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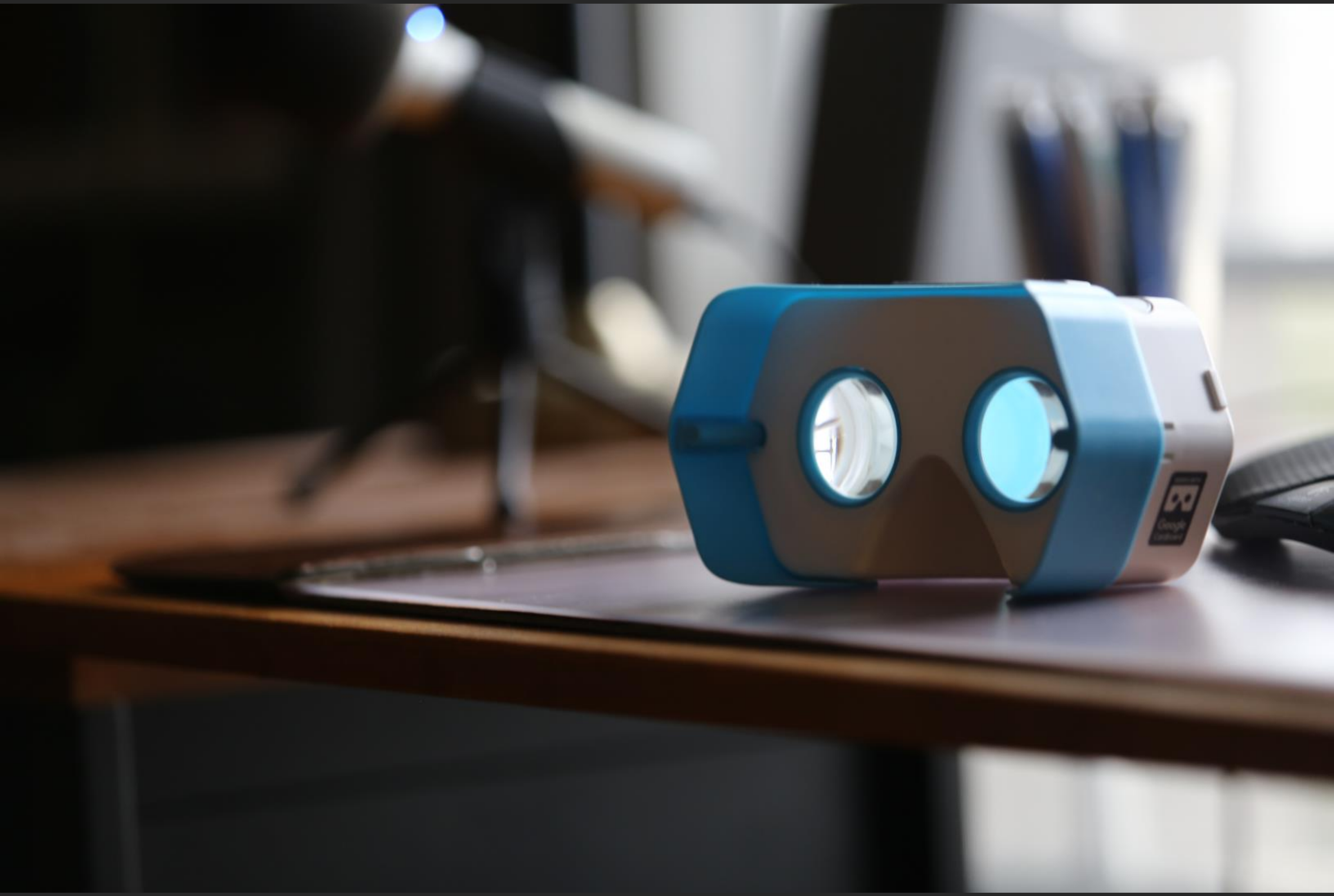

ARTILLRY INTELLIGENCE BRIEFING

THE STATE OF VIRTUAL REALITY

JULY 2017

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Executive Summary

ARtillry Insights are monthly installments of VR/AR data and analysis. They bring together original and third party data to reveal the dynamics of VR and AR sectors, and their opportunities.

In addition to data, a layer of insights is applied to translate market events and raw figures into prescriptive advice for VR/AR players. This takes form in a narrative story arc, grounded in market figures.

This report specifically looks at the current state of VR adoption. It starts with hardware (HMD) sales figures, followed by an analysis of each platform's unique attributes and success factors.

In addition to hardware, we examine the apps that show the most activity and usage at this stage of VR's evolutionary path. What makes them successful, and what lessons does that hold?

The following pages examine these questions through a combination of data and narrative. Questions and requests for deeper analysis can be submitted at **https://artillry.co/contact/.**

Part I. Hardware Adoption By Platform

Units Sold: Summary

Tier 1	
Playstation VR	1M
HTC Vive	.42M
Oculus Rift	.24M
Tier 2	
Samsung Gear VR	5M
Google Daydream	.26M
Tier 3	
Google Cardboard	10M
Total Units	**16.92M**

Units Sold: Breakdown

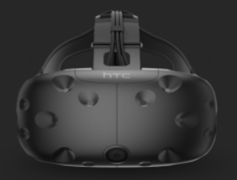
Tier 1

Playstation VR

Price: **$399 (plus PS4 console)**
Estimated Units sold: 1 million

Analysis: PSVR's unit sales are greater than the Rift and VIVE because out of the gate, it's already compatible with an installed base of 60 million PlayStation4 units. That increases its addressable market and lowers the adoption barrier for many consumers, given that competing headsets require a designated PC purchase. However the PSVR lacks some of the feature advantages of competing systems such as resolution, field of vision, and its content library is narrower and focused mostly on games. Conversely, PSVR exceeds its Tier-1 competitors when it comes to social features. For example, it lets friends and family participate in or spectate VR experiences by mirroring game play on a nearby television. This adds a participative dynamic to some of VR's otherwise-isolating tendencies, and has boosted overall satisfaction levels, especially in family households.

HTC Vive



Price: **$599 (plus dedicated PC)**
Estimated Units sold: .42 million

Analysis: The Vive has the second highest unit sales in tier 1, mostly due to its longer tenure in the market. Due to supply chain and shipping delays, the Oculus Rift and PSVR entered the market later in 2016. Other Vive advantages include a better room scale tracking system (Valve's Lighthouse system) and more available content. The latter is a function of its content distribution model that utilizes the Steam platform, which is open for developer submissions. This has made it a favorite among developers. This is analogous to Microsoft's position in the PC world, compared with Apple's more gated approach to approved software. It is a double-edged sword as more content provides volume, but also quality control challenges. Vive has developed as more of an enterprise product (again like Microsoft) compared to the Oculus Rift's greater consumer appeal.

Oculus Rift

Price: **$399 - $499 (plus dedicated PC)**
Estimated Units sold: .24 million

Analysis: The Rift experienced many launch delays in 2016, including its anticipated Touch Controller. The hand controllers are now known as superior to competing HMD inputs, however delays to market hurt the Rift's market share. As stated above competitor HTC Vive has taken an open approach to content development; Rift has taken the opposite approach with a more strict set of standards for content distributed in its Home software distribution platform (again, like Apple). This has made it more of a consumer favorite, while developers and enterprises gravitate more towards the Vive's open and customizable parameters. Though the Rift has superior hand controllers, its room scale tracking system is inferior to HTC Vive. Rift further positioned itself advantageously in July when it dropped the bundled price of its headset and touch controllers to $399 (previously $599).

Tier 2

Samsung Gear VR

Price: $99 - $129 (plus compatible smartphone)
Estimated Units sold: 5 million

Analysis: Gear VR is the best selling headset on the market, due partly to its low price and the inherent benefits of mobile VR. Headsets in this category utilize the device that many consumers already own, rather than requiring an additional costly PC rig. Gear VR's sales volume also result from its tenure in the market. Its closest competitor — Daydream View — only recently entered the market (October 2016). However, Daydream has the potential to outpace Gear VR due to Google's reach and developer network (see below). Samsung is further challenged by the stain left by the Galaxy Note 7 recall. Beyond PR, the loss of that device drastically reduced the addressable market of compatible Gear VR handsets, creating a gap for competitors.

Google Daydream View

Price: **$59 - $99 (plus compatible smartphone)**
Estimated Units sold: .26 million

Analysis: Though Daydream View entered the market later than Gear VR, we believe it will outpace its tenured counterpart. Its growth and eventual market share will result from Google's advantages. For one, it has a massive developer network built from the Android operating system, on which the Daydream platform is based. This will amplify the device's consumer appeal with more content. That content will then compel more device manufacturers to build Daydream-compatible handsets. This virtuous cycle will create a more attractive choice for consumers than Gear VR. Its growth will mirror (in magnitude and model) that of the Android mobile operating system. Importantly, Google is also motivated and vested in Daydream becoming the center of the next major computing platform — just as it did with Android and the smartphone revolution. This outlook indicates that Google will put a lot of muscle behind the Daydream platform.

Tier 3

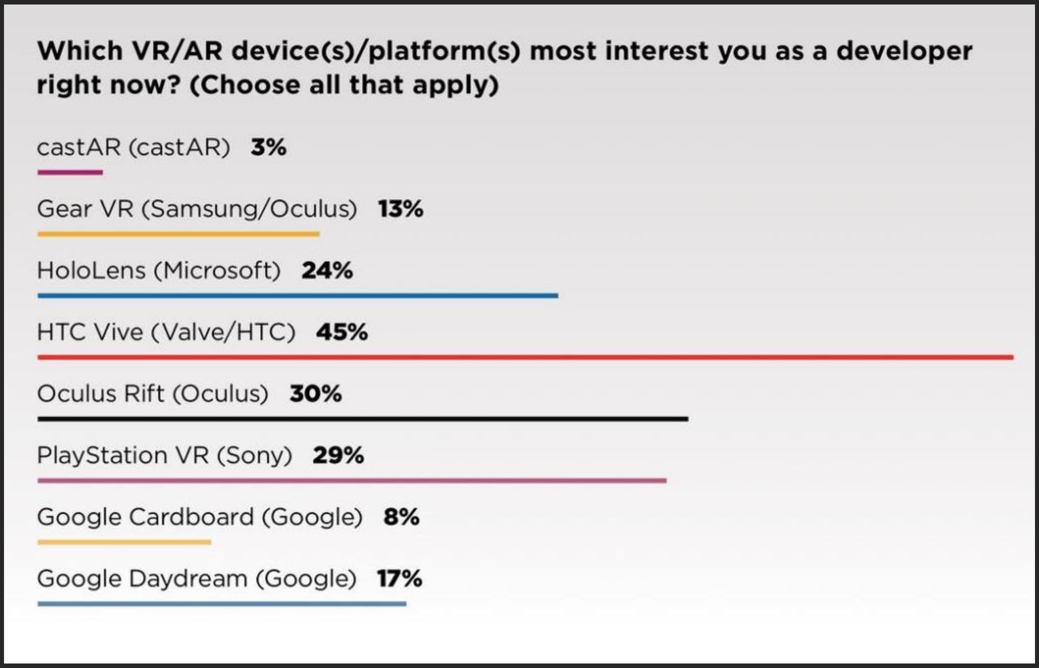
Google Cardboard

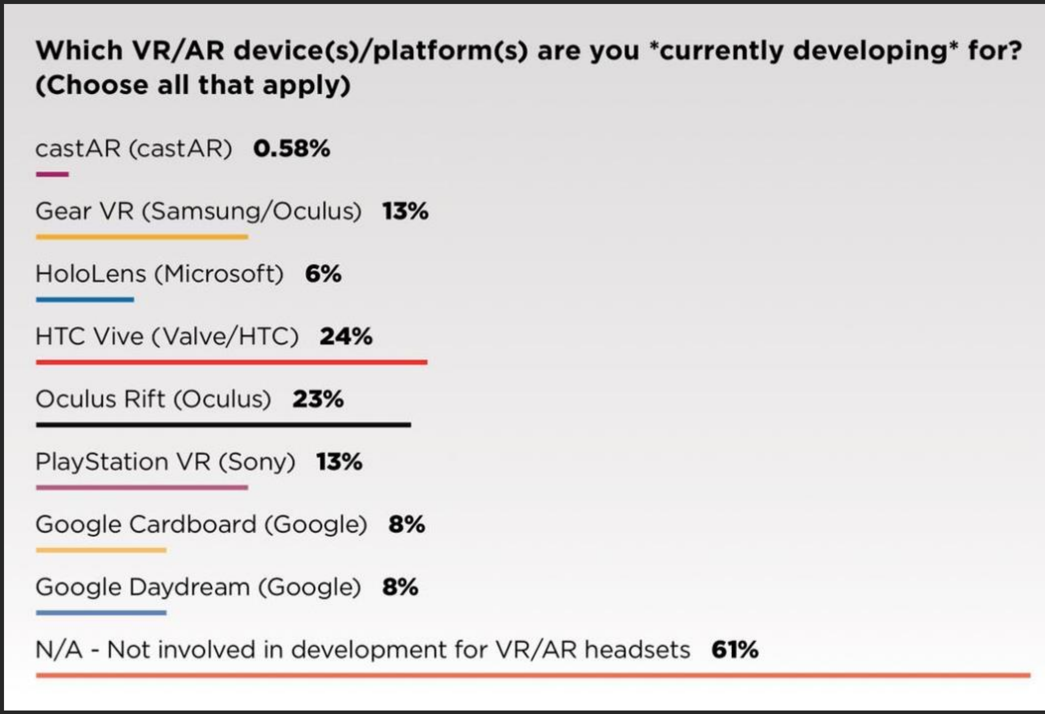
Price: **$0 - $15 (use with any smartphone)**
Estimated Units sold: 10 million

Analysis: Google Cardboard matches Gear VR for the highest selling VR headset, though some consider it not worthy of that designation. It has achieved this status due simply to one factor: cost. Literally made of cardboard, it requires low cost components and a wide compatibility of smartphones. Much of its market penetration in fact has been a result of promotional giveaways in conference SWAG bags or the New York Times' famous cardboard distribution campaign. This was to seed its VR content for embedded reporting and video essays. The user experience is rudimentary, but has served to many as the "gateway drug" for VR. Google will put more effort into Daydream (and its Tango AR platform), but cardboard will still be supported in efforts to distribute VR to developing nations and within schools globally.

Developer Sentiment

A factor in platform success -- in addition to consumer appeal -- is developer sentiment. This seeds content libraries, which is a considerable factor in driving platform utility and appeal. In developer polling, the following results were found:

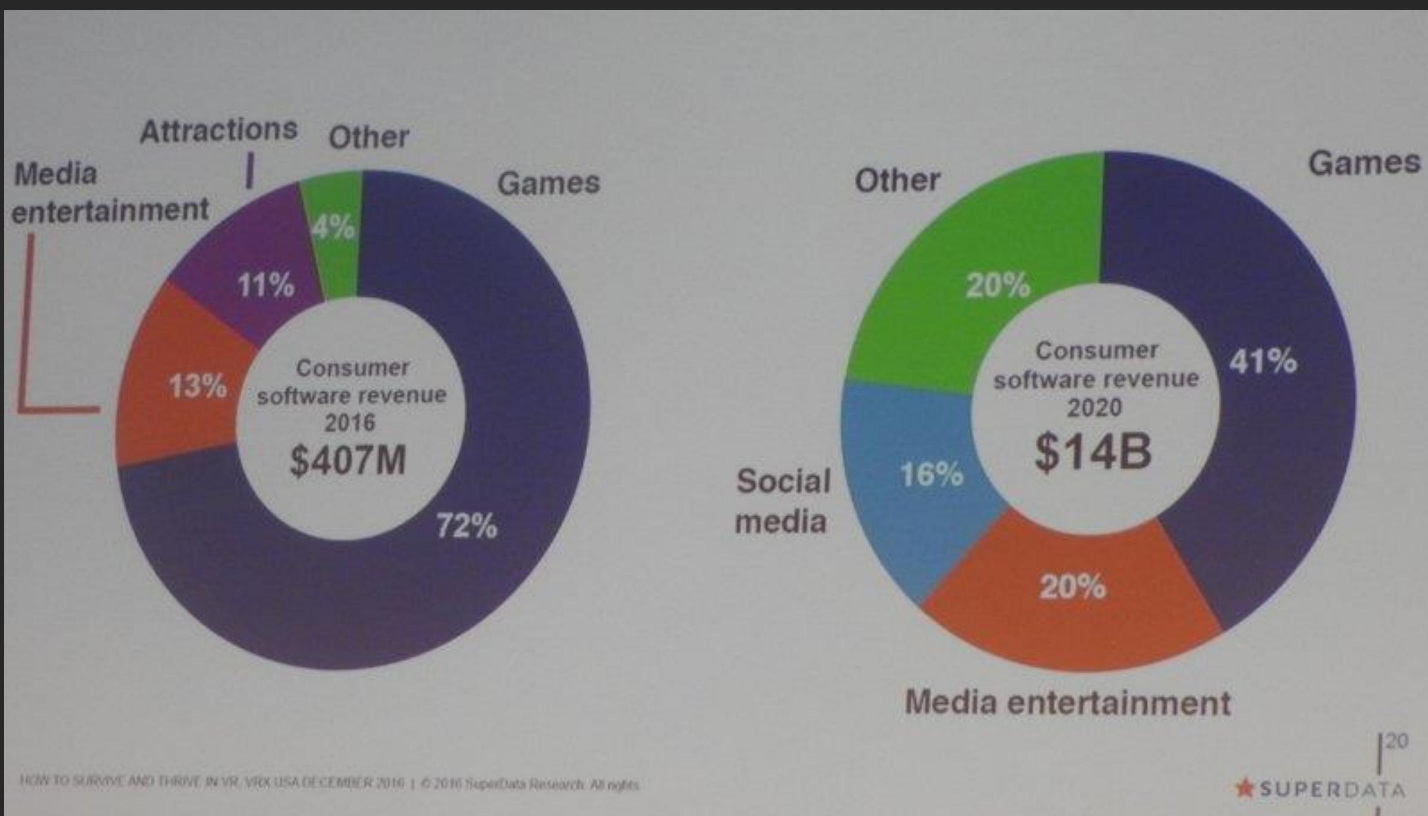




Source: Motherboard

Part II. Top Performing Apps

Before examining top performing apps and their success factors, it's worth noting the breakdown in app type. Currently the majority of apps are games. This is especially true among tier 1 systems. This will shift over time as social and media/entertainment apps gain share. This indicates an opportunity for non-gaming VR apps, as the marketplace for VR content becomes demand-driven and supply-constrained.



Source: Superdata

Tier 1

Many tier 1 apps and games are available across platforms. There are cases where that isn't true, such as economically-incentivized exclusive releases, or compatibility (such as room-scale systems). The top-selling games mentioned below are unique to tier 1, and mostly for VIVE and RIFT..

Job Simulator (Owlchemy)
This game reached $3 million in revenue in January, making it the best selling VR title to date.

Arizona Sunshine (Vertigo Games)
This game recently reached $1.4M in revenue and is the fastest growing VR title to date, given its 12/06 release date

Resident Evil 7 (Capcom)
This is an anticipated game that reached 100,000 downloads in the short time since its 1/24 release date

Raw Data (Servios)
Recently reached $1 million in sales

The Gallery Episode 1 (Cloudhead)
Recently reached $1 million in sales

Playstation VR Titles

The following chart shows the top selling games on the PlaystationVR platform at the time of this writing (some of which are mentioned above).

PlayStation VR Games	
1	Job Simulator
2	Batman: Arkham VR
3	Until Dawn: Rush of Blood
4	PlayStation VR Worlds
5	Keep Talking and Nobody Explodes
6	Here They Lie
7	Sports Bar VR
8	Carnival Games VR
9	Harmonix Music VR
10	EVE: Valkyrie

Source: Sony

Tier 2

Samsung Gear VR
The top 5 downloaded games and apps on GearVR are at the time of this writing are as follows:

Minecraft, GearVR Edition (Microsoft)
Eve Gunjack (CCP Games)
Netflix VR (Netflix)

Lands End (ustwo)
Within (Within)

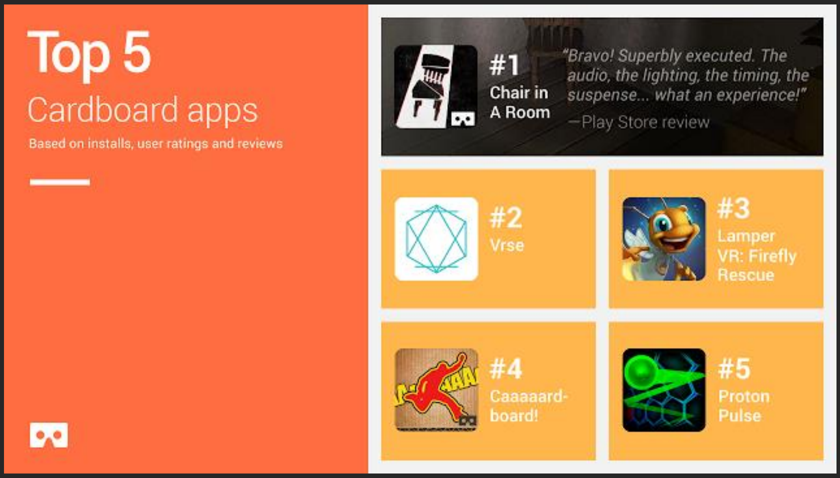
Google Daydream View
The top 5 downloaded games and apps on Daydream View at the time of this writing are as follows:

YouTubeVR (Google)
NetflixVR (Netflix)
The Turning Forest (BBC)
Hunters Gate (Climax Studios)
The Arcslinger (Big Red Button Entertainment)

Tier 3

Google Cardboard

Google Cardboard has seen a total of 25 million app installs. The five most downloaded apps are represented in the graphic below:



Source: Google

Part III. Insights on Performance

A question that arises from the above figures is: Why are the above app leaders performing well? There are a few common attributes that can answer this question:

Native Functionality

Games that utilize the unique aspects of VR immersion tend to perform best. Those that simply take existing 2d media and shoehorn it into a stereoscopic VR view conversely do not resonate. This is analogous to the “native thinking” that was a success factor among smartphone apps. Apps that utilized the unique hardware functions (accelerometer, GPS, camera, etc.) generally outperformed apps that simply put existing media on a smaller screen. A few examples of this principle are Waze, Shazam and Pokemon Go. In VR, those that exhibit this native thinking so far are best sellers like Job Simulator (utilizes spatial 3D rendering and touch control), and Arizona Sunshine (has a realistic “locomotion” effect).

Platform Alignment

Apps developed on platforms with greater reach tend to have more commercial success and market share. Again, this is analogous to the lessons learned in the smartphone era. There, developers making a choice of platform (e.g. iOS, Android) must weigh that platform’s technical alignment with an app’s desired functionality, as well as its customer reach. The latter is not only quantitative but qualitative: weighing a platform demographic alignment with the app’s target market. VR apps and games will follow the same formula.

Looking Forward

Beyond the current market penetration figures, it’s important to forecast where the market will go next. That will hinge on a few key factors.

Mobile

Among the headset sales figures listed above, the tier 1 (tethered) headsets total 1.4M units. Tier 2 and 3 (mobile) headsets total 10.3m units. Furthermore the addressable market for mobile VR extends to the 2.6 billion smartphones on the planet. This makes mobile the nearer term -- albeit more rudimentary -- modality for VR opportunity and scale. Below is a recent presentation segment where we unpack this further (click to play).

https://youtu.be/Eg3jn4RqDKw?t=9m29s

Cost

Only 10 percent of potential VR consumers are willing to spend more than $400, according to Eedar. Cost continues to come down for Tier 1 headsets as Moore's Law marches forward. More headsets in the market are also creating price competition. In addition to the "big 3" headsets analyzed above (tier 1), there are several standalone headsets entering the market such as FOVE. Microsoft has also recently entered the market with its "windows holographic" program. Meant to drive sales of VR-compatible windows PC's this program is working with hardware manufacturers for high end tethered VR headsets at a sub-$400 price point. The first to develop one is Lenovo, which previewed its model at CES in January. Our presentation segment on this pricing analysis can be seen below (click to play).

https://youtu.be/Eg3jn4RqDKw?t=6m48s

Accessibility

Because high-end VR hardware is currently cost-prohibitive for the majority of consumers, there is an opportunity to bring VR to them in temporal ways. In other words, the field of "location based VR" includes VR Arcades, theme parks and other venues where consumers can pay to experience VR for a finite time period. This presents a historical parallel in that it mirrors the arcades of the 80s and 90s that were prevalent before at-home console gaming became ubiquitous. We'll see the same opportunity for VR in the near term, and the same market evolution towards home ownership.

Further Viewing

Much of the above can be viewed in a recent presentation we gave, which can be seen in full below (click to play). Slides are also available upon request.

https://artillry.co/2017/03/09/artillry-workshop-the-state-of-vrar/

About ARtillry

ARtillry is a publication and research firm that chronicles the spawning of augmented reality (AR) and virtual reality (VR). Through writings and multimedia, it provides deep and analytical views into the industry's biggest players and opportunities.

Run by career analyst and journalist Mike Boland, coverage is grounded in a disciplined and journalistic approach. It also maintains a business angle: Though fun and games permeate VR and AR (especially the former) long-term cultural, technological and financial implications are primary.

Learn more at **https://artillry.co/**

About Intelligence Briefings

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Note of Disclosure

ARtillry has no financial stake in the companies mentioned in this report, nor received payment for its production. ARtillry's disclosure and ethics policy can be seen at **https://artillry.co/disclosure-and-ethics-policy/**

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