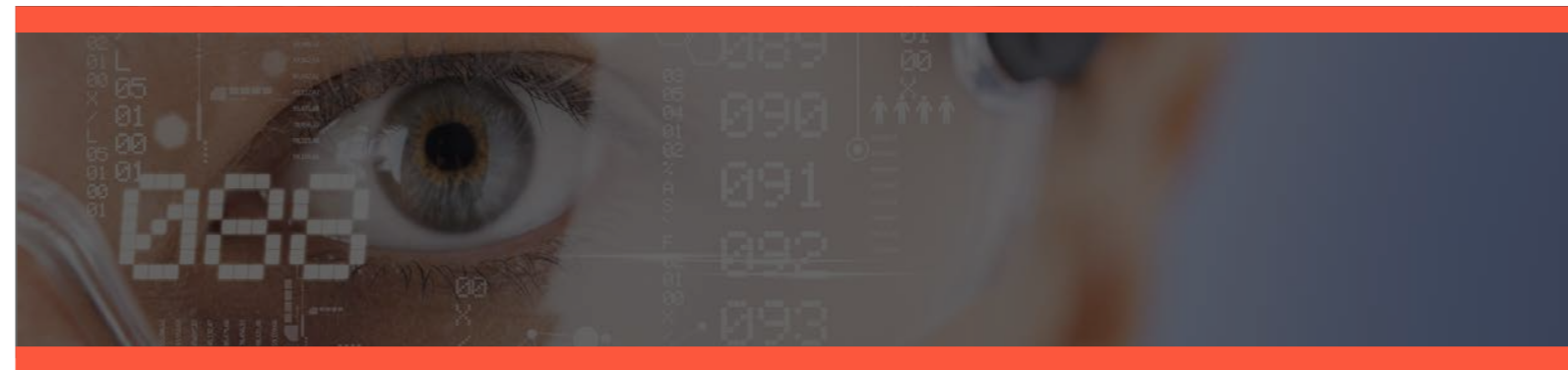
- For both patients and doctors, AR will transform medical and surgical procedures. Currently, monitors are required in operating rooms during surgeries to display vital stats. With AR, the surgeon can wear a headset during the procedure and stay focused on the task at hand with a better analysis of the surgical procedure. Such a technology enabler may minimize mistakes during the operation.
- AR will be pivotal in transforming how medical students and surgical trainees approach medical tasks, providing an enhanced learning experience. AR will enable doctors to perform less invasive surgeries driven by the ability to see patient's insides without opening them up. The technology will improve patient aftercare, especially for elder patients, as a digital health assistant for medication reminders.
- Remote support of live medical procedures by expert doctors, student education with guided annotations on a medical procedure, augmentation of live pictures with notes and medical references to students during training phases are a few of the implications Augmented Reality is set to have in the healthcare industry.

### Manufacturing:

- Manufacturers are ready to embrace AR technology to improve their workplace efficiency. Workers in a plant operate machines on a daily basis along with a high percentage of them getting trained on various machinery aspects. AR tech is already making strides on the industrial manufacturing plant floor and is set for exponential adoption rates in the coming years.
- Augmented Reality aims to cut down production time and quickly identify problems with machinery. The potential benefits of AR in Manufacturing include:
  - Faster workplace: Jet and turbo engine manufacturing is one of the most risky and intricate procedures in the industry requiring the support of only highly experienced and trained personnel. Now with the aid of AR glasses, cameras and motion sensors to overlay all the relevant digital information, engineers are able to see the renderings of bolts, cables, part numbers and are also able to view instructions on how to assemble a specific component with ease.
  - Reduce maintenance time: With AR firm Reflekt, automotive company Bosch is able to drastically cut down its maintenance procedures to stay ahead in the automotive industry. AR enables any person to conduct mechanical tasks by guiding them through 3D models, eliminating the need for any maintenance manuals, and displaying the machine's status in real time for timely maintenance.
  - Training assistance: Both AR and VR are demonstrating immense potential when it comes to assistance in industrial training scenarios. Augmented Reality headsets help in tagging specific objects and provides a digital overlay of information on the display medium which not only provides information on the procedure of a certain task, but also help trainers streamline the training facilities on the manufacturing plant.
  - Visual prototyping / device design improvement: Product design engineers can now study and test complex physics at a level of detail that was impossible through physical testing with the help of Augmented Reality. AR provides an operational visualization of the device under design, improving the efficiency and usefulness of virtual prototyping. One example, observed by Aberdeen Group at the recent LiveWorx 2017 show, was a case study using an AR-based design tool to squeeze 30% more cooling capacity from a product.

### Gaming & Entertainment:

- The Game Developers Conference in 2017 was ruled by 2 technologies: Augmented Reality and Virtual Reality. Fuelled by the success of PokemonGo in 2016, Mobile AR has become the new medium for game developers to focus on the future consumer gaming entertainment. AR-enabled mobile applications (driven by drastic improvements in processing power and mobile camera technology) work by analysing the surroundings and superimposing digital information onto the actual landscape. Mobile technologies are getting better at this especially with improvements in motion sensing and depth sensing aspects.
- For example, iOS game Piclings uses the iPhone camera to create level layouts for the game. The game recognizes the images taken by the camera, redefines them digitally, and incorporates them into the game world. Games like Star Wars Arcade are capable of integrating live camera feeds into the game.
- Unlike VR where there is a high risk of motion sickness / nausea, Augmented Reality substantially diminishes any such effects as the user's eyes are fixed both on real world and virtual objects as well in the same frame of view. Augmented Reality is transforming today's gaming, and is poised to grow quickly in the following ways:
  - Activity driven games & enhanced interactivity: Augmented Reality is proving to be a "game changer" in the way games integrated with AR are structured. Games are becoming more user interactive, requiring users to move around and include surroundings in their gameplay. This fun factor will make the gaming experience more immersive
  - Goldmine for brand advertiser partnerships: As Augmented Reality is primarily about showcasing digital content through the headset or the mobile applications, brands can integrate their marketing campaigns into an AR enabled gaming app and reach a greater audience, resulting in users making purchases from various brands (and in turn unlocking discounts) from the app itself.



### Education:

- Educational content coupled with interactive and immersive features of AR technology can be a game changer for the education industry. Based on our analysis of the education landscape, we have identified few functions through which AR adds to the educational experience:
  - Enhanced health education: Education in health-related fields requires an understanding of the structure & functioning of the human body, which cannot be conveyed accurately through 2-dimensional pictures. AR technology allows for detailed immersive exploration of anatomical structures within the human body.
  - Content creation: AR technology provides an opportunity for any school or training program to create 3D interactive/holographic instructional materials with the help of Startups providing content creation tools (without any prior coding knowledge). Whether students are in a workplace, laboratory or classroom setting, they can receive instruction that is animated, immersive and 3-dimensional. Augment is one such educational tool for the classroom setting using which teachers are able to create scannable handouts and students can generate 3D models and relevant animations for the subject/topic in discussion
  - Portable, less-expensive and evolution to BYOD culture in classrooms: Prototypes, printed material, physical models are all expensive, cumbersome to carry around and are static in their functions. Also, the problems faced due to logistics management for all the supplemental material and inventory management are immense. AR is digitizing all educational material so that institutes do not have to invest in physical materials. Students can browse through the material from any compatible device, accessing the augmented content from any place.
  - Higher retention and enhanced learning experience: Using AR, students are able to access augmented models representing anything from a part of the human anatomy to a famous monument. For example, after scanning a photo linked with a 3D model of the Eiffel tower and viewing the augmented image, students get linked to a web page with more information on the monument. Such an experience creates a complete learning cycle.

## MARKET OPPORTUNITIES FOR VR:

Market studies suggest that Virtual Reality will be worth over \$15bn by 2020. Hardware from the likes of Oculus, Samsung and Sony is driving the current market, although software and applications will be needed to sustain interest and market growth. Business models like VR hardware, both high-end and mobile enabled devices are experiencing high growth levels in both the USA and Europe. Several VR content creation companies are coming up in the market that are making use of the VR devices released by Oculus, Sony and other corporates for testing and development. Companies such as Google, Samsung, Sony, Microsoft are strategizing their devices for VR compatibility and this is poised to grow over the next 5 years.

VR technology is pegged to disrupt the gaming and media industry and is expected to make significant inroads into consumer market as technology improves and prices are driven down. Having more users experience VR technology to understand its potential, remains a challenge, however the emergence of low-cost mobile VR solutions will likely attract new users. In addition to this, expecting consumers to wear cumbersome head-mounted devices will serve as a limiting factor for growth of VR headset sales, posing a need for hardware innovation in this market.

### GAMING & ENTERTAINMENT:

**Integrating & improvising social aspect in gaming:** VR solutions can create a social experience in gaming industry like never before. The virtualized elements & environment the user sees when wearing the headset can not only help in communication with other players in the virtual world, but with the improvements in haptics technology (enabler of sense of touch), the dynamics of team play will get revolutionized. This equips the gaming industry and its users with a higher number of tools at their disposal as compared to TV-screen based gaming. It will inculcate "asynchronous gameplay" where different users have different kinds of information and have to combine them together to solve a problem in front of them.

**Revolutionize the user-interface:** With VR gaming taking off in the market, the industry will see elimination of all unnecessary mouse/keyboard interface for control; VR makes the user feel like they are inhabiting a different world, and entirely works on haptic 'button' control or hand-held motion controllers; camera viewpoint field of view of the user and voice commands will drive majority of the user control.



### RETAIL:

VR technology has a great potential in the retail industry. Companies like IKEA & Dwell use VR to immerse customers and readers in an interactive and highly personalized furniture shopping.

A few opportunities where retail needs & VR offerings meet:

- Traditional method to buy furniture is seeing it and inspecting it in person. Virtual Reality enables users to view objects in a virtual environment, customise their properties and even get an idea of how they look in specific environments.
- Launching a virtual store: The VR app puts a user in the middle of a 360° environment so one can get a realistic feel of the room. Being immersed in this environment, the shopping experience becomes more realistic and tangible, ultimately helping the user to evaluate a purchase. This can be the case of a futuristic shopping experience where users can evaluate and shop the products from their home itself through the use of a VR headset and get them delivered.
- Some retail stores, e.g. IKEA, may not be in a nearby locality. VR transports people to out-of-reach environments and helps save time.
- Customization potential: In-store experiences of VR cataloguing can help product viewing in detail and provide the opportunity for a great amount of customization. Complicated actions like selecting and customising objects are dependent on the applications and hardware available. Systems like the HTC Vive and Rift have intricate controllers, making it easy to interact with complex menus incorporated in the environment. For example, using Magix Home, users can manipulate furniture through task specific controls which directly mimic real-world movement. Changing the colour of a chair is done through simple gestures that feel like a layer of functionality added to user's hands.
- A location marker indicates areas to teleport to within the virtual space. Gaze-based interactions (where one aims using their head and eye movement) are used to control the reticle position that tracks user's eye movement. One can hold the reticle over the location marker and wait for it to time-out or click the action button to immediately move locations within a virtual environment. Once positional tracking technology becomes more available, simplified methods like teleporting are a good and accessible alternative when exploring virtual spaces.

### MARKETING & MEDIA CONTENT:

Several brands are embracing Virtual Reality for their content marketing efforts. With tech giants investing heavily in hardware, it is only a matter of time before there is a widespread adoption of VR headsets at both business and consumer levels. Consumer demand for content on such platforms will increase dramatically to make VR another channel for brands to reach their target customers. Let's take few examples of current VR based brand campaigns in the market and how they work:

- Jaguar has used VR to promote its position as the official car of The Wimbledon Championships in 2016. The brand created a VR experience for fans to 'fly' into the centre court in a virtual overview of British Champion Andy Murray in action. This campaign won the Steve Wozniak Award for Tech Excellence at this year's Masters of Marketing 2016.
- Automotive brand Volvo has created a VR experience for the launch of its CX-90. The virtual experience gave the consumers a cockpit view of the vehicle and allowed them to take it on a virtual test drive. This virtual showcase showed off the features of the car in a way never done before and led to selling out its first run of orders in 2 days of launching.
- NatGeo has come in collaboration with Felix & Paul Studios and Oculus to provide a VR experience to everyone for a virtual journey into Yosemite National Park for their 100-year anniversary of National Park service.
- NBC Olympics has provided Virtual Reality coverage of the Rio 2016 Olympics games exclusively to authenticated users of compatible Samsung Galaxy smartphones together with Samsung Gear VR via the NBC Sports app, first time an Olympic program was available in a VR experience. Users got an immersive experience of the venue, unprecedented view of the opening ceremony and an immersive beach volleyball experience in the sport setting.
- 2015 marked the year of first-time airline offering of a VR experience. Qantas launched a pilot program to offer its users in-flight entertainment service through Samsung Gear VR to show virtual 3D destinations, new Qantas products and in-flight movies. The airline has also extended the VR offering by producing a 3D film of the Great Barrier Reef and Hamilton Island in partnership with Samsung and rapid VR, to present in select local and international lounges and flights.

## HEALTHCARE

Health industry is exploring Virtual Reality for solutions tending to multiple challenges and how the tech can improve several medical treatment methods. Virtual Reality is offering:

- i. Doctors: the ability to analyse injuries
- ii. Medical students: the opportunity to learn hands-on medical procedures
- iii. Patients: a method to quicken their recovery in new and novel ways.

### Pain management:

Currently there is evidence that VR can help relieve pain for patients. The parts of the brain that are linked to pain – the somatosensory cortex and the insula – are less active when a patient is immersed in virtual reality. In some instances, it can even help people tolerate medical procedures that are usually very painful. Several studies have been done on benefits of VR therapy on amputees. For example, conventional methods to treat pain in the ‘phantom limb’ have not been promising, neither a treatment with strong painkillers. With the help of VR, a technique called ‘virtual mirror therapy’ involving putting a VR headset and controlling the virtual version of the absent limb has shown positive results in helping the patients cope with the pain.”

### Therapy:

VR can be used to track body movements, which can in turn help allow patients to use the movements of their therapy exercises as interactions in a VR game. In a VR experience, exercising is found to be more fun, interactive and motivational for the users. Studying how patients perceive and interact with VR systems helps therapy professionals to design better rehabilitation applications.

### Cognitive rehabilitation:

Patients with brain injury from trauma or illness, such as stroke, struggle with everyday tasks such as shopping or making plans for the weekend. VR helps recreate these tasks within virtual environments and allow patients to practise them at increasing levels of complexity to speed up recovery. Doctors can use the virtual environment as even an assessment tool to observe patients carry out a variety of real-world complex tasks and identify areas of memory loss.

### Doctor/nurse training

Virtual Reality enables for creating suitable virtual training environments for students and professionals for both learning and practice. Medical procedures involve multiple complex tasks such as making incisions, inserting plastic tubes through thin membranes and several other specific operations which require accuracy and speed which are lifesaving when performed correctly. Many medical procedures require practice and repetition in order to save lives.

Simulation procedures have been embraced by residency programs and hospital training programs to keep the skills of physicians sharp for rarely performed life saving procedures such as cricothyrotomy. VR can aid in creating these tense, real world clinical situations which require rapid thinking and quick analysis for managing critical patients.

*“By the end of this decade, computers will disappear as distinct physical objects, with displays built in our eyeglasses, and electronics woven in our clothing, providing full-immersion visual virtual reality.”*

Ray Kurzweil

# AR & VR CHALLENGES

## Communication

AR & VR terminology is frequently confused and misunderstood. For example, AR and VR are not the same and share only some attributes yet most people lump the two together in the industry

## Technical

These challenges stem from many fundamental problems such as:

- Lack of integration with existing tools that makes development difficult to scale
- Issues with quality, resolution and usability of the hardware products
- Issues related to the transition from existing mobile platforms to head mounted and other display mediums
- Issues with connectivity.

For example, HoloLens has limited battery life, limited field of view, apps are restricted to about 900MB of memory, and holograms appear best at certain distances.

## Social challenges

Wearing an AR headset out in public is not wise to do so yet, as people would have the privacy implications of a head-mounted camera facing them. However, use of such headsets in workplace scenarios allows the technology implications to sidestep such social ramifications and AR technology can help improve the collaborative synergies between various teams. Future of AR in workplace looks bright – a new tool adding to the computing systems at the workplace and replacing the use of tablets and smartphones. The theme which consistently comes up in the development of AR headsets for future purposes is changing the way future workplaces get work done, driving new ways of creating, discussing and demonstrating ideas.

Currently, the top barriers for wide-scale adoption of AR in organizations are insufficient ROI, security concerns, insufficient allocation of budgets for these new technologies and lack of skills/knowledge for development and implementation.

## Technology/Use-case based barriers for Augmented Reality & Virtual Reality

- **Computing power:** Due to the nascent stage of AR & VR technologies, the key barriers are primarily related to lack of sufficient computing power to render the graphics of the virtual environment created and lack of uniform cross-platform technical standards. Low levels of computing power (unless someone buys a high end system to accompany the headset which proves to be very costly for an end-consumer with no definite use-case currently for that cost) inhibits market adoption at a wider level.
- **AR Hardware:** Currently, there are no AR headsets available for consumers in the market. HoloLens and MetaVision have released their developer versions, but are yet to take their step towards the mass market release. Also, AR headsets come at a very hefty price now which is not an attractive investment for an end consumer looking for gaming/entertainment purposes. Also, the design of the current devices is not sleek enough for a comfortable end-consumer use and there is still a long way to go for getting a streamlined design.
- **Smartphone hardware development:** Currently, 80% of the smartphones in the market are yet to make their hardware (processors, phone cameras) AR compatible. The mobile devices are not equipped with room mapping and depth sensing technology. With Apple and Google releasing their high-end phones with these features, it can be expected that other brands in the smartphone market will follow suit to enable this hardware improvement in their future launches.
- **Not-so-impressive content delivery:** Watching a game in VR (football or basketball) has not satisfied the end consumers and made them feel that the sporting event cast in VR is just like a TV broadcast stuffed in the headset. One such example is consumer dissatisfaction with MLB games live-streamed by Intel, which had issues with both resolution of the streaming and view-points offered
- **Virtual Reality pricing:** The price paid for a VR headset is not justifying an end consumer's use-case for gaming or consuming Virtual Reality content available now in the market.
- **Connectivity:** VR and AR technologies, from collaborative enterprise to consumer entertainment, are already demanding more than ever hardware developments. But data communication speed is one other factor which will play an important role in the seamless experience of these technologies. Development of 5G for faster wireless communication is in the works by many technology enterprises like Intel & Qualcomm to address this.
- **Security:** AR & VR technologies are considered pervasive and the users must be aware of and be cautious about potential cyber attacks, vulnerabilities and threats. Few of the concerns include illegal recording/theft of user behaviour data from the devices, interjection of data into AR & VR to mislead or entice users into selecting items that exfiltrate personal identifiable information, hijacking or taking control of a AR & VR device remotely to impersonate someone in a virtual collaboration and usage of fake AR & VR applications to steal personal information.



## AR & VR GROWTH FACTORS

Market dynamics identify the growth of mobile device market in APAC as one of the primary growth driving factors for AR & VR. The availability of the low-cost smartphones in countries such as India, Indonesia, and China, the rise in usage of e-commerce portals, and rapid urbanization will result in an increased adoption of mobile devices. This increased demand for smartphones and tablet computers will increase the competition among smartphone manufacturers for adoption of AR & VR technologies. To sustain the competition, mobile device companies will start integrating their devices with AR technology to enhance user experience, which will in turn, drive the demand for AR apps.

- More than 50% of the revenue from these technologies will be the output of hardware sales. Technology services revenue will remain as one of the main contributors as compared to one-time software sales, due to the increasing demand in the enterprise segment.
- AR systems will contribute more revenue than the VR systems in the long run. This is for the reason that AR's integration in the form of smartphone apps in the verticals like healthcare, product design, education, manufacturing and several other verticals will eclipse the revenue contributed by VR in entertainment & gaming.

The adoption of both these technologies will be driven primarily by the introduction of less expensive models to the market, first powered by smartphones before the mainstream adoption of stand-alone headsets (which are currently on a high price range in the market and will take time to bring down the prices to result in a widespread adoption, just like the case with the smartphone market transition). The tech industry has promoted the prospect of VR for the past few decades. But only now, with headsets backed by big names like Sony and Facebook, is VR finally becoming a concrete product with mass market potential. While VR technology is largely associated with the gaming industry, the platform offers a new set of content opportunities in entertainment, advertising, and more.

The Virtual Reality & Augmented Reality hardware market is expected to progress in a similar fashion to the past tendencies regarding shipment of computers. Computers did represent a substantial investment initially and were as such mainly purchased for professional use, similar to the observation done for AR & VR currently.

## AR & VR INVESTMENT TRENDS

Top funded companies in Augmented Reality (global) are from business segments like projection-based display medium manufacturers (MagicLeap), Content creation tool providers (Blippar), Smart glass display medium manufacturers (MetaVision) and education applications of AR in content & kit development (NeoBear).

- 100+ global AR companies have received an investment of \$1mn+. Most active investors in this space and few investment examples:
  - > Intel Capital – Avegant, Occipital, Layar, Eyefluence
  - > Qualcomm Ventures – MagicLeap, Blippar, Neobear, Navdy
  - > Presence Capital – MetaVision, ScopeAR
  - > Techstars – Occipital, Vieweet
- Approximately a net investment of \$2.5bn+ has gone into Augmented Reality since 2013.
- Top funded companies in Virtual Reality (global) are from business segments like Content creation infrastructure providers (Improbable), On-demand VR streaming (NextVR), Healthcare applications for VR (MindMaze), developers of interactivity enabling software/hardware (LeapMotion) among others.
- 170+ companies in global Virtual Reality landscape have received an investment of \$1mn+. Few of the top active investors in this space and investment examples:
  - > BoostVC – 8i, Mindshow, BoomTV, SurrealVR
  - > Rothenberg Ventures – JauntVR, 8i, Wevr, AltSpaceVR, TheWaveVR
  - > Presence Capital – Baobab Studios, Bigscreen, TheWaveVR
  - > Virtual Reality Fund – SliverTV, Immersv, Spaces, Varjo Technologies, TheWaveVR
- Approximately a net investment of \$2.7 bn has gone into Virtual Reality since 2013.

# RECOMMENDATIONS

## TO ENTERPRISE COMMUNITY / SUGGESTIONS TO WORK WITH STARTUPS IN AR & VR:

- Both AR and VR technologies are foundational on SMAC stack structuring of an enterprise – meaning an enterprise’s offerings to their clients/consumers are built around Social, Mobile, Analytics and Cloud aspects. Though AR & VR are at a nascent stage requiring lot of development before becoming a heavy-duty computing platform in enterprises, they will be a key component of the future digital enterprise ecosystem. Keeping this in mind, enterprises should ensure a smooth transition with thought out integration of technologies into their current systems along with train and reskill employees for this upgradation.

- **Develop an ecosystem of Startup partners for continued innovation in product & operations:** Corporate houses need to chart out the product roadmap, service or technology innovation by investing in development of Startup ecosystem. The ecosystem aids a continuous innovation cycle for product, service and technology (software, hardware and services) roadmap upgradation with the ultimate goal to increase speed to market and revenue growth.

- **Identify applications that address mission-critical business use-cases for greater adoption:** Corporate giants in the industry segments discussed in the previous sections should identify specific customer service, sales enablement and product development use cases for AR and VR adoption. Keys areas of use-case focus must include customer demos, sales events and product trails

- **Innovate and incubate new technologies faster:** Key industries in the market like gaming, retail, automotive, healthcare and manufacturing sectors should seize the opportunity as early adopters of AR and VR and be seen as brand innovators. When aligned with key business priorities such as customer satisfaction and speed-to-sales, the net value and ROI in AR and VR trials can be significant.

- **Steps for transition to adopt AR & VR at a workplace:** For a smooth transition into adopting AR & VR, enterprises should create the necessary infrastructure in the organization to support content-heavy applications. Enterprises need to add more computing power, network bandwidth and data storage capacity to their existing infrastructure. Enterprises looking to adopt AR & VR will have to develop a set of best practices for new users and a change management program to help employees become comfortable with the hardware/software involved.

- **Addressing data-privacy and security:** The use of HMDs and other AR & VR related software will intensify the need for data privacy since these technologies are capable of tracking user behaviour and serve as a medium for information access. The ‘hyper-personalisation’ aspect of AR & VR for user experience have been raising multiple privacy concerns, especially in consumer entertainment applications. Users should be made aware of and have a say in what information is stored, with necessary steps taken to ensure the safety of enterprise data. Organizations can implement secure messaging between AR & VR devices and a centralised system, encrypt inbound and outbound connections, use proper authentication mechanisms, protect the firmware residing on devices, perform a continuous assessment of devices and applications and monitor any abnormal behaviour of the device/applications.

- **Understanding the roadmap of the technologies & implementing pilots:** Major brands like Coca-cola and McDonalds are trying their hand at using VR to better engage their millennial customers in innovative ways. Innovation executives in industries like retail, automotive, hospitality, tourism are innovating their marketing runs adopting these technologies and giving new mediums of user engagement. Brands are observing not only an increase in return customers but are providing memorable experiences to users who will aid in shooting up their brand value for future business. Enterprises must evaluate their offering to consumers and evaluate how AR & VR technology adoption will improve their bottom line by partnering with the Startups and implementing a pilot.

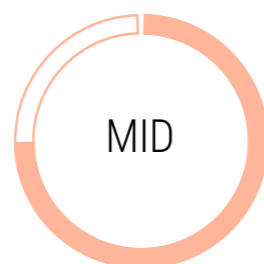
- **Due-diligence of Startup offerings:** While a lot of ‘looking-inward’ is required by an enterprise before adopting AR & VR (existing infrastructure, who are their customers, how can they reach their customers, how these technologies will innovate their means of engaging users), businesses should also keep in mind on how to evaluate a certain technology offering. For companies in the entertainment space (advertising, media, gaming, sports), pilot projects are to be run to understand how the technologies are affecting their customer acquisition cost (CAC), product development costs, service maintenance spends and the overall ROI as compared to traditional methods of their business. For companies in automotive, manufacturing and healthcare, it is more of a factor of improving their daily work flow procedures, accessibility of technology for training purposes, remote accessibility of procedures through VR, rather than a factor of pricing of services

# TOP AR & VR STARTUPS IN INDIA

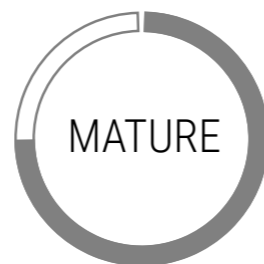
The research identifies the top disruptive startups in AR & VR and categorises them into three stages of growth\* while assigning them with their GrowthEnabler Personal Intelligence Interface score based on the 5 parameters of business success (explained in our Research Methodology section).



Age: < 3 years





Age: between 3 to 5 years




Age: between 5 to 7 years


Startup Details	Synopsis	Strengths	Score
-----------------	----------	-----------	-------


 <p><b>Smartivity</b> New Delhi <a href="http://www.smartivity.in/">http://www.smartivity.in/</a> <b>EARLY</b></p>	<p>Developer of STEM based educational content in the form of toys and DIY kits with Augmented Reality technology enabled. The company has previously claimed of presence in 500+ offline outlets and ecommerce stores. Has raised seed funds of \$200k from S Chand publications in Oct 2015. In May 2016, a round led by S Chand amounted to \$1.2 mn in funds with participation from other institutional investors such as Tandem Capital and Advantedge.</p>	<p><b>Product &amp; Innovation</b> - Has multiple STEM based educational toys for kids' learning. <b>Market Traction</b> - Does direct sales through website and multiple eCom-merce sites. Claims of 200k+ users <b>Financial strength</b> - Raised invest-ment from strategic partners like S Chand Group. Has several other angel investors &amp; VCs. Currently at Series A funding stage. <b>Leadership Team</b> - Founding team with strong educational back-ground and work experience</p>	<p><b>9.41</b></p>
--	---	---	--------------------


 <p><b>PlayShifu</b> Bengaluru <a href="https://www.playshifu.com/">https://www.playshifu.com/</a> <b>EARLY</b></p>	<p>AR technology based learning games for kids aged 2 - 8 years old. Currently the company offers multiple game sets such as Safari, Travel, Space, Jobs and Orboot. The game sets are integrated with smartphone and tablet applications for the Augmented Reality experience. The app scans for the Shifu cards and launches different learning games such as Safari - to learn about animals, Travel - to learn about transportation, and Jobs- to learn about different occupations. Their apps are available on both iOS and Android stores and the company sells its game packs on both Amazon and Flipkart and is shipping to consumers in 60+ countries globally. The company currently has three products in the pipeline and it plans to increase its portfolio to 25 by the end of 2017.</p>	<p><b>Leadership Team</b> - Founders from IIT Kharagpur &amp; Stanford background. Previous work experience in product management / development for 8+ years <b>Product &amp; Innovation</b> - Developers of innovative &amp; immersive edutainment products (toys for learning) for kids aged 2-10. Has multi-themed product offerings. <b>Business Traction</b> - Has a strong Market Traction from both parents &amp; teaching communities for its offerings. Recognition - The company for its innovative offerings for kids' education has got coverage in TechCrunch &amp; ProductHunt. Also ran a successful campaign and raised \$75000+ (pledged a goal of \$15000) on Kickstarter</p>	<p><b>7.37</b></p>
---	---	---	--------------------






Startup Details	Synopsis	Strengths	Score
-----------------	----------	-----------	-------





 <p><b>Empower Labs</b> Hyderabad <a href="http://www.empowerlabs.com">http://www.empowerlabs.com</a> <b>EARLY</b></p>	<p>Developer of a mobile based augmented Reality game - DeltaT. The game play will have offensive and defensive weapons, and the gamer will have to unlock them by doing certain activities and by going through levels. Currently, in-app purchases is company's major revenue driver. As the features of the game involves real world settings, the company believes that increasing its user-base will fuel the opportunity to form long-term partnerships with consumer brands and drive revenue through it. The startup raised INR 3Cr. from investors in June 2016. It provides innovative Online to Offline revenue model which provides brands an opportunity to interact with Delta T gamers through strategic in-game placements and incentivize interaction with them as part of the gameplay.</p>	<p><b>Product &amp; Innovation</b> - Developed an Augmented Reality MMO (Massively Multiplayer Online) game called DeltaT. Users in the game have to travel around and strategize with fellow gamers in the real world in order to play the game while there is interaction with digitized elements through AR mechanism.</p>	<p><b>7.22</b></p>
---	---	---	--------------------

 <p><b>OOBEDU</b> Mumbai <a href="http://www.oobedu.com">http://www.oobedu.com</a> <b>EARLY</b></p>	<p>Integrates educational content with Augmented Reality to provide interactive AR based learning experiences to students. The learning kit along with smartphone application aids for experiential learning. Currently offers a 'World of Alphabet' product for kids for which app is available on Google PlayStore &amp; iOS store.</p>	<p><b>Product &amp; Innovation</b> - Has both institutes and end-consumers for its edutainment products enabled with AR for kids aged 2-5 years. Plans to create similar interactive education products for K-12 standard. <b>Leadership Team</b> - Combined 40+ years of industry experience among the founding team. <b>Market Traction</b> - Started in 2016 and has 5-10 institutes and 2000+ end-consumers using their products</p>	<p><b>7.20</b></p>
--	---	--	--------------------

 <p><b>ShilpMIS</b> Surat <a href="http://www.shilpmis.com/">http://www.shilpmis.com/</a> <b>EARLY</b></p>	<p>Offers products and services such as virtual reality experience, virtual reality apps, 360 degree videos, interactive holograms, augmented experience in real estate industry. Using its offering PPTVR, helps create compatible web-hosted VR experiences without writing any code - an intuitive tool for creating VR content for mass market. For their Virtual Reality content creation tools &amp; services, they have attracted clients like Mercedes Benz, White Wings Group, LT, Raghuvir Builders, The Advantage Raheja Group among others.</p>	<p><b>Product &amp; Innovation</b> - Providing a DIY platform for creating AR &amp; VR content without any coding tools. Plans to be a platform for masses to discover AR &amp; VR content. <b>Market Traction</b> - Claims of 50+ B2B customers in the market. Also offers on a B2C model with 5000+ customers. Its offerings are subscription based.</p>	<p><b>6.31</b></p>
---	---	--	--------------------

 <p><b>Scanta</b> New Delhi <a href="http://www.scanta.io">http://www.scanta.io</a> <b>EARLY</b></p>	<p>AR technology based marketing solutions provider for brands and businesses. Its solutions allow brands to interact creatively with the consumers through use of mobile apps on iOS and Android platforms. Through the apps, users can interact with other users, play immersive mixed reality games, challenge other users to battles and can also share mixed reality content with others. Coca-Cola India is the first brand to leverage this platform for Christmas and New Year 2016 at Cyber Hub, Gurgaon.</p>	<p><b>Product &amp; Innovation</b> - The company is yet to launch to the the public. Claims to be creating world's first AR network for developers to upload their AR content and get access to users</p>	<p><b>5.78</b></p>
---	--	---	--------------------

Startup Details	Synopsis	Strengths	Score
 <b>Yeppar</b> Jaipur <a href="http://yeppar.com/">http://yeppar.com/</a> <b>EARLY</b>	<p>AR mobile application provider to enhance user experience when interacting with print media and serves as an advertising solution. With the help of Yeppar, advertisers are able to develop and provide AR integrated content in their printed publications. Users have to download the application and scan the advertisement through the app to see the AR content. Claims to have partnered with Four Seasons, Dainik Jagran and other brands. Its solutions can currently be useful in industries like Real Estate, Media, Restaurants, Education etc.</p>	<p><b>Market Traction</b> - Has a good number of B2B customers currently providing their solutions to across print media, restaurants, brands.</p>	5.65
 <b>VadR</b> Gurgaon <a href="http://www.vadmet.com">http://www.vadmet.com</a> <b>EARLY</b>	<p>VR based analytics platform to increase user engagement &amp; improve user experience by capturing data about how users are using the content. Launched VR analytics suite that is helping VR developers and VR businesses understand their users better. While users are immersed in the VR experience, VadR is making sure to capture the immense amount of data that is generated and is using advanced visualisation techniques to present the data. Its analytics features include business intelligence, device performance optimisation, user behaviour analytics and the option for specific metrics and the flexibility to view the information as heatmaps, charts or graphs. Has clients from industries like Real Estate, Gaming and Industrial Training.</p>	<p><b>Leadership Team</b> - Founding team from IIT Delhi and from software background</p>	5.20
 <b>Adloid</b> Gurgaon <a href="https://www.adloid.in/">https://www.adloid.in/</a> <b>EARLY</b>	<p>Augmented Reality solutions provider for commerce discovery and furniture augmenting, real-estate 360-degree immersion, API to create AR games and home decor visualizations. The company provides its solutions in 3 options - customized white label solution, API integration for business applications and a plug-play solution for AR enablement in existing website.</p>	<p><b>Leadership Team</b> - Founding team with strong educational background</p>	5.19
 <b>OutsiteVR</b> New Delhi <a href="http://outsitevr.com">http://outsitevr.com</a> <b>EARLY</b>	<p>Provider of experiential learning platform for architecture community through which students/professional architects can experience sites, buildings &amp; immersive architectural content with virtual reality(in real scale) from anywhere. It would help in better understanding of the projects and visualizing the context of the "built environment". Running offline in various architecture institutions in India. Founders are architects and alumni of IIT Roorkee, SPA Delhi, DIT University</p>	<p><b>Product &amp; Innovation</b> - Unique product offering for the architecture community. Only company in India addressing this customer base            Recognition - Innovation awards from CNBC, SiliconIndia Magazine &amp; IIM Ahmedabad</p>	5.18
 <b>StudyMarvel</b> Indore <a href="http://www.studymarvel.com">http://www.studymarvel.com</a> <b>EARLY</b>	<p>AR technology based interactive learning provider to school students. Currently provides an interactive &amp; immersive chemistry book which can augmented by an app available on Google PlayStore. Plans to release content across other K-12 relevant subjects and work with publishers for content development. Part of EduGild Accelerator.</p>	<p><b>Product &amp; Innovation</b> - Serving as the AR enabler for K-12 education by offering a platform for publishers to create digital 3D models, images and videos as an overlay to the content.</p>	4.36

Startup Details	Synopsis	Strengths	Score
 <b>SmartVizX</b> Noida <a href="http://www.smartvizx.com/">http://www.smartvizx.com/</a> <b>EARLY</b>	<p>Creates interactive virtual environments to stimulate potential users in real-estate &amp; design industry to experience virtual spaces of buildings, workplaces etc. The technology helps facilitate consumer buying behaviour and decision making. Has clients like Rockworth, Quikr, PNB Metlife, Developer Group among others. Raised seed funds of \$500k from Indian Angel Network and Stanford Angels in 2016.</p>	<p><b>Leadership Team</b> - Highly relevant work experience &amp; education of founders in architecture. Directors/advisors with experience in Virtual Reality &amp; Cloud/IT industries.  <b>Product &amp; Innovation</b> - Provider of immersive visualization/collaboration tool in architecture-construction industry with 40+ B2B clients. Company has filed multiple patents. Financial Strength - Raised funds from multiple angel networks.</p>	8.14
 <b>Simulanis</b> New Delhi <a href="http://www.simulanis.com/">http://www.simulanis.com/</a> <b>MID</b>	<p>AR &amp; VR based e-learning and skills development startup which helps train engineering students and workforces by providing gamified content. The company is hardware-agnostic and is built around gamified mobile and computer training applications for the education, skilling, and industrial training sectors.</p>	<p><b>Product &amp; Innovation</b> - Multi-suite offering of AR &amp; VR based training products for industries like Pharma, Automotive through 3D simulation            Financial strength - Has raised seed investment and is currently at Series A level for further rounds. Has investors like Edugild, MSME &amp; Village Capital.  <b>Market Traction</b> - Claims of 50+ B2B clients, few of them include UKTI, MSME, Assocham, SiliconIndia. Also part of Make In India initiative.</p>	7.23
 <b>Infurnia</b> Bengaluru <a href="http://www.infurnia.com/">http://www.infurnia.com/</a> <b>MID</b>	<p>In-store technology solution provider for architectural design, interior designing and modular furniture. Allows for interactive visualization, customize and 3D walkthrough home interiors. The software allows consumers to create digital replicas of interiors and even customize the look and furniture in the room. Retailers use it for in-store cataloguing. The company has previously raised funds from Idein Ventures.</p>	<p><b>Product &amp; Innovation</b> - B2B offering for modular kitchen &amp; wardrobe industry for designing using VR technology. Has 2 products.  <b>Leadership Team</b> - Team has strong academic &amp; work experience background.</p>	6.68
 <b>Whodat</b> Bengaluru <a href="http://www.whodat.in">http://www.whodat.in</a> <b>MID</b>	<p>Company has started out with establishing themselves as an AR company for visualization requirements in the retail/furniture space along with home decor and real estate verticals. Now it is also exploring verticals like gaming. The company uses proprietary SLAM technology to place digital content within indoor environments. Based around 2 revenue models - software licensing and software as a service - depending on the requirements of the customer. Their technology is available for both iOS ad Android applications to integrate AR product features. The company has raised \$600k in funding from IdeaSpring Capital in April 2017. Has been part of Microsoft Accelerator selected in September 2016 and also been a part of Target Accelerator's 2nd batch.</p>	<p><b>Product &amp; Innovation</b> - Developing markerless AR engine Origin, a developer platform to build AR solutions. Pivoted from its previous business model.            Financial strength - Raised early stage funding of \$600k from Ideaspring Capital.</p>	6.38



# GROWTHENABLER RESEARCH METHODOLOGY

GrowthEnabler uses its proprietary research methodologies to analyse the business impact of disruptive technologies and digital innovations on the future growth of large corporations and their industries. GrowthEnabler applies its deep-data analysis tools, scoring logic and algorithms to create intelligence that enables senior executives to make informed business growth decisions. The GrowthEnabler Personalised Intelligence Interface (Pii) is an interactive platform that provides corporates the ability to Find, Select, Connect and Manage global Startups based on their business priorities and problems.

## 1. MARKET ANALYSIS

To create and report leading technology-related market trends and industry analysis with a focus on industry sub-sectors, real-life implementations, industry and market landscapes and competitor dynamics, GrowthEnabler analyses large sets of data and information aggregated from various private and public sources, including online databases, market reports, online surveys, journals, and in-depth phone interviews. To further enrich the efficacy of analysis, GrowthEnabler undertakes formal and informal interviews and RFI's and surveys with key decision makers and executives in corporates, as well as founders and owners of Startups. Following this exercise, large volumes of data is categorised and curated, based on, industry and market drivers, risks, opportunities and challenges specific to an industry vertical or technology area, and then injected into a pre-configured regression model to forecast and predict market movements and trends.

## 2. STARTUP TECHNOLOGY LANDSCAPE & ANALYSIS

### STEP 1: Startup database building

The AR & VR Startup database is built using an exhaustive primary and secondary research analysis model, led by dedicated team of tech analysts and subject matter experts (SMEs), who also use Machine Learning and Natural Language Processing (NLP) technologies for data mining and curation.

**Primary Research** – The Primary research data is sourced directly from GrowthEnabler Market Surveys, RFI's with Startups, One-on-One Interviews, Calls and Product briefings, including Startup and Client Registration Information available on the GrowthEnabler Pii platform.

**Secondary Research** – A team of Machine Learning and NLP experts scan thousands of private and public data sources using data scraping and crawling methods to extract relevant secondary data, which is then validated and verified using GrowthEnabler automated data-cleansing methods, industry and technology segmentation taxonomies and mapping protocols and core intelligence from pre-populated Startup profiles and reviews.

The major sources of Secondary research are:

**Analyst validation** – A team of Analysts and Subject Matter Experts validate both the primary and secondary data while using internal peer reviews to substantiate core assumptions and data points, and external discussions with senior decision makers to assess business relevancy, timing and need.

- i. Global Startup websites
- ii. Data aggregators
- iii. VC and Investor portfolios
- iv. News Feeds
- v. Industry reports
- vi. Regional Company registration websites
- vii. Social Sources (Social Sites, Blogs, Articles, Media sites)

A total of 57 data-points and parameters are applied in analysing and predicting the growth potential and health of a Startup, including:

- i. Company information
- ii. Leadership Team
- iii. Business Model
- iv. Financial Strength/Funding/
- acquisition data
- v. Product Innovation - patent data and core features and functions analysis
- vi. Customer value & sentiments
- vii. Social Media and Branding coverage
- viii. Business Traction and progress

### STEP 2: Startup Evaluation with GE Pii

The research identifies Top 15 disruptive Startups in AR & VR India landscape and details the synopsis and strengths of the companies based on information provided on the RFI. Out of the total 57, 30 parameters are classified under 5 broad categories used to calculate the GE Pii Score.

- i. **Product & Innovation**
- ii. **Leadership Team**
- iii. **Market Traction**
- iv. **Financial Strength**
- v. **Social media and Branding**

Photo Attributions:

Oculus Rift Driver, 2015. (Photo by Nan Palmero, licensed under CC BY 2.0.)

Samsung's Virtual Reality MWC 2016 Press Conference (Photo by Maurizio Pesce, licensed under CC BY 2.0.)

A woman using a VR headset at SXSW, 2015. (Photo by Nan Palmero, licensed under CC BY 2.0.)



**GrowthEnabler**

[info@growthenabler.com](mailto:info@growthenabler.com)