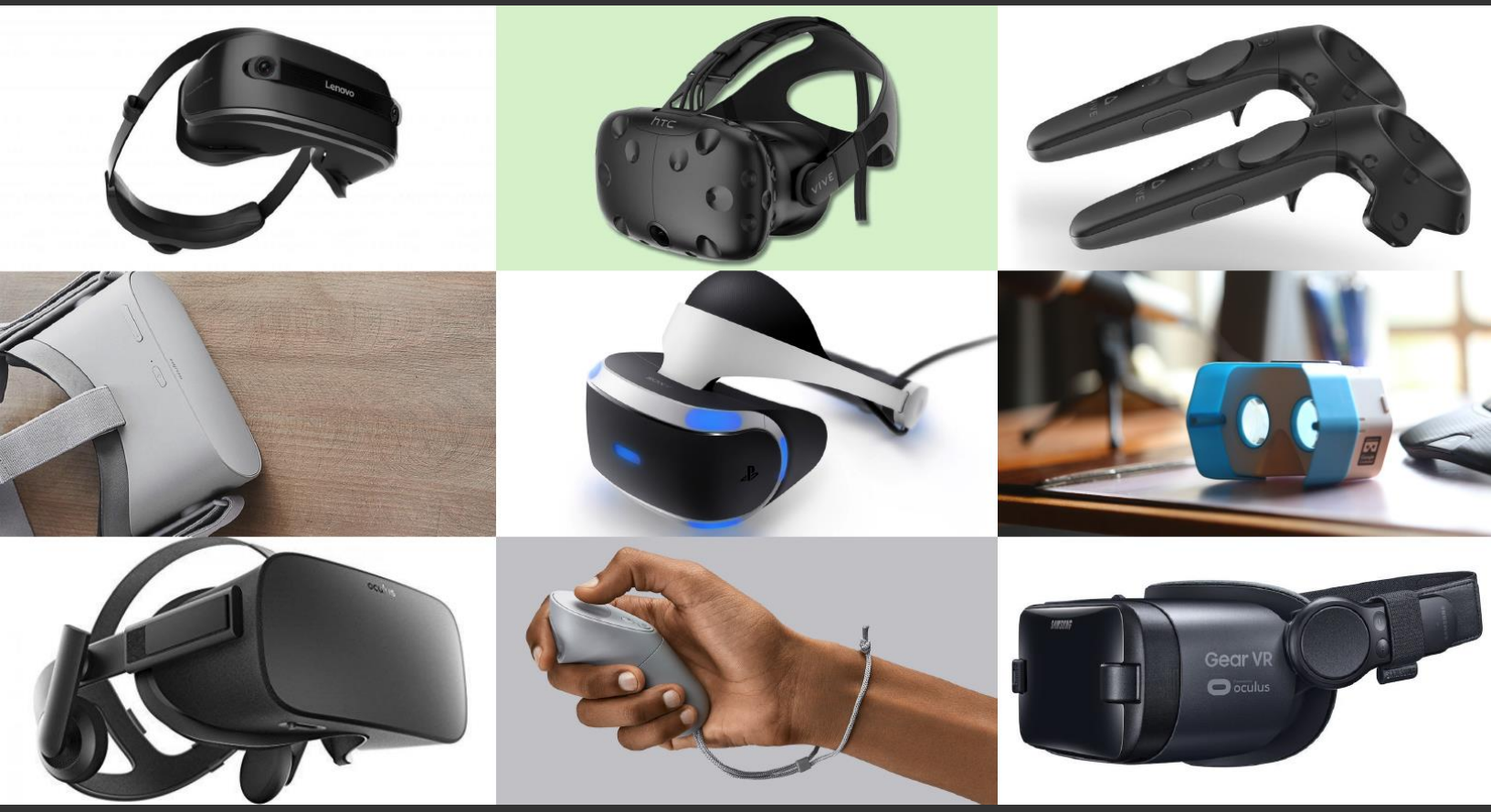
ARtillery Intelligence



ARTILLERY INTELLIGENCE BRIEFING

VR USAGE & CONSUMER ATTITUDES, WAVE III

JUNE 2019

PRODUCED IN PARTNERSHIP WITH

Thrive Analytics
smart decisions that drive success

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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 3,100 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 III of the research now emboldens our perspective and brings new insights and trend data to light. All three waves represent a collective base of 7,065 U.S. adults for a robust longitudinal analysis. This will continue to improve.

Meanwhile, what did we find out? At a high level, 16 percent of consumers surveyed have bought or used a VR headset, up from 11 percent in 2018. More importantly, VR users indicate high levels of satisfaction with the experience: 67 percent reported extreme or moderate satisfaction with VR.

As for price sensitivity, demand seems to inflect 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 (this survey was fielded before Quest's market launch), standalone VR addresses many consumer objections evident in this survey.

However, it's not all good news: Non-VR users report relatively low interest in VR ownership – 27 percent, down from 31 percent in 2018 – 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.

The same challenge was evident in our corresponding AR report, but mobile AR's adoption barriers are lower. This is nonetheless a common challenge for immersive technologies. It will take time, acclimation and price reductions before they reach a more meaningful share of the consumer public.

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

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Key Takeaways

Key takeaways are also highlighted throughout the main body of this report.

- **16% of consumers own or have tried VR, up from 11% last year.**
  - This equals roughly 45 million U.S. VR users, up from 31 million last year.
  - This is different than headset sales or installed base, given multiple users per headset.

- **Samsung Gear VR has the greatest adoption (43%), followed by PSVR (33%) and Oculus Rift (17%).**
  - Gear VR leads due to price and existing installed base, but its share is declining as it retracts from the market.
  - Lowered prices and new entrants (e.g. standalone headsets) are taking share from these incumbents.
  - PSVR is in a strong position due to its installed base of 90 million PlayStation 4 consoles.

- **Windows Mixed Reality (16%) and HTC Vive (14%) had the fourth and fifth highest penetration.**
  - They trail PSVR despite better specs, due mostly to price, PSVRs hardware installed base and its simplicity.
  - They also require a dedicated PC with costly graphical processing, and in some cases (VIVE) cumbersome setup.
  - Rift has won market share from VIVE, due to Oculus' aggressive pricing and content investments.

- **67% of VR users are either moderately satisfied (34%) or extremely satisfied (33%).**
  - This contrasts 4% of users that are either moderately dissatisfied (3%) or extremely dissatisfied (1%).
  - These are strong quality signals: there are few consumer products that show such high satisfaction.

- **50% of VR users want better functionality; 45% want higher quality content; 44% want more content.**
  - Content volume was the biggest desire in past waves, but has been satisfied to some degree by Oculus Go
  - Oculus Go's introduction last year came with broad content options and in-demand cinematic experiences.
  - There continues to be a chicken & egg dilemma between device penetration and content investment.
  - Oculus' content investments, including Oculus Go's backwards compatibility (Gear VR library), has helped.

- **VR users are most interested in cinematic experiences (67%), gaming (53%) and travel (49%).**
  - Cinema's lead is surprising in that it's not "native" to VR (2D viewing in immersive environment).
  - Though cinema doesn't embody VR's true potential, users most want what they're comfortable with.
  - Eventual VR successes will design native immersive experiences that can *only* exist in VR.
  - VR will be conceptualized in activities consumers know until native experiences reframe their thinking.

- **27% of non-VR users are interested in owning or trying VR, down from 31% last year and 41% in 2017.**
  - This dip can be seen as a correction to market-reflective levels, diverging from the 2016-2017 hype cycle.
  - In the next 2-3 years, interest in VR adoption will likely bounce back and equal or exceed 2017 levels.

- **The biggest reason for disinterest among non-VR users was "just not interested."**
  - This definitive sentiment is a wakeup call for VR proponents and compels consumer education.
  - VR users are highly satisfied (see above), so the strategy is to get more non-users to try VR.
  - This will happen through lower-friction standalone VR devices that are starting to penetrate the market.

- **31% of VR users will pay up to $200 and 26% will pay up to $400 for a VR headset.**
  - These demand-inflecting price points should be price targets for VR hardware manufacturers.
  - These also happen to be the price points of Oculus Go and the freshly-launched Quest, respectively.
  - Facebook's deep pockets and long-term platform strategy drive aggressive price competition, a competitive edge.

- **VR adoption will continue to be slow but will be accelerated by standalone headsets.**
  - The "all-in" low price and reduced set-up friction (e.g. inside-out tracking) address consumer concerns.
  - Oculus will be a leader, due to its investments in quality and aggressive price competition referenced above.
  - Oculus Go and the erstwhile-praised Quest will continue to be important tests for mainstream VR's potential.

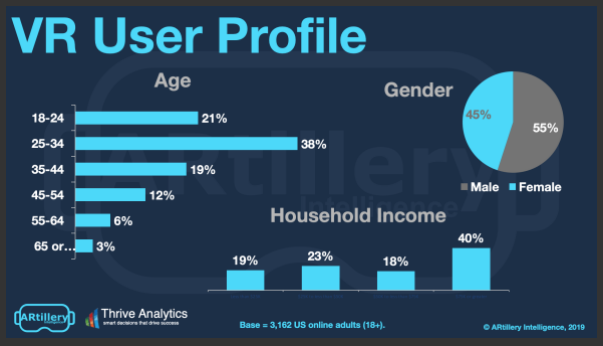
Introduction: A Snapshot

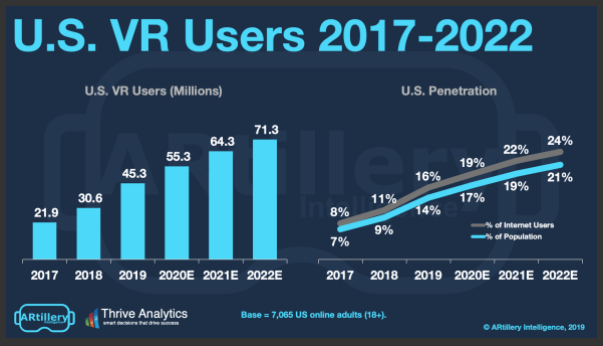
In VR's early stages it's important to understand consumer behavior and desires in order to optimize product strategies. We kicked off this process in 2017 with our first survey-based report on VR adoption. Now, our third-annual report offers experienced perspective on market evolution.

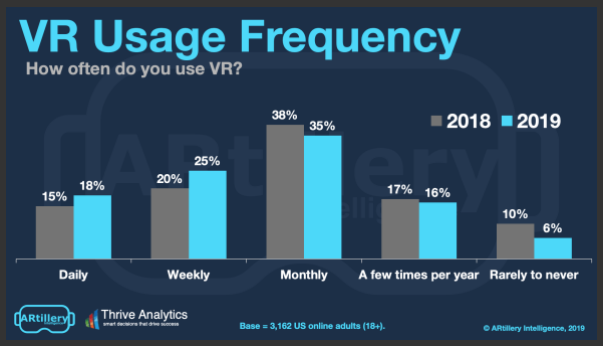
Working with our data partner Thrive Analytics, ARtillery Intelligence wrote questions to present to Virtual Reality Monitor's sample of more than 3,100 U.S. adult consumers. All three waves done to date now represent a cumulative base of 7,065 U.S. adults, enabling robust longitudinal analysis.

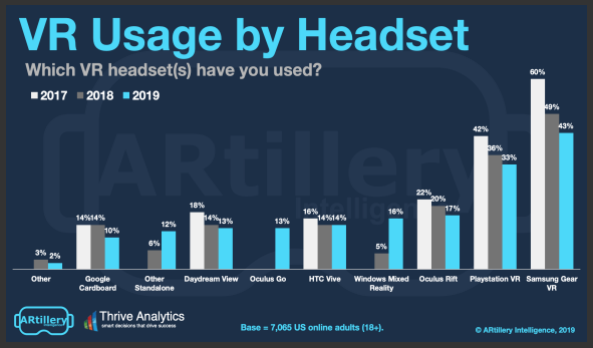
These survey results are a telling snapshot of VR adoption, which we'll detail in the coming pages. That will include charts and a narrative story arc that unpacks strategic takeaways, and our outlook for consumer VR. But before we take that deeper dive, here's a highlight reel of survey findings.

- 16% of respondents own or have tried VR, up from 11% last year.
- 35% of users engage VR monthly, 25% weekly and 18% daily.
- 43% of users own or use Samsung Gear VR, followed by PSVR (33%) and Oculus Rift (17%).
- 33% of users are extremely satisfied with VR, 34% are moderately satisfied.
- 1% of users are extremely dissatisfied with VR, 3% are moderately dissatisfied.
- 87% of Windows Mixed Reality users are satisfied, 83% for Rift and 83% for Oculus Go.
- 40% of users want more content, 45% want better content and 50% want better functionality.
- 27% of non-VR users are interested in owning or trying VR, down from 31% last year.
- 61% of disinterested non-VR users cited "just not interested" as the reason.
- 57% of VR users would pay up to $400 for a headset. 69% of non-users would pay up to $200.









Survey Audience: the "Who?"

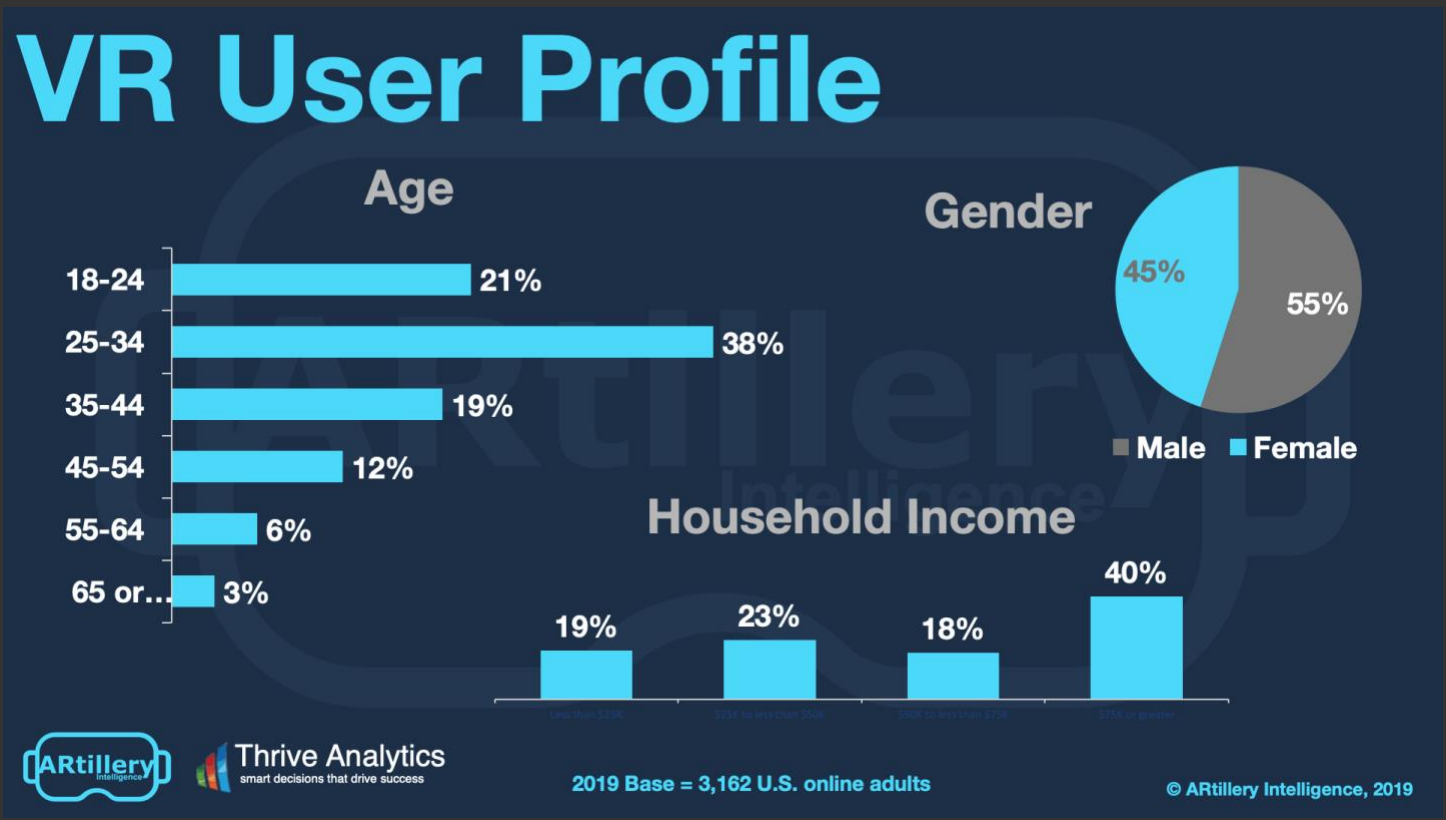
To first add context to survey findings throughout this report, who's answering the questions? It includes more than 3,100 U.S. adults. Going deeper into demographics and psychographics, the respondents break down as shown below. More detail and segmentation are available on request.[ii]

As the data show, the survey sample spans a wide range of U.S. adult consumers. Gender breaks down fairly evenly, while age and income levels skew towards more attractive demographic groups. That includes active and buying-empowered age groups (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 in the initial stages of adoption," said Thrive Analytics managing partner Jason Peaslee. "There are still many technology challenges, but we think AR & VR have the ability to significantly change the way people work, connect, and learn. We are excited about the prospects."

We should also mention for the sake of context that this survey wave was fielded before Oculus Quest's market launch on May 21, 2019.



Part I: VR User Sentiments

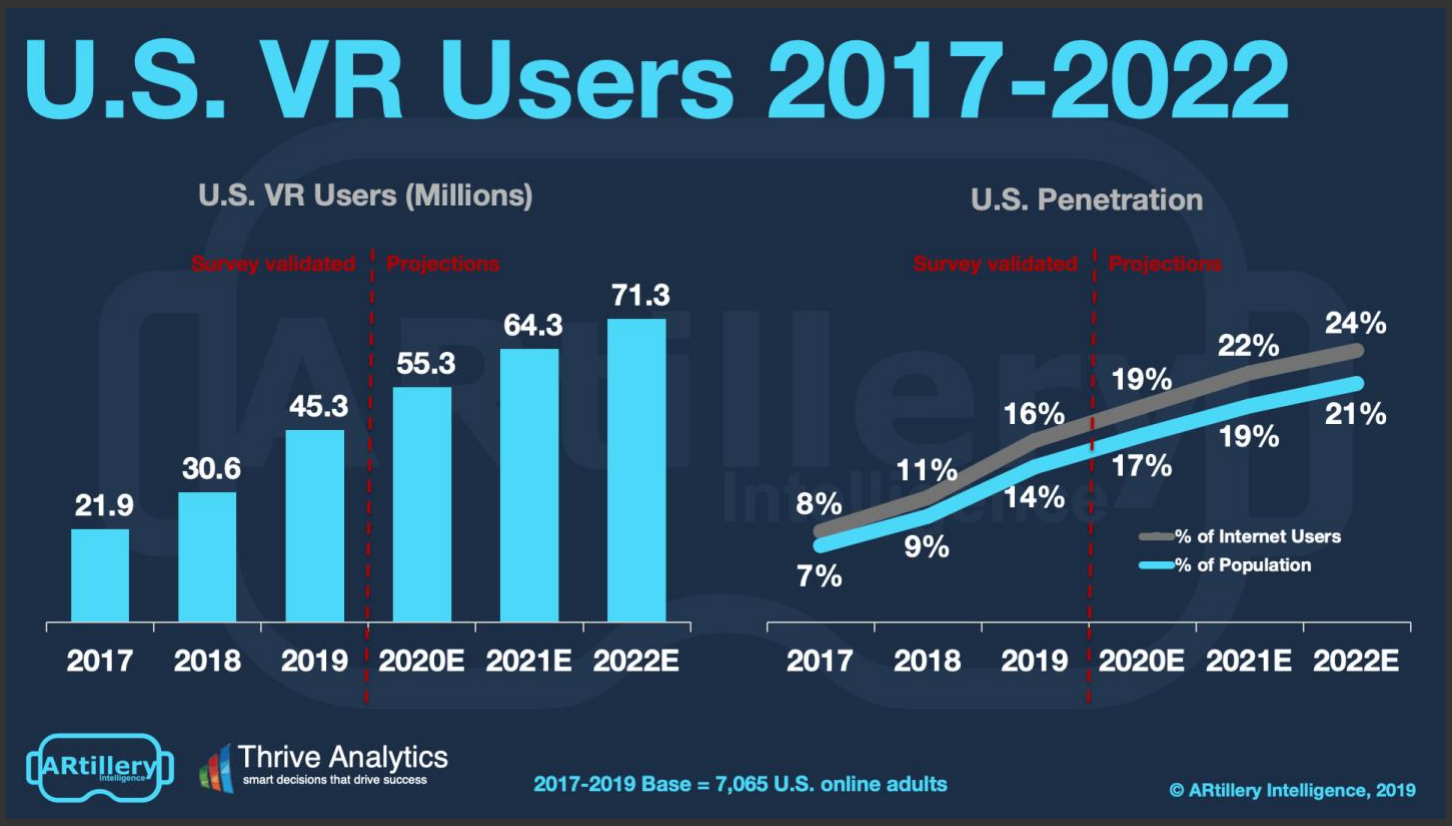
To organize strategic takeaways in this report, we've delineated the sentiments of *current users* and *non-users*. Both can provide telling signals for VR product development and strategy refinement. Starting with current users, what are they saying and thinking? The following sections dive in.

VR Users: the "How Many?"

Starting our analysis at the very top, what's the overall penetration and adoption of VR among consumers? Survey results indicate that it currently stands at 16 percent. This aligns with headset penetration figures reported in our Global XR Forecast[iii], and is up from 11 percent in 2018.

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 2018. 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 71 million users (different than device volume[iv]) by 2022, which will be 24 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.



Frequency: the “How Often?”

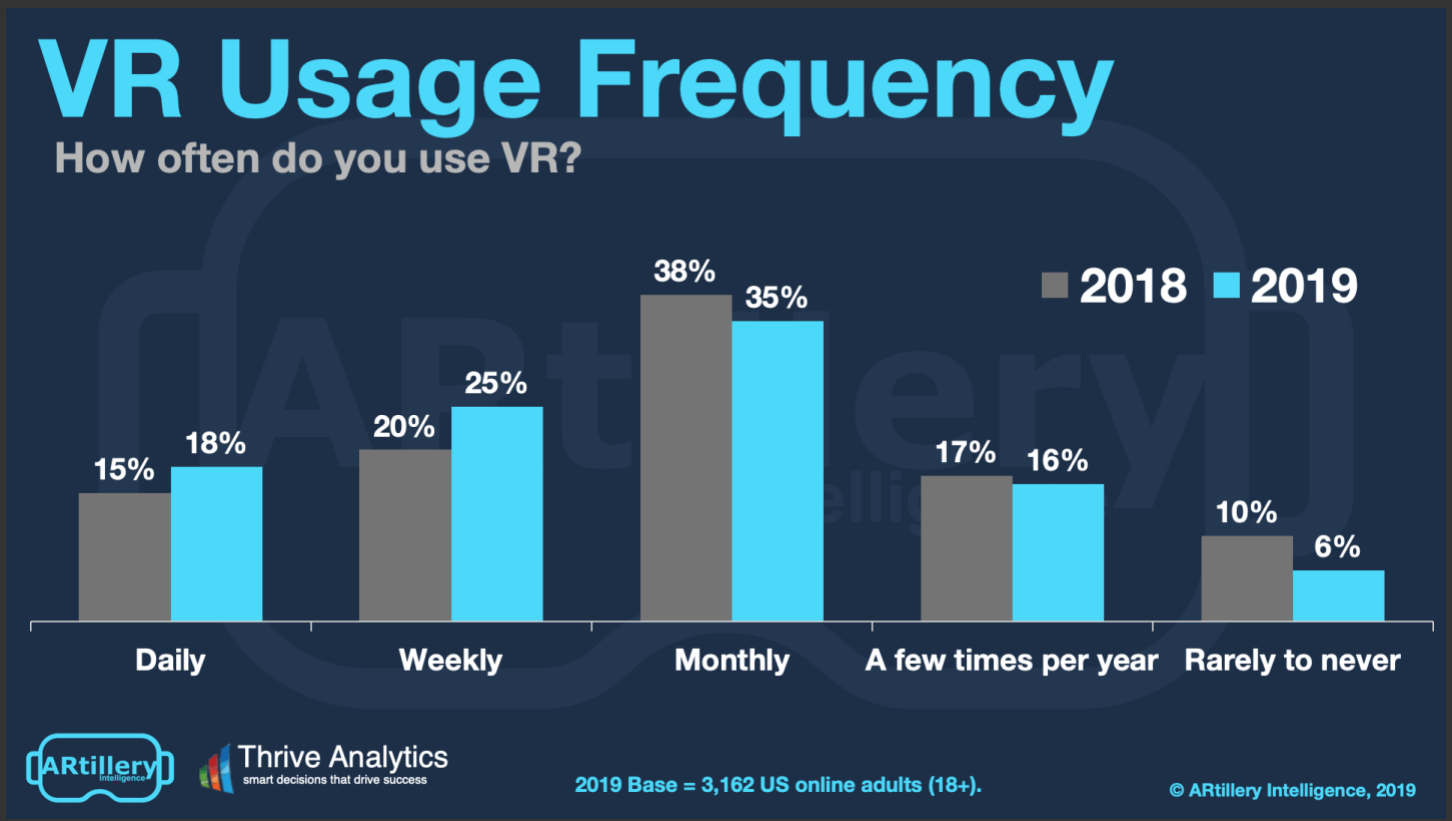
Perhaps more important than number of users, a key variable in tracking success in any digital media is how often it’s being used. Because VR adoption barriers can be high (tracking system set up, technological invasiveness, etc.), the name of the game is to design for ease of use and replayability.

This challenge is starting to recede with the advent of standalone headsets like Oculus Go and Quest (note: this survey was fielded prior to Quest’s launch). So we believe that frequency metrics will improve over time. Meanwhile, VR frequency shows some strengths and some areas to improve.

Specifically, most VR users engage monthly (35%) followed by weekly (25%) and daily (18%). 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 three-percentage points and five percentage points respectively. Monthly usage is down three percentage points. This shows that users are engaging more often, possibly due to more standalone headsets in the market this year.

Standalone headsets such as Oculus Go reduce VR friction. Among other things, this should increase usage frequency, already seen in this survey wave. Any effects so far are likely due to Oculus Go’s limited tenure, and will only improve with more time and with Oculus Quest’s forthcoming penetration.



Headsets: the “What?”

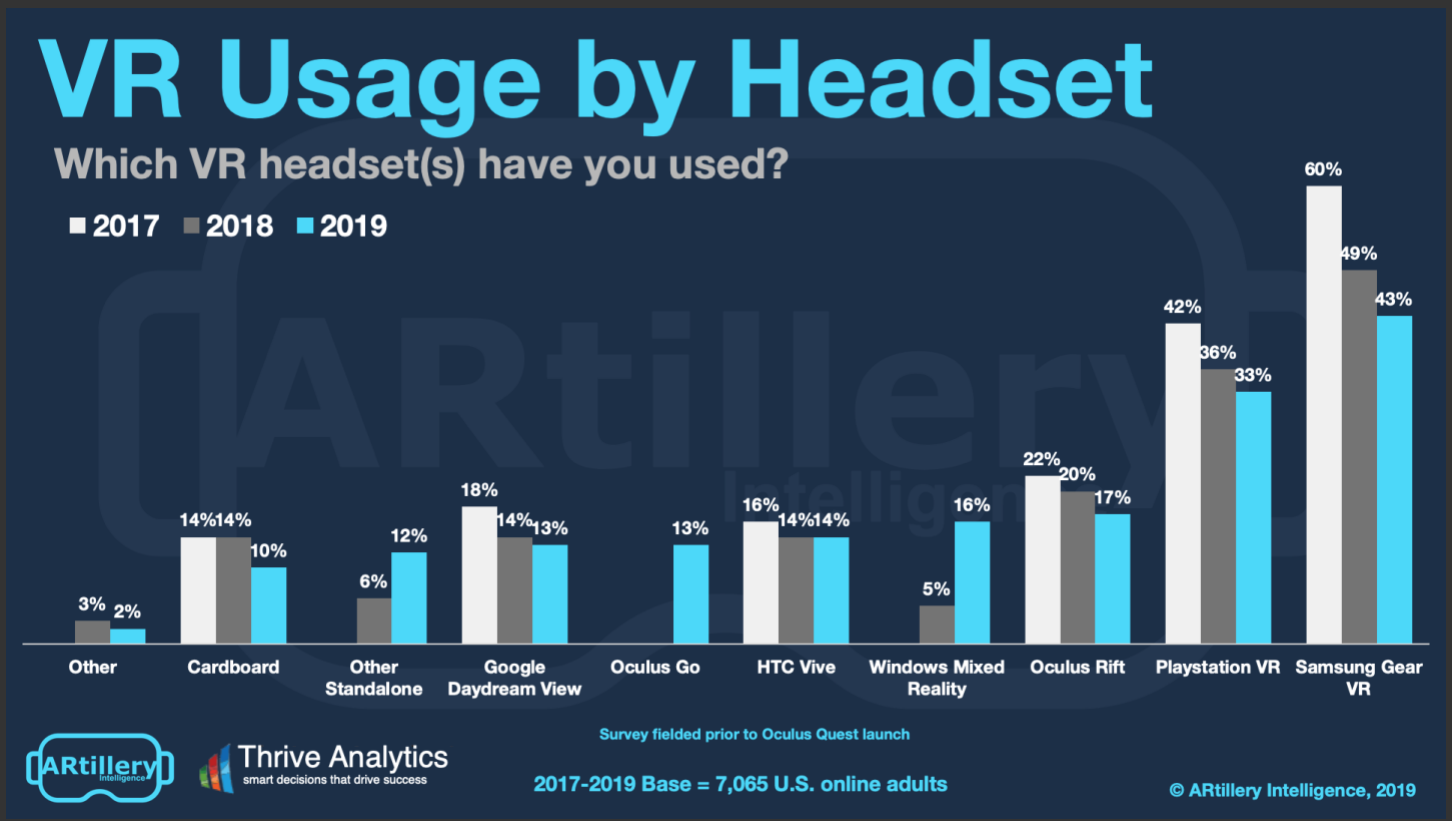
Going one level deeper, what devices are gaining the most traction? Samsung’s Gear VR scored highest at 43 percent. This is surprising due to the device’s market retreat throughout 2018 and 2019. So results are likely due to headsets still in-market (versus new sales) as an installed base.

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. This will be led in future waves by Oculus Go and Quest (note: this survey was fielded before Quest’s launch).

Speaking of Oculus Go it performed well but lower than expected, with 13 percent usage among respondents. On the bright side, it reached that point from just 0% one year ago. A 13 percent market share in one year is reputable, and we expect it to exceed 30 percent of usage in the next wave.

Playstation VR (PSVR) scored second highest in adoption at 33 percent. This makes it the most adopted among tier-1 (tethered) headsets. This isn’t surprising, given an installed base of 95 million compatible PSVR consoles, and our separate headset sales tracking and market share estimates.[v]

Oculus Rift, Windows Mixed Reality and HTC VIVE (including VIVE PRO) 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.



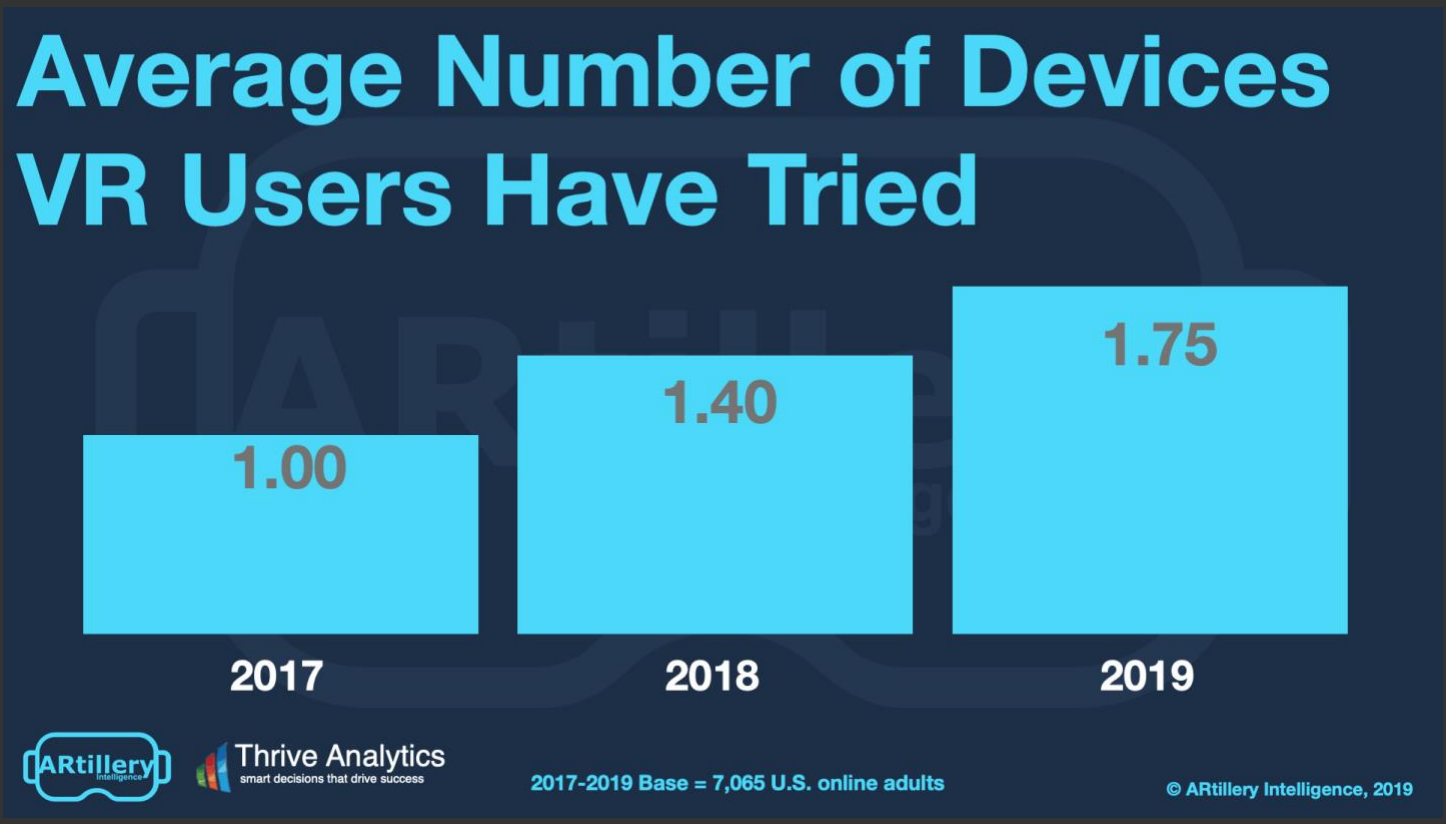
By “all-in pricing,” we mean additional hardware isn’t needed, such as gaming PCs to render high-end graphics for tethered headsets like Rift and VIVE. Despite this PC-requirement, Windows Mixed Reality (WMR) grew from 5 percent to 16 percent, likely due to many headsets on the platform.

This trend kicked off last year and should continue into the next wave. Here’s a quote from last year’s report, which supports the point about WMR as well as the earlier assertion about Oculus Go:

> *“…it’s important to note the rise of new categories tracked in this wave of research, including standalone headsets and Windows Mixed Reality headsets. These headset classes have emerged in the past year and show lots of potential.*
>
> *Standalone headsets especially could accelerate industry sales growth by bringing more users into VR. That’s due to a lower price point and much less friction to set up and launch VR sessions. Oculus Go in particular could be such an accelerant…”*

Overall, the market continues to fragment. The players that ruled 2017 (PSVR, Rift, Vive, Gear VR) are now challenged by WMR, Oculus Go and Quest. We project strong results for the latter in the second half of 2019. More about Oculus’ strategy is explored in the final section of this report.

Meanwhile fragmentation is making its mark. When looking at the average number of headsets users have tried, it continues to rise year-over-year. This is partially due to users’ comfort and savvy, but is also a function of more headsets in the market. This factor is even more pronounced in China.



Satisfaction: the “How Good?”

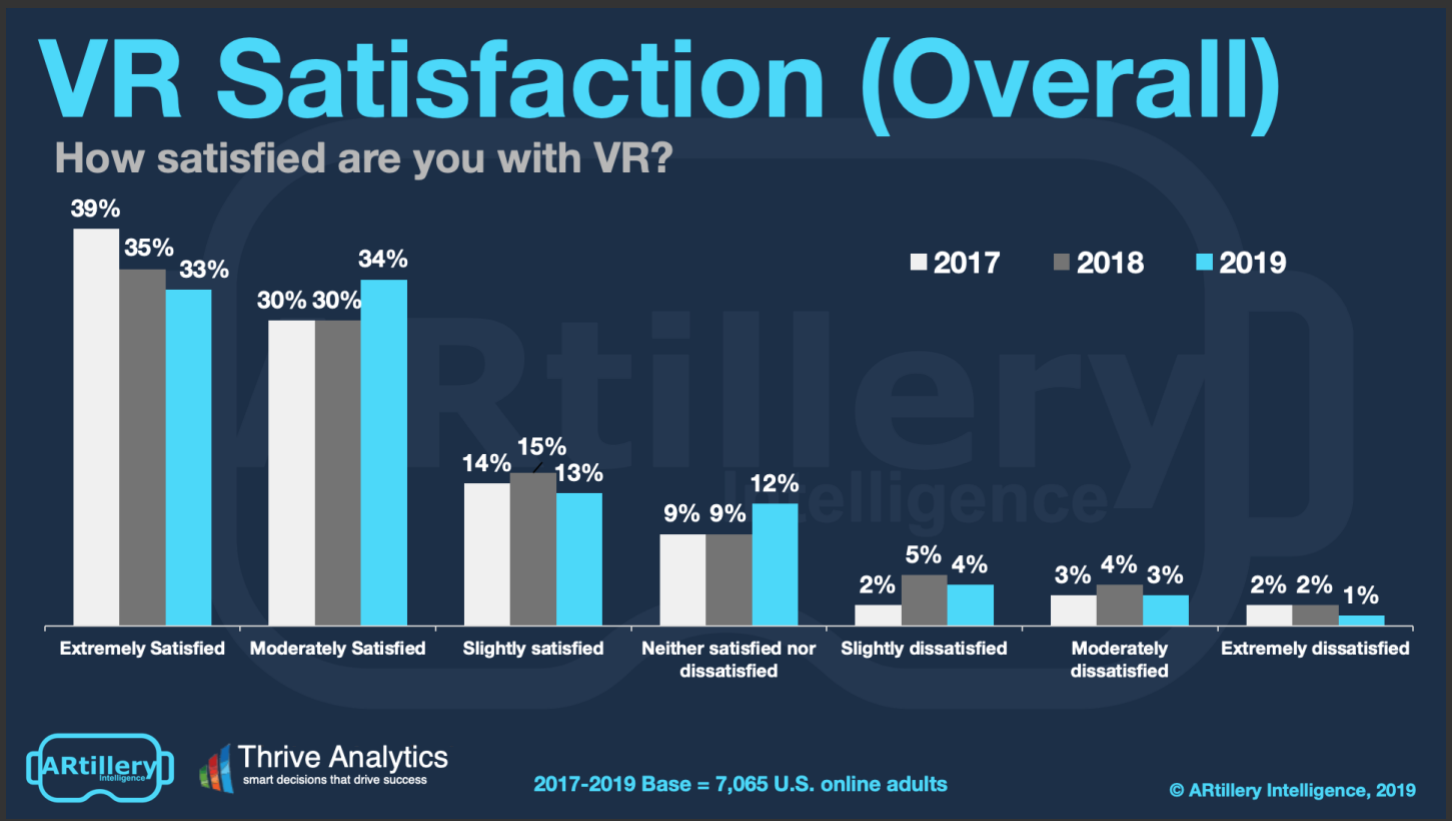
Drilling down from usage, how are consumers satisfied with VR? Satisfaction levels align with the above analysis such as growing affinity for standalone VR. But before getting into per-headset sentiments, it’s worth noting that overall VR satisfaction remains mostly favorable.

Specifically, 67 percent of users are either moderately satisfied (34 percent) or extremely satisfied (33 percent). This contrasts the opposite end of the satisfaction spectrum where only 4 percent of users are either moderately dissatisfied (3 percent) or extremely dissatisfied (1 percent).

These are strong quality signals. In fact, there are few consumer products that show such high satisfaction levels. However, we should note that the corresponding results in our April mobile AR report showed even higher satisfaction levels, with 78 percent of users satisfied or very satisfied.

This tells us that that VR’s highly visual and immersive format, though still early, is already captivating users. This is due to its revolutionary – rather than evolutionary – interface when compared with traditional 2D media to which users are accustomed. Non-users are a different story (explored later).

To be fair, extremely-satisfied responses are down nine percentage points from a 2017 peak of 39 percent. This is likely due to the excitement levels that surrounded VR circa-2017, which have since backlashed. But the dip is partially offset by a small increase in moderately-satisfied responses.



Naming Names

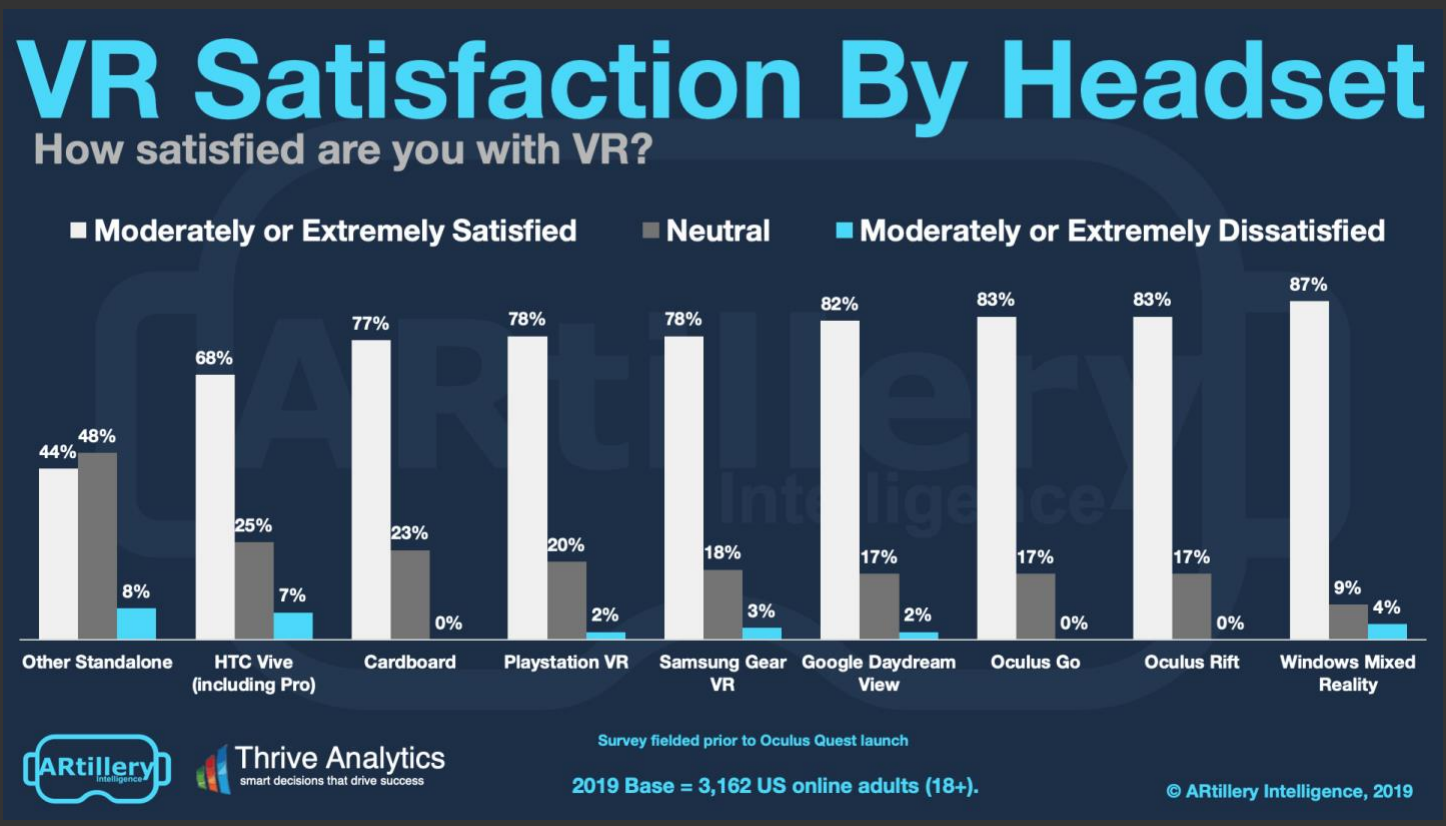
Drilling down another level, how do the above satisfaction ratings map to individual devices? Answering that question can start to indicate the VR features and formats that resonate most with consumers. The high-level takeaway is that satisfaction is high across the board, with some variance.

When ranking headsets by those that received "moderate" or "extreme" satisfaction, Windows Mixed Reality (WMR) leads the pack (87%), followed by Oculus Rift (83%) and Go (83%). This is surprising given that WMR headsets have varying quality and aren't known to be the industry's gold standard.

That designation rather goes to Oculus, given its VR investments. In fact, its loss-leader approach to "trade margins for market share" (explored later), has generally allowed it to market headsets that are technically superior to others in their price classes. That's reflected in these survey sentiments.

HTC VIVE meanwhile underperformed in terms of *lower* high-satisfaction scores and *higher* low-satisfaction scores. We attribute VIVE's outside-in tracking system, known to be the most cumbersome. Consumers are getting a taste of frictionless VR, which shines unfavorably on VIVE.

Meanwhile, surprises include high satisfaction for the primitive cardboard (77%) and the increasingly-neglected Daydream View (82%). Google's disappointing adoption for the latter has caused it to redeploy support resources, resulting in the device's substandard content library and uncertain future.



Another takeaway from these satisfaction rankings – continuing the theme of the rise of standalone VR – is that the category is resonating with users. This considers Oculus Go's high marks. "Other standalone" scored lowest but that's expected. On both of these points, we wrote in last year's report:

> *Standalone VR scored lowest, which makes sense for one reason: This survey was fielded before Oculus Go's launch, during a time when standalone VR was characterized by lower-quality devices.*
>
> *We believe strongly that this survey's next wave will identify the standalone category with much greater satisfaction ratings, due to Oculus Go. In our ongoing use and testing of Oculus Go, it has impressed us in quality levels and price, due mostly to Oculus' investments discussed above.*

Image Credit: Oculus

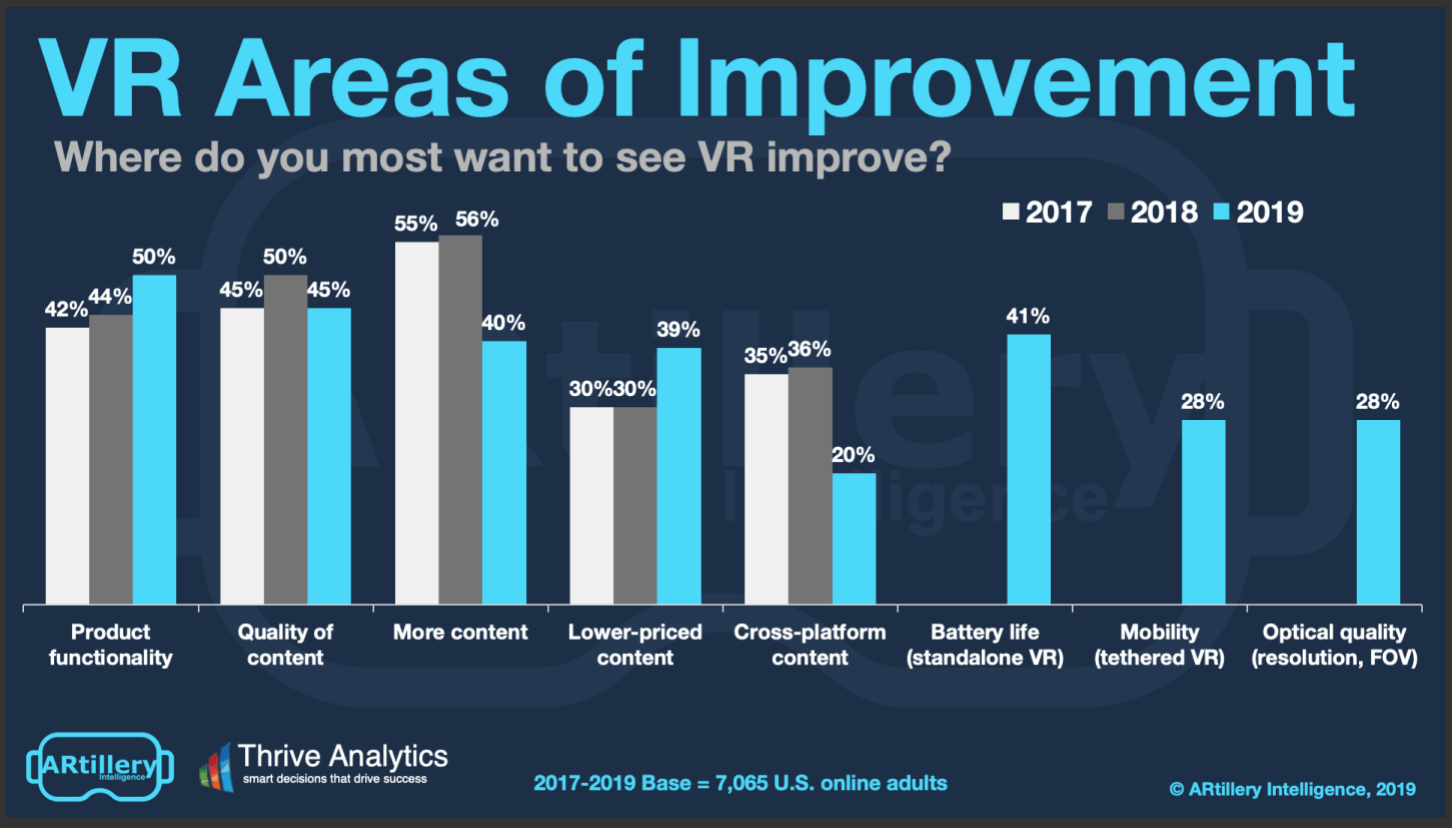
Areas of Improvement: the “What If?”

Stemming from satisfaction is a related factor: What do VR users want to see improved? On functional measures, battery life in standalone VR is a high-ranking desire (41%). We believe this is due to Oculus Go’s low battery life – the biggest complaint for an otherwise-revered device.

Content is another big factor. Past survey waves were all about content quantity, but this year is defined by growing demand for content *quality* (45%). Quantity is less of an issue this year because it’s been satisfied by to some degree by Oculus Go’s rich content library. Or as we wrote last year:

> …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… Invoking Oculus Go yet again, it could help accelerate that step function. It enters the market with more than 1,000 compatible apps, due to backwards-compatibility with Gear VR.

We invoke this passage from last year’s report because it represents an important trend that we’ll see continue with Oculus Go, not to mention Quest. The latter launches with 50 titles including the popular Beat Saber, Rec Room and the YouTube app, which has access to one-million 360° videos.



Part II: Non-User Attitudes

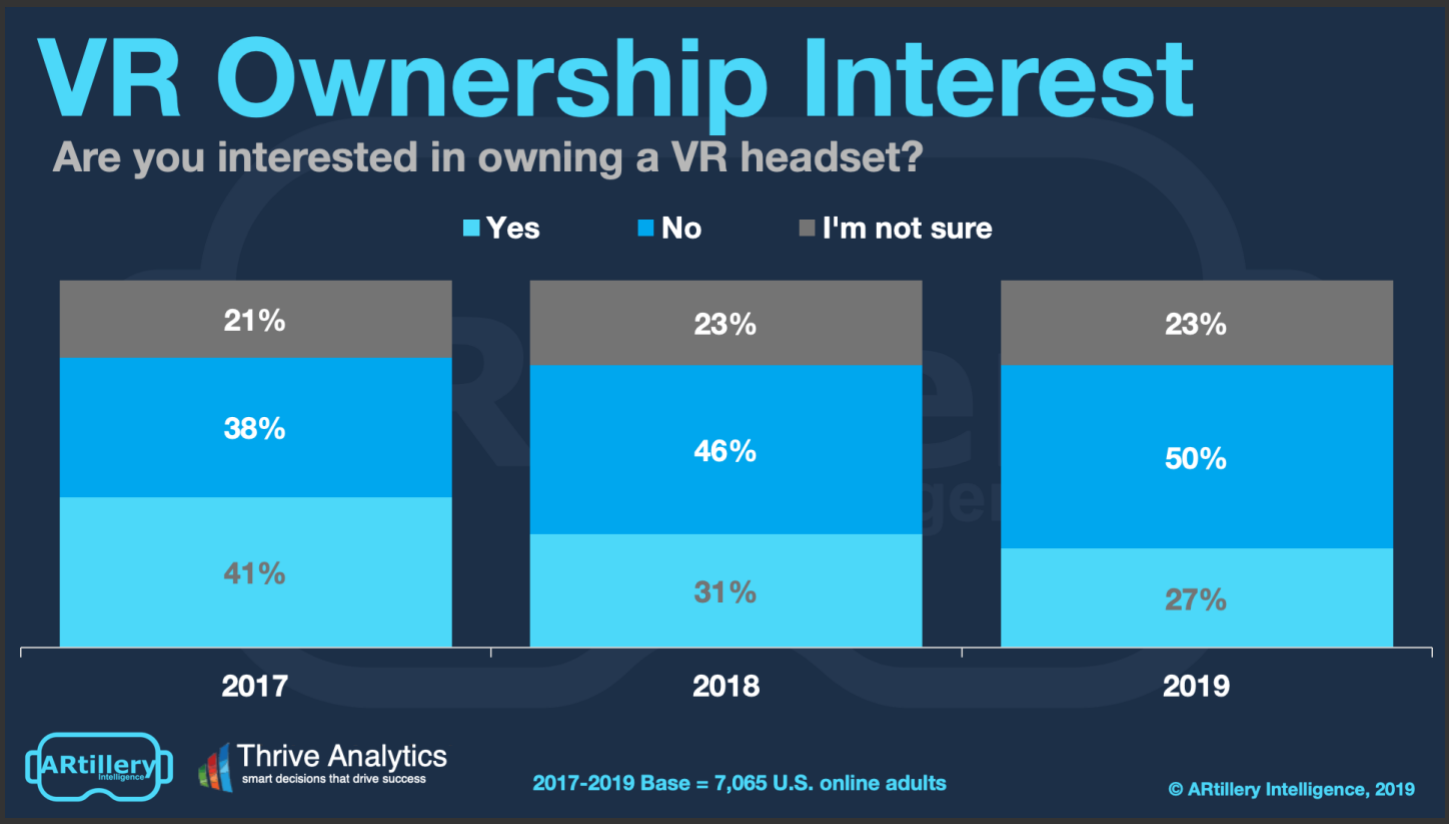
Perhaps more important than current VR users, what are non-users saying? Because they're much larger in number at this early stage, appealing to them is a strategic imperative. And that requires knowing what they like and don't like. The following sections examine these non-user attitudes.

Adoption Likelihood: the "If?"

Among VR non-users, 27 percent report interest while 50 percent aren't interested, and 23 percent aren't sure. Non-user interest is down from 31 percent in 2018 and 41 percent in 2017. This gradual decline is due to a cooling of interest, which aligns with VR sales figured we separately track.[vi]

Another way to read these figures is a classic market correction to the hype cycle that defined 2016 and 2017. Sales continue to regress to market-reflective levels. The good news is that the market will eventually meet 2016 and 2017's lofty expectations... but that rebound will take several years.

It's like the 2000's eCommerce bubble: market projections weren't inaccurate… they were just early. Eventual market sizes exceeded those lofty expectations, but not until 5-7 years later. We believe VR interest, and these representative survey results, will likewise bounce back at a similar pace.



Reasons: the “Why Not?”

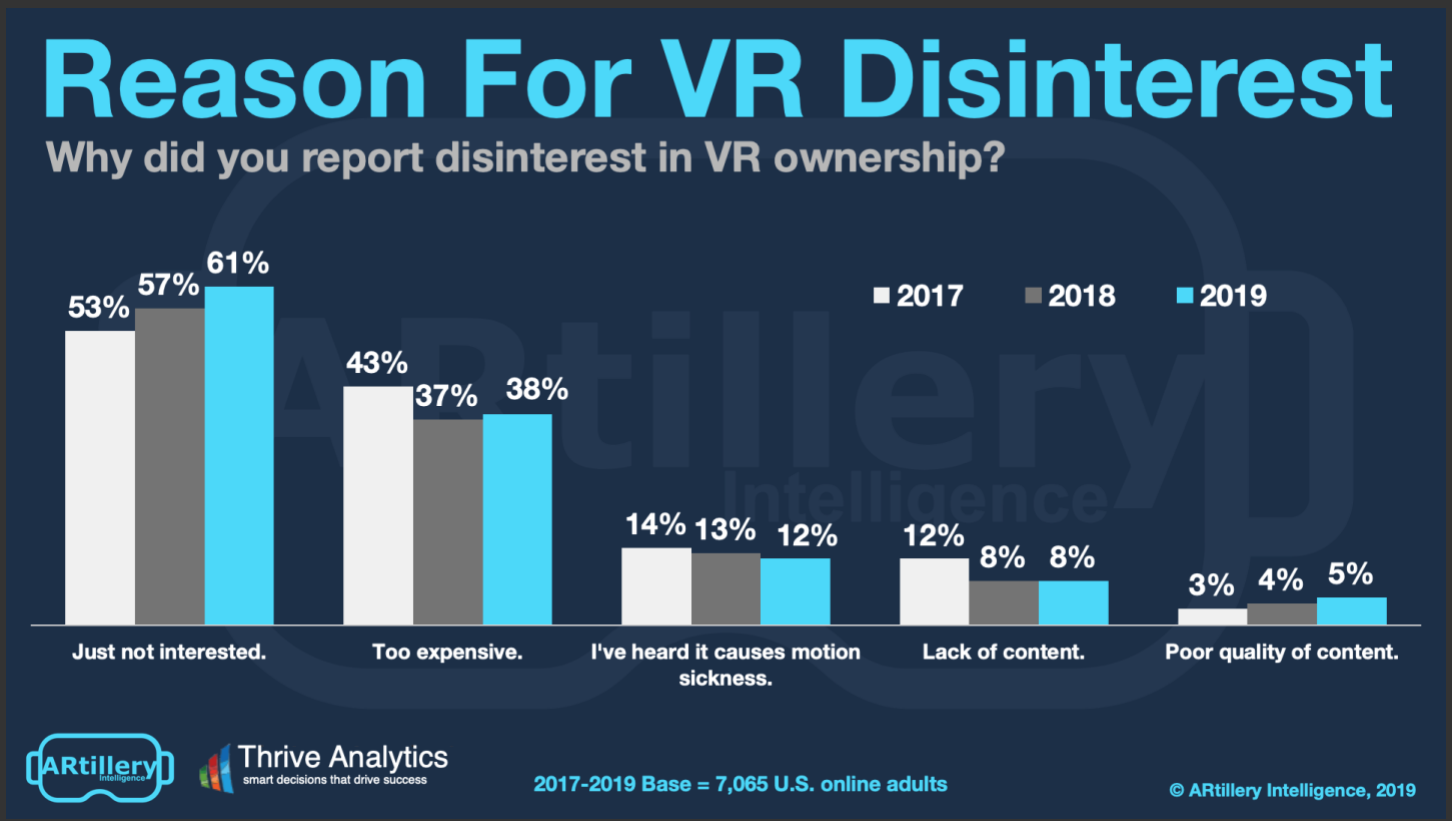
More important than binary interest levels in VR are the reasons behind them. This can shed light on non-users’ objections to VR and therefore what features and components can be changed or optimized to attract more consumers. Their objections can be a telling indication of what’s missing.

Not surprisingly, price was a factor at 38 percent (price is explored more later). But the biggest reason was the rather discouraging “just not interested” (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 but will be even more so with Quest. It walks a fine line between user-friendliness and high-end VR functionality, such as positional tracking.[vii]



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 players best appeal to their interest. 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, 68 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, 62 percent of this "potential buyer" segment don't have children, compared to 38 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 (45%) than $200 (36%). 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.[viii]

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	42%	47%	110
Female	58%	53%	93
Age			
18-24	3%	4%	133
25-34	12%	17%	144
35-44	17%	24%	141
45-54	21%	23%	109
55-64	20%	17%	85
65 and older	27%	15%	55
HH Income			
Less than $25K	22%	20%	90
$25K to less than $50K	28%	29%	102
$50K to less than $100K	35%	35%	99
$100K or more	14%	16%	115
Ethnicity			
White/Caucasian	86%	82%	95
Black/African American	10%	13%	126
Hispanic/Latino	4%	5%	140
Presence of Children in Home			
No	71%	62%	87
Yes	29%	38%	133

DEMOGRAPHIC DATA	SAMPLE	POTENTIAL BUYERS*	INDEX
Total	100%	100%	100
Technology Adoption Segment**			
Innovators	3%	5%	204
Early Adopters	8%	18%	217
Early Majority	41%	57%	139
Late Majority	38%	18%	49
Laggards	11%	2%	22
Currently own a Video Game Console			
Yes	44%	68%	155
No	56%	32%	56
Highest you would pay for a VR System			
$100 to $200	70%	36%	51
$201 to $400	20%	45%	222
$401 to $600	7%	15%	220
$601 to $800	2%	3%	162
$801 to $1,000	1%	1%	179
More than $1,000	1%	0%	52

*Potential Buyers = Non-VR owners reporting likeliness to buy.
**The technology adoption segment is assigned to each individual based on their responses to questions about how they view and utilize new technology.

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2019 Base = 3,162 US online adults (18+).

Part III: The Collective Mindset

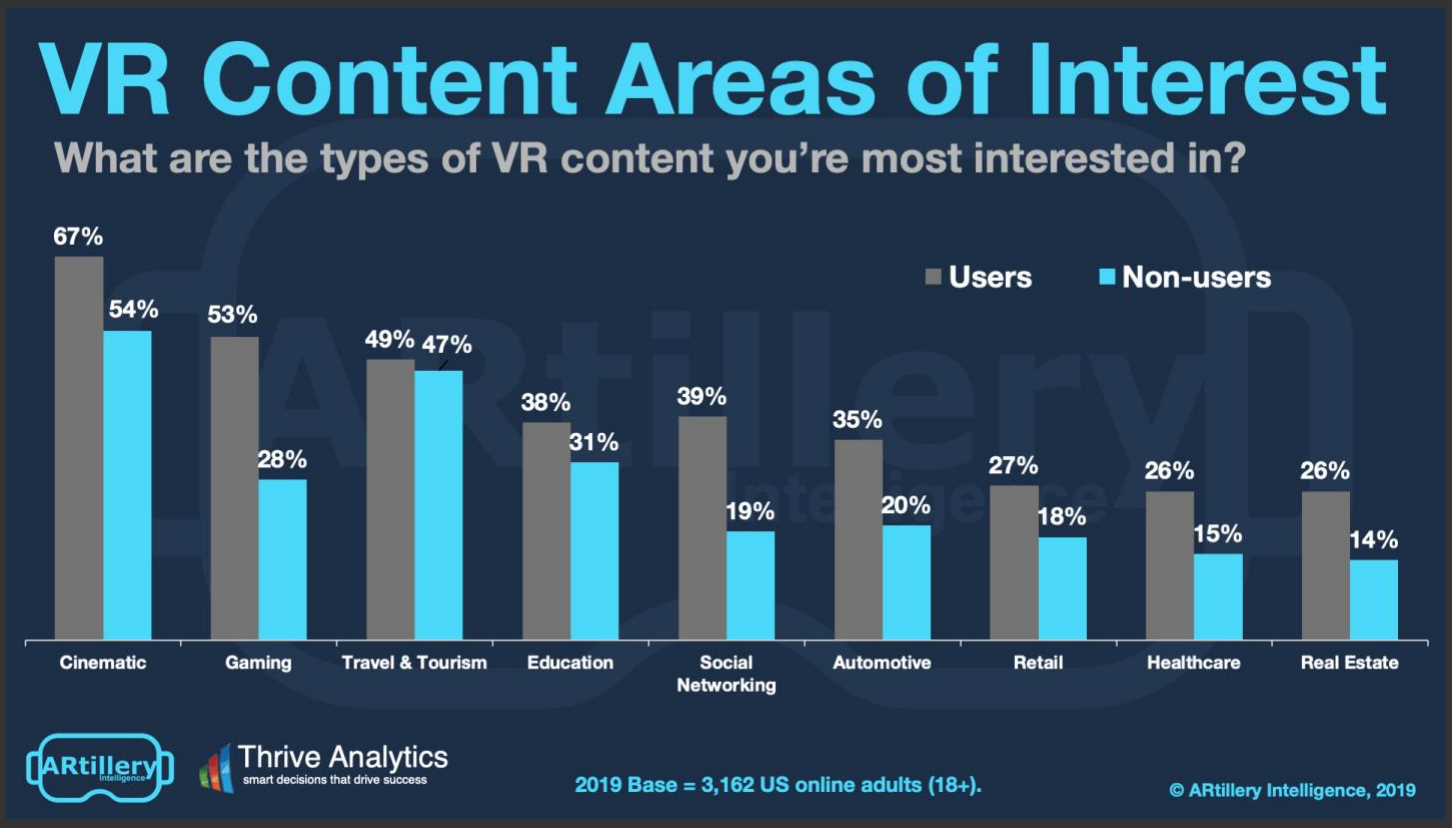
Moving beyond user and non-user sentiments, what are the VR variables that cut across both groups. For example, how does price sensitivity compare between users and non-users? And what are the types of VR experiences each group wants? These questions are covered in the following sections.

Content: the "What?"

Earlier, we explored how content is a key issue for VR users. That goes for both quantity and quality, the latter gaining mindshare in this survey wave. 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, such as watching movies (2D) in a virtual environment. Among VR users, that's followed by gaming, travel & tourism, social networking and education. The story is mostly the same for non-users except that there is a big drop (to 28%) in gaming 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.



Price: The "How Much?"

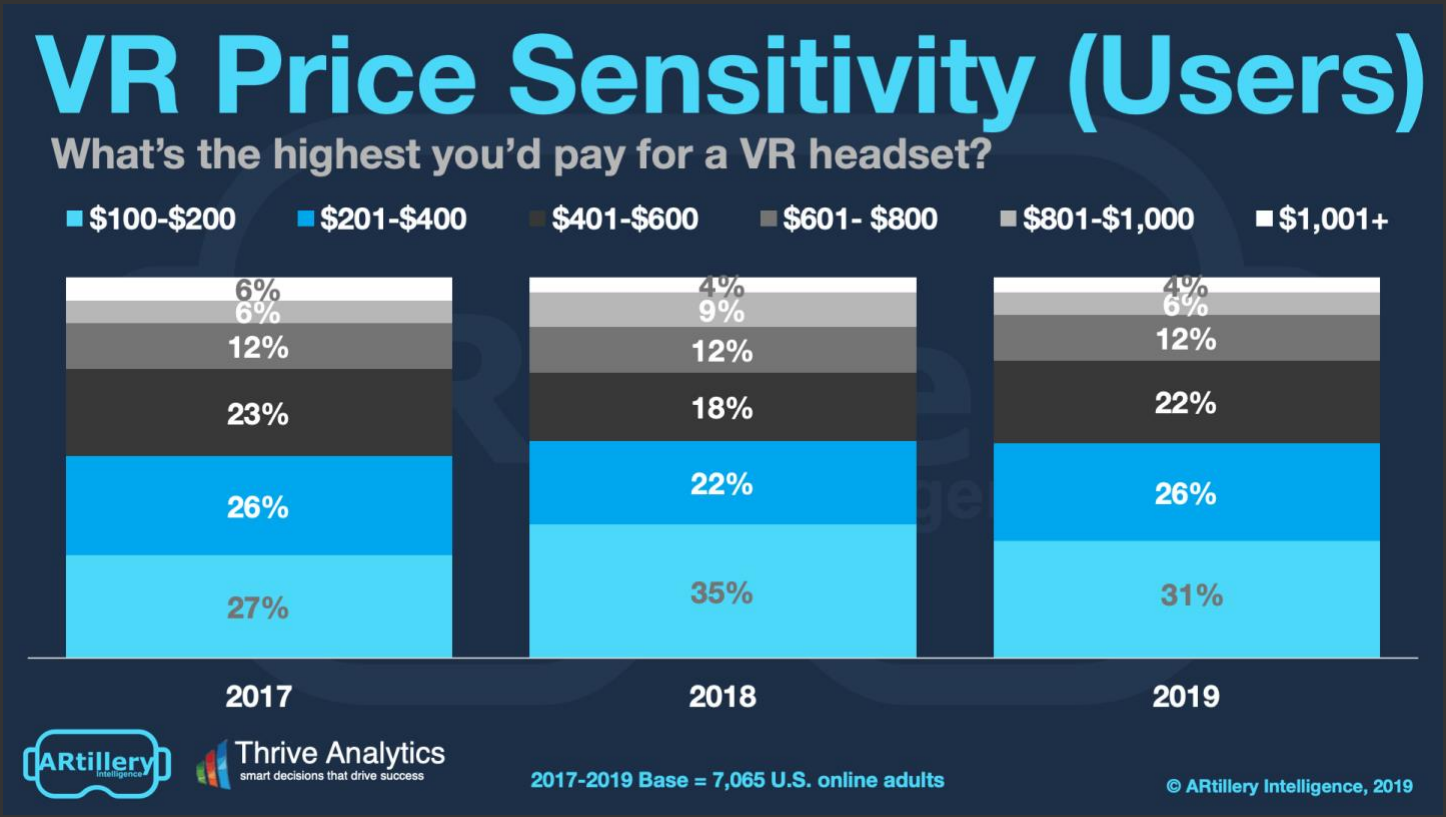
As examined above, price is another important factor in VR adoption, just as it is with most products. But what are the specific ways that price is a gating factor to VR adoption? And more importantly, what price points represent triggers for consumer interest – or disinterest – in VR ownership?

To begin, the greatest interest in VR not surprisingly exists at lower price points ($100 - $200). And the least interest lies with more expensive purchases ($1001+). Given that tethered VR headsets primarily exist at those "all-in" (including PC) price points, 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 next), the greatest interest is at the sub-$200 level (31%). That's followed by the sub-$400 price point (26%) and sub-$600 (22%), both of which are up four percentage points from 2018.

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

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



Non-Users: A Different Tune

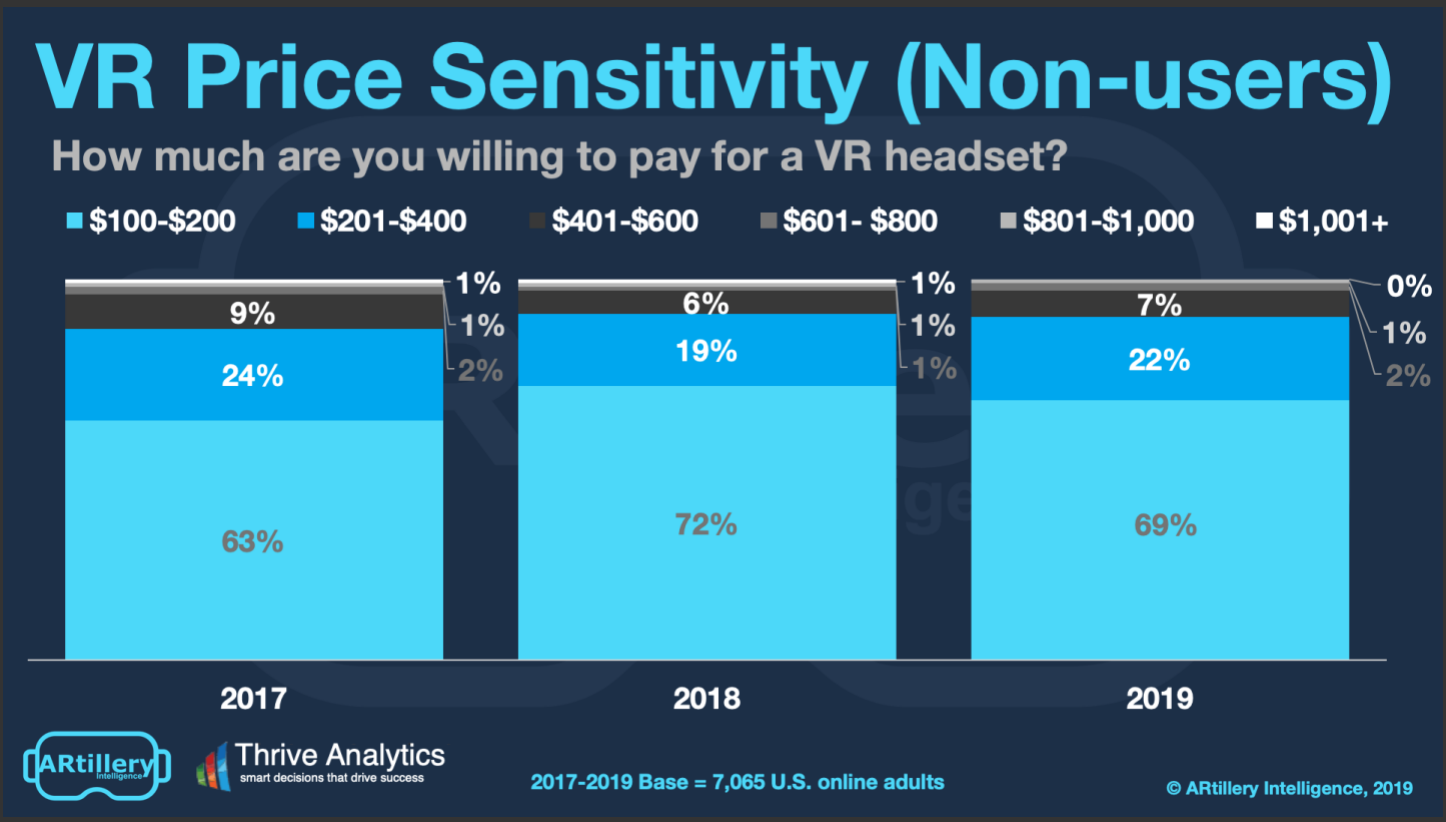
When looking at the same price equation for non-users, it's a different story. Given their ambivalence towards VR explored earlier, their price sensitivity is not-surprisingly greater than current VR users. The most popular pricing tier among this group was by far the lowest one, $100-$200 (69%).

When looking towards higher price points, such as anything over $600, only 3 percent of non-users reported willingness to buy. At the $1001+ level, zero respondents did so. As for trending, these figures remain mostly flat from 2018 with only slight deviations outside the margin of error.

One takeaway is that such resounding sentiment towards the sub-$200 level means that success in selling to this group lies with Oculus Go. There are others in this price range but Go shines with cinematic content (2D cinema in a virtual environment), where consumers, again, express interest.

But going back to our earlier profiling of "potential buyers" (a subset of non-users), they indicated greater interest in paying up to $400 (45%). That compares with this full sample of non-users, 22 percent of whom would pay that much. Altogether this bodes well for both Oculus Quest and Go.

In other words, "potential buyers" (non-users indicated interest in VR) are expressly willing to pay Oculus Quest's price point. The rest of non-users are still potential VR converts who don't know it yet. And for them, Oculus Go is in their price range. So collectively, Oculus has non-users well covered.



Demand Signals: The "What's Next?"

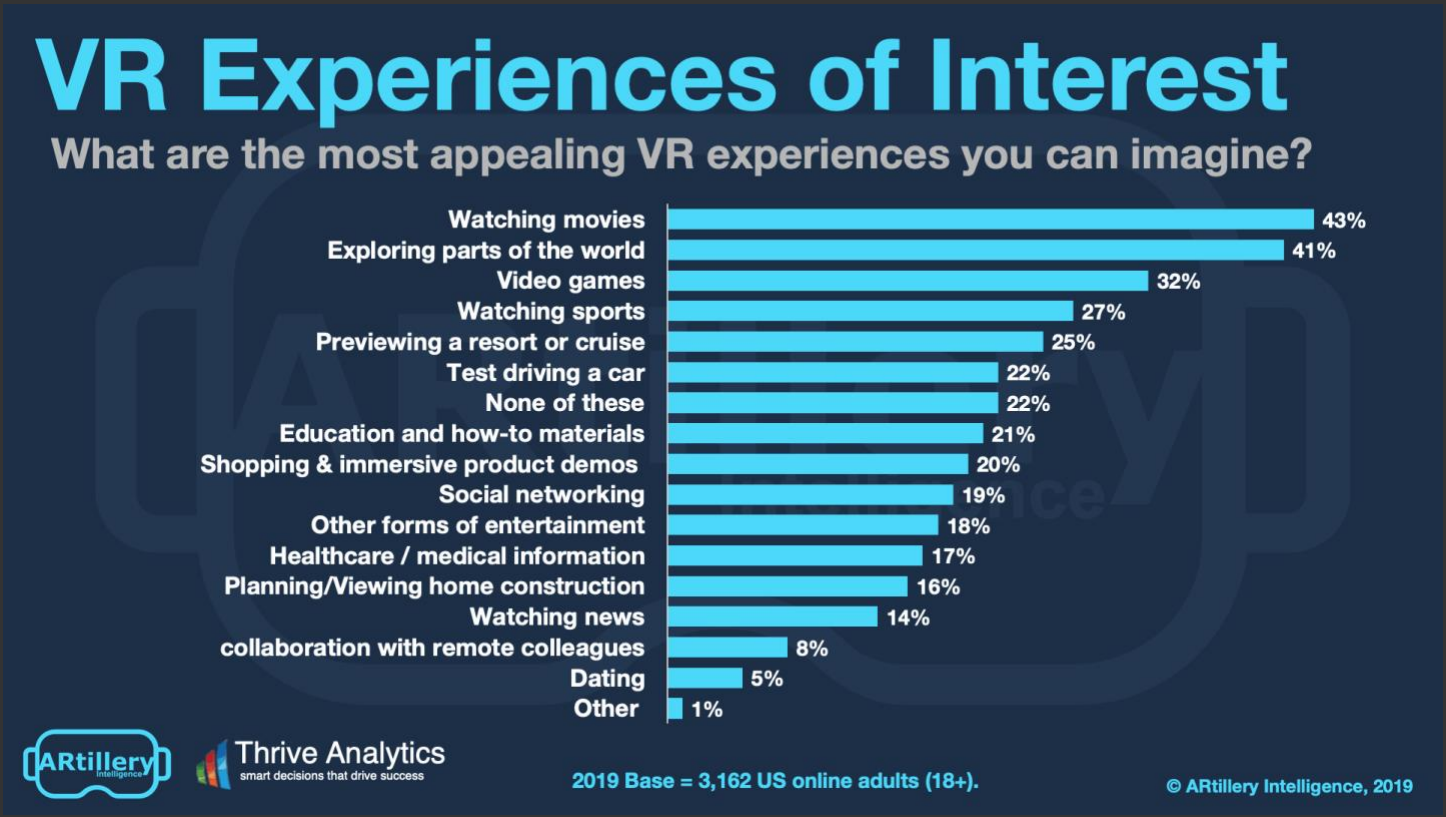
Another useful exercise is to speculate VR activities that are most appealing on hypothetical levels. This overlaps slightly with the earlier chart on VR content types but is more broadly about imagining VR experiences of interest. The question was posed to the entire base of users and non-users.

The top result was watching movies (43 percent), followed by exploring parts of the world (41 percent), video games (32 percent), watching sports (27 percent), previewing a resort or cruise (25 percent) test-driving a car (22 percent) and how-to or educational experiences (21 percent).

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, again, telling of the very early stage in which VR remains.

As we've examined,[ix] 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.



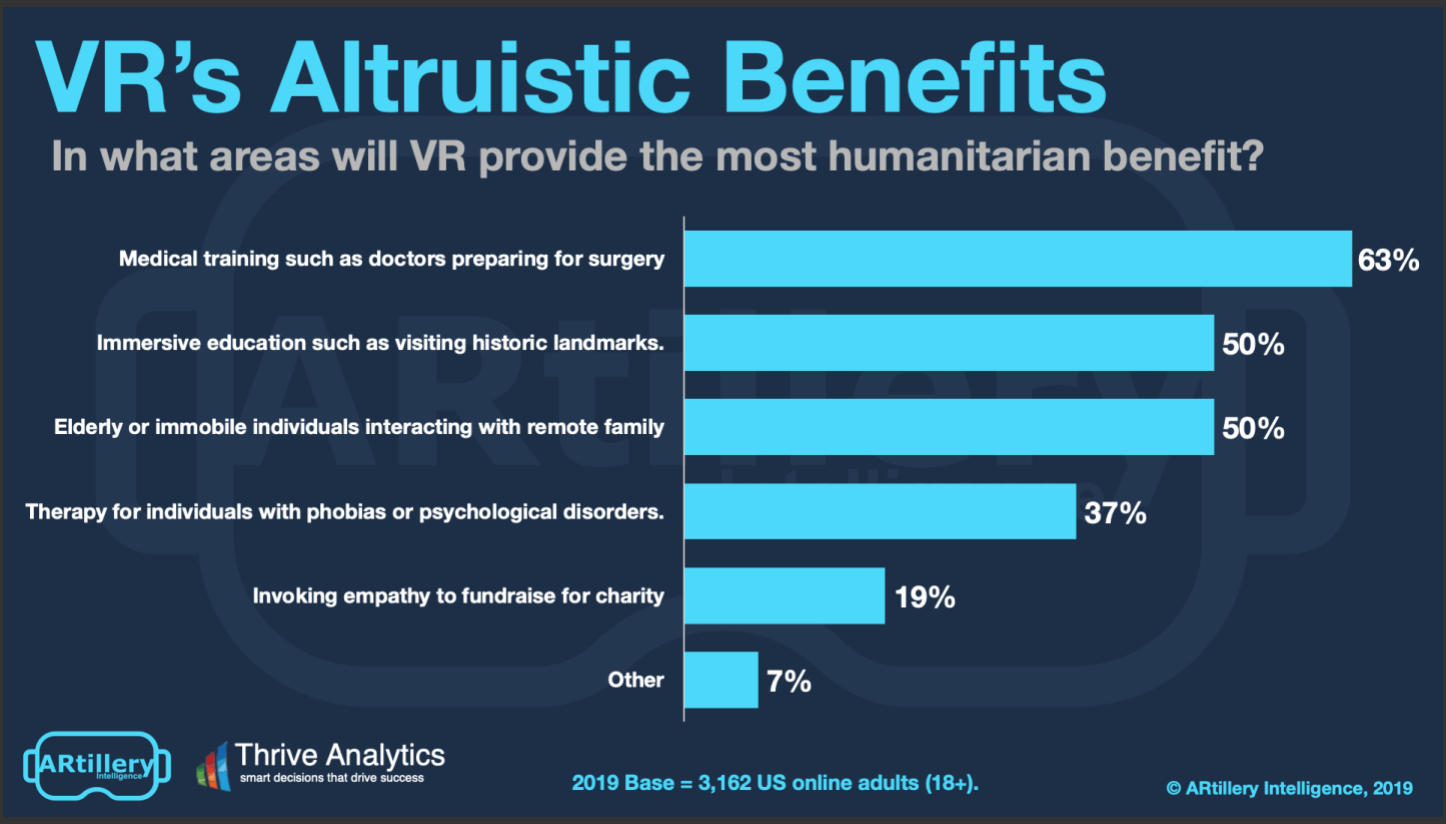
Meanwhile, activities that ARtillery Intelligence believes are worth keeping an eye on include remote collaboration, social interaction, and remote immersive shopping. These are areas we're examining and project strong long-term use cases for VR, despite lower consumer-reported interest today.

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.

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 (63 percent). That was followed by education, (50 percent) communications for the elderly (50 percent) and mental health therapy (37 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 like most technologies do.



Strategic Implications

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 proponents. 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 Quest. The former has more tenure in the market and we view it as an important VR "gateway drug."

Image Credit: HTC

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 native 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. 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

Best of Both Worlds

Beyond Oculus Go, Oculus Quest is the wild card. It's new to the market as this report is being written (survey data were fielded before its market launch). It could have an Oculus Go-like effect of making VR cheaper and more accessible to more people, but with higher-end positionally-tracked VR.

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

But the result is a device with a quality/cost ratio that outperforms the rest of the market. Our favorite reviewers — the always 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. "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."

Image Credit: Oculus

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'll 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 a pre-review. "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."

Tracking has been another consistent praise from reviewers. Hand tracking was developed for precision in movement-intensive games like Beat Saber, which appears to have paid off. This is impressive, given that tracking draws from the same core processor as the rest of the device.

"Controllers move fluidly and let you move your fingers to make it feel like you can reach out and grab things," said CNet's Scott Stein. "Bouncing balls… grabbing a baseball bat… dancing with a virtual robot… the controls are the best thing about Quest. Most games I played are active smooth and fun."

Freedom of movement has also been a source of praise, as expected. 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 and I've gotten used to stepping around wires," said the Verge's Adi Robertson. "But not having to worry about tripping while I'm jumping around a sports game or pausing an adventure game to face the cameras feels better than I thought it would."

Image Credit: Oculus

As for other limitations, Quest is a closed platform with a limited/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 a lot of 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 that's even more convenient."

Speaking of convenience, another perk that joins a long list of improvements is setup. Oculus Insight tracking system eschews the previous outside-in system of the Rift. Setting up a play area is now fast & easy, which is another key attribute needed to appeal to regular folks 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 VR's "iPhone moment," as some have speculated. But it doesn't matter: Quest is a solid device in its own right, and is what VR needs right now.

"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's Stein. "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."

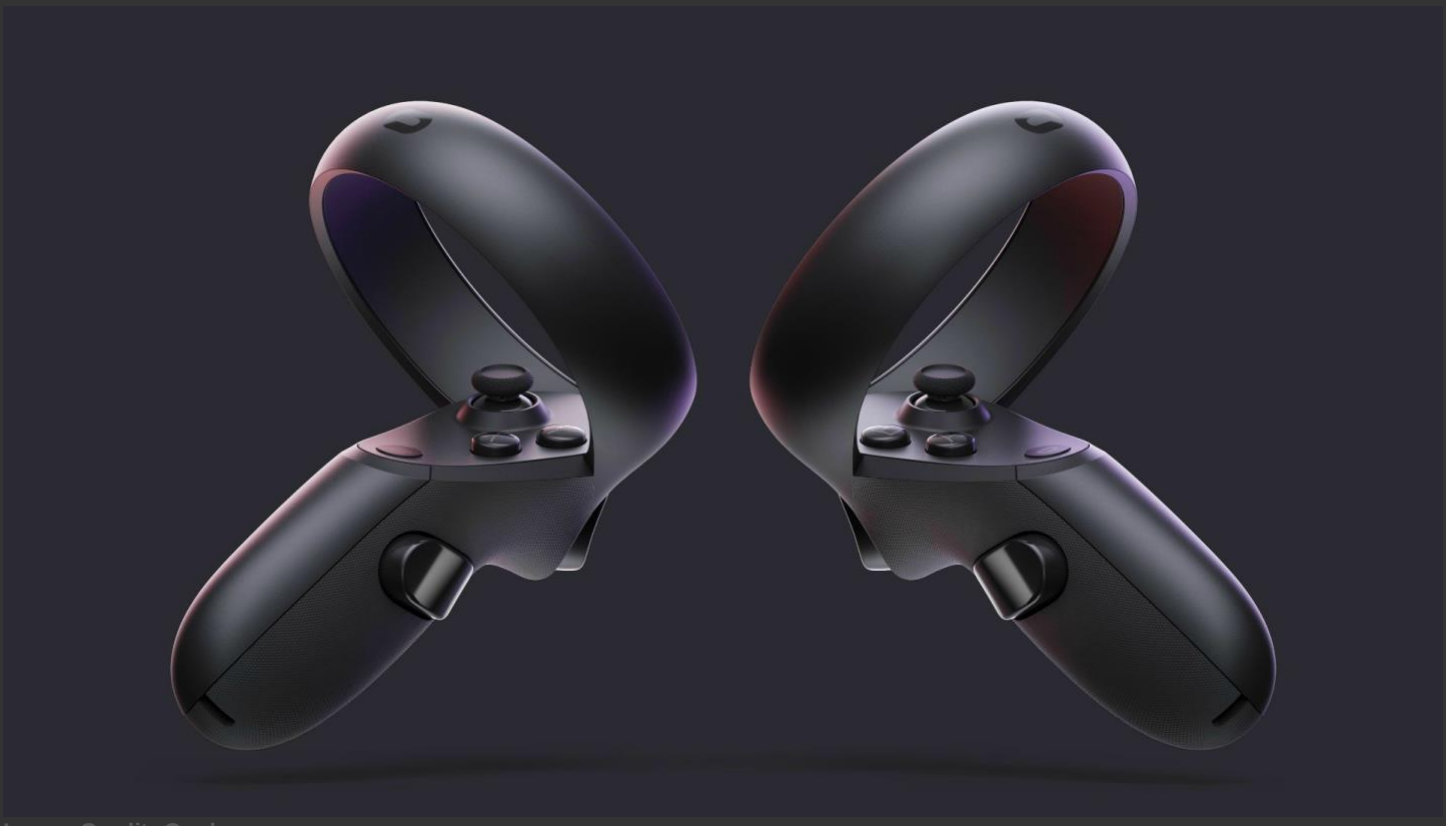


Image Credit: Oculus

Seeding a Market

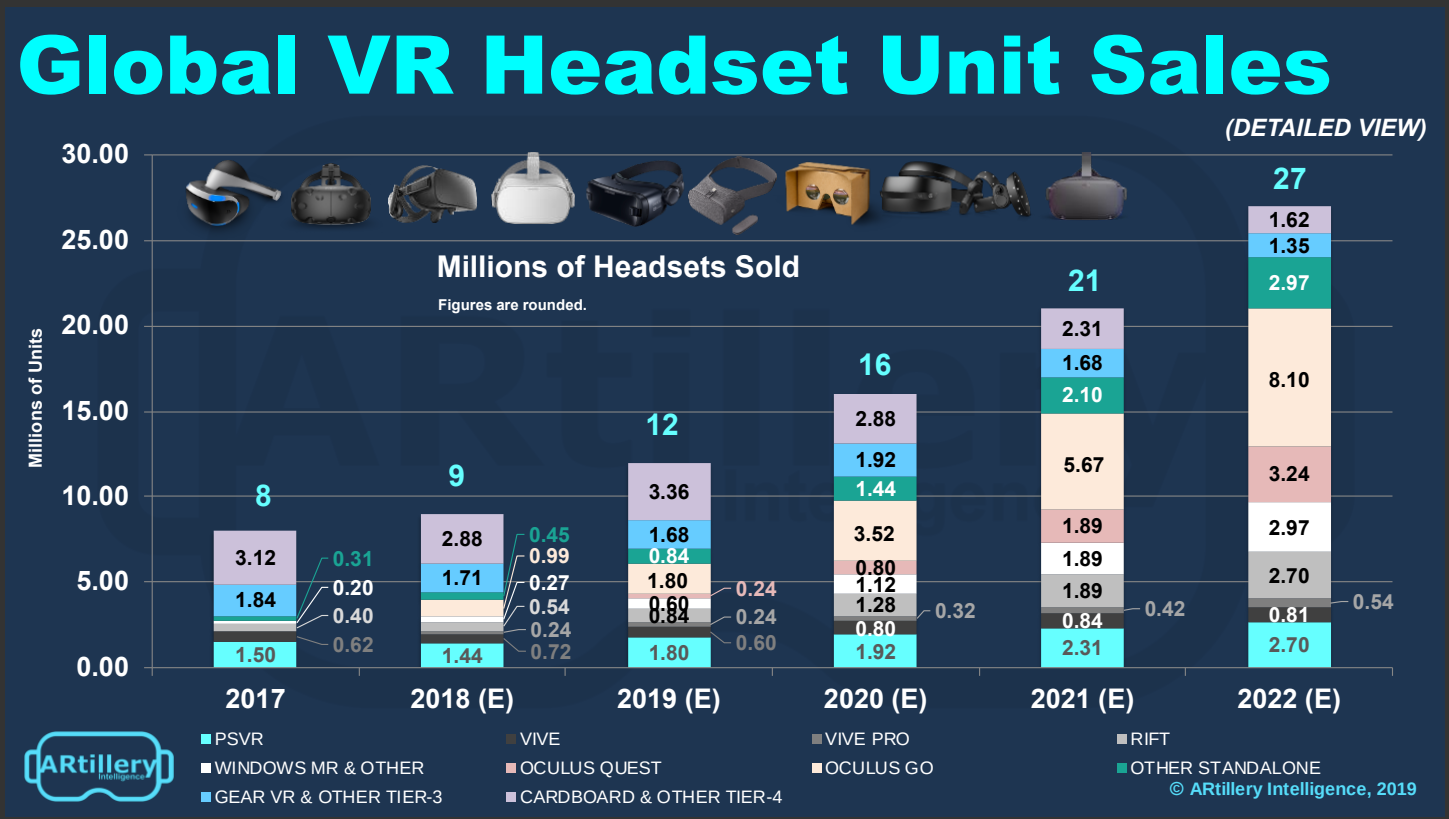
Price is a big factor at this early and unproven stage of VR. As examined in the survey data in this report, demand inflects at $200 and $400. Those happen to be the all-in price points for base-model Oculus Go and Quest, respectively. This likely isn't by coincidence, but rather strategically devised.

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. TechCrunch's Lucas Matney likens Quest to the "Nintendo Switch of VR" — trading specs for overall experience, ease and versatility.

PSVR has done similar. As noted earlier, its user satisfaction is higher than technically superior headsets like HTC VIVE, as it emphasizes overall experience over specs. It's also notable that PSVR is the VR sales leader at the same $399 price tag with which Quest now 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 contract the market. We project Go and Quest to reach 1.8 million and 240,000 respectively in 2019 unit sales.



Meanwhile, VR's overall installed base (not annual sales) will reach 31 million in 2019, and 58 million by 2022. That's still a fragmented set of headsets but could consolidate as the VR hardware landscape matures and as Facebook/Oculus' platform strategy — per the above — plays out.

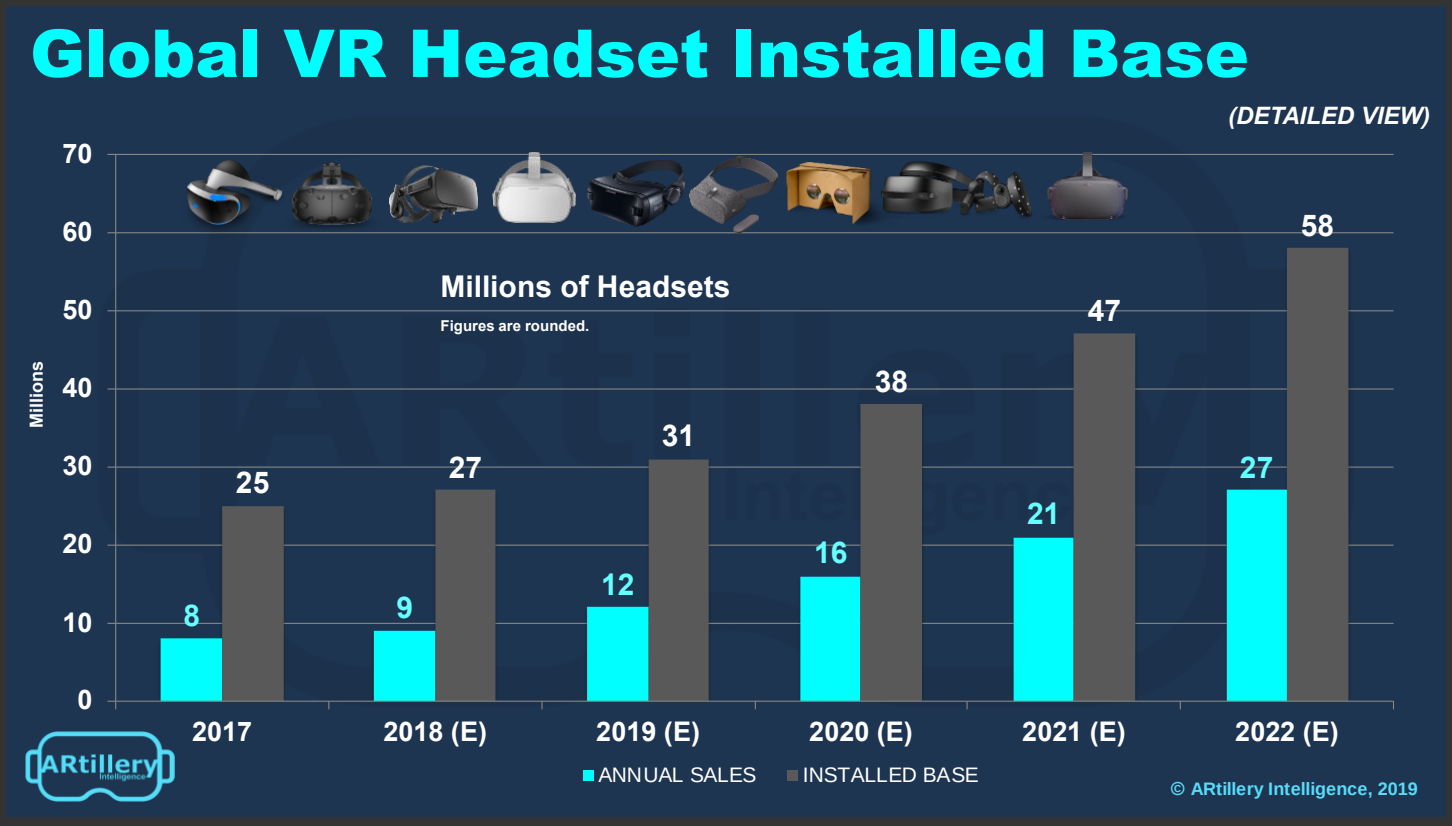
That overall installed base won't reach the "magic number" of 100 million units in the foreseeable future. 100 million is a historically validated milestone for hardware segments to reach a flywheel cycle of incentive for content creation, followed by accelerated consumer adoption.

Another way to look at the 100 million figure is that there are very few products that reach ubiquity that have a price tag over $500. Your car, smartphone and flat-screen TV are on that short list but it's an exclusive club. This is another reason price competition is taking over consumer VR in 2019.

The VR industry, led by Facebook, came to this sobering realization last year, and is well on its way to acceptance 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 $3.5 billion this year and $8.6 billion by 2022. 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 (or game purchases) outpace hardware replacement cycles.

For anything greater than that, VR needs a more compelling reason to buy. As indicated in this report, there's not yet one killer app or one solid answer to the question of why one should buy VR. There are lots of little answers, but that's not going to sway mainstream consumers en masse.



Speaking of reasons to buy a headset, and returning to the discussion of Oculus Quest, what will its content library look like? If it's to be the adoption accelerant many expect, content will be key per this report's findings. This is underscored by the fact that it's a closed system of approved apps.

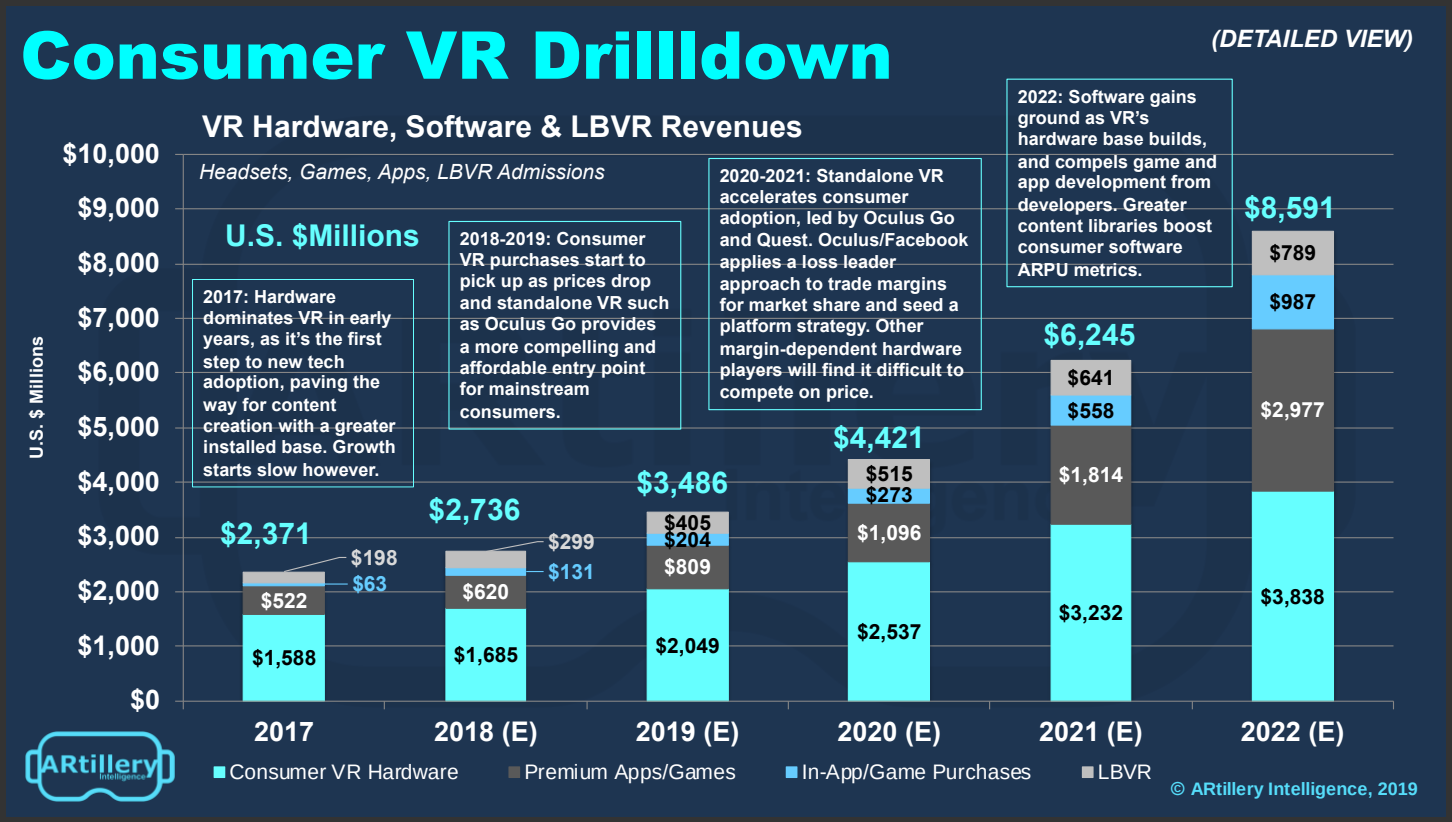
The things that will play best on Quest include positionally-tracked experiences within relatively limited spaces that people set up with the indoor-only Insight tracking system. That correlates to untethered, though still room-scale, range of motion like Beat Saber which is a launch title.

There will be successful ports, but native Quest titles will grow as its installed base attracts developers. Those will eschew Rift-like photorealistic and textured graphics for processing-friendly polygon counts examined above or cartoonish fodder — again a Nintendo-like approach.

"I think you're going to see painting and sculpting apps like Tilt Brush. You're going to see world exploration like Google Earth, and fun toy games like Job Simulator," said Ars Technica's Sam Machkovech recently "[These] have certain compromises so that they'll run on weaker computers."

But in the end, these spec compromises may be moot for most users. If Quest fulfills its goal to bring new users into VR, they won't be slighted by "lesser" specs relative to higher-end devices for which they have no frame of reference. So it will once again come down to price, content and marketing.

In that sense, Oculus Quest could be exactly what VR needs right now. It will accelerate mainstream adoption and has already sold out its first few batches of inventory. But device quality aside, larger forces and market factors indicate that we could be waiting longer for the industry's "iPhone moment."



Key Takeaways (Redux)

Key takeaways are also highlighted throughout the main body of this report.

- **16% of consumers own or have tried VR, up from 11% last year.**
  - This equals roughly 45 million U.S. VR users, up from 31 million last year.
  - This is different than headset sales or installed base, given multiple users per headset.

- **Samsung Gear VR has the greatest adoption (43%), followed by PSVR (33%) and Oculus Rift (17%).**
  - Gear VR leads due to price and existing installed base, but its share is declining as it retracts from the market.
  - Lowered prices and new entrants (e.g. standalone headsets) are taking share from these incumbents.
  - PSVR is in a strong position due to its installed base of 90 million PlayStation 4 consoles.

- **Windows Mixed Reality (16%) and HTC Vive (14%) had the fourth and fifth highest penetration.**
  - They trail PSVR despite better specs, due mostly to price, PSVRs hardware installed base and its simplicity.
  - They also require a dedicated PC with costly graphical processing, and in some cases (VIVE) cumbersome setup.
  - Rift has won market share from VIVE, due to Oculus' aggressive pricing and content investments.

- **67% of VR users are either moderately satisfied (34%) or extremely satisfied (33%).**
  - This contrasts 4% of users that are either moderately dissatisfied (3%) or extremely dissatisfied (1%).
  - These are strong quality signals: there are few consumer products that show such high satisfaction.

- **50% of VR users want better functionality; 45% want higher quality content; 44% want more content.**
  - Content volume was the biggest desire in past waves, but has been satisfied to some degree by Oculus Go
  - Oculus Go's introduction last year came with broad content options and in-demand cinematic experiences.
  - There continues to be a chicken & egg dilemma between device penetration and content investment.
  - Oculus' content investments, including Oculus Go's backwards compatibility (Gear VR library), has helped.

- **VR users are most interested in cinematic experiences (67%), gaming (53%) and travel (49%).**
  - Cinema's lead is surprising in that it's not "native" to VR (2D viewing in immersive environment).
  - Though cinema doesn't embody VR's true potential, users most want what they're comfortable with.
  - Eventual VR successes will design native immersive experiences that can *only* exist in VR.
  - VR will be conceptualized in activities consumers know until native experiences reframe their thinking.

- **27% of non-VR users are interested in owning or trying VR, down from 31% last year and 41% in 2017.**
  - This dip can be seen as a correction to market-reflective levels, diverging from the 2016-2017 hype cycle.
  - In the next 2-3 years, interest in VR adoption will likely bounce back and equal or exceed 2017 levels.

- **The biggest reason for disinterest among non-VR users was "just not interested."**
  - This definitive sentiment is a wakeup call for VR proponents and compels consumer education.
  - VR users are highly satisfied (see above), so the strategy is to get more non-users to try VR.
  - This will happen through lower-friction standalone VR devices that are starting to penetrate the market.

- **31% of VR users will pay up to $200 and 26% will pay up to $400 for a VR headset.**
  - These demand-inflecting price points should be price targets for VR hardware manufacturers.
  - These also happen to be the price points of Oculus Go and the freshly-launched Quest, respectively.
  - Facebook's deep pockets and long-term platform strategy drive aggressive price competition, a competitive edge.

- **VR adoption will continue to be slow but will be accelerated by standalone headsets.**
  - The "all-in" low price and reduced set-up friction (e.g. inside-out tracking) address consumer concerns.
  - Oculus will be a leader, due to its investments in quality and aggressive price competition referenced above.
  - Oculus Go and the erstwhile-praised Quest will continue to be important tests for mainstream VR's potential.

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 such as AR & VR, 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

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smart decisions that drive success

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 VR/AR data and analysis. They synthesize original and third-party data to reveal opportunities and dynamics of VR and AR sectors. In addition to data, 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 LeadsCon. 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

ARtillery Intelligence has partnered with Thrive Analytics by writing the questions for the Virtual Reality Monitor consumer survey. These questions were fielded to more than 3000 U.S. Adults. ARtillery Intelligence wrote this report, containing its insights and viewpoints on the survey results.

For market sizing and analysis, ARtillery Intelligence follows disciplined best practices, developed and reinforced through its principles' 15 years in research and intelligence in the tech sector. This includes the past 2.5 years covering AR & VR exclusively, as seen in research reports and daily reporting.

Thrive Analytics likewise follows best practices in consumer research, developed over its long tenure as a consumer research firm. More information and background on each firm can be seen in the preceding "about us," sections, or through the website links included with those descriptions.

More details about the survey sample (demographics, etc.) can be seen in this report's introduction and 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.

ARtillery Intelligence's disclosure and ethics policy can be seen in full **here.**

Contact

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

References

[i] ARtillery Intelligence Briefing: **Global XR Revenue Forecast, Fall Edition**
[ii] **Contact ARtillery Intelligence**
[iii] ARtillery Intelligence Briefing: **Global XR Revenue Forecast, Fall Edition**
[iv] See above report section: “Seeding a Market”
[v] ARtillery Intelligence Briefing: **Global XR Revenue Forecast, Fall Edition**
[vi] ARtillery Intelligence Briefing: **Global XR Revenue Forecast, Fall Edition**
[vii] **Oculus Quest review**
[viii] **Contact Thrive Analytics**
[ix] AR Insider article: **Is it Better in AR?**