THE ROADMAP FOR FUTURE VR SUCCESS

Whitepaper

JUNIPER RESEARCH

1.1 Introduction

Developments in sensor technologies, processing power and form factors have progressed the VR (Virtual Reality) market and the inclusion of VR in smartphones; a device that is almost ubiquitous in developed countries.

Figure 1: Types of VR Games Content Users

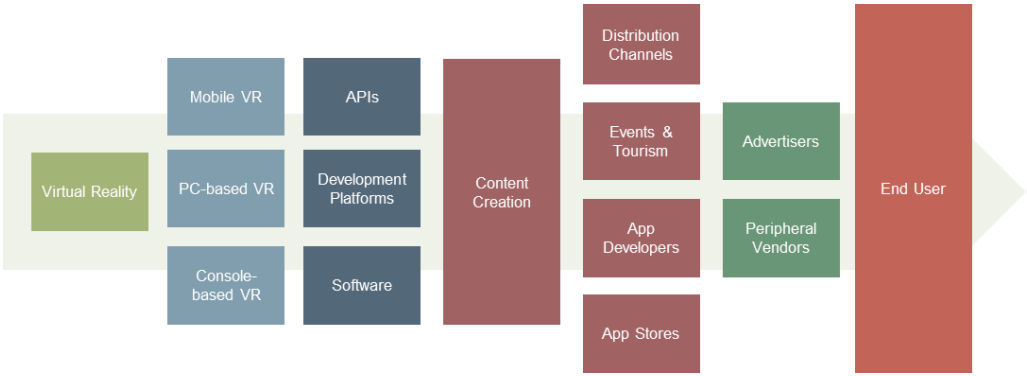
Early adopter
- High spend on content
- Likely to purchase highly price dedicated VR units

Casual user
- Smartphone-based
- Unlikely to invest heavily
- Casual user of content
- High turnover rate of applications

Source: Juniper Research

Additionally, serveral platforms have come to prominence in the development of content and accessories to expand the value proposition for the end user. Although initial VR use cases centred on the multimedia and games industries, the technologies now being developed have the ability to have a mass market impact in other industries, including education, training and healthcare in the future.

Figure 2: Juniper Virtual Reality Ecosytem



Source: Juniper Research

1.1.1 Notable Hardware Launches

Over the course of the previous year there have been a number of notable product launches, from both established technology vendors and new entrants looking to disrupt a market that is looking to establish itself as mainstream.

Most new products are aimed at the PC-based market, however Juniper Research anticipates an increased focus on developing standalone units, thus competing in a less saturated market segment.

Indeed, there have been a few incidences of a manufacturer updating or releasing updated units, including:

- **HTC** initially released the VIVE HMD (Head Mounted Display) in April 2016, however released the VIVE Pro in April 2018, offering increased FOV (Field of Vision). Additionally, the new Pro unit includes an AMOLED (Active-Matrix Organic Light-Emitting Diode) display.
- **Sony** released an updated version of the PSVR (Playstation VR) unit in October 2017 to fix minor hardware issues related to the user's comfort whilst using the device.

In the previous edition, it was mooted that Microsoft would release a competitor to PSVR for its gaming console, Xbox, due to its announcement that Xbox One would support VR at E3 in 2016. However, it has become apparent that Microsoft has shifted focus to AR (Augmented Reality) technologies instead. Microsoft is the manufacturer of the Microsoft HoloLens.

However, Juniper Research believes that Microsoft's support for VR will emerge in 2019, with confirmation of VR support for next generation consoles likely to be announced at E3 in June of this year.

Additionally, Nintendo has not made announcements regarding VR support for its mobile gaming platform, Switch, despite code appearing to support a VR mode being found in August 2018. Despite this, Juniper believes that the device's resolution of 1280×720 is insufficient to compete with incumbent players.

Table 3: Select Virtual Reality Headset Launches January 2017-June 2018

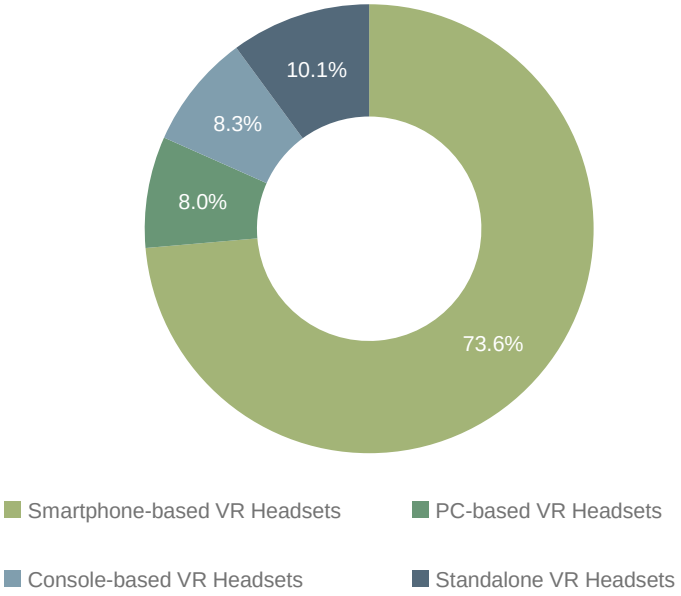
Manufacturer	Model	Platform	Launch Date
DPVR	DPVR VR E3	PC	Mar-2017
Dell	Dell Visor	PC	Oct-2017
Lenovo	Lenovo Explorer	PC	Oct-2017
Acer	Acer WMR headset	PC	Oct-2017
HP	HP WMR headset	PC	Oct-2017
Samsung	Samsung Odyssey	PC	Nov-2017
HTC	HTC VIVE Focus	Standalone	Jan-2018
Asus	Asus HC102	PC	Feb-2018
HTC	HTC VIVE Pro	PC	Apr-2018
Oculus	Oculus Go	Standalone	May-2018
Lenovo	Lenovo Mirage Solo	Standalone	May-2018
VRginners	VRginners XTAL	PC	Jun-2018

Source: Juniper Research

1.1.2 2018 VR Headset Shipment Figures

Overall, the VR market has suffered a degree of regression since the last edition of this research in 2017. Indeed, shipment figures have not fulfilled expectations, with many vendor's figures declining since 2017. The exception to this has been smartphone-based VR. Likely due to the low cost it has continued to act as the gateway for many new users to the VR space. However, smartphone-based VR will remain relatively low-end.

Figure 4: Platform Share of VR Headsets, Device Shipments Per Annum (%) in 2018, Split by 4 VR Platforms



Source: Juniper Research

PSVR reportedly shipped just over 100,000 units in Q1 2018, compared with over 300,000 units in Q1 2017. Indeed, a lack of VR-comptible games and apps has been a key factor in dampening initial interest in VR services. However, Juniper Research anticipates that price reductions in many countries and additional Christmas spending, will propel Sony to sell over an estimated 1 million units in 2018 alone.

Whilst sales have increased due to price drops more recently, Juniper believes that sales could be further increased by undertaking the following:

- Additional price drops – Any further price drops will have a negative effect on hardware vendors' profit margins, but the impact of increased sales may in fact push up overall revenues from VR headset sales.
- Bundling of peripherals and services – A strategy already taken up by a number of providers, but Juniper Research urges vendors to bundle VR headsets, accessories and any available content into a single consumer offering. In turn, this will increase the value proposition of the purchase for users and increase overall adoption of VR headsets. New additions to bundles must align with the intended audience of the product.
- Exploration of a subscription model – Whilst this may take time to implement, reducing the initial acquisition cost of the unit will open up VR to those who were previously unable to buy, or hesitant about buying, a unit.

1.2 VR Market Landscape

Due to the nascent state of the market, Juniper Research believes that revenue from hardware sales will generate the majority of revenues throughout the forecast period. The lack of content creation in the market will continue to plague the industry; if this trend continues then the value proposition of a headset will only diminish.

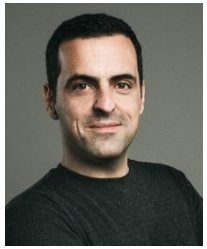
Juniper estimates that around 42% of revenues in the market will be attributable to headset sales. Efforts to mitigate the lack of content creation have been attempted by hardware vendors with a limited degree of success. Juniper anticipates revenues from VR content to exceed VR headset sales revenues for the first time in 2023.

Given the various industries that VR is anticipated to permeate, Juniper believes that any future strategies to encourage content creation cannot be ‘one-size-fits-all’ solutions. For example, the mobile ecosystem is able to leverage exisiting APIs and app stores as an immediate platform for third party development, where as content development is hindered by a fragmented ecosystem involving a high degree of specialist service providers.

However, monetisation of content will remain a concern. VR apps that fail to impress or fulfil a significant value will face attrition rate similar to the wider app ecosystem.

Conversely, the console VR market comes with high expectations. Juniper believes that development of the first AAA VR console game will begin with launch of 5th generation gaming consoles anticipated in 2020.

1.3 VR Movers & Shakers



Hugo Barra

Facebook

Vice President of Virtual Reality

Barra is currently VP of Virtual Reality at Facebook. From 2008 to 2013 he had at a variety of roles for Google, working mostly on Google's Android OS. From 2014, he was the Vice President of Xiaomi; his last role before joining Facebook.

Barra graduated from MIT (Massachusetts Institute of Technology) with a Master in Electrical Engineering and Computer Science.

Barra has worked with a number of market leaders in the VR space, however his role at Facebook is the first VR-specific role. Juniper believes his role will focus on the development of mobile VR and its use in social settings. As a result, Juniper Research believes that Facebook are well positioned to release a form of social VR within 3 years.

Aaron Chen

DPVR

VP of Engineering

Chen is currently VP of Engineering at DPVR. He was responsible for delivering the first binocular laser tracking PC VR system, called Polaris. He has also collaborated with Huawei and China Mobile to build the first cloud-based VR service by leveraging 5G.

Previously, Chen had various roles at HyperReal, AMD and Intel. At AMD he was responsible for the development and maintenance of graphic drivers for the PlayStation 4 gaming console.

As the market becomes increasingly competitive, Chen's experience in innovation of graphics processors and displays will become integral to enabling DPVR to compete on a global scale.

Paul Brown

HTC

General Manager of VIVE Europe

Brown was appointed General Manager of VIVE Europe in May 2018 and is tasked with increasing VIVE's presence in the region. Prior to working with VIVE, Brown had positions at Disney and Spotify, where he was responsible for the latter's digital content division, overseeing its music subscription service.

He has also had positions at Sony Music and Pandora Media.

Brown's appointment would indicate HTC's focus on content and developing revenue models beyond the sale of VR headsets. Given the accomplishments Brown has had in previous roles, it would seem the hiring is motivated by the desire to achieve similar goals at HTC.

Min-Liang Tan

Razer

Co-founder & CEO

Min-Liang Tan is the co-founder and CEO of Razer, where he is responsible for the design and development of all Razer hardware. Tan graduated from the National University of Singapore Law School and was employed as a lawyer before co-founding Razer in 2005.

Tan has been elected to the board of the PC Gaming Alliance.

Tan will continue to oversee all of Razer's product hardware developments, thus is vital to the direction of the company in the VR space. The focus is very much on gaming and, according to Juniper Research's market forecasts, the PC-based VR market is anticipated to be worth over $1 billion by 2023 and Tan will be responsible for attaining the higher proportion of market share.

Richard Marks

Google

Director, Technical Group Lead at ATAP

Marks joined Google as a senior member of its ATAP (Advanced Technology & Products) team in July 2018. Before this Marks spent 19 years at Sony Interactive, in which he was responsible for the development of many aspects of PSVR through Sony's Magic Lab.

He was involved in the creation of the EyeToy and PlayStation Camera, the foundation of PlayStation Move and PSVR's motion-tracking technology.

Notably, Marks now has a role that has much less focus on VR. Nonetheless, Juniper Research believes that his experience in the VR space will be used in some form by Google for the creation of VR services.

Joachim Ante

Unity Technologies

Co-Founder & Chief Technology Officer,

Ante is currently CTO of Unity Technologies, having co-founded the company in 2004 and is also its Director.

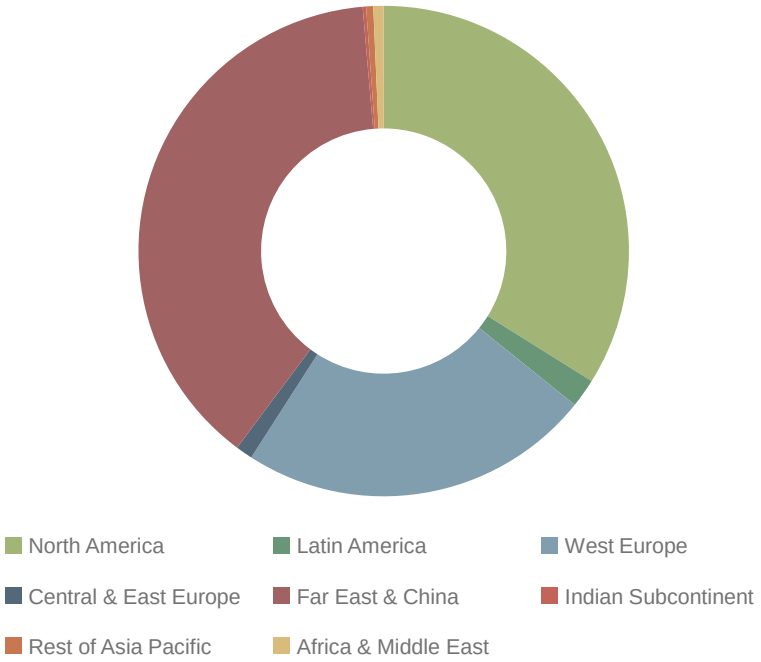
His responsibilities include leading the development of its VR platform, which is used to develop over 50% of VR games released.

Ante will continue to be vital to increasing the capabilities of Unity's platform. Given that Juniper believes that games will be the biggest revenue generating sector of VR content, it is essential that Ante positions Unity to best capitalise on the VR games market as it moves closer to AAA VR games on gaming consoles.

1.3.1 Market Forecast Summary: Total VR Games Market Value

Revenues from VR-specific games will reach $8.2 billion by 2023, rising from an expected $1.2 billion in 2019. The development of smartphone VR content is essential to increase consumer confidence in VR across all platforms, following a disappointing year of hardware sales in 2018.

Figure 6: Total VR Games Market Value ($m), Split by 8 Key Regions, 2023



Source: Juniper Research

- Over 100 million mobile VR devices, including smartphone and standalone headsets, will access games globally by 2023, rising from 52 million devices in 2019. Low cost mobile VR content is needed to initially engage users and encourage them to other VR platforms.
- 50% of mobile VR games accessed in 2019 will not be monetised due to the difficulty in implementing advertising into VR content without impeding the user experience. In response, app developers must leverage in-app purchases to recover this shortfall in potential advertising revenue.
- Sustaining the growth of VR hardware sales will only be achieved by creating a profitable VR content market. Juniper has identified 2023 as the year in which VR content revenues, including games, multimedia, gambling and others, will surpass hardware revenues for the first time. VR headset vendors must now focus on increasing their VR content libraries through app store partnerships to capitalise on the anticipated growth of VR users.

Order the Full Research

Juniper's latest **Virtual Reality** research provides in-depth analysis of the VR industry, covering both software and hardware. The report analyses VR prospects across 8 key vertical markets, including Games, Multimedia, Advertising and more.

The research identifies key trends and strategic recommendations for a range of stakeholders, alongside extensive market forecasts. This combined approach showcases the key opportunities in the sector, split by PC, Console, Smartphone and Standalone VR, alongside VR Content, Apps, Peripherals and 360° Cameras.**Key Features**

- **Benchmark Industry Forecasts:** 5 year forecasts provided for the VR market. Global, regional & country level data provided for Adoption, shipments and hardware revenues for VR headsets and accessories; Adoption and revenues for VR content including games, multimedia and VR gambling; VR data forecasts split by tethered *vs* untechered
- **Sector Technology Impact Analysis:** Analysis of future VR prospects across 8 key vertical markets including Advertising, Education, Games, Multimedia, Real Estate, Retail, Tourism and Training.
- **Strategic Recommendations:** Strategic review of the VR ecosystem, together with recommendations for stakeholders across the value chain.
- **Competitive Intelligence for 25 VR Players:** Analysis includes market leaders, challengers, and disruptors. Companies are directly compared, alongside individual write-ups.

http://www.juniperresearch.com

What's in this Research?

1. **Executive Summary & Core Findings** – Top-level report summarising key trends, competitive analysis and market forecasts, allied to a series of key takeaways and strategic recommendations for C-level executives. (PDF)
2. **Deep Dive Strategy & Competition** – Strategic analysis of market dynamics, drivers and trends, together with a detailed investigation of key VR sectors and player analysis through the Juniper Leaderboard. (PDF)
3. **Deep Dive Data & Forecasting** – Future VR prospects analysis, together with 5 year forecasts for key VR metrics, including adoption, hardware shipments and revenues. (PDF)
4. **Interactive Forecast Excel** – Highly granular dataset comprising more than 16,000 datapoints, allied to an Interactive Scenario Tool giving users the ability to manipulate Juniper's data. (Interactive XL)

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