ARTILLRY INTELLIGENCE BRIEFING

SMART MONEY: INSIGHTS FROM AR & VR INVESTORS
NOVEMBER 2017

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Executive Summary

Investors are excited about AR and VR, just like most of the tech world is. But they see things through a different lens than the rest of us. Given risk profiles and often-higher stakes than other entities in the AR and VR landscape, they have additional layers of insight and consideration.

They also have perspective that's advantaged by depth and breadth. The former comes from the diligence they must apply to investment opportunities with individual companies. The latter comes from looking at several companies and sectors. This positions them to see things that others don't.

ARtillry has ventured (excuse the pun) to capture that perspective in this report. We've spent much of the last year talking to investors, and attending/absorbing industry events where top investors speak. The result is a collection of insights, which we've synthesized into a categorized narrative.

Where do AR and VR investors see the biggest opportunities? What are their investment theses? What factors signal strong financial upside? What do they look for in a pitch? Finally, what can the rest of us take away from those insights in order to choose the right paths in AR and VR sectors?

These questions are tackled in the following pages, organized into sections that signify different areas of opportunity. Those areas include enterprise versus consumer approaches; high-end AR and VR versus more rudimentary (but scalable) mobile formats; and strategies around immersive content.

Investors we've spoken to have lots to say on these and other topics that will steer the course of AR and VR. Their credibility is stronger than many other industry voices, given not only unique vantage points mentioned above but another key factor: They're putting money where their mouths are.
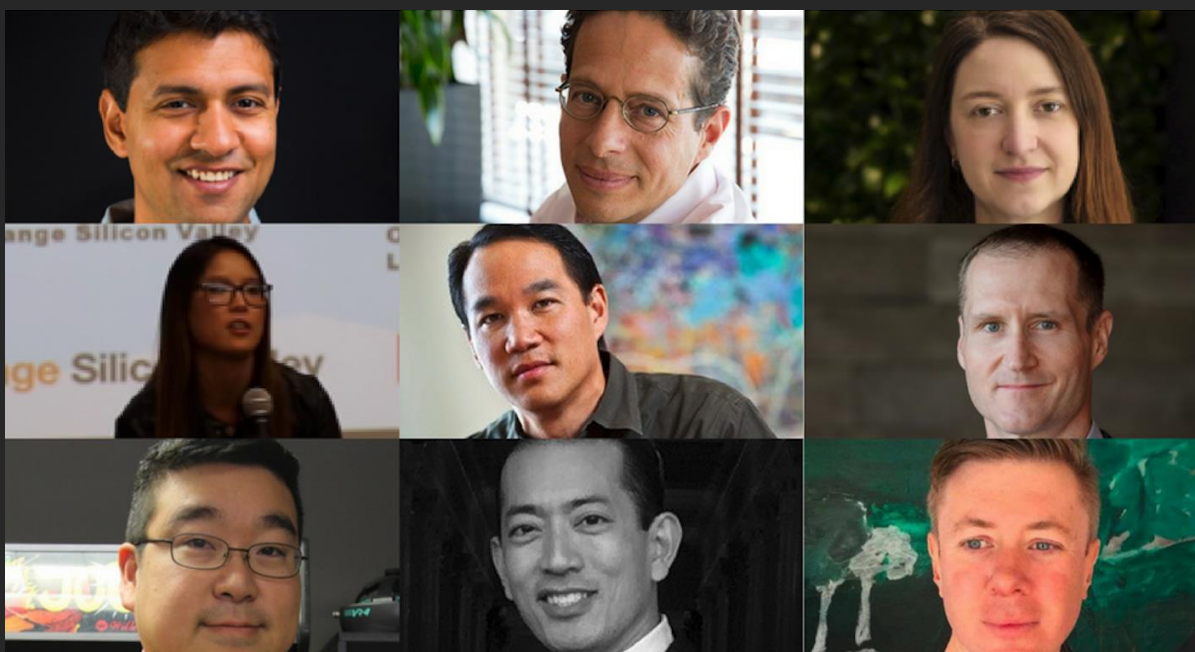
Key Takeaways

- AR & VR have elicited considerable investor excitement and projections of smartphone-sized transformation.
  - We've witnessed a rise in AR and VR-focused investment firms (Presence Capital, The Venture Reality Fund, Super Ventures), and corporate VC firms (Comcast Ventures, Qualcomm Ventures, Intel Capital, Lenovo Capital).

- More than $4 billion in venture funding has been invested in AR & VR companies since 2012.
  - Magic Leap alone has received $2 billion, which should signal caution, but we believe funding dispersion will even out.
  - AR companies have received the most funding, followed by consumer VR, enterprise VR, and VR games.

- Underlying tech has received the most funding recently, followed by video content, games and peripherals.
  - In this relatively early phase, building blocks hold a large opportunity, including haptics, processing and inputs.
  - All parts of AR & VR's collective spec sheet are underdeveloped, creating opportunities across the board.

- Addressable market is a big investment criteria, and is currently diminished by consumer VR's small base.
  - Consumer hardware ubiquity is marked by 100 million units. VR headset penetration is currently 17 million units.
  - Until consumer VR reaches ubiquity, enterprise and mobile AR hold nearer-term opportunities for scale.

- Mobile AR's benefits include volume penetration, portability, all-day access and frequency of use.
  - ARkit and ARCore create 505 million AR-compatible smartphones today, increasing to 4.3 billion by 2020.
  - ARCore is advantaged by a lower-friction web AR approach. ARkit is advantaged by more structured revenue models.

- Enterprise AR & VR have more receptive buyers than consumer markets, due to a strong ROI case.
  - Enterprise AR & VR can benefit from the unit economics of SaaS pricing/packaging.
  - Successful enterprise execution is often found in entrepreneurs with vertical or industrial knowledge.
  - Knowledge of enterprise software dynamics and business processes (in addition to VR/AR) is a winning formula.
  - Warning signs of enterprise approaches include lack of customer diversification or recurring revenue potential.

- AR & VR content companies can be risk prone, and don't often see venture-sized returns or exits.
  - There can be longer-term value and recurring revenue outside of content itself, such as merchandising.
  - Broadcast-focused AR & VR companies can tap into the sector's scale and receptiveness to innovation.

- Social is thought by many to be AR & VR's eventual killer app, especially VR.
  - Social functions can make games and apps more multidimensional, with greater appeal for repeat usage.
  - Social can also amplify growth potential through viral marketing dynamics and network effect.

- After product, market and other aspects of business models are optimized, pitch tactics must equally be refined.
  - The art of pitching investors includes proper selection, "networking in," and streamlined talking points.
  - Key tactics are specificity, quantitative-focus (unit economics, market size, etc.) brevity, and humility.

- The consumer VR sector is experiencing a shakeout, meaning deceleration of new investments and a funding crunch.
  - This will impact existing players who will compete for a finite supply of follow-up investment rounds.
  - New entrants should model out spending levels, cash and the macro environment.
  - All players should build conservative to aggressive forecasting ranges and operate lean.

Key takeaways are also highlighted throughout the main body of this report.
See appendix for a full list of investors quoted in this report, and their portfolio companies.

The VR/AR Climate

Along with mobile technologies and SaaS-based enterprise software, few areas in the past decade have gotten investors as excited as AR and VR. Also known as immersive computing, many investors predict that it will be the next transformational computing shift, on the order of smartphones or PCs.

"Looking for the next major computing platform, people often posit that it could be autonomous driving, robotics, or drones," Comcast Ventures' Michael Yang told ARtillry. "As a diversified technology fund, we're always chasing big markets in computing. We think VR/AR is one of them."

Confidence signals include the fact that some forms of AR and VR build from the foundation already set by the smartphone ecosystem, including hardware and distribution (app stores). It's also both consumer and enterprise-relevant, global and validated through investments from tech giants.

"When was the last time you saw a technology where you have Google, Facebook, Apple, Microsoft, Samsung, Sony and HTC beating each others' brains out," said Yang. "If they're focused on this, it's going to go somewhere."

Comcast Ventures' Michael Yang

Proof Points

To back up investors' excitement levels, it's best to look at where they've placed their chips. Turning to figures from SuperData, there's been roughly $4.1 billion spent on AR and VR companies since 2012. And the 2017 annual total is on pace to hit roughly $1.6 billion.

There's also been an increase in AR and VR-focused investment firms such as Presence Capital, The Venture Reality Fund and Super Ventures. Venture capital arms of tech giants have also shifted focus to AR and VR, including Comcast Ventures, Qualcomm Ventures and Intel Capital.

"A surge in the number of VR/AR focused funds indicates high interest and enthusiasm in the market," said Orange Silicon Valley (OSV) business strategist Kristie Cu.[1] OSV is a strategic investing subsidiary of French telecom carrier Orange, and has made VR investments such as Wevr.

AR and VR investments have also interestingly happened outside of the usual suspects of tech-focused venture capital firms on Sand Hill Road. Though many of them are warming up to immersive technologies, investing has mostly come from the above companies and some overseas capital.

"I was looking at VR and AR investment over the past couple years, and I don't think I saw a single traditional Silicon Valley venture firm," said Ben Narasin, general partner at Canvas Ventures at the AWE conference. "It's a lot of strategic [investors], and money out of China."

Orange Silicon Valley's Kristie Cu

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[1] *Cu is no longer employed by OSV, but was at the time this quote was captured.*

Segmenting AR & VR

Though funding totals so far indicate a strong level of confidence for AR and VR, it's important to note that most of it went to a few companies including Unity, Improbable and Magic Leap. In fact, this month, Magic Leap closed a $505 million series D, which brings total funding to $2 billion.

This isn't entirely surprising, as funding in emerging sectors will sometimes cluster in this way. But when looking at funding levels as a leading indicator of industry health, it should be noted that a few large outliers like Magic Leap have boosted total spending figures. We believe this will even out.

As for technologies being funded, AR companies have received the most money, according to Superdata, followed by consumer VR, enterprise VR, VR games and VR hardware. For the latter, tech giants like Google and Facebook do most of the building, rather than venture-backed startups.

DigiCapital has gotten even more granular in categorizing funding by sub-sector. Of the $800 million it tracked in AR and VR funding in the second quarter of 2017, underlying technology received more funding than any other category. That was followed by video content, games and peripherals.

This dispersion of sub-sectors brings up another important point: The AR and VR ecosystems are segmented and nuanced. Though interlinked, each has its own dynamics and technological underpinnings. They should likewise be viewed with different metrics and expectations.

"We have learned because it's a fast moving industry, that certain segments within VR have taken off and they have little curves and trajectories in and of themselves, said Comcast Ventures' Yang. "So you can't describe [AR/VR] as a whole monolithic investment climate."

Canvas Ventures' Ben Narasin

Collective R&D

The focus on underlying technology in DigiCapital's findings is reflective of AR and VR's early stages, during which enabling technology is vital. This is a concept that was validated by many of the investors we've talked to, and is reflective of some of the opportunities they're tracking.

In this relatively early phase, there's funding emphasis – and thus startup opportunity – on building blocks. Technologies like haptics, processing and inputs are attractive venture funding targets. Input controls are especially important, and a key focal point for Super Ventures' partner Matt Miesnieks.

"Most of the input systems we use are a single mode. It might be voice or gestures or touch," he said at June's AWE conference. "I'm interested in solutions that are multimodal, that combine gesture with voice and computer vision, and intelligently tie them together to get a more natural means of input."

Examples of this principle include eye-tracking startup Eyefluence, which Google acquired last year for an undisclosed sum. And Ultrahaptics received $23 million in series B funding in May to advance its ultrasonic haptics technology for AR and VR – another key building block.

"We provide haptic feedback using ultrasound so you can get a sense of touch, just putting your hand in the air," Ultrahaptics VP of strategic partnerships Robin Alter told ARtillry. "We vibrate the nerves on your hand so that when you reach out, there's an object or texture right there in space."

AR/VR investor and Across Realities CEO Steve Lukas adds that AR and VR's fully-realized vision won't materialize until we refine these building blocks. That includes technical specs required for immersive computing to be viable for mass-market. It's all about a collective R&D process.

"Every company working on AR and VR is doing R&D for our AR/VR future," he said at the AWE conference. "What do we need to achieve the next level of VR so we can get to the medium term? If all we're thinking is long term, we're drilling too deep into a market we haven't saturated."

Across Realities' Steve Lukas

Size Matters

In addition to focusing on the enabling technology needs of today, AR and VR investing is about gauging the market size of tomorrow. Key investment metrics often involve unit economics, recurring revenue, acquisition cost, customer lifetime value, and total addressable market (TAM).

The latter is a particularly important metric in AR and VR because it's a function of hardware sales. And with consumer VR especially, hardware sales (headsets) have been slower than expected. The industry's excitement levels – though recently cooling – haven't been proportionate to sales levels.

Specifically, ARtillry has done the math,[2] indicating that there are roughly 17 million headsets sold so far globally at all device tiers. To put that into perspective, the current predominant consumer tech product – smartphones – have reached a global installed base of roughly 3.2 billion units.

This indicates that VR headsets have a long way to go. ARtillry believes the magic number is 100 million units. That's the size of the installed base that will be a key milestone and turning point for VR. It's the number that attracts content creators and supporting functions, and engenders network effect.

This is precisely what we saw with smartphones. Once 100 million units were sold globally, the mobile industry accelerated and could support an app economy and several other moving parts. This is due to the larger incentive for content creators and supporting tech vendors to enter.

This happens through a sort of snowball effect. The gravitational pull of 100 million units attracts new entrants who accelerate the industry's advancement and output. That further boosts unit sales, which in turn attracts more entrants. So the march to 200 million or 2 billion happens at a faster pace.

The lesson is that until high-end consumer VR reaches that point of ubiquity, there are other points along the immersive computing spectrum that represent nearer-term scale and opportunity. These most notably include mobile AR and VR (building on an existing installed base) and enterprise.

The Mobile Base

Mobile is especially opportune because its installed base already sits at 3.2 billion units -- roughly half the population of the earth. Though it doesn't represent the fully-realized vision of VR, it's good enough for a minimum viable product, given ubiquity, baseline processing and graphical capacity.

"VR rides on the mobile ecosystem for hardware, compute processing and app store dynamics," said Comcast Ventures' Yang. Across Realities' Lukas agrees: "When we first saw Oculus Rift, we identified that the future of computing is AR and VR, and the future of AR and VR is mobile."

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[2] See ARtillry Intelligence Briefing, *The State of Virtual Reality*, June 2017

Mobile VR

VR headsets segment into three tiers. Tier 1 is high-end tethered VR including Oculus Rift and HTC Vive. Tier 2 includes mobile VR such as Daydream View. Tier 3 is Google Cardboard. A fourth tier is emerging – between tiers 2 and 3 – with Windows Mixed Reality headsets from Asus and others.
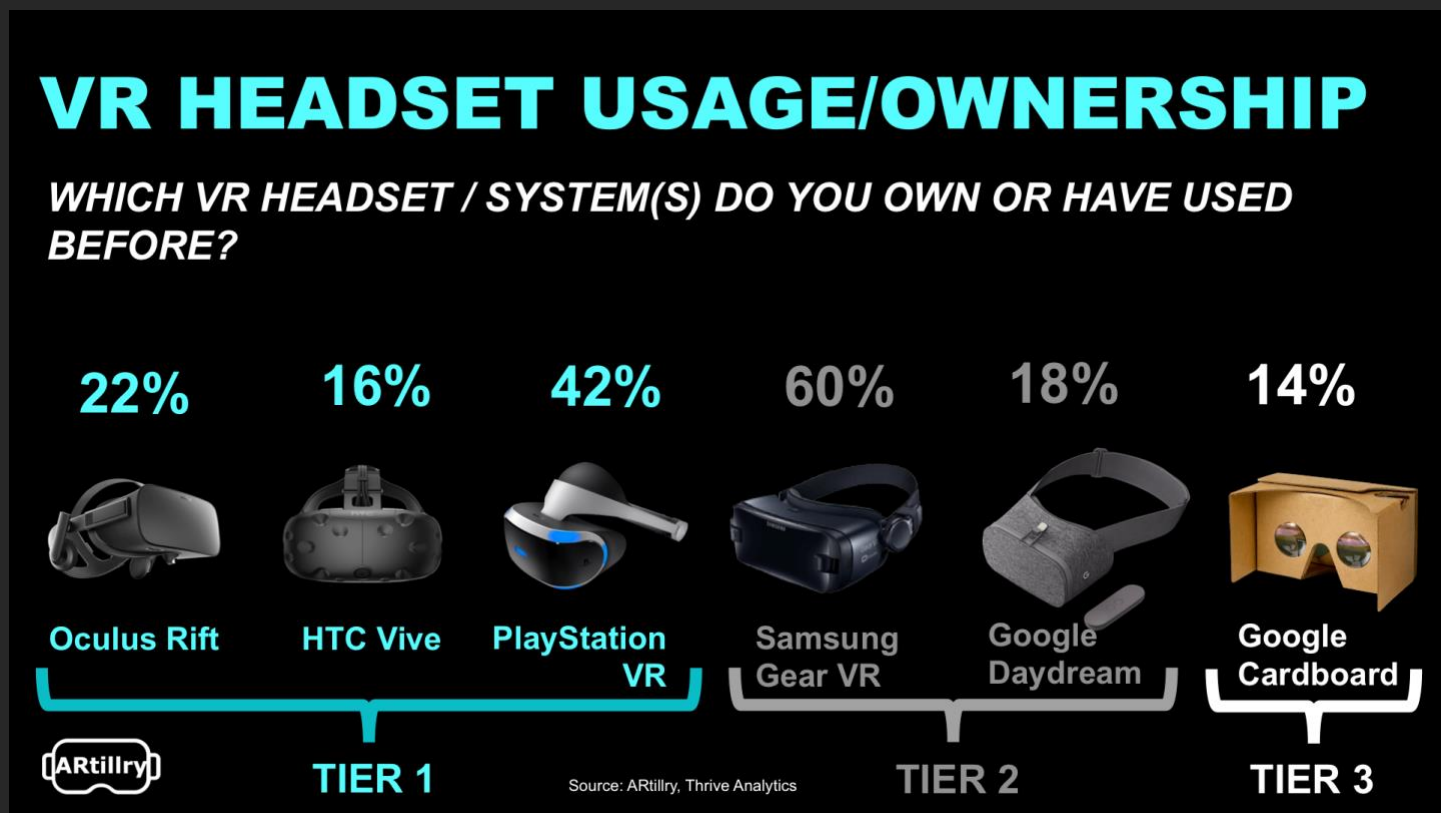
Mobile is opportune because it represents VR's short and long-term opportunity. Near term, mobile devices scale better, used in Tier-2 and 3 headsets. Long-term, mobile processing and optics will be good enough to run higher-end (and untethered) VR experiences approaching today's tier-1 quality.

Presence Capital Partner Amitt Mahajan agrees with this notion, telling ARtillry that mobile VR will likely catch up to high-end VR in capability, before high-end VR comes down to mobile VR in price. We're already seeing steps in this direction through "standalone" VR headsets such as Oculus Go.

"I think it's the equivalent of enterprise-level desktop," Mahajan said of Tier-1 VR headsets. "PCs were a big thing but the number of people running high-end workstations were pretty small. If high-end VR has a use case that's mass market, it will be a B2B use case. I think it's too cumbersome."

With mobile VR conversely, the opportunities cover a spectrum of supporting technologies. Venture firms like Orange Silicon Valley for example view opportunities through the lens of a global telecom carrier, given the heavy bandwidth requirements for mobile VR that will drive 5G network rollouts.
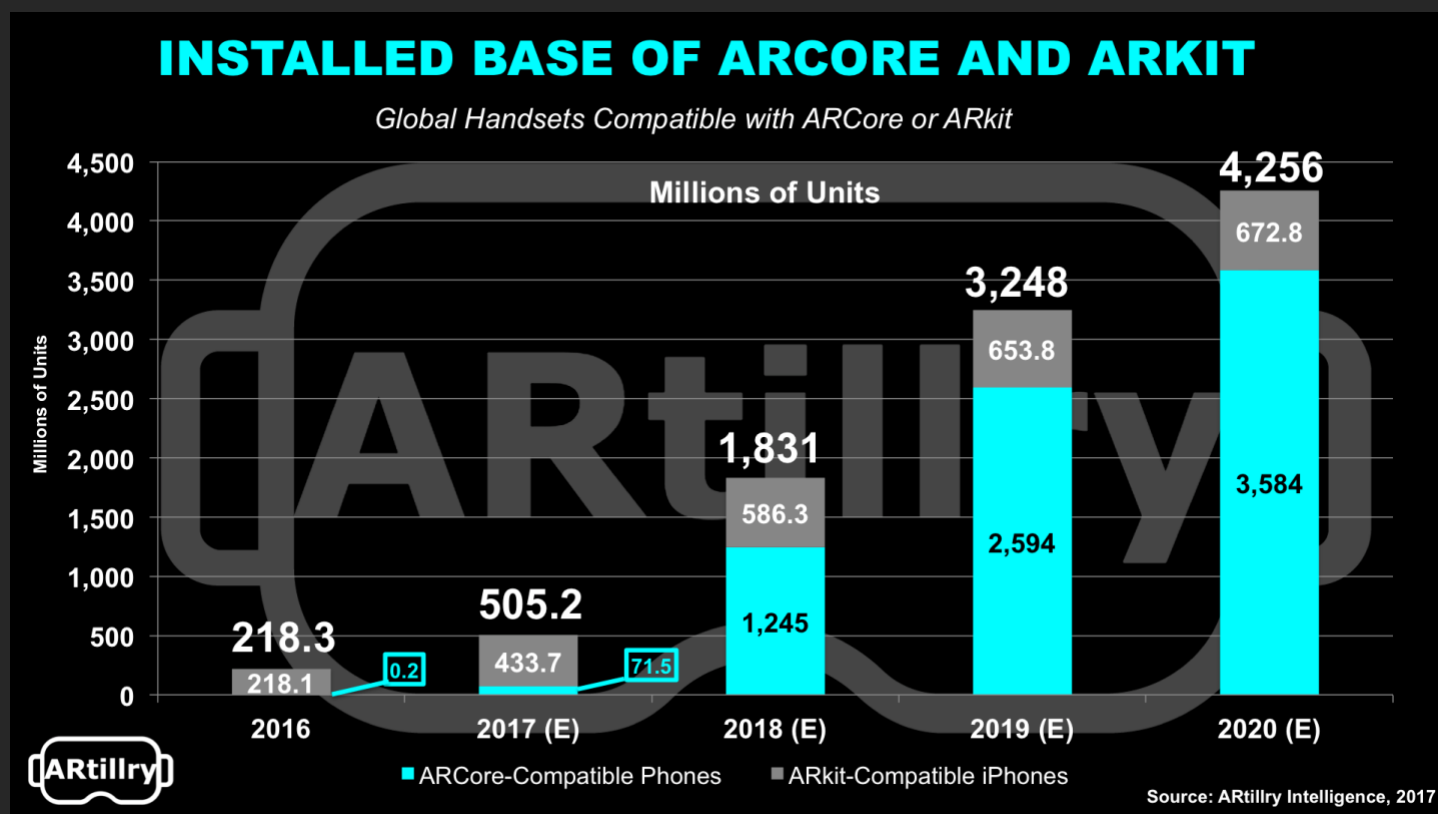
"Between 2015 and 2018 [Orange has] committed €15 billion to get this infrastructure out," Orange Silicon Valley's Kristie Cu told ARtillry.[3] "So there's a lot of money behind 5G, and VR is one of the driving factors in having the bandwidth."

Mobile AR

In AR, the story is slightly different. The mobile AR opportunity is greater than mobile VR because smartphones are more conducive to AR. Whereas mobile VR (tiers 2 and 3) carry stark quality differences from tier-1 systems, mobile AR can accomplish closer renditions to top-tier AR systems.

This is mostly due to smartphones' inherent qualities – portability, GPS, optics – that make them capable of a broad range of AR activities. That capability was further unlocked with the "democratization," of advanced AR through Apple's ARkit and Google's ARCore.

Back to the question of scale, mobile AR hits and exceeds the 100 million mark right out of the gate. ARkit and ARCore create a half-billion AR-compatible smartphones today, increasing to 4.3 billion by 2020 according to ARtillry data. This lowers the barrier for developers, and venture-backed startups.

INSTALLED BASE OF ARCORE AND ARKIT
Global Handsets Compatible with ARCore or ARkit

Millions of Units

Year	ARkit-Compatible iPhones	ARCore-Compatible Phones	Total
2016	218.1	0.2	218.3
2017 (E)	433.7	71.5	505.2
2018 (E)	586.3	1,245	1,831
2019 (E)	653.8	2,594	3,248
2020 (E)	672.8	3,584	4,256

■ ARCore-Compatible Phones ■ ARkit-Compatible iPhones

Source: ARtillry Intelligence, 2017

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[3] Cu is no longer employed by OSV, but was at the time this quote was captured.

"We are going to see AR apps become available for ~500 million iPhones in the next 12 months and at least triple that in the following 12 months, as we can now include the numbers of ARCore-supporting devices from Google," Super Ventures partner Matt Miesnieks wrote recently.[i]

Mobile AR's benefits also branch from what we call "addressable media time." Given that our phones are with us all day, mobile AR is eligible for a greater share of our time spent with media (versus television, radio, web, or even VR). Founders Fund partner Cyan Bannister is thinking in these terms.

"I don't foresee people jacking into VR for eight, nine hours a day," she said on a TechCrunch podcast. "I'm very bullish on AR and very bearish on VR for that reason… We have these phones in our pockets. Mobile-first AR is going to be massive."

Founders Fund's Cyan Bannister

Enterprise

The second area that holds nearer-term opportunities for AR and VR is in the Enterprise. The adoption drivers are strong due to clear cost savings that can be achieved in areas like guided assembly and maintenance, remote design collaboration and other costly enterprise activities.

"In the B2B setting, an interesting area is corporate training," Comcast Ventures' Yang told ARtillry. "For anyone who has worked at large corporations, you have mandatory training for legal or compliance reasons. VR or even AR [can] solve that or make the training less brutal, frankly."

In training and other functions, it usually involves graphically-guided assistance on one's field of view, using AR glasses such as ODG, Daiquiri or Google Glass Enterprise edition (GGEE). Google Glass has been rebuked for its failure in consumer markets, but has found solid footing in the enterprise.

Google in fact reports that GGEE reduces manufacturing and assembly time by 25 percent and inspection time by 30 percent. It also reduced medical doctors' administrative work from 33 percent of their day, to ten percent. And DHL gained a 15 percent boost in supply chain efficiency.

Presence Capital's Ammit Mahajan

"For us there are clearer benefits in the enterprise," Presence Capital's Amitt Mahajan told ARtillry. "You can really model out what [AR and VR] mean for a business, or how much it's going to affect their bottom line and what that means in terms of a payback period for hardware investments."

Presence Capital is among a short list of venture firms blitzing AR and VR as part of a central and defining investment thesis. In just two years, the seed-stage fund has invested in 33 AR and VR Companies. And 27 of those are enterprise-focused according to Mahajan.

The firm doesn't categorically preclude consumer-geared investments, like VR gaming, but it does raise the bar for them. In other words, because they lack the desired enterprise-focus, consumer AR and VR apps need to have a prevailing counterbalance, like a rock-star entrepreneur.

"All of our entrepreneurs are great but on the consumer side, our bar is higher," said Mahajan. "There are very few cases when we say 'We think gaming and VR are going to be big, so let's invest in it.' It's much more like, 'This is a phenomenal person, let's back them.'"

Another key advantage for enterprise AR and VR is less buyer resistance. Besides price, AR and VR's biggest consumer adoption barrier is style, especially when asking someone to put something on their face (notwithstanding mobile AR). But that's not an issue at work.

"Almost all of the reasons to not adopt these things as a consumer go away in the enterprise," said Mahajan. "If you make an employee more effective, or you make it so that they are able to perform a job at all, the form factor does not matter. People will put that thing on."

Transforming Work

Mahajan's interest in enterprise goes beyond unit economics and productivity advantages, though they are favorable. He sees a much larger vision of transforming the institution of "work." This can have broader societal and macro-economic impact, such as reducing unemployment.

"I have this thesis that we can help people take on new jobs, even ones they have no training for," said Mahajan in reference to Presence Capital portfolio company Scope AR. "The idea that you don't need knowledge to perform in a given role is pretty powerful."

Scope AR for example, lets workers perform assembly or maintenance while guided by graphics or live remote support. This can eliminate the need for highly-skilled professionals to complete tasks. It also has cost savings for enterprises, which no longer need to dispatch experts to remote locations.

"We're seeing use cases across virtually every heavy industry," Scope AR CEO Scott Montgomerie told ARtillry. "Automotive, utilities, telcos, energy, mining, oil & gas… you name it. It's wherever there are remote workers, or there's no one on site that can solve a problem."

Looking forward, Mahajan believes we'll see a trend towards specialization in enterprise AR. As AR becomes more recognized and demanded by enterprises, the market size will justify that verticalization. And the technology could naturally drive towards specialization as AR matures.

Comcast Ventures' Michael Yang agrees, and believes that more successful enterprise AR ideas and execution will come from this vertical focus. Specifically, he looks for entrepreneurs with specific industry perspective, rather than generalists or opportunists applying AR & VR to various industries.

"For a general-purpose developer, trying to understand a vertical is harder," he said. "I'm looking for people from oil and gas, or aerospace or construction who envision AR overlays that make processes more efficient and intelligent. That's the future we're particularly excited about."

Venture Reality Fund's Tipitat Chennavasin

Enterprise Challenges

Along with enterprise AR and VR's advantages come challenges. Factors that should signal investor caution include revenue models that aren't diversified enough. Risk is heightened when large shares of an AR or VR company's revenue are allocated to a few major enterprise deals.

"When we meet enterprise companies, there are quite a few that say they've been doing studio and client work," said Venture Reality Fund's Tipatat Chennavasin at AWE. "They have huge customers and are bringing in revenue, but they're one-off projects, not necessarily repeatable or scalable."

This issue of recurring revenue — often a key investment and valuation metric — is mostly endemic to enterprise-focused AR and VR companies. Though enterprise is a nearer-term opportunity, challenges like this should be acknowledged, along with organizational barriers such as bureaucracy.

"There's another aspect to enterprise that's not necessarily unique to AR, which is sales cycles," said DigiCapital's Tim Merel at AWE. "Selling to enterprises takes a long time. When you have an education element, it takes longer. So investors in enterprise AR need to have a long-term approach."

Speak the Language

Building from Merel's comments, Comcast Ventures' Michael Yang believes navigating enterprise-buying cycles requires speaking the right language. Most often this means putting aside technical nuances and telling a more focused ROI story, which will ultimately drive buying decisions.

"Whiz-bang visualization in itself doesn't derived value," Yang said at an SVVR event that ARtillry attended. "[Enterprises] want to know how a knowledge worker is going to use it and why their job is now freed up, and how there's bottom line result [for] the next time they have to report to Wall Street."

To pull this off, Yang cautions that it's critical to understand tech-buying patterns of target enterprises. And the most effective way to do that is to adapt to the customs and cadence of the enterprise software world, as well as intimately knowing a prospect's business.

"To really understand how to create a software solution for them, you have to understand their underlying business process," he said. "Talking amongst other VR people isn't going to move the agenda in terms of getting an enterprise oriented app into corporate America."

This is about understanding business processes and the types of software that has erstwhile supported them, says Yang. It's about CRM, ERP and other enterprise software systems. Knowledge of those processes, in addition to technical chops with VR, will be a winning combination.

"Many folks we meet aren't thinking that way," said Yang. "It's because we haven't cross-fertilized the DNA. If you haven't spent time with enterprise software developers or systems integrators, you're not really understanding the business problem you're trying to apply VR to."

The Bright Side

This exercise of adapting to enterprise software patterns applies to pricing as well. And that means there's an opportunity to benefit from enterprise software's advantages – chief of which is the recurring revenue, scalability and unit economics of SaaS packaging.

"If it's going to be an enterprise businesses that wants to be valued appropriately, it has to be a SaaS subscription-based software license model," said Yang. "Corporations are accustomed that. They're buying CRM. They're buying databases. They're buying stuff in that way."

And despite the challenges of selling into enterprises, Yang says there's a bright side in that they will increasingly need VR integrations. And they're not going to do it themselves, as it's not their competency. This will open up lots of opportunity to VR companies that can speak the right language.

"I would challenge VR folks to step right into that," he said. "[Enterprise software] is a multi-billion dollar global business and they don't know anything about VR. They're scared about VR and AR and frankly need your help, so that's where it can all come together."

Super Ventures' Matt Meisnieks

Content is King

Shifting gears to other sub-sectors of AR and VR, content will be an opportune area. But it comes with challenges. Consumer VR suffers from a "chicken and egg," dilemma, where there isn't enough content to motivate mass-headset sales, yet not enough headsets to motivate content investment.

Investors caution that startups should anticipate this and manage expectations about timing and upside. Often it's not a quick return, nor a revenue scale that's typical of venture-backed companies. But there can be longer-term value and recurring revenue in other ways, like merchandising.

"The possibility for venture scale returns can be pretty limited," said Betaworks partner Peter Rojas at the AWE conference. "Content isn't necessarily enough to build a massive and scalable multi-billion dollar venture business, but we see it as being an entry point into a bigger opportunity."

Presence Capital's Amitt Mahajan agrees: His portfolio company Harmonix makes Rock Band VR, which offers "music packs" that create recurring revenue. And Baobab Studios creates characters and stories that are VR-first, but have many more avenues for monetization.

"We're viewing it as building reusable network-effect IPs," he said. "It's similar what Disney has done, where their movies are two-hour commercials for theme parks, books, merchandise and the other stuff they monetize. We think of content as a lead into something much larger."

Betaworks' Peter Rojas

Go Live

AR and VR also have to follow a longstanding content playbook. That includes things like production quality and packaging, especially in a Google and Facebook-dominated world. It really has to be good to compete, says Rojas, citing folded portfolio company Vrideo.

"When YouTube and Facebook introduced 360 video, Vrideo's product wasn't 10x better," he said. "It was maybe a little better, maybe even twice as good. But to shift consumer behavior or get them to adopt a new brand they're not familiar with, you have to be a lot better."

Specifically with VR, one area of growth will be live sports broadcasting. This gives far-flung fans the chance to experience events (or concerts for that matter) in immersive ways. It's particularly fitting to sports that have a small field of play and high intensity levels, such as Hockey, Basketball or Tennis.

Beyond user benefits, it can be valuable to broadcasters. In fact the "saving grace" from cord cutting for broadcasters is live sports; and VR gives an additional boost to that existing advantage. VR can also help teams reach beyond the inventory constraints (seats) of their live event venues.

"There's still a lot of money behind that, and you see it with traditional broadcast," said Comcast Ventures' Yang who led an investment in VR event broadcaster NextVR. "If you're passionate about a particular sport, or a particular team, you'll go to great lengths to see those games."

Social

Social media is another area of opportunity. Some even believe it's VR's eventual killer app. In fact, the current wave of AR and VR excitement kicked off when Facebook acquired Oculus in 2014. Mark Zuckerberg himself has an outspoken VR-centric vision for the future of social interaction.

"Some people say VR is isolating and anti-social," he said at October's OC4 event. "I actually think it's the opposite… We all have limits to our reality – places we can't go, people we can't see, things we can't do. Opening up more of those experiences to all of us… that's not isolating, that's freeing."

Orange Silicon Valley's Kristie Cu[4] agrees, stating to ARtillry: "VR as isolating… yes it's something that people keep talking about, but bringing people in to the same thing that you're experiencing… that's going to make VR so much more compelling once it does take off."

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[4] Cu is no longer employed by OSV, but was at the time this quote was captured.

To Cu's point, social features have the potential to add value to any VR game or app, in addition to VR experiences that are expressly labeled as social, like Facebook Spaces. Specifically, it can make games and apps more multidimensional, with greater appeal for repeat usage.

"I haven't seen a single experience in VR where adding another person doesn't make it more fun," said RoadToVR Executive Editor Ben Lang at an SVVR event. "When you add another person and see them present, that's something… When you add interactions, magic really starts happening."

Socially-oriented VR can also benefit from a network effect over time. Infusing social functionality in any game or app can amplify its growth potential through basic viral marketing dynamics. This factor gives us confidence in VR experiences that incorporate or are built on social graphs.

In terms of how social can be infused in VR, that's an entirely separate white paper. But at a high level, it can be accomplished through the technology that's already built in. For example, most VR experiences are networked, and the hardware itself has sound input for voice communications.

"[Headsets] all have microphones built in," said Lang at the same SVVR event, "which means every user that you are likely to be touching has a microphone and the ability to talk. You should be taking advantage of that."

Social VR: Facebook Spaces

What to Build

Earlier we discussed the different segments and sub-segments of the AR and VR ecosystems, which should each be viewed as different animals. This raises the question of which areas hold opportunity. Though building blocks top that list, as explored earlier, several parts of the value chain have gaps.

"Facebook buying Oculus was the announcement of the game, and right now we're all taking batting practice, we're not even in the first inning," Comcast Ventures' Michael Yang told us. "All parts of the stack need to be iterated. Nothing is particularly good at any level. So I think you can chase all of it."

By "all of it," Yang means the breadth of opportunities to choose from, rather than an unfocused shotgun approach for any one company. Startups should maintain focus on a core competency. In rare cases (or with larger companies) owning more of the tech stack can be attractive.

"They're truly owning the user experience and building a complete stack," said Lenovo's Joe Mikhail[5] of the company's strategic investment in Meta. "It's a system-level solution – everything from the hardware to OS to platform, as well as seeding that platform with productivity use cases."

Platform Choice.

When looking for opportunity all along the immersive computing spectrum, one of the biggest areas is mobile AR. Not only does it tap into a massive installed base of smartphones, as explored above, but ARcore and ARkit have lowered the development barriers. But which development kit is better?

One big consideration according to Presence Capital's Mahajan is Apple's app-centric approach. This has some disadvantages in that ARkit apps could face the same friction and usage challenges that have plagued apps for years. Those include download friction and "app fatigue."

"You effectively have all the same problems that a mobile app has," Mahajan told ARtillry. "You have to convince someone to download it, [and] convince them to come back every day. All of the friction involved to get to that experience is still pretty high."

Mahajan's proposed solution is centralized ARkit functionality at the OS level, which then hooks into disparate apps. This would make it a sort of "lite" app experience a la Google Instant Apps or deep linking. In iOS terms, that could function like Wallet or Spotlight Search.

"There could be a single app at the OS level that other apps can then add functionality to," said Mahajan. "It's similar to the way that Spotlight is a single app that exists as part of iOS, but then apps can expose content they want within Spotlight. They could do something similar with AR."

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[5] Mikhail is no longer employed by Lenovo, but was at the time this quote was captured.

Mahajan's comments also bring to mind Google's competing ARCore development kit. Though it will be comparable to ARkit in several ways, part of its distribution model includes Web AR. Compared to forcing bulky app downloads, Web AR lets users access AR experiences through mobile websites.

That means ARCore – carrying Google's web DNA instead of Apple's app DNA – could have some benefits for developers. On the other hand, Apple's app-based approach has some inherent advantages including more structured monetization, such as downloads and in-app purchases.

Either way, these advantages and disadvantages are going to force a platform choice from both users and developers. This flows from the mobile OS wars between Android and iOS over the past decade, which forced that same decision. We'll see ARCore and ARkit compete in similar ways.[6]

Video Companion: ARCore vs. ARkit
(Click URL)

https://youtu.be/angUM2cNCF0

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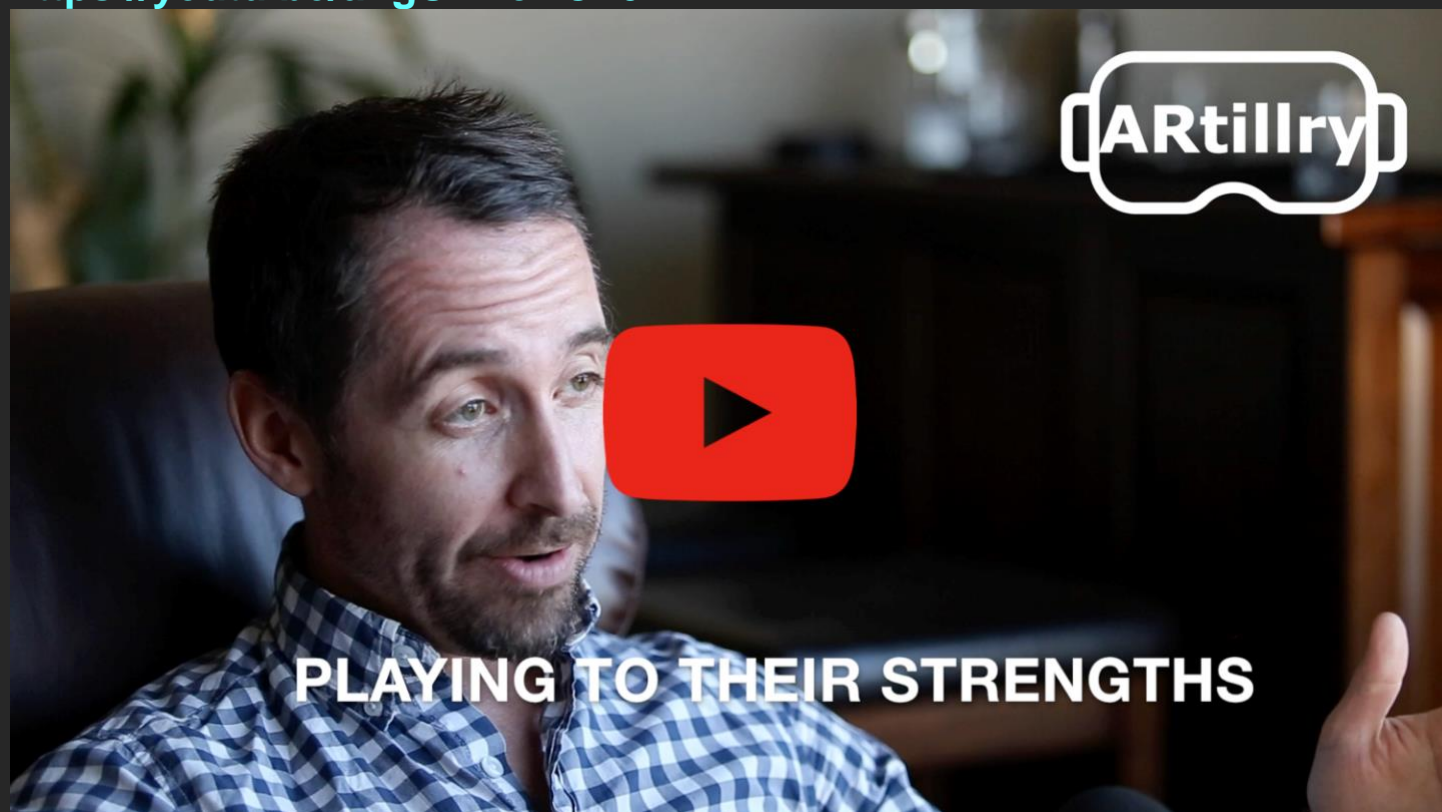
[6] See Artillry Intelligence Briefing, *ARCore & ARkit: The Acceleration of Mobile AR.*

The Art of the Pitch

Beyond opportune entry points and building blocks in AR and VR, there is an equally important set of tactics for pitching VCs. What do they want to hear, and not hear? These questions could fill their own report, but we've collected a few high-level tactics to end this report on a practical note.

Before pitching begins, investors we talked to advise to choose investment firms wisely. Make sure there's alignment in sector focus and investment stage. View investment firms' portfolios for these signals, and to make sure there aren't conflicting/competing investments they've already made.

"Do your homework," said Comcast Ventures' Michael Yang. "Have they already invested in AR or VR? If they haven't, you've got a tall bar to clear. If they have, then you can see at what round and at what stage they usually join, and you can get a road map for what their appetite is."

Then it's time to secure a meeting. Here it's important not to cold call. As Marc Andreessen has said many times, a true test of an entrepreneur's resourcefulness and salesmanship is if he or she can network their way to him. It tests an entrepreneur's value, before the pitching has even begun.

"VCs will tell their limited partners how they have this great deal flow based on relationships," said Loup Ventures partner Gene Munster at AWE. "Which means that a cold call coming in, even if it's a phenomenal idea, [is] probably going to be viewed skeptically… Find a way to network into the VC."

Next, one of the predominant points of advice we've heard from investors is to respect their time and penchant for brevity. This is a challenge, but the best pitches will hit all of the right points of valuation in a cohesive narrative – market size, unique value, defensibility – but will do so quickly.

"There are a few things that typically get missed. One is attention to brevity," added Munster. "The respect for time and the clarity we hear from entrepreneurs that know how to effectively communicate and answer questions is a great value to a VC."

Canvas Ventures' Ben Narasin agrees and adds that it's not just about brevity, but telling the *right* story. Refrain from long build ups about general tech transformation, or cute metaphors (e.g. slide graphics of ape-to-man evolution). Get right to the specific points of differentiation.

"One classic mistake from first-time entrepreneurs is long narratives to get to the point. Nobody cares," said Narasin at AWE. "What are you doing? Who are you? Why are you qualified to do it? Why is it a big market? You've got to get that point across and you've got to be able to do it quickly."

Lastly, a turnoff for investors is entrepreneurs who appear stubborn to new ideas or pushback on their talking points. This is a red flag because one of the desired qualities in entrepreneurs is coachability. Raw talent, experience and focus are good, but they need to be balanced with a dash of humility.

"You have to have a big vision, huge passion and laser focus on what you're building," said Lenovo's Joe Mikail.[7] "But you also have to be coachable… and admit there are things that you don't know, and there are things that you might have to go out and get, such as senior talent."

Loup Ventures' Gene Munster

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[7] *Mikhail is no longer employed by Lenovo, but was at the time this quote was captured.*

Final Thoughts: A Funding Crunch

The past six months have seen a backlash to the AR and VR excitement that characterized the previous 18 months. Slower-than-expected Tier-1 headsets sales have inspired media coverage of VR's demise – sometimes by the same publications that inflated expectations to begin with.

This has led to the shakeout in the VR sector that ARtillry predicted last May[ii] (a scenario in which we regret to be right). The way this shakeout will play out isn't necessarily a halt in venture funding, which will continue, but rather a tempered pace of new investments and follow-up rounds.

This will lead to a market correction in which some companies will perish by exhausting cash reserves and failing to secure additional funding. But the industry overall will grow, albeit slower than expected. To clarify, this speaks mostly to consumer VR, rather than other sub-sectors.

"VR is going to take a while," Comcast Ventures Michael Yang told ARtillry. "So if you're starting a company today, how are you going to sustain yourself until that time of mass adoption? It's either going to be through VC money or finding some form of monetization and subsidy."

The lesson for startups in AR and VR is to plan accordingly. They should model out spending levels, cash, and the macro environment. Build conservative to aggressive forecasting ranges in both path to revenue and the marketplace's overall health. That includes factors like consumer adoption.

"Consumer adoption of VR has been slower than everyone thought," Presence Capital's Mahajan said. "So keep your burn low and extend your runway as long as possible, because the market will come but it will take longer… We're seeing people get into a funding crunch as a result."

Key Takeaways (Redux)

- AR & VR have elicited considerable investor excitement and projections of smartphone-sized transformation.
  - We've witnessed a rise in AR and VR-focused investment firms (Presence Capital, The Venture Reality Fund, Super Ventures), and corporate VC firms (Comcast Ventures, Qualcomm Ventures, Intel Capital, Lenovo Capital).

- More than $4 billion in venture funding has been invested in AR & VR companies since 2012.
  - Magic Leap alone has received $2 billion, which should signal caution, but we believe funding dispersion will even out.
  - AR companies have received the most funding, followed by consumer VR, enterprise VR, and VR games.

- Underlying tech has received the most funding recently, followed by video content, games and peripherals.
  - In this relatively early phase, building blocks hold a large opportunity, including haptics, processing and inputs.
  - All parts of AR & VR's collective spec sheet are underdeveloped, creating opportunities across the board.

- Addressable market is a big investment criteria, and is currently diminished by consumer VR's small base.
  - Consumer hardware ubiquity is marked by 100 million units. VR headset penetration is currently 17 million units.
  - Until consumer VR reaches ubiquity, enterprise and mobile AR hold nearer-term opportunities for scale.

- Mobile AR's benefits include volume penetration, portability, all-day access and frequency of use.
  - ARkit and ARCore create 505 million AR-compatible smartphones today, increasing to 4.3 billion by 2020.
  - ARCore is advantaged by a lower-friction web AR approach. ARkit is advantaged by more structured revenue models.

- Enterprise AR & VR have more receptive buyers than consumer markets, due to a strong ROI case.
  - Enterprise AR & VR can benefit from the unit economics of SaaS pricing/packaging.
  - Successful enterprise execution is often found in entrepreneurs with vertical or industrial knowledge.
  - Knowledge of enterprise software dynamics and business processes (in addition to VR/AR) is a winning formula.
  - Warning signs of enterprise approaches include lack of customer diversification or recurring revenue potential.

- AR & VR content companies can be risk prone, and don't often see venture-sized returns or exits.
  - There can be longer-term value and recurring revenue outside of content itself, such as merchandising.
  - Broadcast-focused AR & VR companies can tap into the sector's scale and receptiveness to innovation.

- Social is thought by many to be AR & VR's eventual killer app, especially VR.
  - Social functions can make games and apps more multidimensional, with greater appeal for repeat usage.
  - Social can also amplify growth potential through viral marketing dynamics and network effect.

- After product, market and other aspects of business models are optimized, pitch tactics must equally be refined.
  - The art of pitching investors includes proper selection, "networking in," and streamlined talking points.
  - Key tactics are specificity, quantitative-focus (unit economics, market size, etc.) brevity, and humility.

- The consumer VR sector is experiencing a shakeout, meaning deceleration of new investments and a funding crunch.
  - This will impact existing players who will compete for a finite supply of follow-up investment rounds.
  - New entrants should model out spending levels, cash and the macro environment.
  - All players should build conservative to aggressive forecasting ranges and operate lean.

Key takeaways are also highlighted throughout the main body of this report.
See appendix for a full list of investors quoted in this report, and their portfolio companies.

About ARtillry

ARtillry is a publication and research firm that examines augmented reality (AR) and virtual reality (VR). Through writings, data and multimedia, it provides deep and analytical views into the industry's biggest players and opportunities. It's about insights, not cheerleading.

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

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

About Intelligence Briefings

ARtillry Intelligence Briefings are monthly installments of VR/AR data and analysis. They synthesize original and third-party data to reveal the dynamics of VR and AR sectors, and their opportunities.

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

Questions and requests for deeper analysis can be submitted at:
https://artillry.co/contact/

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 ARtillry, covering emerging tech.

Mike is a frequent speaker at industry conferences such as VRLA, ad:tech and LeadsCon. He has authored in-depth reports on the changing tech & media landscape including social networking and mobile. He contributes regularly to highly read online 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*. Mike was previously a San Francisco-based journalist for business and technology print publications, such as *Red Herring*, *Business 2.0*, and *Mobile* Magazine.

Note of Disclosure

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

Appendix: Investors Cited in This Report

The following links provide greater detail about the investors mentioned in this report, and their portfolio companies

Comcast Ventures
http://www.comcastventures.com/companies

Super Ventures
http://www.superventures.com/

Orange Silicon Valley
http://www.orangesv.com/

Canvas Ventures
http://www.canvas.vc/portfolio/

Founders Fund
https://foundersfund.com/portfolio/

Presence Capital
https://www.presencecap.com/#portfolio

Venture Reality Fund
http://www.thevrfund.com/#portfolio

Loup Ventures
http://loupventures.com/

Betaworks
https://betaworks.com/fund/#investments-div

Methodology

ARtillry follows disciplined best practices in market sizing and forecasting, developed and reinforced through 15 years in research and intelligence. It also follows best practices in journalistic reporting (see disclosure and ethics policy above).

This report focuses on insights gathered from investors. Quotes have been captured through direct conversation and events that ARtillry attended (e.g. panel discussions). The context and environment of each captured quote are specified throughout this report.

To support the narrative, data are also cited throughout the report. These include ARtillry original data, as well as third parties. Data sources are attributed in each case.

More about ARtillry's market-sizing credentials can be found here:

http://www.mikebo.land/forecasting

References

[i] https://blog.prototypr.io/ar-first-mobile-second-614e85673083
[ii] https://artillry.co/2017/05/25/artillry-intelligence-is-a-vrar-shakeout-coming/