ARtillery Intelligence Briefing

VR Usage & Consumer Attitudes, Wave IV

April 2020

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▊▊▊ Executive Summary

How do consumers feel about VR? Who's using it? What devices and apps do they prefer? And what do they want to see next? Perhaps more important, what are non-users' reasons for disinterest? And how can VR software developers and hardware players optimize product strategies accordingly?

These are key questions at VR's early stages that we set out to answer. Working closely with **Thrive Analytics**, ARtillery Intelligence wrote questions to be presented to more than **1,000** U.S. adults in Thrive's established consumer survey engine. And we've analyzed the results in a narrative report.

This follows similar reports we've completed over the last two years. Wave IV of the research now emboldens our perspective and brings new insights and trend data to light. All four waves represent a collective base of **9,079** U.S. adults for robust longitudinal analysis. This capability will continue to improve.

Meanwhile, what did we find out? At a high level, **19 percent** of consumers surveyed have bought or used a VR headset, up **from 16 percent** in 2019. More importantly, VR users indicate high levels of satisfaction with the experience: **55 percent** reported extreme or moderate satisfaction with VR.

As for price sensitivity, demand inflects at **$400** and **$200**. These are interestingly the price points for **Oculus** headsets including **Quest**, **Rift S** and **GO**. This indicates **Oculus'** competitive edge, aggressive price competition and accelerating market share, congruent with our separate projections.i

Furthermore, standalone VR – embodied by **Oculus Quest**, **Go** and other emerging headsets – represents a key inflection point for

VR this year. Though still early, standalone VR addresses many consumer objections to PC-based VR including cost and setup friction.

However, it's not all good news: Non-VR users report relatively low interest in VR ownership – **27 percent**, down from **31 percent** in 2019 – and explicit lack of interest. This downward trend in interest is concerning for VR but isn't surprising given the dip in excitement we've anecdotally observed.

Moreover, the disparity between current-user satisfaction and non-user disinterest underscores a key challenge for VR: you have to "see it to believe it." In order to reach high satisfaction levels, VR has to first be tried. This presents marketing and logistical challenges for the industry to push that first taste.

But if anything is going to bring that accessibility and interest to mainstream markets, it's the lowered pricing and compelling play of standalone VR headsets like **Oculus Quest.** The device continues to turn heads and break pricing barriers, given **Oculus'** loss-leader pricing strategy to subsidize hardware in order to build a network effect.

These points join several other strategic implications that flow from the latest consumer VR sentiments. We'll examine those takeaways in the coming pages, including the latest wave of findings, and our analysis for what it means. The goal is to empower you with a greater knowledge position.

▊▊▊ ARtillery Intelligence

▋▋▋ Key Takeaways

▋▋AR 19% of consumers own or have tried VR, up from 16% last year.
- ▋▋AR This equals roughly 45 million U.S. VR users, up from 31 million last year.
- ▋▋AR This is different than headset sales or installed base, given multiple users per headset.

▋▋AR Samsung Gear VR has the greatest adoption (48%), followed by PSVR (38%) and Oculus Rift (19%).
- ▋▋AR Gear VR's lead is surprising due to its retraction from the market, owing usage to a cumulative base.
- ▋▋AR Lowered prices and new entrants (e.g. standalone headsets) are taking share from VR incumbents.
- ▋▋AR PSVR is in a strong position due to its installed base of 100 million PlayStation 4 consoles.

▋▋AR Oculus Rift (19%) and HTC Vive (15%) had the fourth and fifth-highest penetration.
- ▋▋AR They trail PSVR despite better specs, due mostly to price, PSVR's console base and its simplicity.
- ▋▋AR They also require a dedicated PC with costly graphical processing, and in some cases cumbersome setup.
- ▋▋AR Rift has won market share from VIVE, due to Oculus' aggressive pricing and content investments.
- ▋▋AR Oculus Quest has 13% market share in this survey, a fast riser given its mid-2019 launch

▋▋AR 55% of VR users are either moderately satisfied (22%) or extremely satisfied (33%).
- ▋▋AR This contrasts 11% of users that are either moderately dissatisfied (7%) or extremely dissatisfied (4%).
- ▋▋AR These are strong quality signals: there are few consumer products that show such high satisfaction.

▋▋AR 54% of VR users want better functionality; 38% want higher quality content; 37% want more content.
- ▋▋AR Content volume was the biggest desire in past waves but has been satisfied to some degree.
- ▋▋AR Oculus Go's 2018 introduction came with broad content options including YouTube and cinematic experiences.
- ▋▋AR Oculus Quest has a more limited and curated library, but it includes hit games like Beat Saber – a boon for VR.
- ▋▋AR Additional blockbuster games serve as VR milestones, such as Half-Life: Alyx for higher-end PC-based VR.

▋▋AR VR users are most interested in cinematic experiences (64%), gaming (54%) and travel applications (53%).
- ▋▋AR Cinema's lead is surprising in that it's not "native" to VR (viewing 2D movies in an immersive environment).
- ▋▋AR Though 2D cinema doesn't embody VR's true potential, users most want what they're comfortable with.
- ▋▋AR Eventual VR successes will design native immersive experiences that can *only* exist in VR.
- ▋▋AR VR will be conceptualized in activities consumers know until native experiences reframe their thinking.

▋▋AR 29% of non-VR users are interested in owning or trying VR, up from 27% last year and 31% in 2018.
- ▋▋AR All of the above represents a dip from 2017 (41%) which represents a market correction from VR hype at the time.
- ▋▋AR VR could get back to or exceed those 2017 interest levels but that could take 3-5 years.

▋▋AR The biggest reason for disinterest among non-VR users was "just not interested."
- ▋▋AR This definitive sentiment represents VR's biggest challenge as it widely deviates from user satisfaction, shown above.
- ▋▋AR Getting more users to *try VR* is therefore the name of the game, partly through lower-friction standalone VR.
- ▋▋AR Compelling content and VR killer apps will likewise be needed to attract more users to VR over the coming years.

▋▋AR 37% of VR users will pay up to $200 and 24% will pay up to $400 for a VR headset.
- ▋▋AR These demand-inflecting price points should be price targets for VR hardware manufacturers.
- ▋▋AR These also happen to be the price points of Oculus Go and Quest (and PSVR), respectively.
- ▋▋AR Facebook's deep pockets and long-term platform strategy drive aggressive price competition – a competitive edge.

▋▋AR VR adoption will continue to be slow but will be accelerated by standalone headsets.
- ▋▋AR The "all-in" low price and reduced set-up friction (e.g. inside-out tracking) address consumer concerns.
- ▋▋AR Oculus will be a leader, due to its investments in quality and aggressive price competition referenced above.

▋▋AR Simplicity in product design and marketing, versus a hardware-specs arms race, is showing some effectiveness
- ▋▋AR This "Nintendo-like" approach is showing success for leaders like PSVR and Oculus Quest.
- ▋▋AR There will be a market – though limited to a subset of gaming enthusiasts – for high-end hardware like Valve Index.

▐▌ Introduction: A Snapshot

In VR's early stages it's important to understand consumer behavior in order to optimize product strategies. We kicked off this process in 2017 with our first survey-based report on VR adoption patterns and consumer attitudes. Now, the 4th-annual report offers experienced perspective on market evolution.

Working closely with our data partner **Thrive Analytics**, ARtillery Intelligence wrote survey questions to present to the firm's **Virtual**

Reality Monitor and its sample of more than **1000** U.S. adult consumers. All four waves now represent a cumulative base of **9,079** U.S. adults, enabling robust longitudinal analysis.

These results are a telling snapshot of VR adoption, which we'll detail in the coming pages. That will include charts and a narrative story arc that unpacks strategic takeaways, and our outlook for consumer VR. But before taking that deep dive, here's a highlight reel.

▐▌AR   **19%** of respondents own or have tried VR, up from **16%** last year.
▐▌AR   **31%** of users engage VR monthly, **27%** weekly and **20%** daily.
▐▌AR   **48%** of users have used Samsung Gear VR, followed by PSVR (**38%**) and Oculus Rift (**19%**).
▐▌AR   **33%** of users are extremely satisfied with VR, **22%** are moderately satisfied.
▐▌AR   **4%** of users are extremely dissatisfied with VR, **7%** are moderately dissatisfied.
▐▌AR   **78%** of Oculus Rift S users are satisfied, **66%** for VIVE Cosmos and **63%** for PSVR.
▐▌AR   **37%** of users want more content, **38%** want better content and **54%** want better functionality.
▐▌AR   **29%** of non-VR users are interested in owning or trying VR, up from **27%** last year.
▐▌AR   **59%** of disinterested non-VR users cited "just not interested" as the reason.
▐▌AR   **61%** of VR users would pay up to **$400** for a headset. **69%** of non-users would pay up to **$200**.

Image Credit: HTC

Survey Sample: the "Who?"

To first add context to survey findings throughout this report, who's answering the questions? It includes more than **2,000** U.S. adults. Going deeper into demographics and psychographics, the respondents break down as shown below. More detail and segmentation are available upon request.ii

As the data show, the survey sample spans a wide range of U.S. adult consumers. Gender breaks down fairly evenly, as do age and income levels. The latter include attractive demographic groups such as active and buying-empowered ages (**25-34**), and high-income homes (**$75K+**).

This is all a function of Thrive Analytics' longstanding position and strategy development in consumer surveys. Its time-tested methodology and survey network comply with industry standards and best practices. ARtillery will continue working with Thrive for annual AR and VR consumer surveys.

"AR and VR are still in early-adoption phases," said **Thrive Analytics** managing partner **Jason Peaslee**. "There are still technology challenges, but we think AR & VR have the ability to transform the way people work, connect, and learn. We're excited about the prospects, and committed to measuring them."

VR User Profile

Age

Age	Percent
18-24	11%
25-34	18%
35-44	19%
45-54	15%
55-64	18%
65+	19%

Gender

Male 48%
Female 52%

Household Income

Income	Percent
<$25K	28%
$25K - $50K	30%
$50K - $75K	19%
$75K+	23%

ARtillery Intelligence   THRIVE ANALYTICS

2017-2020 Base = 9,079 U.S. online adults

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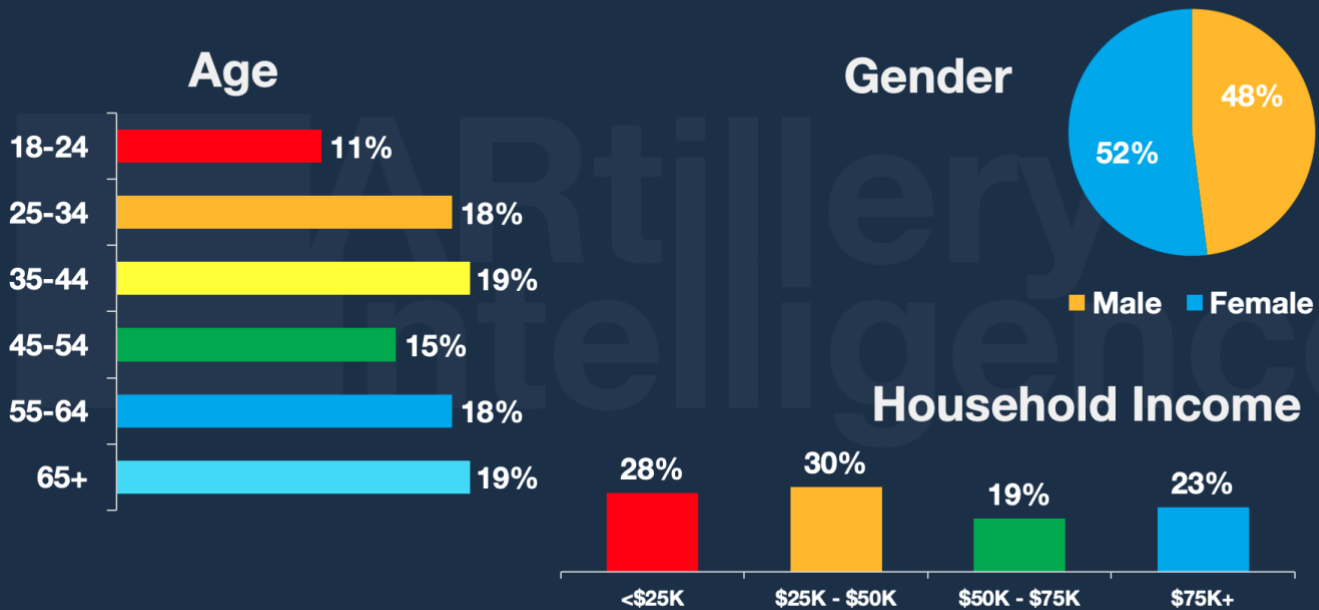
▋▋ What User Groups are Growing?

Drilling down one level, what user groups among the above demographics are growing from past survey waves? Among the overall survey population, those reporting VR use is growing across demographic groups, represented in the percentages shown below.

But where is the most growth happening? VR is notably – and perhaps unsurprisingly – growing most among Generation Z, (**8 percentage points**) followed by generation Y

(**5 percentage points**). The former includes individuals under the age of 25, while the latter range from 25-40 (a.k.a. millennials).

This bodes well for VR's future. These digital-first generations are more tech-savvy and are reaching for immersive digital experiences that VR offers. As Gen-Z cycles into the ranks of the buying-empowered adult consumer population, they represent VR's future consumers.

VR User Growth
Growth in VR Users, by Demographic

Growth is greatest among Gen Z and Y...

■ 2018   ■ 2020

Demographic	2018	2020
Male	19%	26%
Female	13%	19%
Gen Z	32%	40%
Gen Y	34%	39%
Gen X	17%	18%
Boomers	6%	9%
Silent Gen	4%	4%

ARtillery Intelligence   THRIVE ANALYTICS   2017-2020 Base = 9,079 U.S. online adults   © ARtillery Intelligence, 2020
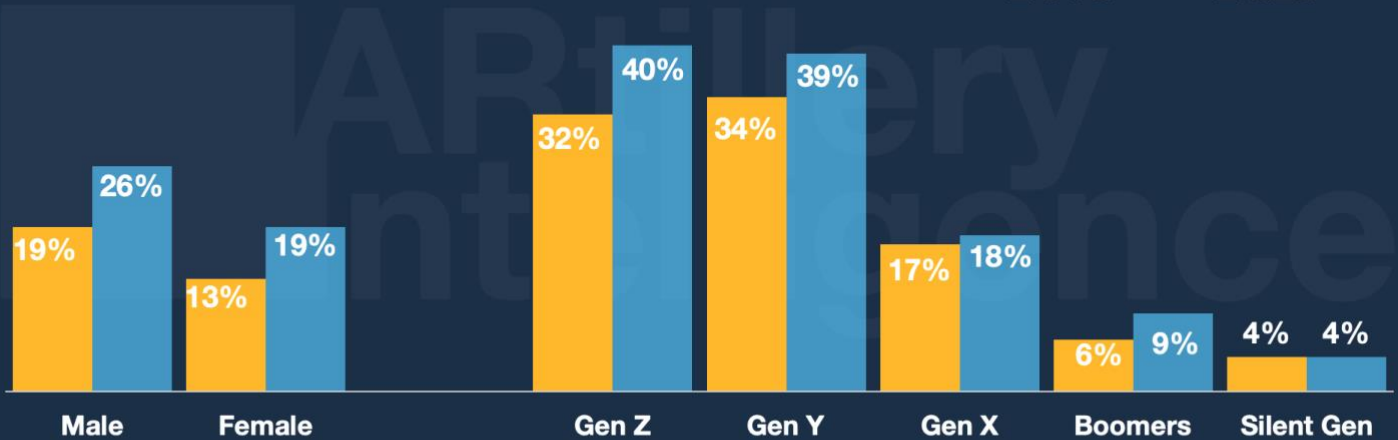
Part I: VR User Sentiments

To organize strategic takeaways in this report, we've delineated the sentiments of VR *users* and *non-users*. Both can provide telling signals for VR product development and

strategy refinement. Starting with current users, what are they saying and thinking? The following sections dive in.

VR Users: the "How Many?"

Starting at the very top, what's the penetration and adoption of VR among consumers? Survey results indicate that it currently stands at **19 percent.** This aligns with headset penetration figures reported in our Global XR Forecast[iii], and is up from **16 percent** in 2019.

Applying that percentage to the total population of U.S. adults yields a total base of **45.3 million** users, up from **30.6 million** in 2019. This is different than the total installed base of

VR headsets in market. The latter is a smaller figure, examined later in this report, due to multiple users per headset.

Speaking of signals, we project VR to reach **70.2 million** users (different than device volume[iv]) by 2023, which will be **25 percent** of internet users. These projections stem from three years of survey data, trendline analysis and other factors such as historical growth comparisons and sales momentum.

U.S. VR Users 2018-2023

U.S. VR Users (Millions)

Survey validated | Projections

21.9 (2018)
30.6 (2019)
45.3 (2020)
59.6 (2021E)
65.0 (2022E)
70.2 (2023E)

U.S. Penetration

Survey validated | Projections

% of Internet Users: 11% (2018), 16% (2019), 19% (2020), 22% (2021E), 24% (2022E), 25% (2023E)

% of Population: 9% (2018), 14% (2019), 16% (2020), 18% (2021E), 19% (2022E), 21% (2023E)

— % of Internet Users
— % of Population

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2017-2020 Base = 9,079 U.S. online adults

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▮ Frequency: the "How Often?"

Perhaps more important than the number of users, a key variable in tracking success in any digital media is *how often* it's being used. Because VR adoption barriers can be high (tracking system set up, technological invasiveness, etc.), the name of the game is to design for ease of use and replayability.

This challenge is being addressed with the advent of standalone headsets like **Oculus Go** and **Quest**. Given their ease of use and growing penetration, we believe that frequency metrics will improve over time. Meanwhile, VR frequency already shows positive momentum.

Specifically, most VR users engage monthly (**31 percent**) followed by weekly (**27 percent**) and daily (**20 percent**). This means that **78 percent** of users activate monthly or more, while **22 percent** do so monthly or less. This is

a strong signal for VR engagement levels, compared to other consumer tech like mobile apps.

As for year-over-year trending, daily and weekly usage are up two percentage points each. Monthly usage is down four percentage points. This shows that users are engaging more often – at daily and weekly levels rather than monthly, possibly due to more standalone headsets in the market this year.

Standalone headsets such as **Oculus Go**, **Quest** and **Vive Focus** reduce VR friction. Among other things, this should increase usage frequency, already seen in this survey wave. Meanwhile, the positive momentum shown here is likely impacted by **Oculus Quest's** limited time in the market, and will only improve with more tenure.

VR Usage Frequency

How often do you use VR?

High-frequency usage is increasing...

■ 2018 ■ 2019 ■ 2020

	Daily	Weekly	Monthly	A few times per year	Rarely to never
2018	15%	20%	38%	17%	10%
2019	18%	25%	35%	16%	6%
2020	20%	27%	31%	17%	5%

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2017-2020 Base = 9,079 U.S. online adults

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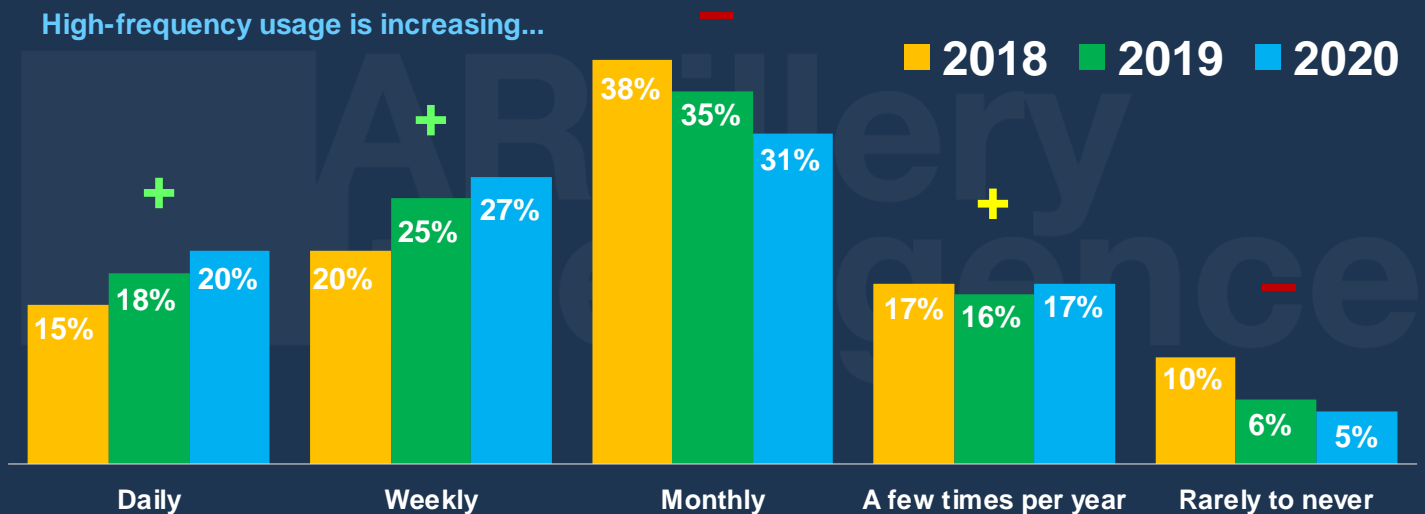
▮ Headsets: the "What?"

Going one level deeper, what devices are gaining the most traction? **Samsung's Gear VR** scored highest at **48 percent**. This is surprising due to the device's market retreat throughout 2019 and 2020. So results are likely due to headsets still in-market (versus new sales) as an installed base.

Gear VR however is trending downward year-over-year, as expected. We project this to continue into further waves, as standalone headsets take over mobile VR's market-leading position. We believe this will be led in future waves by **Oculus Go**, **Quest**, **VIVE Focus** and other standalone headsets that enter.

Speaking of **Oculus Quest** it performed well but lower than expected, with **13 percent** usage among respondents. On the bright side, it reached that point from **zero percent** eight

months before this survey was fielded. **13 percent** in eight months is reputable, and we expect it to grow significantly in the next wave.

Playstation VR (PSVR) scored second highest in adoption at **38 percent**. This makes it the most adopted among tier-1 (tethered) headsets. This isn't surprising, given an installed base of **100 million** compatible **PSVR** consoles, and our separate headset sales tracking and market share estimates.ᵥ

Oculus Rift, **Windows Mixed Reality** and **HTC VIVE** (all variants) had the third, fourth and fifth-highest penetration. They scored lower than **PSVR** despite better specs. The takeaway: ease of setup and "all-in" pricing (**PSVR's** main benefits) outsell specs like processing and screen resolution. We'll explore this principle in greater depth later in the report.

VR Usage by Headset
Which VR headset(s) have you used?

■ 2017   ■ 2018   ■ 2019   ■ 2020

Samsung Continues to lead, despite sunsetting Gear VR
Oculus Quest has a disproportionate usage share given limited time in market
Future research waves will break out emerging hardware such as Valve Index

Headset	2017	2018	2019	2020
Other		6%	12%	7%
Windows Mixed Reality		5%	16%	12%
Oculus Go			13%	12%
Oculus Quest			13%	
Oculus Rift S				13%
Cardboard	14%	14%	10%	14%
HTC Vive	16%	14%	14%	15%
Oculus Rift	22%	20%	17%	19%
Playstation VR	42%	36%	33%	38%
Samsung Gear VR	60%	49%	43%	48%

2017-2020 Base = 9,079 U.S. online adults

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VR Usage by Brand

Figures represent share of overall sample of VR users
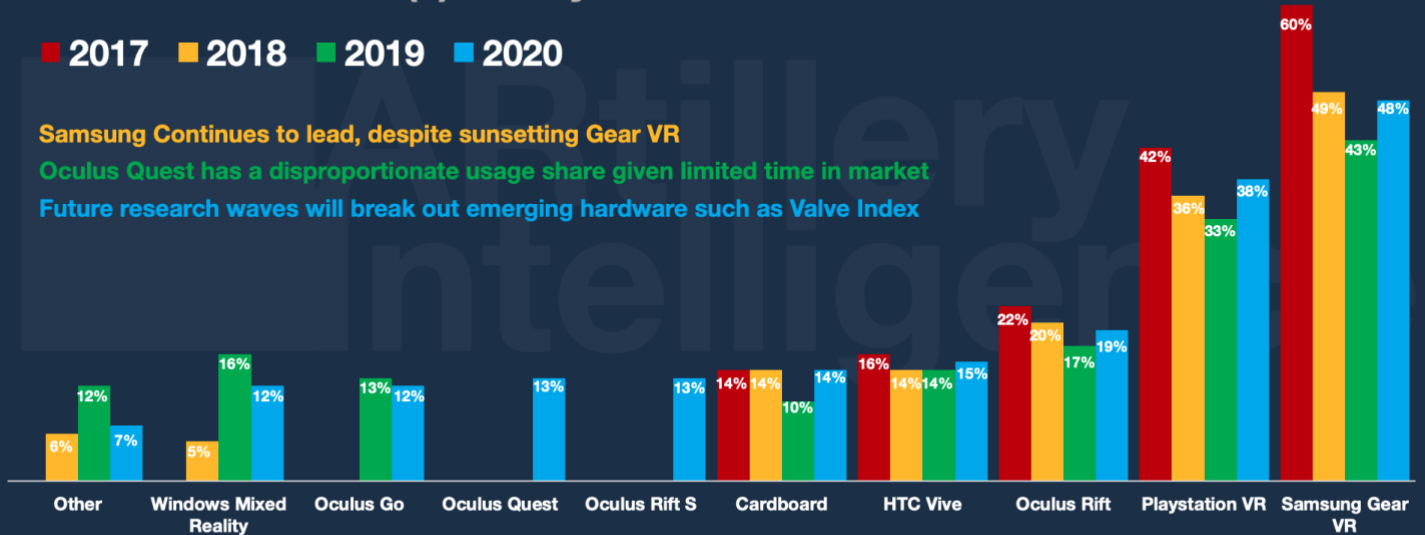
Breakdown of Oculus Headsets

Quest's short time in the market shows disproportionate usage share...

Go	Quest	Rift S	Rift (legacy)
12%	13%	13%	19%

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Thrive Analytics

2020 Base = 1,014 U.S. online adults

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VR Usage by Brand

Figures represent share of overall sample of VR users
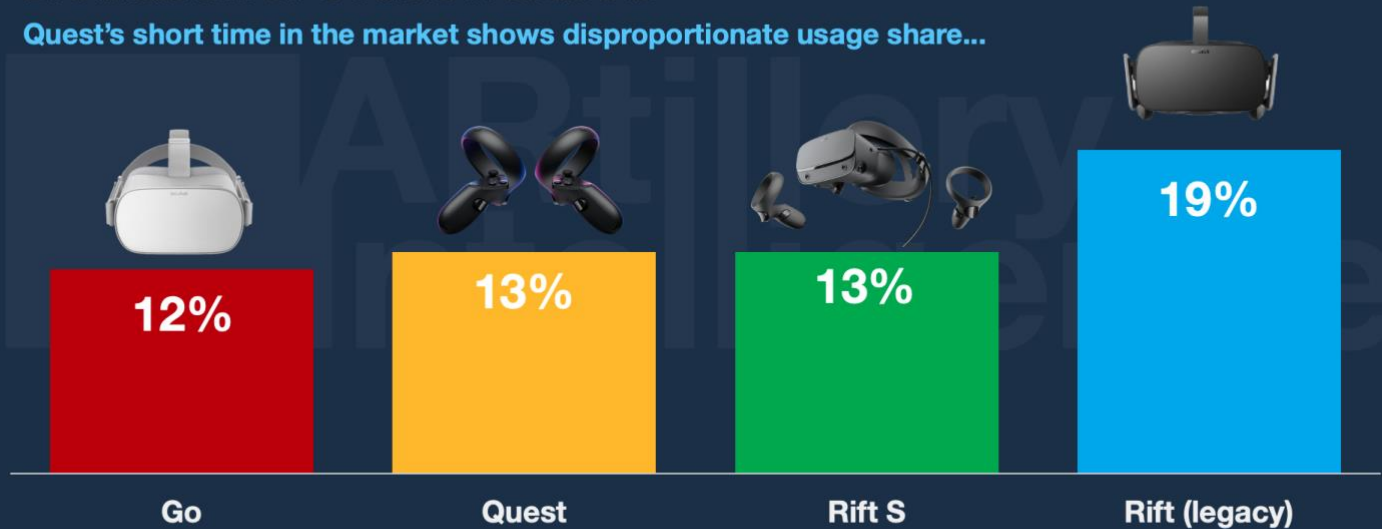
Breakdown of HTC Headsets

Usage for main HTC headset models (includes sub-model permutations)

Cosmos	Focus	Vive PRO	Vive
6%	7%	12%	15%

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Thrive Analytics

2020 Base = 1,014 U.S. online adults

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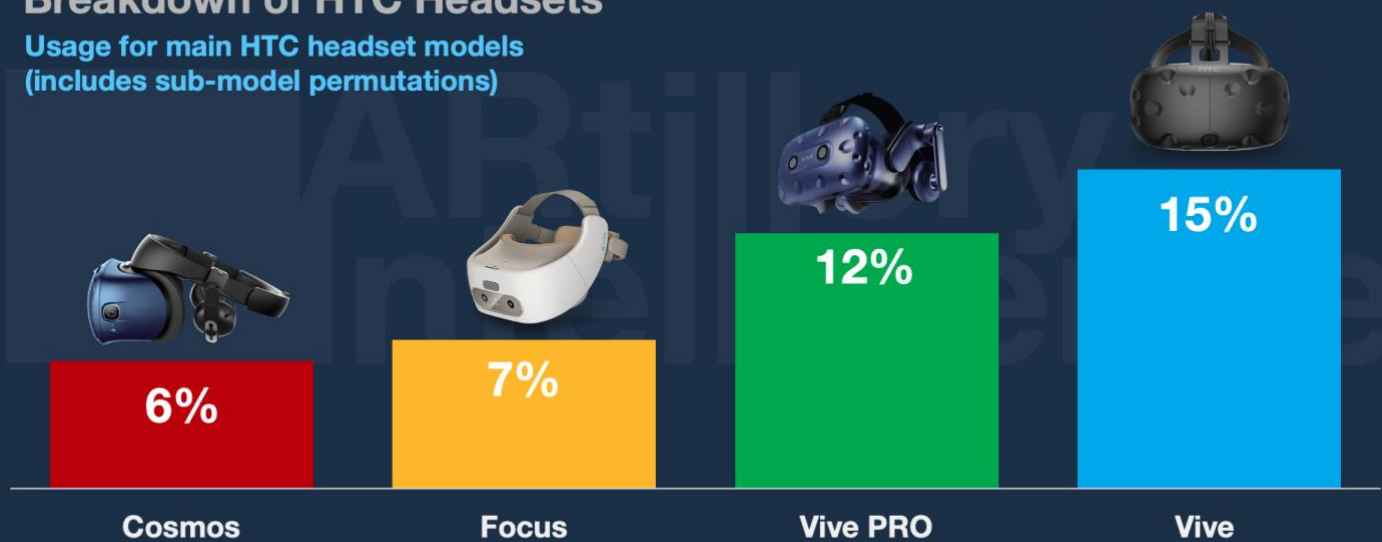
▍▍ A Fragmented Market

To define the term "all-in pricing," used above, it means that additional hardware isn't needed, such as gaming PCs to render high-end graphics for tethered headsets like **Rift** and **VIVE**. Price is a key variable in unproven product classes like VR, which we'll explore later when tackling survey sentiments on price.

Panning back, it's evident that the market continues to fragment. The players that ruled 2017 (**PSVR**, **Rift**, **VIVE**, **Gear VR**) are now challenged by a new cast of players like **Oculus Go**, **Quest**, **Vive Focus** and others. These challengers look to hit a sweet spot between "all-in" price, quality and ease of use.

So far that sweet spot has been best achieved by **Oculus Quest**, which has been well received at under **$400**. This has a lot to do with **Facebook's** investment in VR, and its willingness to sacrifice margins to gain market share in its long-term platform approach (more on those pricing dynamics later in the report).

Meanwhile, fragmentation is making its mark. The average number of headsets users have tried continues to grow year-over-year, now standing at **2.3**. This is due to a combination of users' comfort and savvy, the passage of time (cumulative headset use), and the quantity of in-market headsets explored above.

Average Number of Devices

How Many VR headset models have you used?

Varied device usage continues to grow...

2017	2018	2019	2020
1.00	1.40	1.75	2.3

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▌ Satisfaction: The "How-Good?"

Drilling down from usage, how are consumers satisfied with VR? Before getting into per-headset sentiments, it's worth noting that overall VR satisfaction is mostly favorable. This continues the trend we've seen over four waves of survey data, though there are some short-term declines.

Specifically, **55 percent** of users are either moderately satisfied (**22 percent**) or extremely satisfied (**33 percent**). This contrasts the opposite end of the satisfaction spectrum where only **11 percent** of users are either moderately dissatisfied (**7 percent**) or extremely dissatisfied (**4 percent**).

These are strong quality signals. In fact, there are few consumer products that show such high satisfaction. However, as noted, we should acknowledge that satisfaction

decreased from last year. Extremely-satisfied users were flat but moderately-satisfied users dipped from **34** to **22 percent**.

Both moderate and extreme satisfaction, again **55 percent**, are also down from the 2017 peak of **69 percent.** This is likely due to the excitement levels that surrounded VR circa-2017, which have since backlashed a bit. But we believe VR will return to or exceed that peak as quality and price improve.

Moreover, strong results overall continue to validate that VR is captivating users, though still small in scale. This is due to its revolutionary – rather than evolutionary – interface when compared with traditional 2D media to which users are accustomed. Non-users tell a different story (explored later).

VR Satisfaction (Overall)
How satisfied are you with VR?

Legend: ■ 2017 ■ 2018 ■ 2019 ■ 2020

	Extremely Satisfied	Moderately Satisfied	Slightly satisfied	Neither satisfied nor dissatisfied	Slightly dissatisfied	Moderately dissatisfied	Extremely dissatisfied
2017	39%	30%	14%	9%	2%	3%	2%
2018	35%	30%	15%	9%	5%	4%	2%
2019	33%	34%	13%	12%	4%	3%	1%
2020	33%	22%	16%	12%	5%	7%	4%
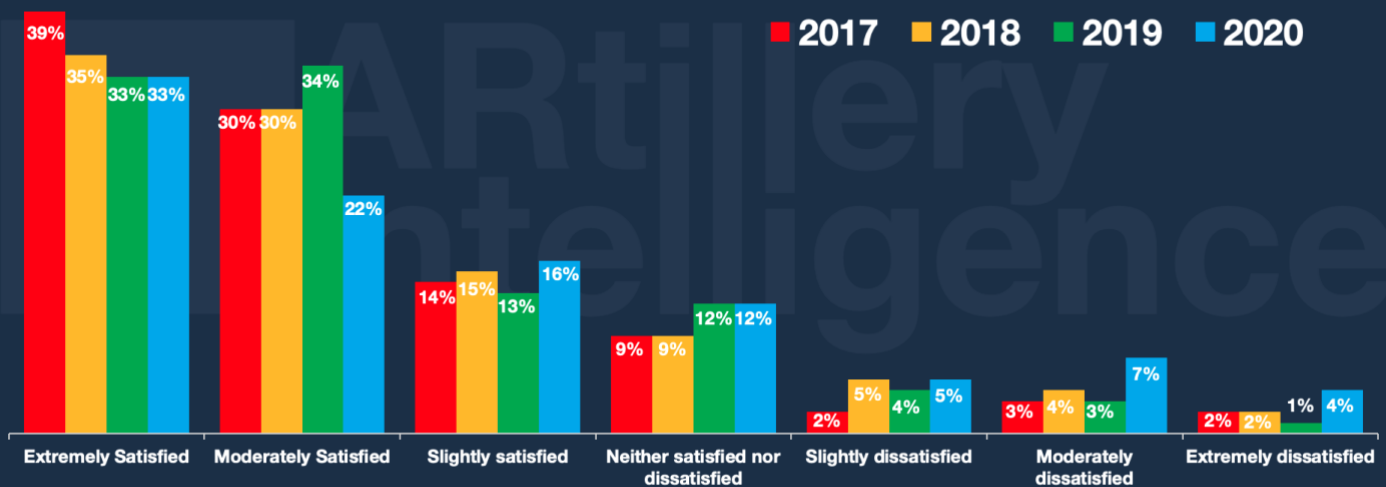
▮▮ Naming Names

Drilling down, how do satisfaction ratings map to individual devices? Answering that question can start to indicate the VR features and formats that resonate most with consumers, which in turn can offer strategic guidance in devising features or product road maps.

When ranking headsets by those that received "moderate" or "extreme" satisfaction, **Oculus Rift S** leads the pack (**78 percent**), followed by **Google Daydream**-operated headsets, most notably the **Lenovo Mirage Solo** (**72 percent**), followed by **Oculus Rift** (**70 percent**) and **HTC VIVE Cosmos** and its variants (**66 percent**).

These results surprised us, which can be a good thing: new perspectives and discoveries can often result from unexpected outcomes. Most notable is the elephant in the room: **Oculus Quest's** low score deviates from anecdotal awareness of its otherwise glowing market reception and reviews.vi

But here, the people have spoken and these results are notable. To discern greater levels of insight and strategic takeaways, we will cross-reference **Quest** users' answers to other survey questions such as areas of improvement. This follow-on analysis will be conducted in the coming weeks.

Other surprises include high marks for **Google Daydream**, given unfavorable professional reviews and the platform's retraction from the market. Meanwhile, **Oculus Rift's** high performance continues to be owed to **Facebook's** investments in VR quality as it executes a long-term platform strategy.vii

Playstation VR is in the middle of the pack, but notably beats higher-spec'd rivals like **HTC VIVE**. This continues to result from **PSVR's** "experience sell" and simplicityviii that we'll explore later in this report.

Satisfaction by Headset

How Satisfied Are You with the VR Experience?

% of users satisfied or extremely satisfied

Headset	Percentage
Other	18%
Windows Mixed Reality	42%
Oculus Quest	50%
HTC Vive PRO	52%
Oculus Go	54%
HTC Vive	58%
Samsung Gear VR	60%
Playstation VR	63%
HTC Vive Focus	65%
HTC Vive Cosmos	66%
Oculus Rift	70%
Daydream (e.g. Mirage Solo)	72%
Oculus Rift S	78%

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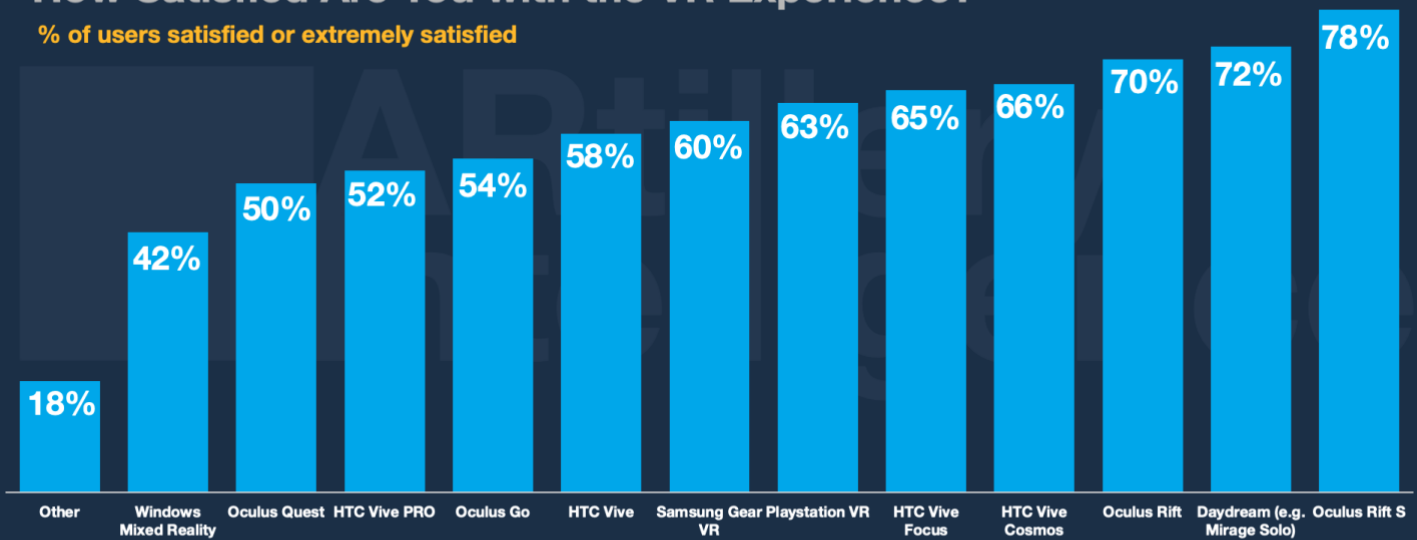
▦ Improvement Areas: The "What If?"

Stemming from satisfaction is a related factor: What do VR users want to see improved?

On functional measures, battery life in VR is a high-ranking desire (**40 percent**). This could be due to the rise of standalone headsets where untethered orientation makes battery life a bigger factor. Optical quality also continues to be a key functional factor.

Content is another influential area. Past survey waves were all about improving content quality and quantity. Though this is still a prominent factor on users' minds – content is king after all – declining designation as an improvement area validates that content quantity and quantity are gradually improving.

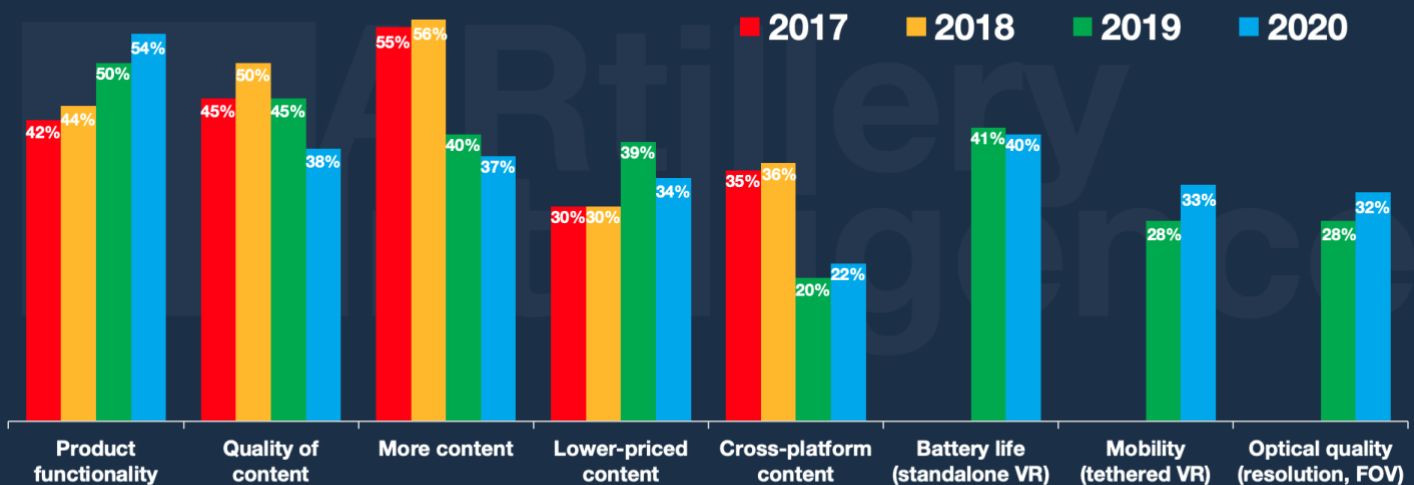This is due to expanding content libraries; improving UX design; and hit games like **Beat**

Saber and **Half-Life: Alyx**. There's also continued investments by Facebook to stimulate the VR ecosystem, including the incentive and exit potential it signals from game studio acquisitions like **Beat Games**.

This gradual improvement of available content follows the trend we predicted in last year's report, and the Wave II (2018) counterpart:

…The challenge today is a classic "chicken & egg" dilemma… there isn't enough content to compel mass adoption… [nor] enough of an installed hardware base to compel content creators to invest time and money... We'll see this dilemma naturally alleviate over time, as more content is created, and more devices are sold, in a sort of slow-moving step function…

VR Areas of Improvement
Where do you most want to see VR improve?

Legend: 2017 · 2018 · 2019 · 2020

Area	2017	2018	2019	2020
Product functionality	42%	44%	50%	54%
Quality of content	45%	50%	45%	38%
More content	55%	56%	40%	37%
Lower-priced content	30%	30%	39%	34%
Cross-platform content	35%	36%	20%	22%
Battery life (standalone VR)			41%	40%
Mobility (tethered VR)			28%	33%
Optical quality (resolution, FOV)			28%	32%

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2017-2020 Base = 9,079 U.S. online adults

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Price: The "How Much?"

As examined earlier, price is another important factor in VR adoption, just as it is with most products. But what are the specific ways that price is a gating factor to VR adoption? And more importantly, what price points represent triggers for consumer interest – or disinterest – in VR ownership?

To begin, the greatest interest in VR not surprisingly exists at lower price points **($100 - $200)**. And the least interest lies at higher pricing tiers **($1001+)**. Given that tethered VR headsets primarily exist at those higher price points (including requisite PC), they're most susceptible to price sensitivity.

But breaking down lower price points is where things get interesting. Among current VR users (non-users examined later), the greatest interest is at the **sub-$200** level (**37 percent**).
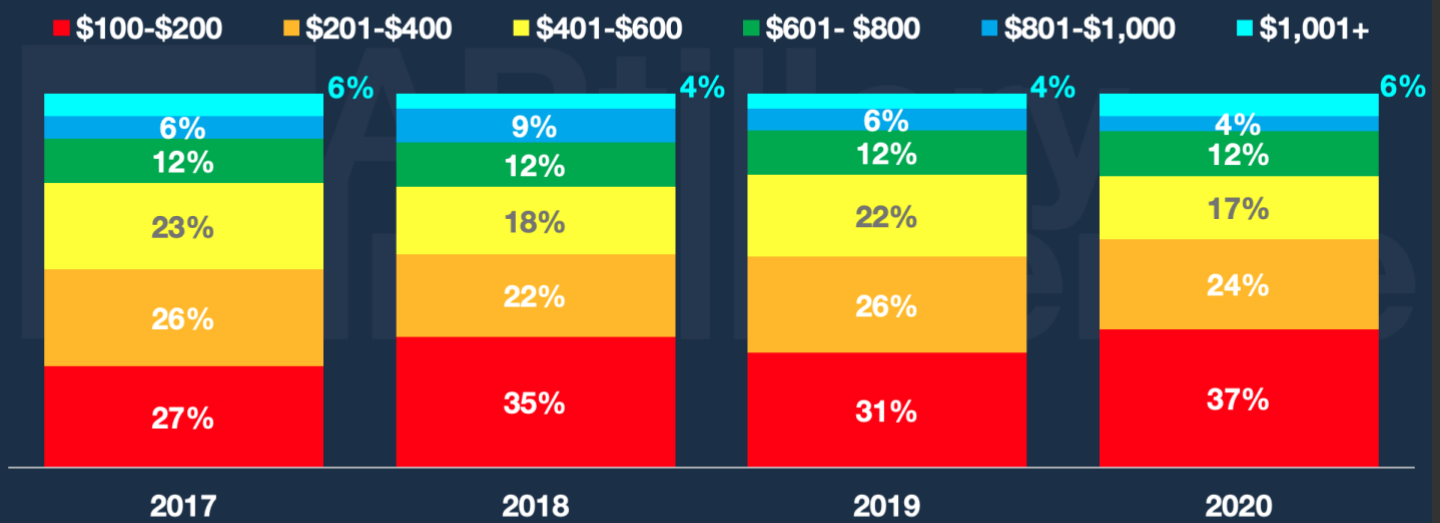
That's followed by the **sub-$400** price point (**24 percent**) and **sub-$600** (**17 percent**), which are both down from 2019.

This tells us a few things. First, declining satisfaction among VR users explored earlier is validated by their decreased willingness to spend up to **$400** and **$600** levels. Second, the two most popular price ranges align with standalones such as **Oculus Quest** and **Go**, priced at **$399** and **$199** respectively.

This is likely by design as **Facebook** has done its homework on the market's price elasticity. It has likely discovered figures similar to the below and has pinpointed price points that will move the most headsets regardless of margin, pursuant to its loss-leader driven platform strategy (see final section).

VR Price Sensitivity (Users)
What's the most you'd pay for a VR headset?

Legend: ■ $100-$200 ■ $201-$400 ■ $401-$600 ■ $601- $800 ■ $801-$1,000 ■ $1,001+

	2017	2018	2019	2020
$1,001+	6%	4%	4%	6%
$801-$1,000	6%	9%	6%	4%
$601-$800	12%	12%	12%	12%
$401-$600	23%	18%	22%	17%
$201-$400	26%	22%	26%	24%
$100-$200	27%	35%	31%	37%

ARtillery Intelligence | THRIVE ANALYTICS | 2017-2020 Base = 9,079 U.S. online adults | © ARtillery Intelligence, 2020

▌▌ Part II: Non-User Attitudes

Perhaps more important than current VR users, what are non-users saying? Because they're much larger in number at this early stage, appealing to them is a strategic imperative. And that requires knowing what they like and don't like. The following sections examine these non-user attitudes.

▌▌ Adoption Likelihood: the "If?"

Among VR non-users, **29 percent** report interest while **49 percent** aren't interested, and **22 percent** aren't sure. Non-user interest is up from **27 percent** in 2019 and down from **31 percent** in 2018. This slight bounceback is notable, and potentially aligned with **Oculus'** big 2019 TV marketing push.
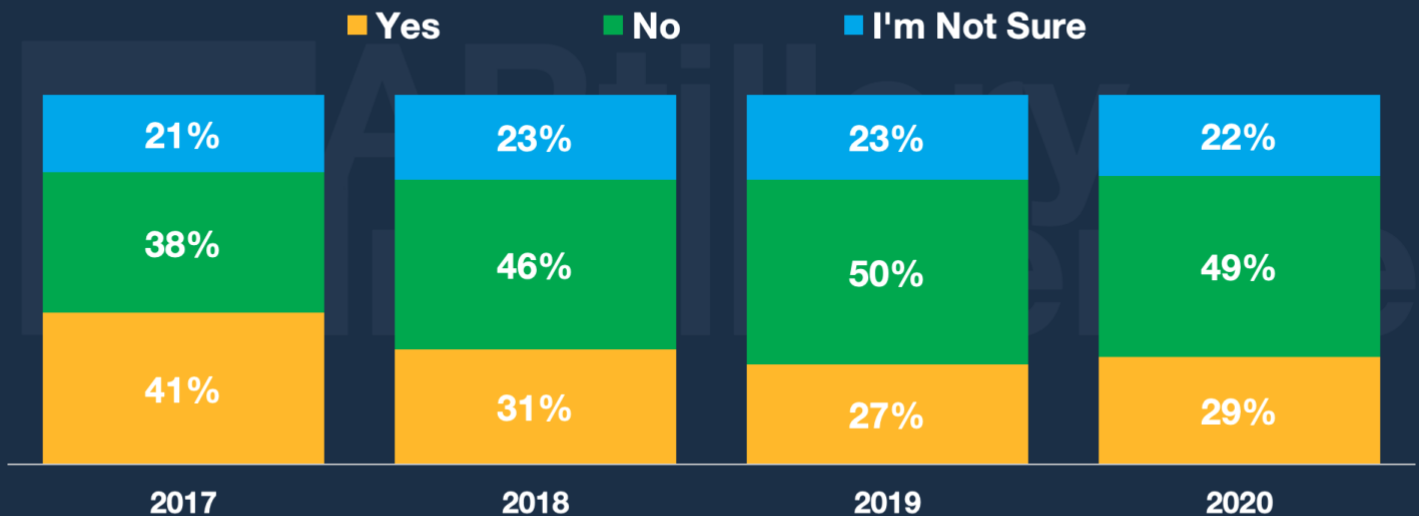
However, the slight rebound isn't enough to return to 2017's lofty **41 percent** non-user adoption interest. Sentiments at the time were likely boosted by VR's hype cycle that was in full swing during the early-2017 period in which the survey was fielded. Interest will eventually return to those levels.

This however could take a few years. We look at this like the early 2000's eCommerce bubble. After the bust period, consumer activity and eCommerce sector revenue eventually returned to, and even exceeded, the levels forecasted at the height of the boom. But that didn't happen until about 2005.

VR Ownership Interest
Are you interested in owning a VR headset?

■ Yes   ■ No   ■ I'm Not Sure

	2017	2018	2019	2020
I'm Not Sure	21%	23%	23%	22%
No	38%	46%	50%	49%
Yes	41%	31%	27%	29%

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▋ Reasons: the "Why Not?"

More important than binary interest levels in VR are the reasons behind them. This can shed light on non-users' objections to VR and therefore what features and components can be changed or optimized to attract more consumers. Their objections can be a telling indication of what's missing.

Not surprisingly, price was a factor at **43 percent** (price is explored on the next page). But the biggest reason was the rather discouraging "just not interested" at **61 percent**. But what's most notable is the difference between this non-user ambivalence and VR users' high satisfaction explored earlier.

This divergence underscores VR's marketing challenge: getting people to try it. VR's immersion is its greatest strength in captivating
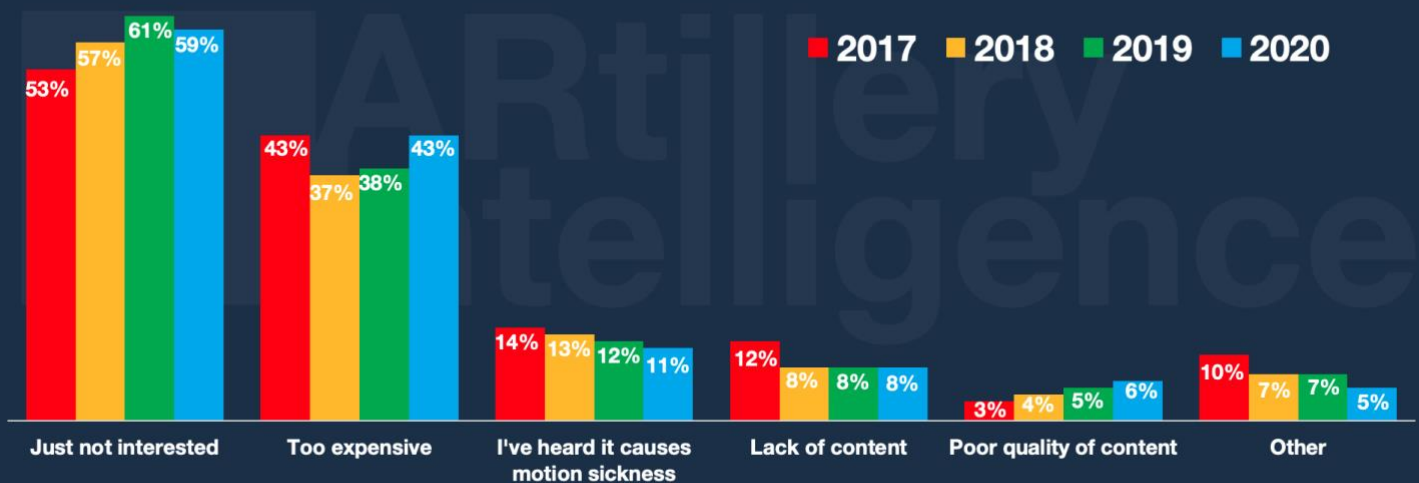
users. But it's also the greatest weakness in that the experience can't be captured through traditional marketing. As we like to say, it's like "selling TVs on the radio."

This challenge is exacerbated by VR's set-up friction and technological invasiveness. Getting people to try it – after which they're often converted – is made more difficult given all that activation energy. This includes things like setting up tracking systems, expensive hardware and several moving parts.

This is yet another reason we're bullish on standalone VR. Its lack of friction will bring that "first taste" to more consumers. That's the case for **Oculus Go** and even more so with **Quest**. It walks a fine line between user-friendliness and high-end VR functionality, such as 6-degree-of-freedom movement.ix

Reason For VR Disinterest
Why did you report disinterest in VR ownership?

Legend: ■ 2017 ■ 2018 ■ 2019 ■ 2020

Just not interested	Too expensive	I've heard it causes motion sickness	Lack of content	Poor quality of content	Other
53%	43%	14%	12%	3%	10%
57%	37%	13%	8%	4%	7%
61%	38%	12%	8%	5%	7%
59%	43%	11%	8%	6%	5%

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Price: The "How Much?"

Just like we examined pricing sentiments earlier for VR users, what about non-users. Given their ambivalence towards VR explored earlier, price sensitivity is not-surprisingly greater than VR users. The most popular pricing tier among this group was by far the lowest one, **$100-$200** (**69 percent**).

When looking towards higher price points, such as anything over **$600**, only **five percent** of non-users reported willingness to buy. At the **$1001+** level, **two percent** of respondents did so. As for trending, these figures remain mostly flat from 2019 with only slight deviations.

One takeaway is that popularity of the sub-**$200** pricing tier means that potential success in selling to this group lies with **Oculus Go**. Th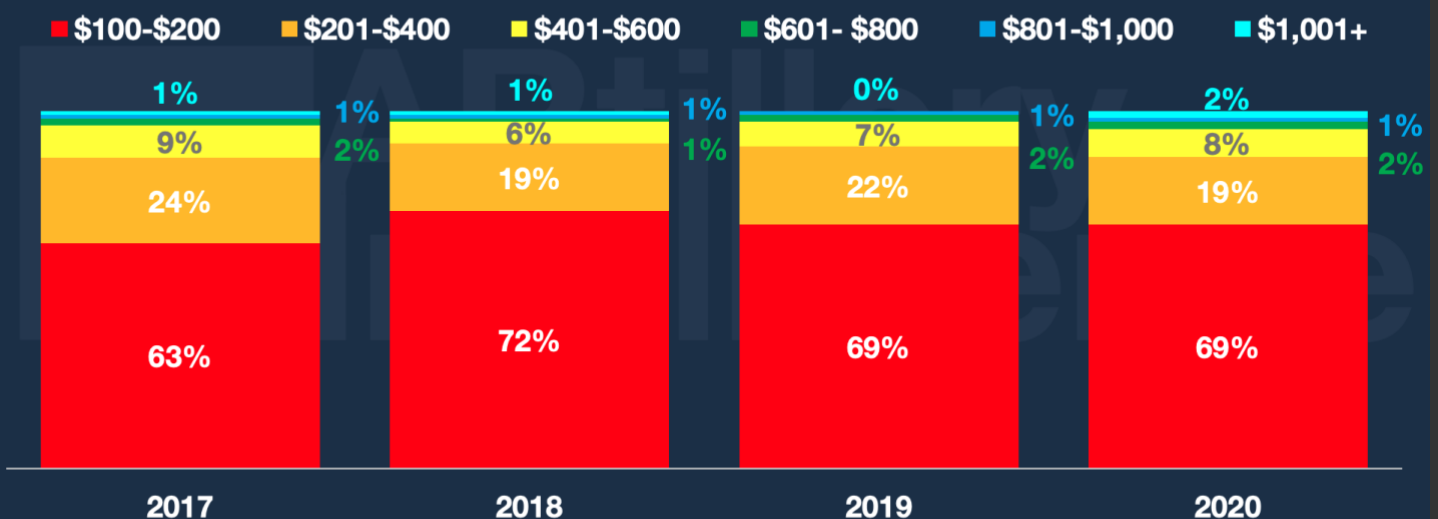ere are others in this price range but Go shines with cinematic content (2D cinema in a virtual environment), where consumers express interest (examined later).

Skipping ahead to the next section that examines "potential buyers" (a subset of non-users), they indicated greater interest in paying up to **$400** (**38 percent**). That compares with this full sample of non-users, **19 percent** of whom would pay that much. This indicates hope within a subset of non-users.

In other words, "potential buyers" (non-users who indicated interest in VR) are expressly willing to pay **Oculus Quest's** price point. Remaining non-users are still potential VR converts. And for **69 percent** of them, **Oculus Go** is in their price range. So collectively, **Oculus** has non-users well covered.

VR Price Sensitivity (Non-users)

What's the most you'd pay for a VR headset?

Legend: ■ $100-$200 ■ $201-$400 ■ $401-$600 ■ $601- $800 ■ $801-$1,000 ■ $1,001+

	2017	2018	2019	2020
$1,001+	1%	1%	1%	2%
$801-$1,000	1%	1%	0%	1%
$601-$800	—	2%	1%	2%
$401-$600	9%	6%	7%	8%
$201-$400	24%	19%	22%	19%
$100-$200	63%	72%	69%	69%

2017-2020 Base = 9,079 U.S. online adults

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Profiling VR Converts: the "Who?"

Based on some of the above factors and several others we've synthesized, who are the non-VR users that are most likely to adopt. Pinpointing those buyer personas can help VR companies best appeal to their interests. That goes for product planning as well as targeted marketing.

Thrive Analytics uncovered several factors to identify this "potential buyer" group of non-VR owners that are most likely to adopt, such as how they answered survey questions. And for those individuals, there are characteristics they exhibit which could represent targeting parameters for VR players.

For example, **66 percent** of non-VR owners who are likely to convert already own a video game console. This is a fairly obvious finding that stands to reason. Going deeper into less-obvious territory, **61 percent** of this "potential buyer" segment don't have children, compared to **39 percent** who do.

As for age, potential buyers are most likely to be **35-44.** They're also paradoxically more willing to pay up to **$400** for a headset (**38 percent**) than **$200** (**36 percent**). And the list goes on... these potential buyers exhibit several other attributes detailed in the chart below, which we've highlighted for notable data points.x

Bringing it all together, VR companies interested in non-users who are most likely to convert should target people **aged 35-44** who own a video game console and don't have children. And they're most likely to buy a headset up to **$400** in price, which is the price point for **PSVR** and **Oculus Quest**.

VR Potential Buyer Profile

DEMOGRAPHIC DATA	SAMPLE	POTENTIAL BUYERS*	INDEX
Total	100%	100%	100
Gender			
Male	46%	56%	122
Female	54%	44%	82
Age			
18-24	9%	15%	174
25-34	13%	18%	137
35-44	18%	26%	146
45-54	17%	17%	105
55-64	20%	15%	74
65 and older	23%	8%	35
HHld Income			
Less than $25K	29%	33%	114
$25K to less than $50K	30%	28%	94
$50K to less than $75K	18%	18%	98
$75K to less than $100K	10%	8%	88
$100K or more	13%	13%	94
Ethnicity			
White/Caucasian	76%	68%	89
Black/African American	11%	13%	115
Hispanic/Latino	4%	6%	145
Presence of Children in Home			
No	72%	61%	86
Yes	28%	39%	133

DEMOGRAPHIC DATA	SAMPLE	POTENTIAL BUYERS*	INDEX
Total	100%	100%	100
Technology Adoption Segment**			
Innovators	3%	3%	122
Early Adopters	9%	16%	181
Early Majority	42%	55%	132
Late Majority	36%	23%	64
Laggards	11%	2%	24
Currently own a Video Game Console			
Yes	43%	66%	154
No	56%	34%	60
Most you would pay for a VR System			
$100 to $200	69%	36%	52
$201 to $400	19%	38%	199
$401 to $600	8%	19%	235
$601 to $800	2%	3%	153
$801 to $1,000	1%	2%	286
More than $1,000	2%	3%	167

*Potential Buyers are respondents stating likelihood of future VR purchase
**Technology adoption segment is assigned to each individual based on their responses to a series of questions about how they view and utilize new technology.
Source: Thrive Analytics, Virtual Reality Monitor

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▐▐ Part III: Collective Mindset

Moving beyond user and non-user sentiments, what are the VR variables that cut across both groups. For example, what types of VR experiences are consumers interested in? And

what are the areas of VR that could advance our society? These questions are covered in the following sections.

▐▐ Content: the "What?"

Earlier, we explored how content is a key issue for VR users. That goes for both quantity and quality, both of which continue to improve in VR. Going one level deeper, what types of content are VR users and non-users most interested in? The results are mixed and mostly as expected.

Topping the list is cinematic content (**64 percent**), such as watching movies (2D) in a virtual environment. That's followed by gaming (**54 percent**), travel & tourism (**53 percent**),
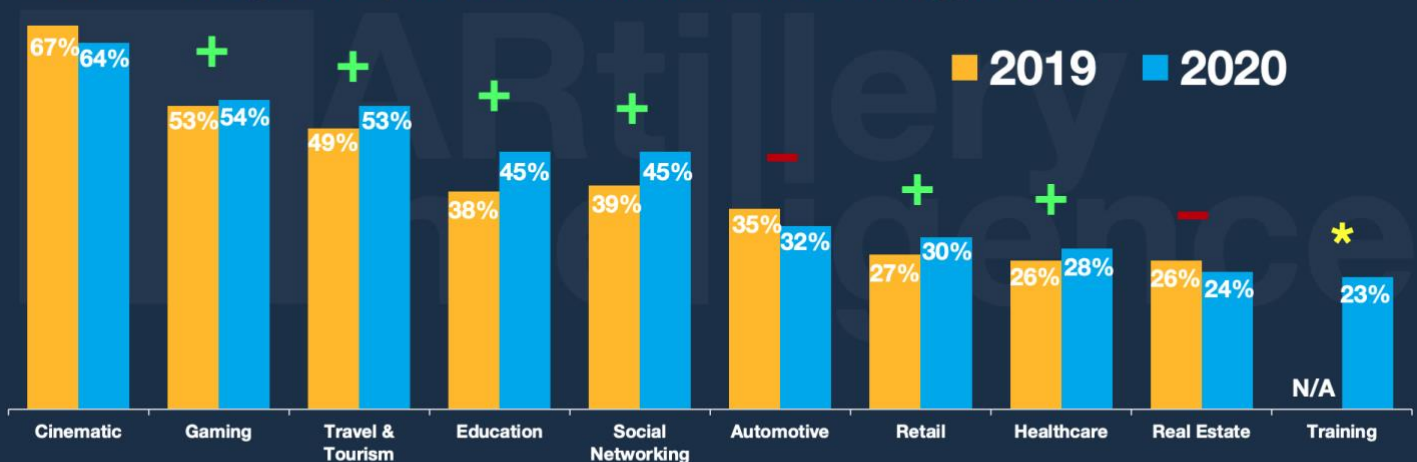
education (**45 percent**) and social networking (**45 percent**). These rankings are mostly the same as they were in 2019, with some slight deviation in degrees of interest.

These responses aren't surprising but it's notable that users are most interested in what they know: Cinematic content. Though 2D movies and TV don't harness VR's benefits and immersion, they're still what consumers want. This will evolve over time but is meanwhile a key finding for VR players.

VR Content Areas of Interest

What are the types of VR content you're most interested in?

Net growth is positive. Education and Social are the biggest movers...

2019 (orange) ■ 2020 (blue)

Category	2019	2020
Cinematic	67%	64%
Gaming	53%	54%
Travel & Tourism	49%	53%
Education	38%	45%
Social Networking	39%	45%
Automotive	35%	32%
Retail	27%	30%
Healthcare	26%	28%
Real Estate	26%	24%
Training	N/A	23%

*Training measured for the first time in Wave IV

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▎▎ Content: Strategic Implications

Interestingly, these results are a mix of "native" VR activities (fully immersive 3D) and standard 2D content that has been brought into a VR environment (e.g. watching movies). The fact that the latter represents the most popular activity is telling of the early stage in which VR lingers.

As we've examined,[xi] eventual VR successes will design native experiences. In other words, they can *only* exist in VR. They'll apply unique capabilities to immerse users in 3D sensory experiences. This will represent a learning curve for developers, just like we saw with native smartphone app design.

In the meantime, consumers need time to wrap their heads around this revolutionary jump in content formats. Their desired VR activities will continue to be conceptualized in the activities

they already know – that is, until new/native experiences are offered that re-frame their thinking and their interests.

Meanwhile, activities that ARtillery Intelligence believes are worth keeping an eye on include training, social interaction, and remote immersive shopping. These are areas we're examining and project strong long-term use cases for VR, despite lower consumer-reported interest today.

Either way, these consumer sentiments should be considered when evaluating VR's points of intersection with existing business. For example, online travel, car shopping, and sports broadcasting should examine these sentiments when designing product road maps and long-term evolution – especially where it aligns with their target demographics.

VR Content Areas of Interest
Category Heat Map, by Age

	Values represent indexed responses (100 is average)					
	18-24	25-34	35-44	45-54	55-64	65+
Training and collaboration	166	170	119	117	33	25
Gaming	150	132	143	90	63	40
Social	130	126	126	115	51	65
Automotive	123	109	106	109	89	75
Healthcare / medical information	120	93	57	107	84	147
Real Estate	118	137	130	95	69	57
Retail / Shopping interactions	114	102	97	129	86	83
Education	101	119	90	132	84	83
Travel & Tourism	80	100	120	111	76	106
Entertainment	73	109	118	120	99	75

▎▎ ARtillery Intelligence   ▎▎ THRIVE ANALYTICS   2020 Base = 1,014 U.S. online adults   © ARtillery Intelligence, 2020
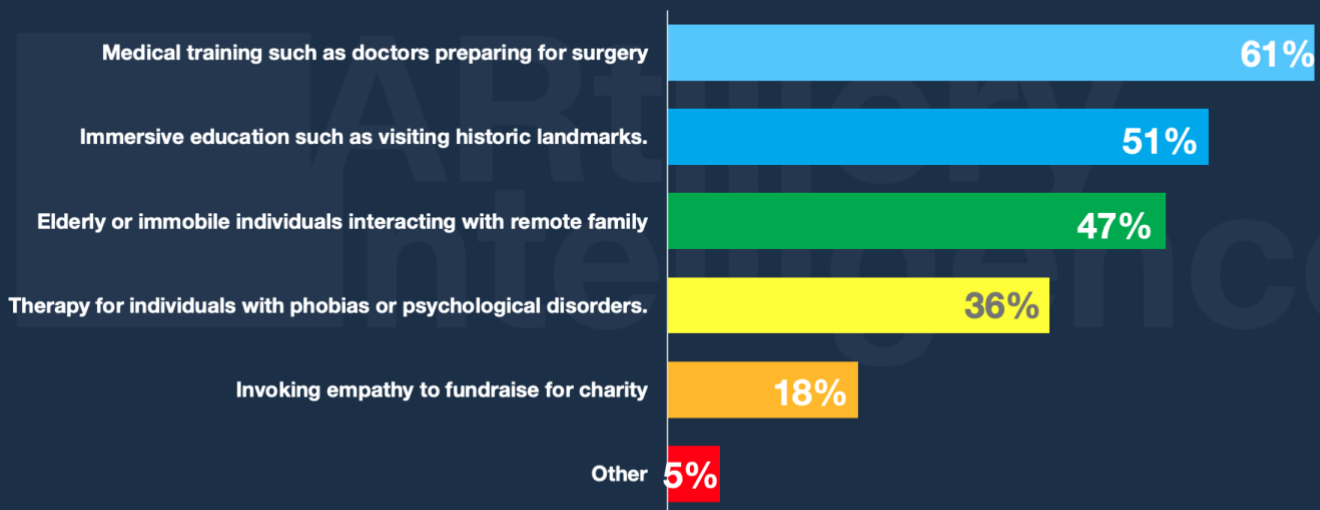
VR For Good

As for altruistic VR applications – those that serve a greater good rather than personal needs – respondents rated medical training as the top use case (**61 percent**). That was followed by education, (**51 percent**), communications for the elderly (**47 percent**), and mental health therapy (**36 percent**).

These results weren't surprising, nor do they have immediate business takeaways for consumer-focused VR companies. But it's still telling of consumers' view of the technology and the role it will play in several aspects of our lives. VR will have societal impact, just as most technologies do.

VR's Altruistic Benefits
In what areas will VR provide the most humanitarian benefit?

Category	Percent
Medical training such as doctors preparing for surgery	61%
Immersive education such as visiting historic landmarks.	51%
Elderly or immobile individuals interacting with remote family	47%
Therapy for individuals with phobias or psychological disorders.	36%
Invoking empathy to fundraise for charity	18%
Other	5%

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▕▎▏ Strategic Takeaways

One of the key themes throughout this report is the stark difference in sentiment between VR's current users and those who haven't tried it yet. Users report impressively-high satisfaction and engagement. Non-users conversely show explicit disinterest and price sensitivity.

These findings hold important lessons for VR players. Once again, it's a double-edged sword: VR's highly visceral interface captivates users. But that same orientation makes it so that the advantages can't be communicated adequately by traditional methods of product marketing.

People need to experience VR before they convert, which presents logistical challenges in pushing that "first taste" at scale. Our sister report on mobile AR had similar findings, but its adoption barriers are lower due to "zero cost hardware" (existing smartphone) and less bulky/invasive devices.

This is where standalone VR will accelerate adoption, due to lowering both cost and usage friction. The category is represented best by the **$199 Oculus Go** and the more recently-launched **$399 Oculus Quest**. The former has more tenure in the market but the latter shows more promise to stimulate VR

▕▎▏ Start Small

For VR developers, the above statement has important implications. Though **Oculus Go** has a more basic user interface and less sophisticated positional tracking (rotational head tracking versus full-6D spatial movement), it will be a strategic point of entry to a larger addressable market for VR content.

But based on its unique capabilities, it requires optimizing content accordingly. For example, the device's 72 Hz processing, 3 degrees of freedom (3DOF) and low interactivity make it better suited to "lean-back" experiences. That means movies (which scored high in this survey) and casual games.

This follows a core design principle that should guide VR developers: Optimize software for the tools you have now, rather than getting carried away in features that the device can't or shouldn't handle. Former **Oculus** CTO John Carmack advocates this optimization strategy, especially for **Oculus Go**.

"Some of [my favorite VR experiences] are clearly very synthetic worlds where it's nothing but cartoony, flat-shaded things with lighting but they look and they feel good," he said. The lesson: a "low-poly" approach is better if it works, versus intensive graphics that the device can't handle.

Most of all, it should be remembered that this optimization process will be a moving target. VR has a long way to go and will evolve quickly. But several points along that path will meanwhile represent value for those who can utilize available toolsets, and apply them in optimal ways to their fields.

Image Credit: Oculus

▮▮ Stepping Up

Beyond **Oculus Go**, **Oculus Quest** represents the next step up. It's already proving to make VR cheaper and more accessible to more people, but with higher-end positionally-tracked VR. This has many industry proponents believing that it could be the device that brings true VR to the mainstream.

Reviews have been unanimously positive for the **$399** standalone VR device. Its quality goes back to **Facebook's** loss-leader approach we often cite (detailed further below) where it sacrifices margin to reduce prices and boost sales, pursuant to its longer-term platform strategy. It's betting big on VR.

The result is a device with a quality/cost ratio that outperforms other headsets. Our favorite reviewers — the in-depth and insightful folks at **Tested** — agree with this take, and even assert that consumers should take advantage of **Facebook's** thin margins on **Quest**.

"This is Facebook accelerating adoption by subsidizing and selling these at very little margin," said **Tested's** Jeremy Williams.xii "That's something the competitors can't necessarily do, but we as consumers can take advantage of it. This is a device that probably shouldn't exist at this price."

One of **Quest's** marks of quality for example is how well **Oculus** was able to optimize performance with limited specs. The device is run by a **Snapdragon 835** chip, which essentially gives it the processing power of an average **Android** smartphone. But it makes efficient use of this limitation.

"I was surprised by how few compromises there were," said **Tested's** Norman Chen. "Yes, there are going to be technical limitations: it has to run on a battery, it's not going to run graphics to the fullest. But the display looks fantastic, the optics look fantastic, and the tracking is rock solid."

Beyond **Oculus'** work in creating a device that deals well with its own technical limitations, the same challenge will be put to developers. Just as examined above in light of **Oculus Go**, they should optimize the UX for limited processing by creating less graphically-intensive and textured game elements.

"It's very much about graphical styling," said Williams in the same review cited above. "There's been six months of optimization, and developers are learning how to get the most out of this processor. I'm really impressed with what the first generation of games are able to pull out… It's just going to get better."

Freedom of movement has also been a source of praise. The tethered experience of PC-VR has always distracted from the immersion and presence that VR is meant to evoke. And though standalone hardware has processing limitations, it's another welcome tradeoff.

"I've been using VR for a long time. I've gotten used to stepping around wires," said the Verge's Adi Robertson in a review.xiii "Not having to worry about tripping while jumping around a sports game or pausing an adventure game to face the cameras feels better than I thought it would."

Image Credit: Oculus

▐▌ Convenience is King

As for other limitations, **Quest** is a closed platform with a curated set of experiences. Then again, curation may appeal to new and novice VR converts (the intended audience) otherwise intimidated by the wild-west quality variance of VR's independent game libraries.
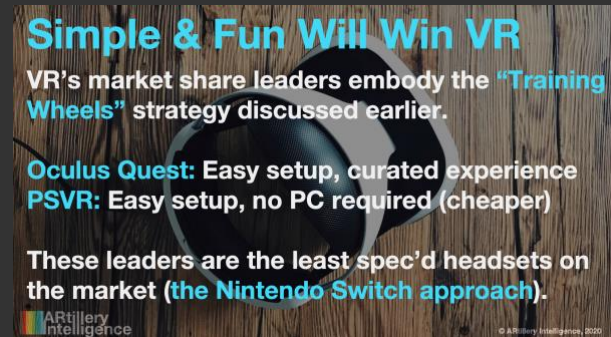
"Oculus seems to be betting that people will be happy with a convenient, lower-powered headset that plays a smaller number of games," said Robertson. "Sony [PSVR] is making the same play… Oculus could tap into that market with something more convenient."

Speaking of convenience, another **Quest** perk is ease of setup. **Oculus** Insight tracking system eschews the previous outside-in system of the **Rift**. Setting up a play area is fast & easy – a key factor to appeal to mainstream consumers and accelerate VR.

"If you are using VR for fun, you want a seamless experience and that's what Oculus is trying to deliver here," said Robertson. "It's simplified things that used to be annoying. You can just draw a line to set up virtual boundaries, for instance, instead of physically walking around the room."

Bottom line, **Quest** has technical compromises but does a good job dealing with them. Larger market factors will prevent it from being a revolutionary step for VR, as some have speculated. But **Quest** is the evolutionary step that the technology needs at this stage.

"Quest is the best hardware version of a mobile VR experience that I've ever seen, and the price is not crazy high," said **CNet** reviewer, Scott Stein.xiv "Sure, more advanced ideas will happen, and this isn't the last step in immersive tech, but Oculus Quest is a major moment in self-contained VR."

Simple & Fun Will Win VR
VR's market share leaders embody the "Training Wheels" strategy discussed earlier.

Oculus Quest: Easy setup, curated experience
PSVR: Easy setup, no PC required (cheaper)

These leaders are the least spec'd headsets on the market (the Nintendo Switch approach).

▐▌ Simple Wins

Another key lesson we've observed in these survey results and in other marketplace evidence is the need for simplicity in all aspects of VR product marketing. This includes reducing some of the hardware setup requirements mentioned above and trading specs for an overall "experience sell."

Oculus Quest and **PSVR** are exemplars. They've eschewed the arms race over VR hardware specs. Instead, they've taken a sort of Nintendo approach (a la **Wii** and **Switch**) to make it more of an experience sell with a fun persona. Their marketing materials rarely mention hardware specs.

If it's any validation for this approach, **PSVR** is the market share leader with more than **5 million** units sold to date. This is partly owed to the advantage it has with the installed base of **PlayStation 4** consoles, but its straightforward product marketing is also responsible for this success.

This simplicity in value proposition, product design and marketing will be a VR success factor. But we should qualify that there will also be a market for higher-end experiences for gaming enthusiasts, and corresponding high-end devices, such as **Valve Index**.

Quantifying Quest

Joining the above considerations, price is a big factor at this early and unproven stage of VR. As examined in this report, demand inflects at $200 and $400. Those happen to be the all-in price points for base-model Oculus Go and Quest (and PSVR) respectively. This likely isn't coincidence, but strategically devised.

As background, Facebook's VR pricing stems from a loss-leader strategy to establish its platform. Early market share is the name of the game in platform wars as it attracts developers, which grow the content library to attract more users. This creates a sort of self-propelled "flywheel" virtuous cycle.

As such, Go and Quest are dispatched to bring more people into VR. Lower price tags mean spec compromises, but it's a deliberate tradeoff of specs for scale. Bringing back the
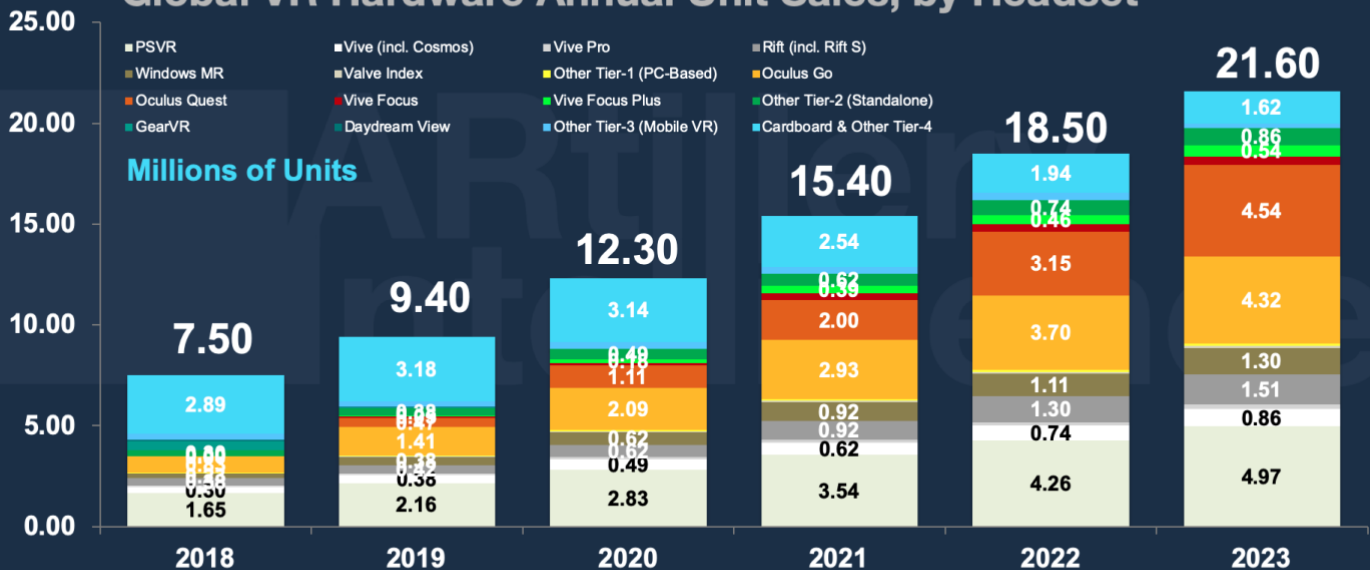
Nintendo analogy used earlier, we liken Quest to the "Nintendo Switch of VR" — trading specs for overall experience and ease.

PSVR has done similar. Its user satisfaction is higher than technically-superior headsets like HTC VIVE, while emphasizing overall experience over spec-based marketing. It's also notable that PSVR is the VR sales leader at the same (and sometimes less) $399 price tag with which Quest enters the market.

So what will Quest's market impact be? We'll continue to see aggressive price competition from Oculus, which will benefit consumers, accelerate adoption to some degree, and further propel the market. We project Quest to reach 1.11 million units in 2020, up from 470,000 units in 2019. PSVR is meanwhile projected to reach 2.83 million units in 2020.

VR Hardware Unit Sales

Global VR Hardware Annual Unit Sales, by Headset

Legend:
- PSVR
- Windows MR
- Oculus Quest
- GearVR
- Vive (incl. Cosmos)
- Valve Index
- Vive Focus
- Daydream View
- Vive Pro
- Other Tier-1 (PC-Based)
- Vive Focus Plus
- Other Tier-3 (Mobile VR)
- Rift (incl. Rift S)
- Oculus Go
- Other Tier-2 (Standalone)
- Cardboard & Other Tier-4

Millions of Units

Year	2018	2019	2020	2021	2022	2023
Total	7.50	9.40	12.30	15.40	18.50	21.60

2018: 1.65, 0.50, 0.48, 0.89, 2.89
2019: 2.16, 0.38, 0.52, 0.62, 1.41, 0.89, 3.18
2020: 2.83, 0.49, 0.62, 1.11, 2.09, 0.48, 3.14
2021: 3.54, 0.62, 0.92, 0.92, 2.93, 2.00, 0.39, 0.62, 2.54
2022: 4.26, 0.74, 1.30, 1.11, 3.70, 3.15, 0.46, 0.74, 1.94
2023: 4.97, 0.86, 1.51, 1.30, 4.32, 4.54, 0.54, 0.86, 1.62

*Headsets are stacked from bottom to top in order of product classes (tier 1- tier 4).
** Some headsets don't appear in some years if it's before their launch or after their discontinuation.
*** Data are available in chart form to decipher labels where clustered. Also see pie charts on the next slides.

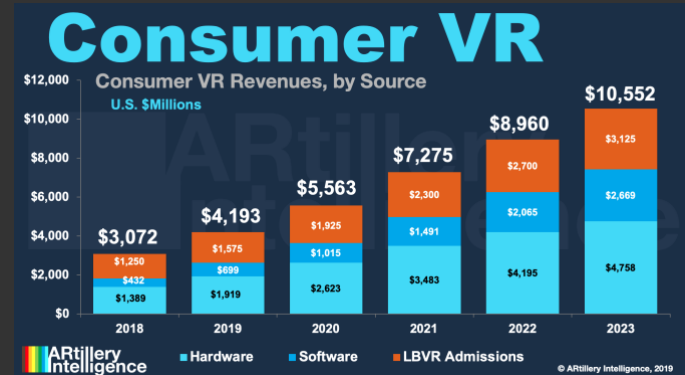© ARtillery Intelligence, 2019

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🏳️‍🌈 Panning Back

Meanwhile, VR's overall installed base (not annual sales) will reach **18 million** in 2020 and **48 million** by 2023. This may seem like rapid growth but is based on installed base calculations – factoring an average **2.5-year** replacement cycle – which has a snowball effect as in-market hardware accumulates.

That overall installed base won't reach the "magic number" of **100 million** units in the foreseeable future. **100 million** is a historically validated milestone for hardware segments to reach a flywheel cycle of incentive for content creation, followed by accelerated adoption.

Meanwhile, the VR industry has come to the sobering realization over the past few years that VR won't be the ubiquitous consumer product dreamed circa 2016. But that doesn't mean it can't grow into an opportune sub-segment of consumer entertainment.

Specifically, we project consumer VR to grow to **$5.6 billion** this year and **$10.6 billion** by 2023. That's led by hardware in the near term, with software's share increasing as it builds on a larger installed base, and as refresh rates (app and game purchases) outpace hardware replacement cycles.

Consumer VR
Consumer VR Revenues, by Source
U.S. $Millions

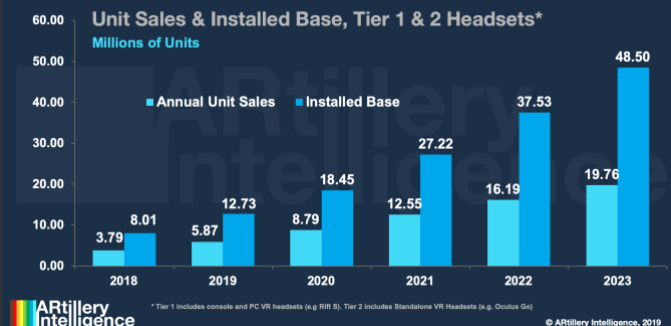| Year	Hardware	Software	LBVR Admissions	Total
2018	$1,389	$432	$1,250	$3,072
2019	$1,919	$699	$1,575	$4,193
2020	$2,623	$1,015	$1,925	$5,563
2021	$3,483	$1,491	$2,300	$7,275
2022	$4,195	$2,065	$2,700	$8,960
2023	$4,758	$2,669	$3,125	$10,552

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🏳️‍🌈 iPhone Moment

For the above figures to accelerate, VR needs more compelling adoption drivers. As indicated in this report, there's no killer app or one solid answer to the question of *why one should buy VR.* There are lots of little answers, but that fragmented set of reasons isn't going to sway mainstream consumers en masse.

Until that killer app is discovered and marketed, there are smaller inflections that the industry is experiencing. Those include Beat Saber and emerging titles like Half-Life: Alyx. These games exist at the casual/welcoming and advanced/enthusiast ends of the spectrum, respectively. Both endpoints need to be cultivated, especially the former.

On the hardware side, **Oculus Quest** could be what VR needs at this stage to appeal to the masses. Though, again, high-end PC VR will still be popular among subsets of gaming enthusiasts. Either way, signals indicate that we could be waiting longer for VR's "iPhone moment."

VR Hardware Penetration
Unit Sales & Installed Base, Tier 1 & 2 Headsets*
Millions of Units

Year	Annual Unit Sales	Installed Base
2018	3.79	8.01
2019	5.87	12.73
2020	8.79	18.45
2021	12.55	27.22
2022	16.19	37.53
2023	19.76	48.50

* Tier 1 includes console and PC VR headsets (e.g Rift S). Tier 2 includes Standalone VR Headsets (e.g. Oculus Go).

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▌▌ Key Takeaways

IAR 19% of consumers own or have tried VR, up from 16% last year.
  IAR This equals roughly 45 million U.S. VR users, up from 31 million last year.
  IAR This is different than headset sales or installed base, given multiple users per headset.

IAR Samsung Gear VR has the greatest adoption (48%), followed by PSVR (38%) and Oculus Rift (19%).
  IAR Gear VR's lead is surprising due to its retraction from the market, owing usage to a cumulative base.
  IAR Lowered prices and new entrants (e.g. standalone headsets) are taking share from VR incumbents.
  IAR PSVR is in a strong position due to its installed base of 100 million PlayStation 4 consoles.

IAR Oculus Rift (19%) and HTC Vive (15%) had the fourth and fifth-highest penetration.
  IAR They trail PSVR despite better specs, due mostly to price, PSVR's console base and its simplicity.
  IAR They also require a dedicated PC with costly graphical processing, and in some cases cumbersome setup.
  IAR Rift has won market share from VIVE, due to Oculus' aggressive pricing and content investments.
  IAR Oculus Quest has 13% market share in this survey, a fast riser given its mid-2019 launch

IAR 55% of VR users are either moderately satisfied (22%) or extremely satisfied (33%).
  IAR This contrasts 11% of users that are either moderately dissatisfied (7%) or extremely dissatisfied (4%).
  IAR These are strong quality signals: there are few consumer products that show such high satisfaction.

IAR 54% of VR users want better functionality; 38% want higher quality content; 37% want more content.
  IAR Content volume was the biggest desire in past waves but has been satisfied to some degree.
  IAR Oculus Go's 2018 introduction came with broad content options including YouTube and cinematic experiences.
  IAR Oculus Quest has a more limited and curated library, but it includes hit games like Beat Saber – a boon for VR.
  IAR Additional blockbuster games serve as VR milestones, such as Half-Life: Alyx for higher-end PC-based VR.

IAR VR users are most interested in cinematic experiences (64%), gaming (54%) and travel applications (53%).
  IAR Cinema's lead is surprising in that it's not "native" to VR (viewing 2D movies in an immersive environment).
  IAR Though 2D cinema doesn't embody VR's true potential, users most want what they're comfortable with.
  IAR Eventual VR successes will design native immersive experiences that can *only* exist in VR.
  IAR VR will be conceptualized in activities consumers know until native experiences reframe their thinking.

IAR 29% of non-VR users are interested in owning or trying VR, up from 27% last year and 31% in 2018.
  IAR All of the above represents a dip from 2017 (41%) which represents a market correction from VR hype at the time.
  IAR VR could get back to or exceed those 2017 interest levels but that could take 3-5 years.

IAR The biggest reason for disinterest among non-VR users was "just not interested."
  IAR This definitive sentiment represents VR's biggest challenge as it widely deviates from user satisfaction, shown above.
  IAR Getting more users to *try VR* is therefore the name of the game, partly through lower-friction standalone VR.
  IAR Compelling content and VR killer apps will likewise be needed to attract more users to VR over the coming years.

IAR 37% of VR users will pay up to $200 and 24% will pay up to $400 for a VR headset.
  IAR These demand-inflecting price points should be price targets for VR hardware manufacturers.
  IAR These also happen to be the price points of Oculus Go and Quest (and PSVR), respectively.
  IAR Facebook's deep pockets and long-term platform strategy drive aggressive price competition – a competitive edge.

IAR VR adoption will continue to be slow but will be accelerated by standalone headsets.
  IAR The "all-in" low price and reduced set-up friction (e.g. inside-out tracking) address consumer concerns.
  IAR Oculus will be a leader, due to its investments in quality and aggressive price competition referenced above.

IAR Simplicity in product design and marketing, versus a hardware-specs arms race, is showing some effectiveness
  IAR This "Nintendo-like" approach is showing success for leaders like PSVR and Oculus Quest.
  IAR There will be a market – though limited to a subset of gaming enthusiasts – for high-end hardware like Valve Index.

About ARtillery Intelligence

ARtillery Intelligence chronicles the evolution of spatial computing. Through writings and multimedia, it provides deep and analytical views into the industry's biggest players, opportunities and strategies.

Run by analysts and former journalists, coverage is grounded in a disciplined and journalistic approach. It also maintains a business angle: Though there are lots of fun and games in spatial computing, cultural, technological and financial implications are the primary focus.

Products include the AR Insider publication and the ARtillery PRO research subscription, which together engender a circular flow of knowledge. Research includes monthly narrative reports, market-sizing forecasts consumer survey data and multi-media, all housed in a robust intelligence vault.

Learn more **here**.

About Thrive Analytics

Thrive Analytics is a leading digital marketing research and customer engagement consulting firm. With clients spanning leading national brands as well as publishers and agencies serving the small business community, it pairs proprietary market research services and data analytical tools with time-tested business insights and methodologies to help organizations measurably improve customer experience, loyalty and sales. Its mission is to provide superior research and support services that inspire clients to make smarter decisions. For more information or to contact, visit here.

About Virtual Reality Monitor

Virtual Reality Monitor™ is Thrive Analytics' proprietary survey of virtual reality/augmented reality technology users. These surveys, conducted semiannually, track the adoption rates, usage, satisfaction levels, profiles and many other areas related to VR/AR users. Each wave has a customizable section for client specific inquiries. Results & key insights are communicated in advisory reports & presentations, charts & infographics, newsletters & articles and custom data views. Information from these studies are used by marketers, product managers, consultants and other people working in the technology space.

▮▮▮ About Intelligence Briefings

ARtillery Intelligence Briefings are monthly installments of spatial computing analysis. They synthesize original and third-party data to reveal opportunities and dynamics of VR and AR sectors. A layer of insights is applied to translate market events and raw figures into prescriptive advice.

More information, past reports and editorial calendar can be seen **here.**

▮▮▮ About the Author

Mike Boland was one of Silicon Valley's first tech reporters of the Internet age, as a staff reporter for *Forbes* (print) starting in 2000. He has been an industry analyst covering mobile and social media since 2005, and is now Chief Analyst of *ARtillery Intelligence* and Editor-in-Chief of *AR Insider.*

Mike is a frequent speaker at industry conferences such as AWE, VRLA and XRDC. He has authored more than 120 reports and market-sizing forecasts on the tech & media landscape. He contributes regularly to news sources such as *TechCrunch*, *Business Insider* and the *Huffington Post.*

A trusted source for tech journalists, his comments have appeared in A-list publications, including *The New Yorker*, *The Wall Street Journal* and *The New York Times.*

Further background, history and credentials can be read **here.**

▚ Methodology

This report highlights *ARtillery Intelligence* viewpoints, gathered from its daily in-depth coverage of spatial computing. To support narratives, data are cited throughout the report. These include *ARtillery Intelligence* original data, as well as that of third parties. Data sources are attributed in each case.

For market sizing and forecasting, *ARtillery Intelligence* follows disciplined best practices, developed and reinforced through its principles' 15 years in tech-sector research and intelligence. This includes the past 4 years covering AR & VR exclusively, as seen in research reports and daily reporting.

Furthermore, devising these figures involves the "bottom-up" market-sizing methodology, which involves granular revenue dynamics such as unit penetration, pricing and growth patterns. More on ARtillery Intelligence market-sizing research and methodologies can be read **here.**

▚ Disclosure and Ethics Policy

ARtillery Intelligence has no financial stake in the companies mentioned in this report, nor was it commissioned to produce it. With respect to market sizing, *ARtillery Intelligence* remains independent of players and practitioners in the sectors it covers, thus mitigating bias in industry revenue calculations and projections.

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▚ Contact

Questions and requests for deeper analysis can be submitted **here.**

⧉ References

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[i] See ARtillery Intelligence Briefing: **VR Global Revenue Forecast 2018-2023** (sign-in required)
[ii] **Contact ARtillery Intelligence**
[iii] See ARtillery Intelligence Briefing: **VR Global Revenue Forecast 2018-2023** (sign-in required)
[iv] See section of this report entitled, "Quantifying Quest"
[v] See ARtillery Intelligence Briefing: **VR Global Revenue Forecast 2018-2023** (sign-in required)
[vi] See ARtillery Intelligence Article: **Oculus Quest Review Roundup** (sign-in required)
[vii] See AR Insider Article: **Can Oculus Quest Take VR Mainstream**
[viii] See ARtillery Presentation: **Projecting 2020 Top Spatial Trends** (sign-in required)
[ix] See ARtillery Intelligence Article: **Oculus Quest Review Roundup** (sign-in required)
[x] **Contact Thrive Analytics**
[xi] See AR Insider article: **Is it Better in AR?**
[xii] See ARtillery Intelligence Article: **Oculus Quest Review Roundup** (sign-in required)
[xiii] See ARtillery Intelligence Article: **Oculus Quest Review Roundup** (sign-in required)
[xiv] See ARtillery Intelligence Article: **Oculus Quest Review Roundup** (sign-in required)