# 2016 AUGMENTED AND VIRTUAL REALITY SURVEY REPORT

## INDUSTRY INSIGHTS INTO THE FUTURE OF AR/VR

SEPTEMBER | **2016**

PRESENTED BY

PERKINSCOIE

UPLOAD

# Executive Summary

## A CROSSROADS FOR AUGMENTED AND VIRTUAL REALITY

The early days of 2016 saw some heady growth projections for augmented and virtual reality (AR/VR). Multiple reports predicted that within 10 years, AR and VR would produce revenue in the tens of billions of dollars.

But by midyear, little of that growth had materialized as skepticism began to take hold. "It Doesn't Look Like Virtual Reality Is a Thing Yet," a *FORTUNE* headline proclaimed on July 5, 2016. The very next day, Pokémon GO launched. Within a month, the AR game had been downloaded 100 million times, and smartphone users around the world were dedicating more time to "catching them all" than to Facebook, Snapchat or Twitter.

After shocking the world with its out-of-nowhere popularity, does the release of Pokémon GO—along with mounting investments in both AR and VR, improving technology and continued proliferation of mobile devices—signal a noticeable shift in prospects for the AR/VR industry?

These developments could help break down some of the growth barriers identified in a new survey by global law firm **Perkins Coie LLP** and **Upload**, an organization serving the AR/VR community. More than 650 respondents, ranging from entrepreneurs and technology executives to investors and consultants, cited the lack of compelling content, problems with user experience and cost as the main impediments to AR and VR adoption in the coming years.

Signaling an early-stage mindset among companies developing AR and VR technologies, only 4% of respondents said the biggest hurdle to growth of AR/VR would be regulation and legal risks. Further, startup founders overwhelmingly identified a lack of an established market as the chief concern they hear from potential investors—another concern that could be quickly dispelled by the runaway success of Pokémon GO and other AR/VR technologies.

Addressing a question that is likely top of mind for leaders in the space—particularly in the post–Pokémon GO world—the survey also asked whether AR (with its more sweeping range of possibilities) or VR (with its more established technology) would end up predominating. The vast majority of respondents believe that AR will surpass VR in revenue. But respondents also said the dominance of AR has a long runway, with only 18% predicting that it would happen within three years.

The survey results, along with industry developments, make it clear that 2016 and 2017 will be key for AR and VR. One survey respondent took a big picture—and remarkably simple—view in predicting how AR and VR would develop in the years ahead:

"Compelling content will drive demand. Demand will drive technology. Technology will drive the masses. Masses will expand the markets. Make the content commercially viable and the chain will follow."

# Key Findings

- Lack of compelling content was the biggest challenge facing the AR/VR industry, with the majority of respondents (37%) selecting it as the most significant obstacle. Reluctance by consumers and businesses to embrace AR/VR innovation was the second-most prevalent choice at 23%, followed by technological limitations at 20%.
- Putting content aside, cost and issues with user experience are the biggest obstacles to mass adoption of both AR and VR technology, respondents said. For VR, 38% of respondents cited user experience (e.g., bulky hardware and technical glitches) and 32% cited cost as the biggest obstacles. In comparison, there was a larger delta between user experience (35%) and cost (25%) for AR technology, perhaps because AR has more practical uses that can justify a higher cost in addition to greater availability of low-cost AR games and apps.
- Two-thirds of respondents expect the AR market to surpass VR in revenue, but 82% expect it will take at least three years.
- Nearly 9 of 10 respondents (89%) said VR and smartphone manufacturers will focus on developing mobile VR technologies in the next two years, likely seeking to capitalize on the increasing amount of time consumers spend on mobile devices and the opportunity to provide less expensive options.
- Respondents did not express a great deal of concern over regulatory or legal risks, with only 4% considering them among the biggest challenges facing AR/VR. When asked to select the biggest legal risks in developing AR/VR technology or content, respondents chose technology and IP licensing (19%) and product liability and health and safety issues (18%).
- In reflecting on the sectors expected to see the most investment directed to AR/VR technology or content in the next 12 months, gaming was selected by 78% of respondents, followed by movies and television (40%) and live events (34%).
- The majority of investors responding to our survey (88%) directed the bulk of their capital to investments of $5 million and below last year. But over the next year, 22% expect to make investments in the $6–10 million range. They are mainly interested in investing in content, creative tools, and middleware and analytics.

*The survey was completed by 653 respondents. In the charts that follow, some questions do not add up to 100% due to rounding and some exceed 100% because respondents were invited to select more than one answer. For the full survey methodology and a breakdown of respondent demographics, see page 20.*

# Verbatims: Assessing the State of AR/VR

We asked AR/VR startup founders, technology executives and investors to reflect on key challenges and opportunities facing the industry and share their thoughts in their own words. The need for compelling content was widely cited by respondents, although feedback also centered around challenges in regulating a quickly developing technology, securing investments and the need for success stories in the space. A sampling of verbatim responses appears below.

## STARTUP FOUNDERS AND EXECUTIVES

"Content creators need to be unleashed, unchained and well-funded by responsible investors."

"Adoption of AR/VR will only take time. The difference in perception between someone who has never experienced AR/VR and someone who has is overwhelming."

"As with any technology, it's nearly impossible for appropriate regulation to keep pace, and the rate at which the technology is accelerating has made it even more difficult."

"Smartphone VR is a critical first step for the industry. More focus on growing the entry level is required for the high-end to be successful."

"It seems as though companies have the funds to invest but are becoming hesitant to do so because the market is moving slowly. It looks like high-profile projects are receiving money, but the more artistic, 'risky' projects are harder to get even small amounts of money to produce."

"Low-cost, ubiquitous hardware is a matter of time, but we still need a 'killer app' to convince the majority of people to get onboard."

## TECH EXECUTIVES

"Compelling content will come–it just is pretty thin at this point."

"The AR/VR user experience needs to be optimized and it needs buy-in from major content creators and distributors."

"The current experiences are 'impressive' but not 'impressive' enough."

"AR/VR technologies are still very immature, with the possibility of new players all the time. We remain open but cautious in investing and pushing the technology and would like to see better metrics on how either or both technologies will drive revenue."

"I would love to see VR become more mainstream, but so far, the hardware, software and content limitations are still not allowing for wider adoption outside the VR-enthusiast arena."

"This feels like a repeat of the smartphone revolution."

## INVESTORS

"VR and AR cannot simply recreate the same experience we have today on mobile and web. It has to bring a significant incremental value-add—not just be a slight enhancement to existing technologies and experiences."

"More public demonstrations are necessary to promote AR/VR to the general public, as typical means of advertising are inadequate at explaining the technology to the unfamiliar."

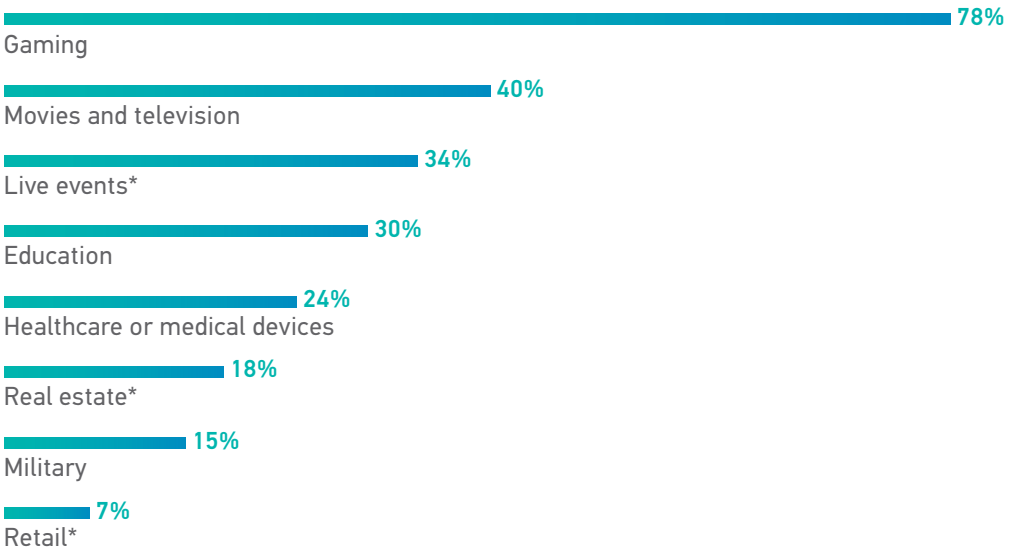
"We need to see some financial 'hits' in gaming and live action."

"Until headsets/technology are more streamlined and less clunky, it will be difficult for the average consumer to experience AR/VR not only in their homes, but also outside of the home in everyday life experiences."

"A few more generations of hardware will need to come along to lower total cost of ownership. The market needs to grow and killer apps are needed."

"We need better technology, smaller devices and more content directed at specific use areas, rather than promising the moon to consumers."

## In which sectors do you expect to see the most investment directed to the development of AR or VR technology or content in the next 12 months? [select up to 3 options]



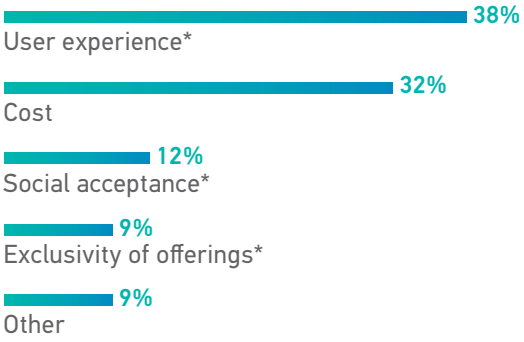

Gaming, movies and television, and live events emerged as the top three sectors in which respondents expect to see the most investment directed to AR/VR over the next year. Among the investors who responded to our survey, the percentage who selected gaming was 16 percentage points higher than all respondents (94%), reinforcing the belief that gaming is currently the key focus of the investor community.

Given that most of the buzz around VR has centered on the technology's entertainment implications and VR's primary markets thus far have been games and 3D films, this finding is not surprising. However, the fact that roughly a quarter of respondents selected education (30%) and healthcare or medical devices (24%) as sectors that will see more investment may suggest that while startups are developing AR/VR solutions for these industries, they remain in the infrastructure phase and do not expect to attract significant investment dollars in the next year.

Building on the innovative technology and drive for more personalized care that are already revolutionizing the healthcare industry, AR/VR can be used to provide simulated trainings for physicians and to treat patients. Similarly, technology has had a profound impact on the teaching and learning process, and AR/VR offers new ways to engage students and provide a more hands-on learning environment.

** See Glossary of Terms on page 19.*

## What is the biggest obstacle to mass adoption of VR technology?



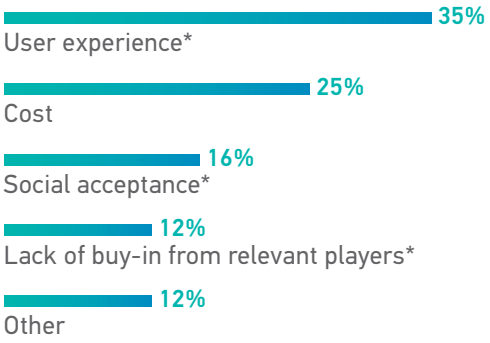

Respondents selected user experience as the biggest obstacle to mass adoption of VR, highlighting two of the key historical drawbacks for the industry: technical glitches and consumers' reluctance to wear bulky, restrictive equipment. However, the fact that nearly as many respondents chose cost as the biggest obstacle could indicate that they believe the technology is ready, but too expensive for the masses. For instance, *FORTUNE* reported in its July 5 article that while big technology players have made major pushes in VR in recent years, "most of the better gear released this year required an expensive gaming PC," diminishing expectations of the industry's growth prospects.

A 2015 report on AR/VR from investment firm Oppenheimer & Co. Inc. identified similar problems facing VR and categorized them in two ways. The easily solvable problems included the need to improve graphics and display resolution and a lack of apps, games and available content. More obstinate problems included lack of development of human interface components (e.g., making the experience more "virtual" and less "reality"), ergonomics (e.g., devices block users' views of their surroundings and tether them to the devices) and social issues, as VR has mostly been a single-person experience.

Some of the 9% of respondents who chose "other" pointed to lack of awareness, but many more cited a content deficit—a challenge that cropped up throughout this survey. As one respondent put it, "right now, there is more hardware than engaging content."

** See Glossary of Terms on page 19.*

## What is the biggest obstacle to mass adoption of AR technology?



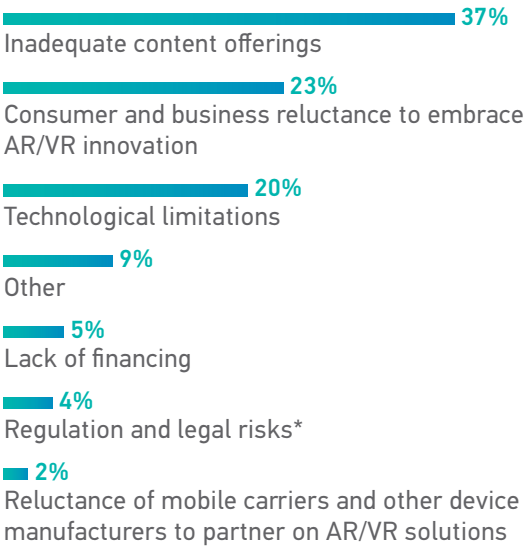

As in the previous question about VR, respondents identified cost and user experience as the top obstacles facing AR; however, the delta between the two obstacles is larger for AR. This may reflect that AR has more practical uses than VR and can therefore justify a higher retail price, making cost less of a concern. It may also be driven by the availability of more low-cost AR games and apps to consumers via their mobile devices that do not require the purchase of an additional device to play.

Social acceptance ranked higher for AR (16%) than for VR (12%), which is not surprising given that VR is meant for use in private, whereas AR generally requires using the technology in public settings. However, respondents completed the survey just before the release of Pokémon GO, which has made playing AR games more socially acceptable. Pokémon GO's success as a smartphone app has been cited as a game-changer by some in the industry. As Paul Travers, chief executive of wearable-device maker Vuzix, told *Investor's Business Daily* in a July 22, 2016 article, "Pokémon Go points out how exciting AR can be. That is the tip of an iceberg for how cool this stuff is going to get."

Among respondents who chose "other," content and lack of awareness were also identified as common obstacles for AR.

** See Glossary of Terms on page 19.*

## What is the biggest challenge facing the AR/VR industry as a whole?




When asked to single out the most significant challenge facing the AR/VR industry as a whole, inadequate content offerings rose above all other obstacles. The focus on content shortcomings could signal that respondents believe other hurdles, including technological limitations and cost, can be overcome, but the availability of high-quality and robust content is a larger obstacle. One respondent put it bluntly, saying investors "need to fund content, not technology. Only killer content will make it desirable."

Indeed, content has been the fuel that launched many successful technology products. Apple's App Store offering helped make it the leader in smartphones. And as one respondent noted, "Consoles like Nintendo and Sega wouldn't have sold without a Sonic or a Mario."

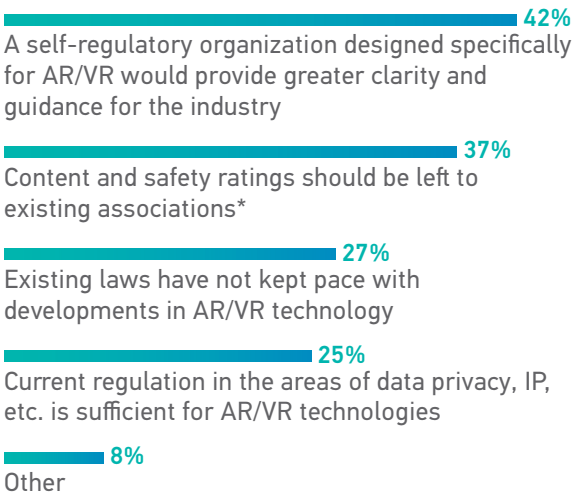
Consumer and business reluctance to embrace AR/VR innovation followed content as the second biggest challenge facing AR/VR. Interestingly, this was identified as less of a concern by AR/VR startup executives (18%) and more of a concern by investors (30%). This signals that investors are still less optimistic than startups that consumers and businesses will embrace the technology.

Respondents showed little concern over legal risks, which is a clear sign of a young industry. However, tricky and serious legal questions will continue to arise as AR and VR become more widely adopted. With heightened attention to user privacy and data security amid a string of high-profile data breaches, regulators and users of AR/VR have raised questions about data collection and sharing practices, user location tracking, and the extent to which a company's privacy practices and privacy policies protect consumers' private information. For instance, shortly after the release of Pokémon GO, U.S. Senator Al Franken (D-Minn.), chair of the Judiciary Subcommittee on Privacy, Technology and the Law, **wrote to** the developer expressing concern that the app "may be unnecessarily collecting, using, and sharing a wide range of users' personal information without their appropriate consent."

In addition to privacy and security issues, the industry faces legal risks related to compliance with various regulations, as well as product liability, health and safety, and IP considerations (in both the real and virtual worlds).

** See Glossary of Terms on page 19.*

## Which of the following describes your feelings regarding regulation of the AR and VR industry?

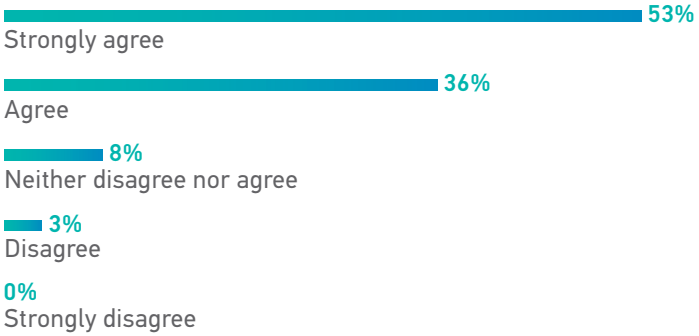



Respondents were largely mixed on the appropriate approach to regulating the AR/VR industry. While the largest group of respondents (42%) called for a self-regulating organization, one-quarter (25%) said they considered existing laws on such matters as IP and data privacy to be sufficient. Responses in the "other" category mainly indicated that no regulation was needed or that it was too early to know how to properly regulate the industry.

The lack of a clear favorite option could be a sign that respondents in this young industry have not yet come to their own decisions. Still, governance is top of mind for at least a few respondents. As one said, "AR/VR is the new Wild West. As pioneers, I believe that we need to be responsible and regulate this environment."

** See Glossary of Terms on page 19.*

## To what extent do you agree with the following statement: In the next two years, VR and smartphone manufacturers will place a focus on developing mobile VR solutions?

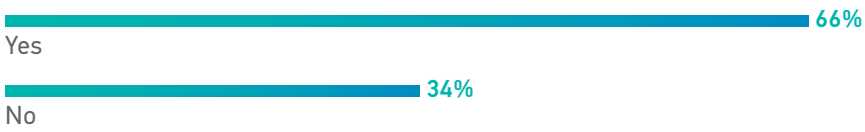



The vast majority of respondents (89%) agreed that VR and smartphone manufacturers will place a focus on developing mobile VR solutions. The investors who responded to our survey expressed even stronger affirmation, with 64% of them strongly agreeing (compared to 53% of all respondents). It is likely that manufacturers and investors see the amount of time consumers already spend using smartphones, as well as the broader movement to mobile, as an opportunity to attract users to VR with less expensive options that run on a device they already own.

Some have postulated that mobile VR has the potential to drive mass adoption of VR. Indeed, mobile VR combats some of the obstacles our respondents identified earlier in this survey, including cost, the need to buy and carry additional hardware, and bulky equipment that feels cumbersome to the user. However, it is worth noting that mobile VR technology does not solve the content issue, which has been the key impediment to VR's traction.

As one survey respondent put it, "Once the public has low-cost access to the hardware packed with content they are interested in, the demand is going to be great and immediate."

## Do you anticipate that the AR market will surpass the VR market in revenue?



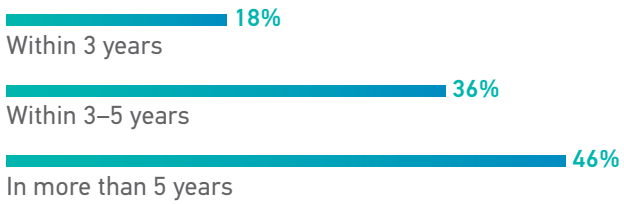

With two-thirds of respondents anticipating that the AR market will surpass VR in revenue, our survey results support a conclusion also reached in other studies. For instance, Digi-Capital predicted that AR will account for 75% of total AR/VR revenue by 2020. Some in the industry have predicted that AR's ability to combine the virtual and real worlds, as well as its greater adaptability to uses beyond gaming and entertainment, will attract a larger number of consumers.

Respondents from startups and investors were even more bullish on AR, with 75% saying it would surpass VR (nine percentage points higher than all respondents). This finding is particularly telling given that the majority of technology and startup executives who responded to our survey are in the VR industry (70% identified their focus as exclusively or predominantly VR, and only 9% identified their focus as exclusively or predominantly AR).

A March 27, 2016 article in *The Wall Street Journal* noted that investors should pay closer attention to AR, despite the focus on VR. The former "might have the wider range of potential users, ranging across fields such as design, retail, medicine, education, entertainment and automotive."

According to one survey respondent, "While VR is hot right now, I believe the long-term success will be in AR. The seamless integration of reality and AR can have a profound impact on how we live. I see AR potentially disrupting product design, manufacturing, military, medicine and education."

## When do you expect the AR market to surpass the VR market in revenue?



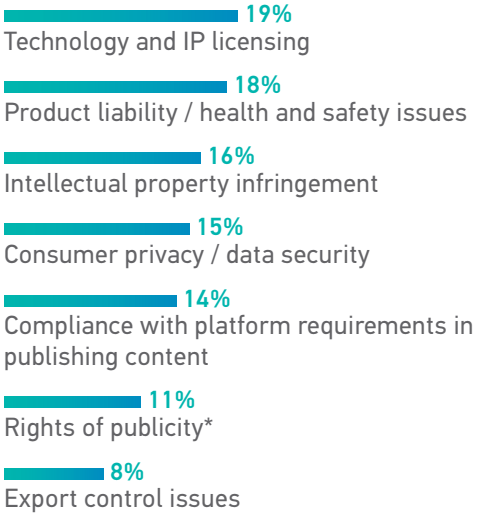

Respondents who expect AR to surpass VR do not expect it to happen soon. Of course, these projections predate the launch of AR sensation Pokémon GO.

The Goldman Sachs report, which is more bearish on AR, noted significant technology hurdles. But when those are surpassed, the report predicted "stronger enterprise use cases emerging, especially considering AR enables you to see your physical environment whereas VR completely blocks it."

While they were more bullish than the average respondent on the prospects for AR ultimately overtaking VR, it is worth noting that respondents from startups and investors were mostly aligned with the overall results on the timeline, indicating that they also believe AR has a longer runway from which to take off.

The following questions were answered only by startup founders and executives with large tech companies.

## Which of the following legal risks are of concern to your company in developing AR or VR technology or content?




As we saw earlier, startups and tech executives did not express a great deal of concern about the legal risks facing the industry. However, for a young industry, it is interesting that they are at least starting to think about a range of legal issues. In particular, technology and IP licensing—issues that normally bedevil mature technology companies—ranked as the top legal risk. As with any new technology, there are both incredible business opportunities and potential legal pitfalls.

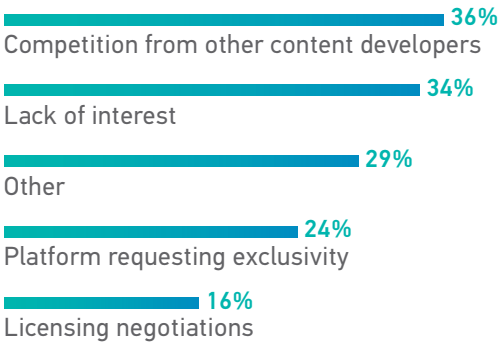
Another significant concern that surrounds AR/VR is its impact on health and safety and the potential for product liability lawsuits (an option selected by 18% of respondents). Concerns in this area range from health effects (e.g., seizures, motion sickness, eye strain, etc.) to safety issues when users are immersed in an AR or VR experience.

While consumer privacy and data security may have been expected to score higher given the attention directed toward these issues by regulators and the general public, some respondents did express serious concerns. "Data privacy is the biggest issue," one respondent said. "Old rules cannot apply and the industry needs to declare a HIPAA-like contract with users."

** See Glossary of Terms on page 19.*

Respondents received this question only if they identified themselves as content developers.

## As a content developer, what challenges have you faced in negotiating deals with AR/VR developers?



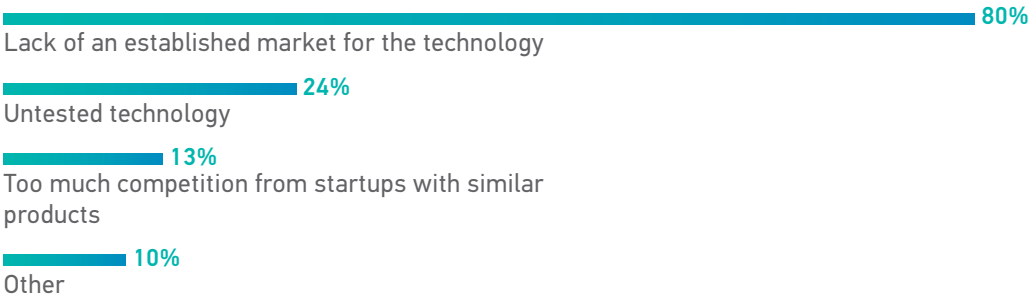

Content developers appear to face a range of challenges in negotiating AR/VR deals. This finding reiterates the results earlier in the survey that creating quality content and providing consumers with a range of options are both significant challenges.

While it may seem contradictory that competition from other content developers was identified as the top challenge and lack of content was cited earlier as a key obstacle facing AR/VR, it is likely that content developers are referencing the competition for funding. Indeed, among the respondents who chose "other," funding was a commonly listed challenge. "There is always interest, but getting companies to fully fund projects is a different story," one respondent said.

Lack of interest closely followed as a challenge cited by 34% of content developers. This may be driven by the industry's reluctance to invest in content until there are a few major success stories that make them more comfortable doing deals in this area.

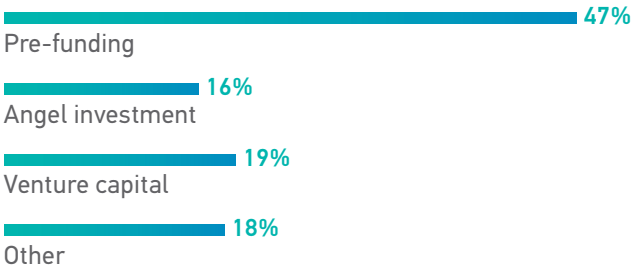
The following questions were answered only by startup founders.

## What are the most common concerns you hear from potential investors in AR or VR startups?

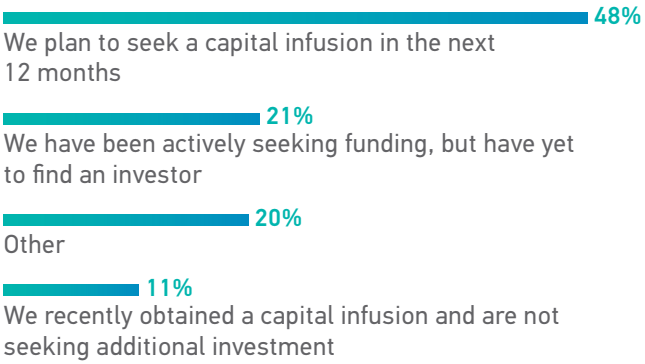



AR/VR startup founders overwhelmingly identified the lack of an established market as the greatest concern among investors (80%). One respondent noted a focus on angel investors and venture capitalists (VCs). "The market is yet unestablished and the technology is untested, but surely many can see the vision of VR to come, and as a startup, at this stage, pre-funding, those are the people I know will be most open to our ideas."

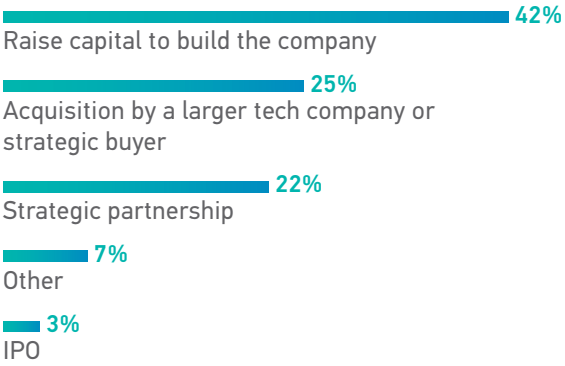
## What is the current state of your company's funding?




## What is the current status of your efforts to raise capital?




## Which of the following best describes your growth or exit strategy over the next three years?

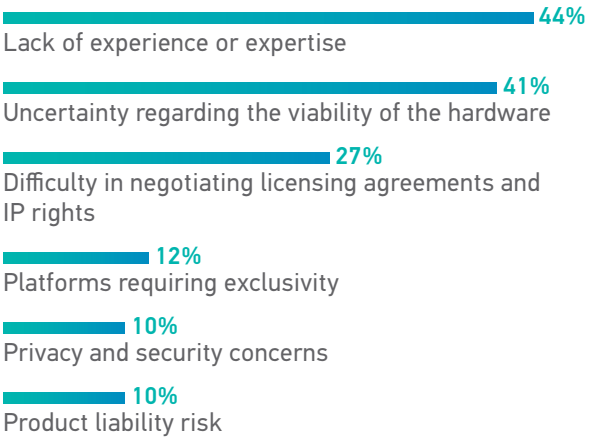



Clearly, many AR/VR companies are early-stage and actively seeking funding. The fact that 19% have received venture capital funding is a good sign for AR/VR. Of the startups who have received VC funding, the majority were from the software (28%), entertainment (22%) and gaming (17%) industries.

Demonstrating that startups in this area are gaining traction, roughly half are planning an exit over the next two years, with 25% looking at an acquisition and 22% looking at a strategic partnership. However, it is also telling that the majority (42%) say they are in it for the long haul and plan to continue raising capital to build their companies. Unlike mobile apps, where startups could develop technology relatively quickly and flip their companies in just a few years, AR/VR technology takes more time to develop, and startups are taking a longer-term view of building their companies.

This question was answered only by tech executives.

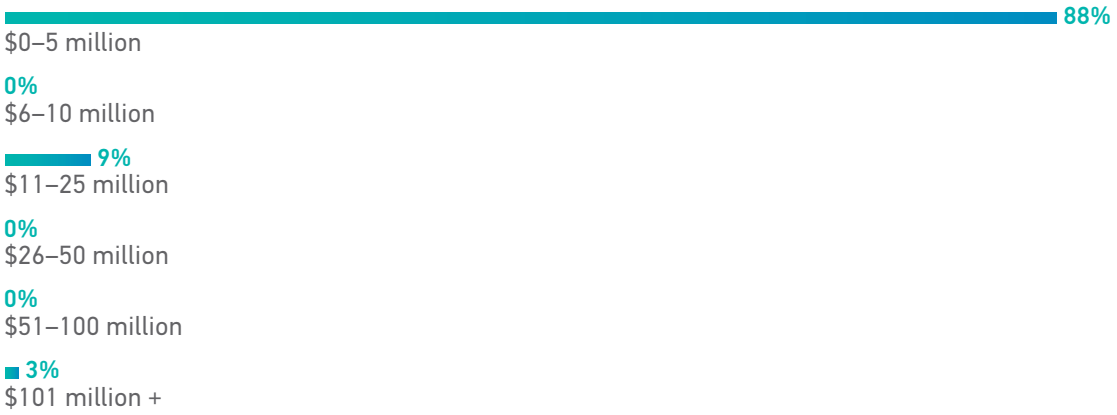
## What challenges have you faced in entering into deals with companies developing AR or VR solutions?



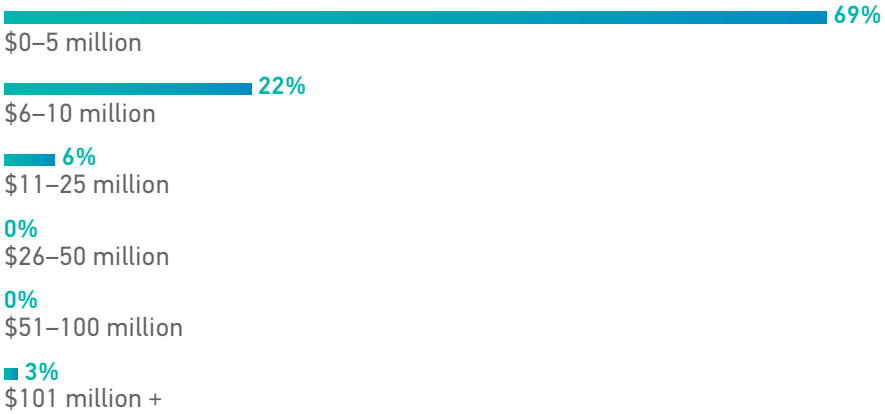

These responses from tech executives again depict an industry in its early phases. Challenges with hardware and technology are not uncommon at this stage of development; however, 27% of tech executives listing concerns with licensing as a major challenge was a bit of a surprise.

The following questions were answered only by investors.

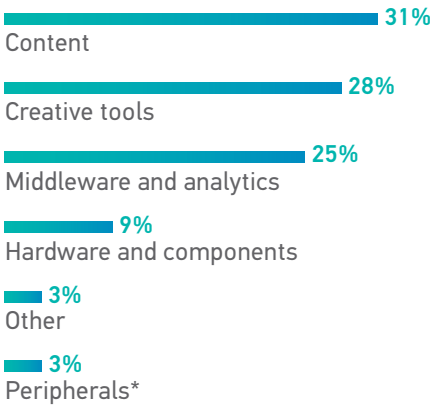
## In the past 12 months, approximately how much have you invested in AR/VR companies?




## In the next 12 months, approximately how much do you expect to invest in AR/VR companies?



## In what area within AR/VR are you most interested in investing?




$3.5 billion in VC investments poured into AR and VR in 2014 and 2015, according to Goldman Sachs. CB Insights reported that AR and VR startups saw a 347% increase in funding in the first quarter of 2016, compared with the final three months of 2015, fueled mainly by a $793 million investment in Magic Leap.

Our survey shows that investments in AR/VR companies are still relatively small. Although, interestingly, 22% of investors said they expect to invest $6 million to $10 million in the next year—a range that was selected by no investors for the previous 12 months.

Content emerged as the top area investors are looking at in the AR/VR space. Consistent with other findings in our survey, investors seem to recognize that the development of quality content will be the industry's primary and most valuable driver.

** See Glossary of Terms on page 19.*

# Glossary of Terms

**Content and safety ratings should be left to existing associations:** MPAA for VR films, ESRB for video games, etc.

**Exclusivity of offerings:** lack of compatibility among diverse devices, content limited to certain platforms

**Lack of buy-in from relevant players:** existing social media platforms, brands, mobile carriers, etc.

**Live events:** sports, concerts, etc.

**Peripherals:** cameras, tracking devices, haptic devices, etc.

**Real estate:** virtual showings, construction, etc.

**Regulation and legal risks:** data privacy/security, IP infringement, product liability, etc.

**Retail:** shopping

**Rights of publicity:** for brands and people portrayed in the virtual experience

**Social acceptance:** isolating aspect of technology, lack of appeal to non-gaming audience

**User experience:** bulky hardware, technical glitches, motion sickness, etc.

# Methodology and Demographics

From late May to early July 2016, 653 respondents completed Perkins Coie and Upload's Augmented and Virtual Reality Survey via an online survey tool. The results were tabulated, analyzed and released in September 2016.

More than half of respondents (51%) hold C-level or VP titles (e.g., CEO, president, owner, chief technology officer, etc.). Individuals completing the survey came from a variety of industries, with entertainment (29%), gaming (19%) and software (15%) among the most prominent. The breakdown of respondents includes:

Founder/executive of an AR or VR startup (39%)

Adviser/outside consultant (17%)

Executive within a large tech company (7%)

Developer/engineer or content producer (6%)

Investor (5%)

Media/marketing (5%)

Artist/designer (4%)

Other professional (17%)

The AR/VR startup executives and tech company executives that responded to the survey identified their focus as:

Content development (43%)

Software development (34%)

Hardware development (10%)

Company seeking AR/VR technology or content (6%)

Other (7%)

Due to rounding, the percentage breakdown may not add up to 100% for some questions, while others may exceed 100% because respondents were invited to select more than one answer.

# About the Study Authors

PERKINSCOIE

With more than 1,000 lawyers in 19 offices across the United States and Asia, Perkins Coie represents great companies across a wide range of industries and stages of growth—from startups to FORTUNE 50 corporations. Named the 2015 "Law Firm of the Year" in Technology Law by U.S. News – Best Lawyers, Perkins Coie works with clients focused on intellectual property and technology products and services, including augmented and virtual reality, interactive entertainment, Internet of Things, hardware, software, and app and content development. The firm represents several AR and VR market leaders in identifying, anticipating and resolving legal issues raised by this developing technology, including content strategy execution, commercialization, IP protection, product liability and corporate financings.

UPLOAD

Upload is dedicated to accelerating the growth of the VR industry and using immersive technology to make a positive global impact. Through conferences, events, community, daily news coverage, talent placement, corporate connections and content creation, among other activities, Upload is focused on building the professional ecosystem for virtual and augmented reality. The Upload Collective is a verticalized co-working space in San Francisco and opening soon in Los Angeles. It is specifically dedicated to companies in the VR and AR industry and brings together the resources necessary to grow startups in this emerging ecosystem, alongside the VR Academy, which provides developer education through various programs.

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