ARtillery Intelligence

ARTILLERY CLIENT INQUIRY BRIEF
ENTERPRISE AR REVENUE OUTLOOK BY VERTICAL
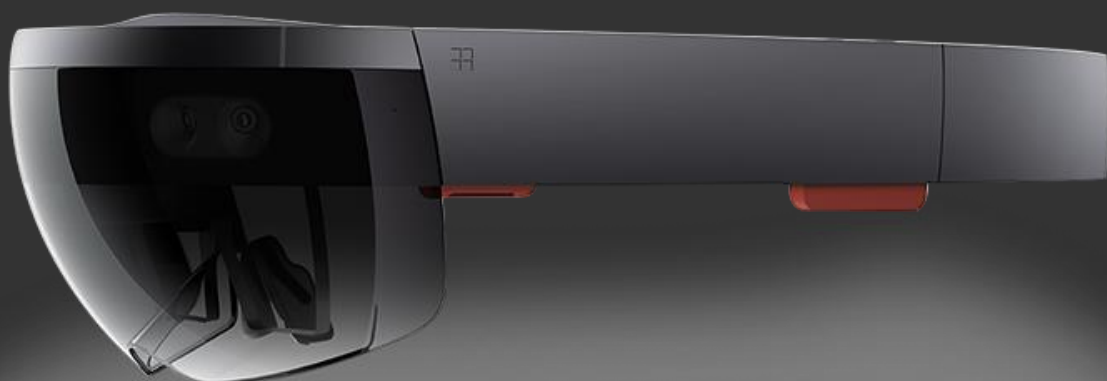**5/24/19**

ARtillery Intelligence

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Introduction

ARtillery Client Inquiry Briefs are research deliverables that are assembled by our analysts in response to specific questions from clients and ARtillery PRO Premium Subscribers. This analysis focuses on the vertical spending breakdowns for Enterprise AR hardware and software.
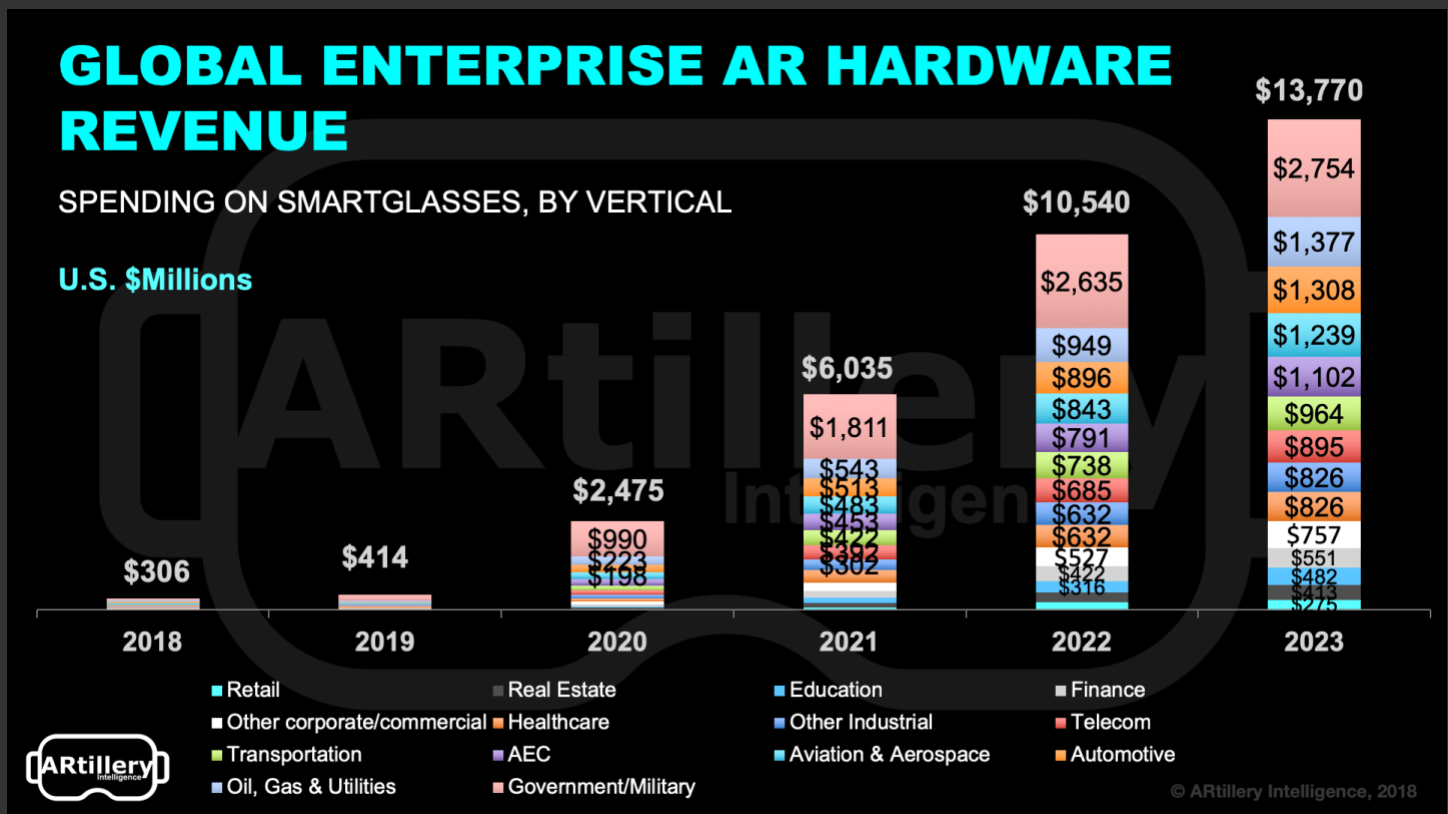
I. ARtillery Market Sizing

Below are a few charts that draw upon our XR market sizing, specifically zeroing in on AR hardware (headworn devices) and software, segmented by vertical.

A. Hardware

Chart 1. Overall AR hardware revenue, by vertical

Explanations:

- Due to low numbers in early years, see chart 2 for detailed drilldown of market shares in 2020.
- The jump in 2020 is due to a few factors that we've analyzed and incorporated into our outlook

  1. Microsoft's $480 million contract with the U.S. Army to supply Hololens units has moved the needle and will go into effect throughout 2019 and 2020. Other such spending will continue.
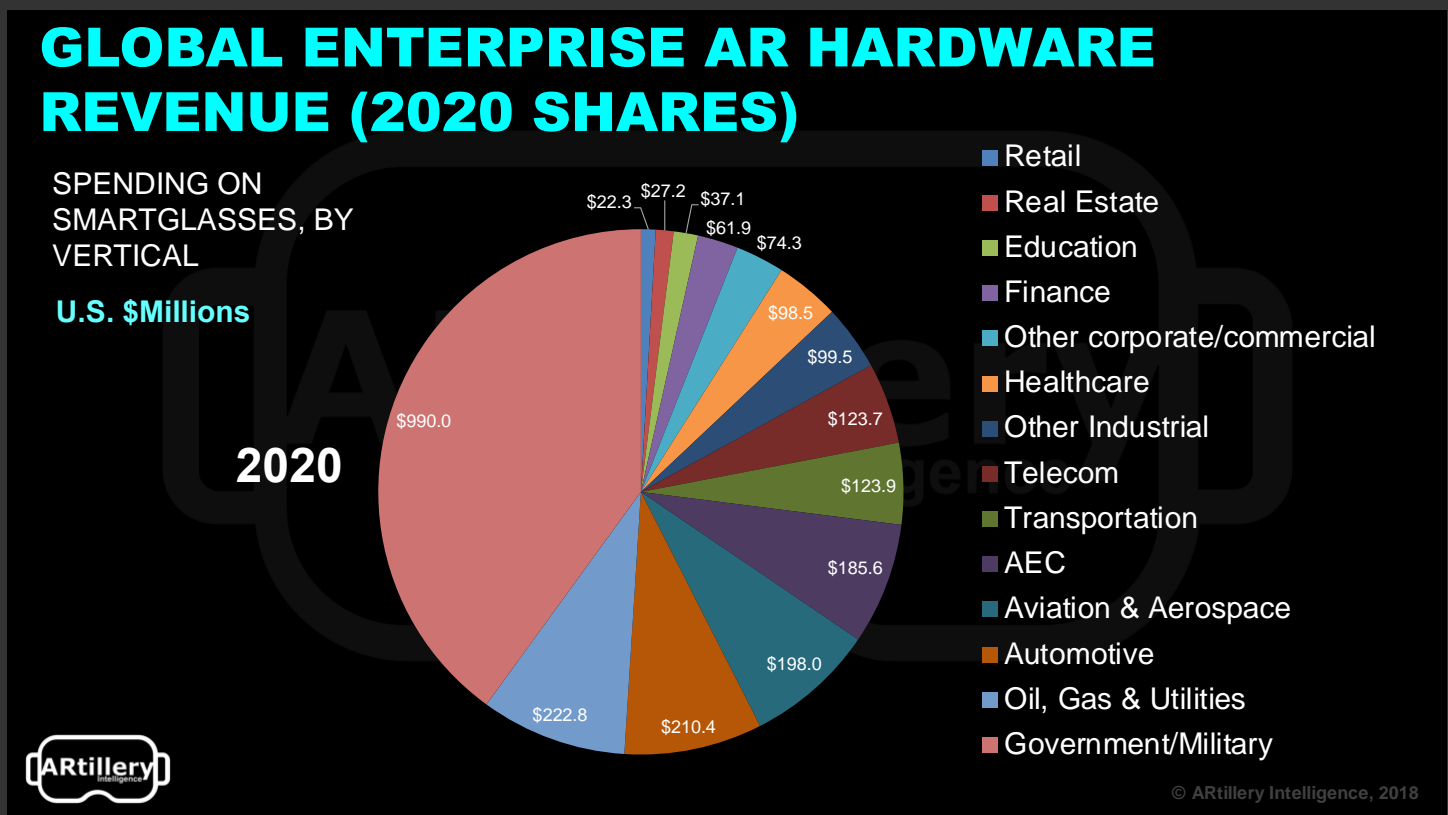
2. 2020 is our predicted year for enterprise AR's tipping point. Though AR's scale will result from wide applicability, a form factor that supports all-day use, and demonstrable ROI, adoption is currently dampened by organizational inertia, risk aversion and front-line adoption.

We believe these factors will continue to stunt enterprise AR growth but will be outweighed eventually by the momentum, support and ROI realizations that are currently building. A tipping point will come in 2020, after which adoption accelerates in a sort of enterprise herd mentality.

This will follow a similar pattern, though on a smaller scale, as enterprise smartphone adoption over the past decade.

Chart 2: 2020 Drilldown

Because it's difficult to see the delineation of market shares in early years of chart 1, here is a more detailed view of 2020 shares. The same explanations apply, including Microsoft's government contract which accounts for a large share of the segment's growth in 2020. That share will diminish over time as other verticals catch up.

GLOBAL ENTERPRISE AR HARDWARE REVENUE (2020 SHARES)

SPENDING ON SMARTGLASSES, BY VERTICAL

U.S. $Millions

2020

$22.3 $27.2 $37.1
$61.9
$74.3
$98.5
$99.5
$123.7
$123.9
$185.6
$198.0
$210.4
$222.8
$990.0

- Retail
- Real Estate
- Education
- Finance
- Other corporate/commercial
- Healthcare
- Other Industrial
- Telecom
- Transportation
- AEC
- Aviation & Aerospace
- Automotive
- Oil, Gas & Utilities
- Government/Military

B. Software

Here are the corresponding charts for software. Please note that the dominating presence of retail in this chart is due to the inclusion of mobile apps & software, such as shopping apps. There will be a lot spent on AR by retailers to transform the consumer shopping process on ubiquitous smartphones

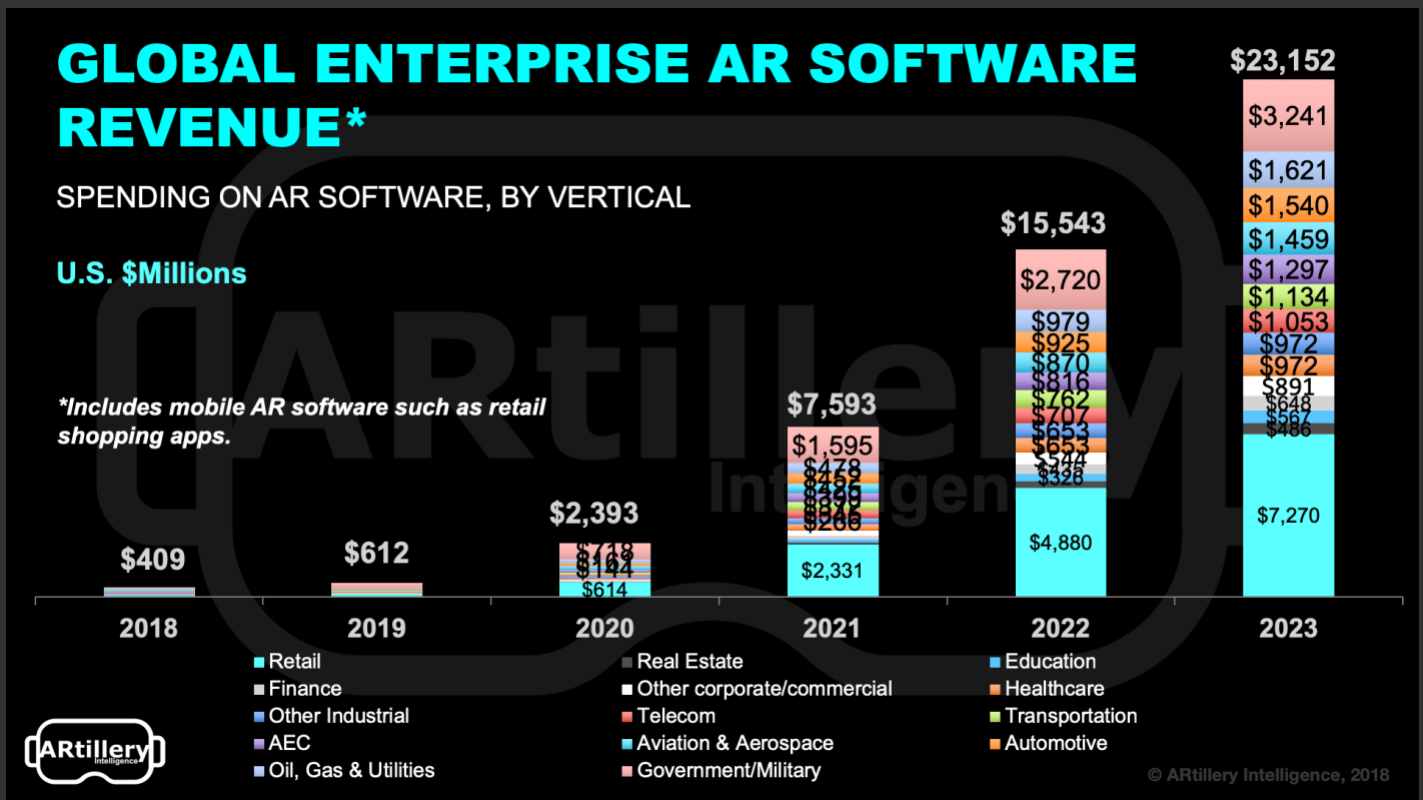## Chart 3: Overall VR Software revenue, by vertical

Chart 4: 2020 Drilldown

GLOBAL ENTERPRISE AR SOFTWARE REVENUE* (2020 SHARES)

SPENDING ON AR SOFTWARE, BY VERTICAL

U.S. $Millions

*Includes mobile AR software such as retail shopping apps.

2020

$717.8
$614.3
$161.5
$152.5
$143.6
$134.6
$89.7
$89.7
$71.8
$71.8
$53.8
$44.9
$26.9
$19.7

- Retail
- Real Estate
- Education
- Finance
- Other corporate/commercial
- Healthcare
- Other Industrial
- Telecom
- Transportation
- AEC
- Aviation & Aerospace
- Automotive
- Oil, Gas & Utilities
- Government/Military

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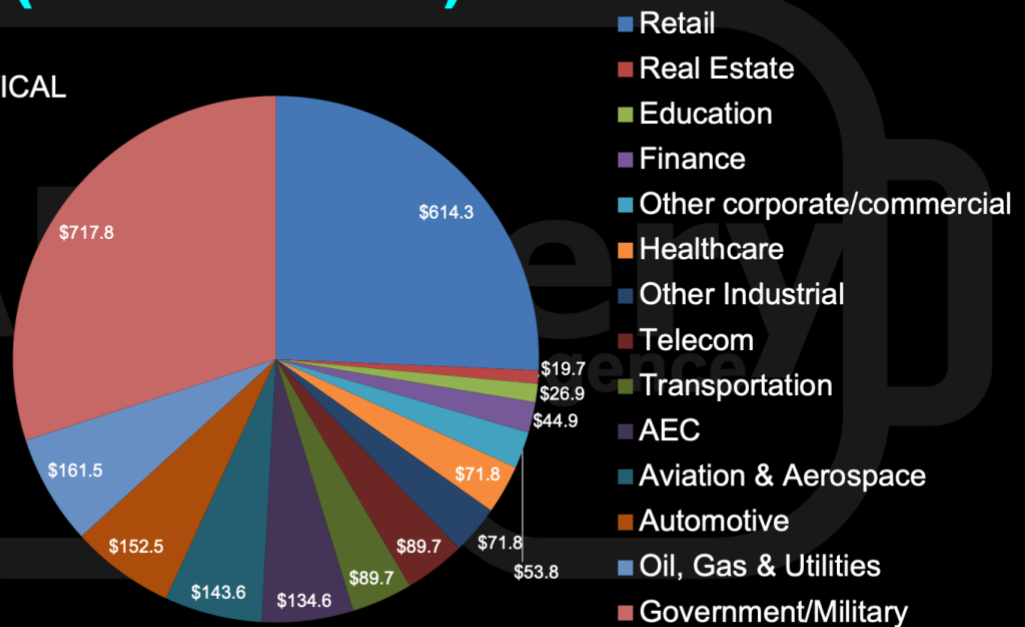
II. Additional Analysis

To support the above and provide more color on our considerations when projecting spending share (especially hardware), here is more narrative analysis. In addition to industry spending levels and historical data, there are dynamics that will impact buying behavior across verticals and industries.

At a high-level, adoption is impacted by three main factors:

1. Product/market fit (how well does AR solve problems in the vertical)
2. Necessity/demand (how big can AR's impact be and how motivated are buyers to adopt)
3. Spending Power and other barriers (such as regulatory)

Chart 3: AR Adoption Factors by Vertical
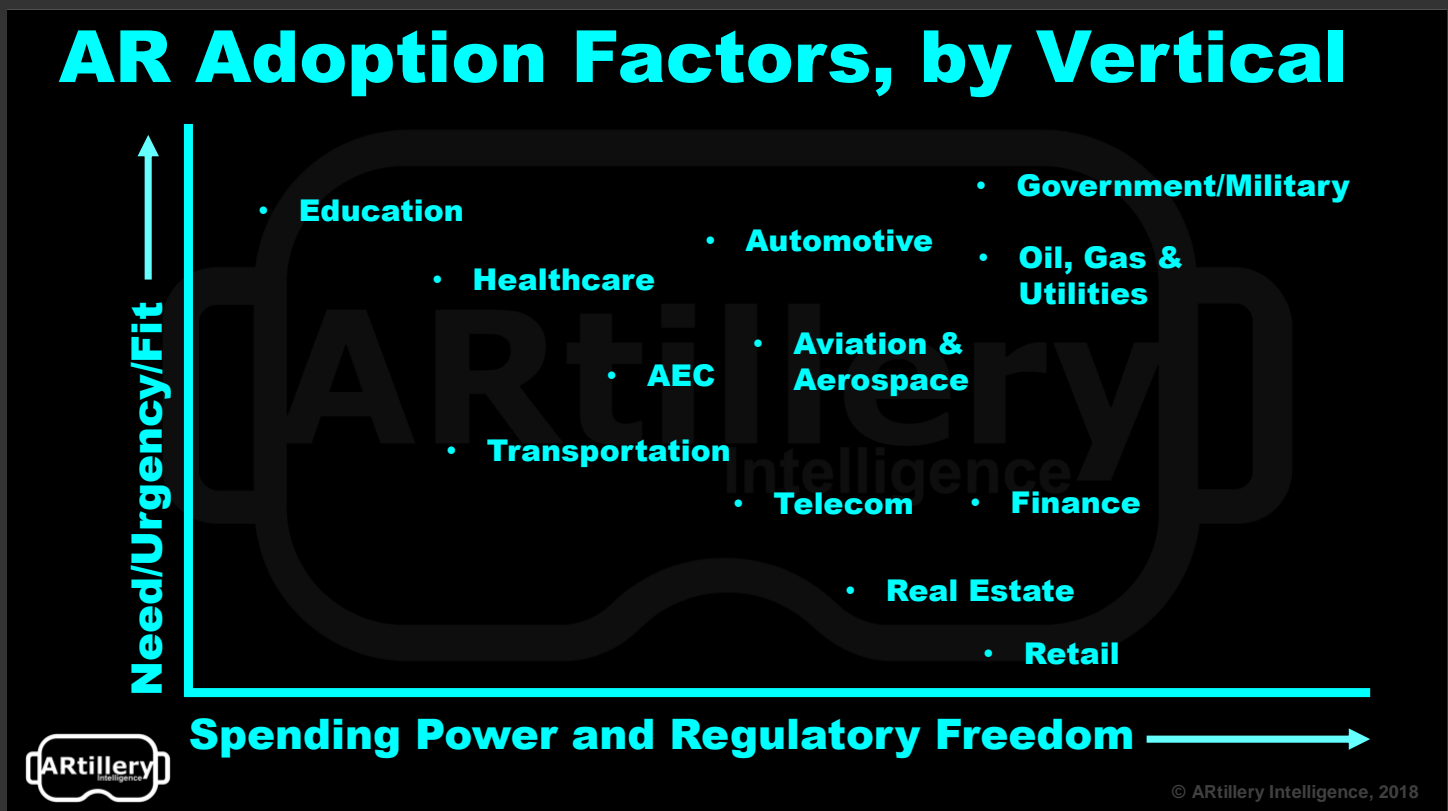
How verticals map to these factors can be telling in projecting their share of AR spending. For example, AR has strong product/market fit and demand in education, but spending power is low. There is also strong fit and demand in healthcare, but regulatory scrutiny is high.

Demand is high and price resistance is low when selling technologies into sales organizations or departments (Salesforce built an empire on this principle). As a revenue center, they have lots of political capital and budget for things that make them more effective in bringing in business.

There's a similar dynamic in high finance:

"In financial markets people are literally competing based on who has the best information… giving them an edge is an extremely high value proposition," said Virtual Cove CEO Bob Levy at the ARiA conference. "So you can envision a rank-ordered list of segments to go after based on the value of the problem that you're solving."

There's also industry size. The classic example there is Strivr. It started as a VR training tool in sports, spun out of work done at Stanford with its football team. But after discovering that there are only so many football teams, it pivoted to retail and works with companies like Walmart.

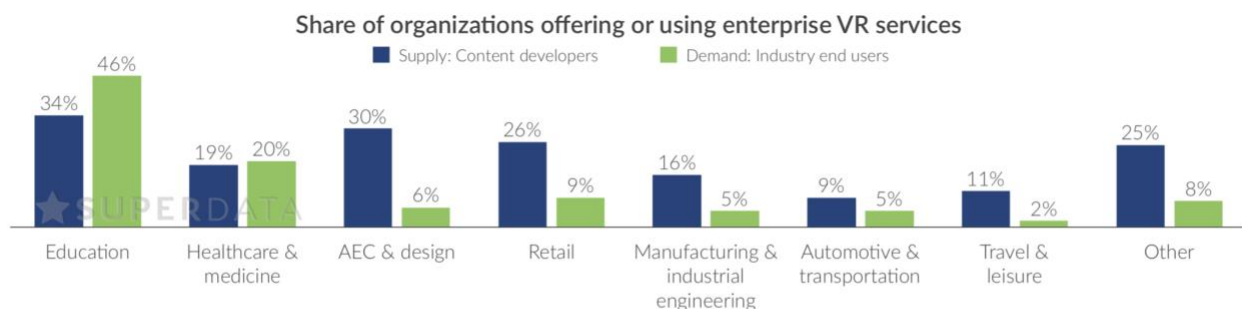That's a VR example but the principle applies to AR.

Supply/demand Gap

Similarly, Superdata has revealed an important supply/demand gap in VR, the principle of which applies to AR. Through survey data, it uncovered supply and demand levels across target verticals in VR. Healthcare has the biggest deficiency in supply, followed by education.

Developers are focusing most on fields like design, retail and manufacturing despite an overwhelming demand for education and healthcare solutions

Organizations are most interested in VR for education and healthcare as supply in those fields rises to meet demand.
As interest in education solutions grow, many schools and hospitals are using VR. However, these institutions can have limited spending power compared to major conglomerates. On the other hand, large retail corporations like Walmart and Lowe's are willing to invest in applications that make training safer and cheaper.

Share of organizations offering or using enterprise VR services
■ Supply: Content developers   ■ Demand: Industry end users

Segment	Supply	Demand
Education	34%	46%
Healthcare & medicine	19%	20%
AEC & design	30%	6%
Retail	26%	9%
Manufacturing & industrial engineering	16%	5%
Automotive & transportation	9%	5%
Travel & leisure	11%	2%
Other	25%	8%

*Supply share measures the percentage of all developers in the VR industry who are focused on each segment. Supply percentages do not add up to 100% due to overlap of suppliers who work on multiple segments. Demand share measures the percentages of all organizations looking for VR solutions who are focused on each segment.
STATE OF THE XR MARKET, FEBRUARY 2018 | © 2018 SuperData Research Holdings, Inc. All rights reserved.

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SUPERDATA

But beyond this opportunity signal, there are other factors to consider.

For example, there could be a supply shortage in these verticals for a reason. There could be challenges that have erstwhile deterred would-be entrants. Those include capital intensiveness, technological complexity, or relatively small addressable markets (think: heart surgeons).

Some challenges we've observed in these two verticals specifically include the fact that the barriers to entry are high. In healthcare for example, it's a highly regulated environment where the potential buyers (doctors and health group administrators) aren't always "tech-forward."

In education, the demand is high as examined above, but the opportunity is gated to some degree by spending power, especially in elementary and lower education environments. The story is different in higher education contexts with well-funded research or endowments.

Vertical Example: Healthcare

To illustrate some of the above principles, we'll take a deeper dive on one vertical: healthcare. It operates differently than many enterprise verticals. Industry-specific nuances should be considered in all verticals. For example, in healthcare, there's less cost-sensitivity but greater regulatory scrutiny.

"It can be difficult and frustrating when you're trying to innovate in this space, because you don't have the raw velocity of consumer use cases," said BrickSimple founder Det Ansinn at ARiA. "It requires cleverness and understanding of what's needed from a compliance and regulatory aspect."

On the other side of the coin, there's less friction around cost. AR costs such as headsets — though they're currently cost prohibitive in some fields and consumer use cases — pale in comparison to the astronomical prices of medical equipment and procedures.

"We're targeting vascular interventions, so to be used intra-operatively there's not that much of a cost consideration," said Columbia medical student Gabrielle Loeb at ARIA. "An AR headset is less than the cost of just one procedure so one-time purchase it's not really a major factor."

But another path altogether is XR for nursing, said Ansinn. There's less regulatory scrutiny but more importantly, nursing happens on a much greater scale than surgical procedures. So AR for nursing functions — including patient care and data entry — can have a greater overall impact.
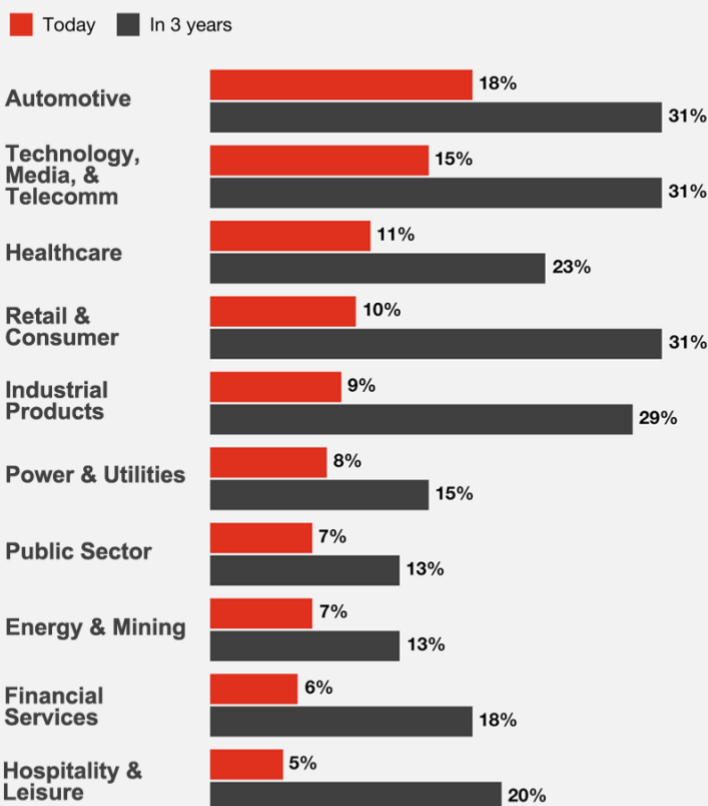
"There are only so many surgeons in the country but a given institution has tens of thousands of nurses," Ansin said. "The amount of time nurses spend doing data entry on a per patient basis is mind-blowing. If we can take those types of steps there's very quickly financial justification."

III. Additional Data

Below are several data points from various sources to supplement the above. Some are survey data and some are market sizing projections, and we've listed them in the order of importance and relevance to your question.

Augmented reality investment by industry

Which technologies are you making substantial investments in?

■ Today ■ In 3 years

| Industry	Today	In 3 years
Automotive	18%	31%
Technology, Media, & Telecomm	15%	31%
Healthcare	11%	23%
Retail & Consumer	10%	31%
Industrial Products	9%	29%
Power & Utilities	8%	15%
Public Sector	7%	13%
Energy & Mining	7%	13%
Financial Services	6%	18%
Hospitality & Leisure	5%	20%

Source: PwC, *2017 Global Digital IQ® Survey*
Bases: Automotive: 72; Energy & Mining: 135; Financial Services: 332; Healthcare: 237;
Hospitality & Leisure: 75; Industrial Products: 375; Power & Utilities: 131; Public Sector: 156;
Retail & Consumer: 217; Technology, Media & Telecommunications: 433

PwC | pwc.com/nextintech

Goldman Sachs Revenue Projections
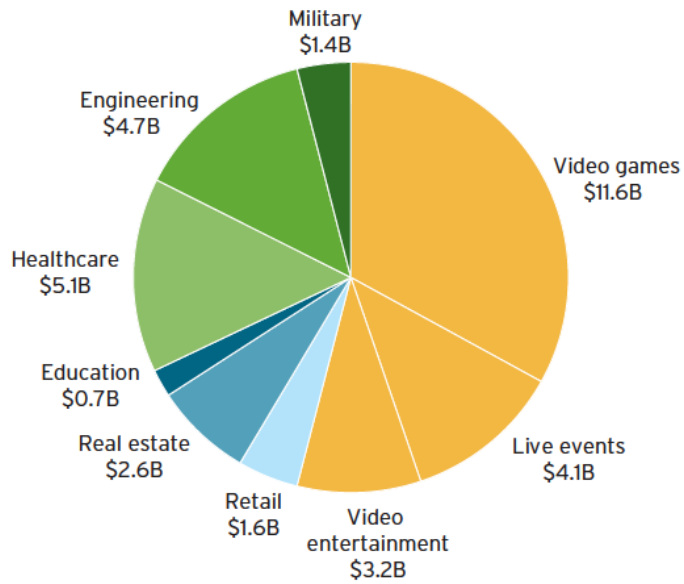
Note: Includes AR & VR (use for directional perspective)

Perkins Coie XR Executive Survey

> 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 — 59% (2018), 78% (2016)
Education — 26% (2018), 30% (2016)
Healthcare and medical devices — 26% (2018), 24% (2016)
Real estate (e.g., virtual showings, construction) — 21% (2018), 18% (2016)
Marketing and advertising — 20% (2018)*
Live events (e.g., sports, concerts, etc.) — 19% (2018), 34% (2016)
Military and defense — 19% (2018), 15% (2016)
Movies and television — 18% (2018), 40% (2016)
Retail (e.g., shopping) — 18% (2018), 7% (2016)
Manufacturing and automotive — 17% (2018)*

"Business customers need to know that VR/AR can solve specific problems in ways that are better, faster, cheaper or more effective than traditional methods."
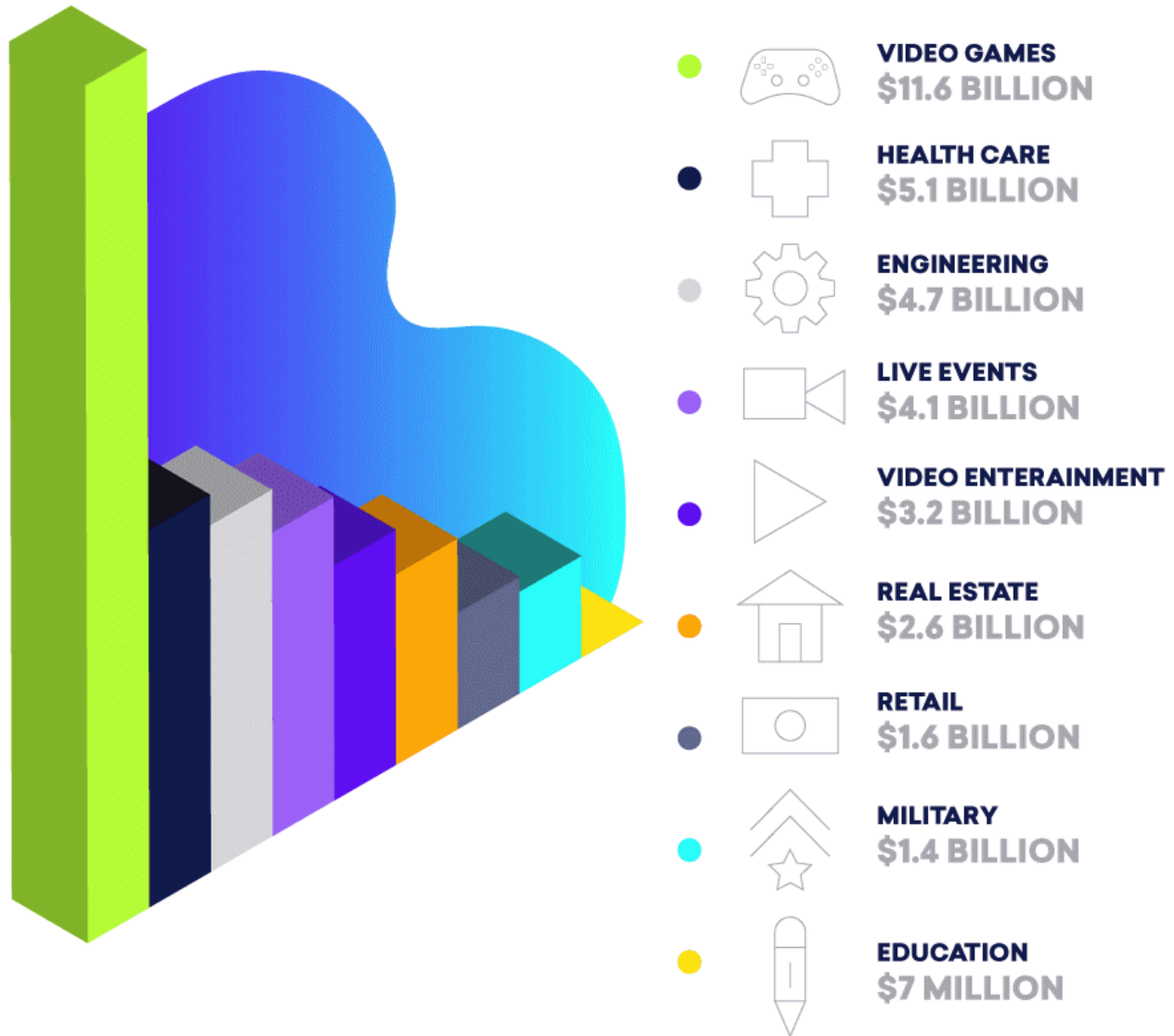– VR startup founder

■ 2018   ■ 2016
* This answer choice was not provided for the 2016 survey

Note: Includes AR & VR (use for directional perspective)

Lumus AR and VR industry projections

BIGGEST INDUSTRIES

for augmented and virtual reality, by potential 2025 revenue

- **VIDEO GAMES** $11.6 BILLION
- **HEALTH CARE** $5.1 BILLION
- **ENGINEERING** $4.7 BILLION
- **LIVE EVENTS** $4.1 BILLION
- **VIDEO ENTERAINMENT** $3.2 BILLION
- **REAL ESTATE** $2.6 BILLION
- **RETAIL** $1.6 BILLION
- **MILITARY** $1.4 BILLION
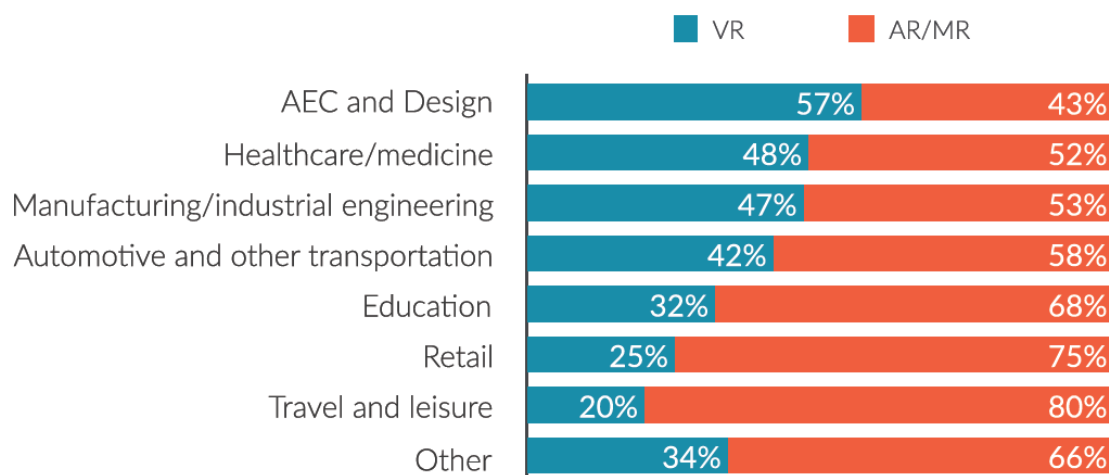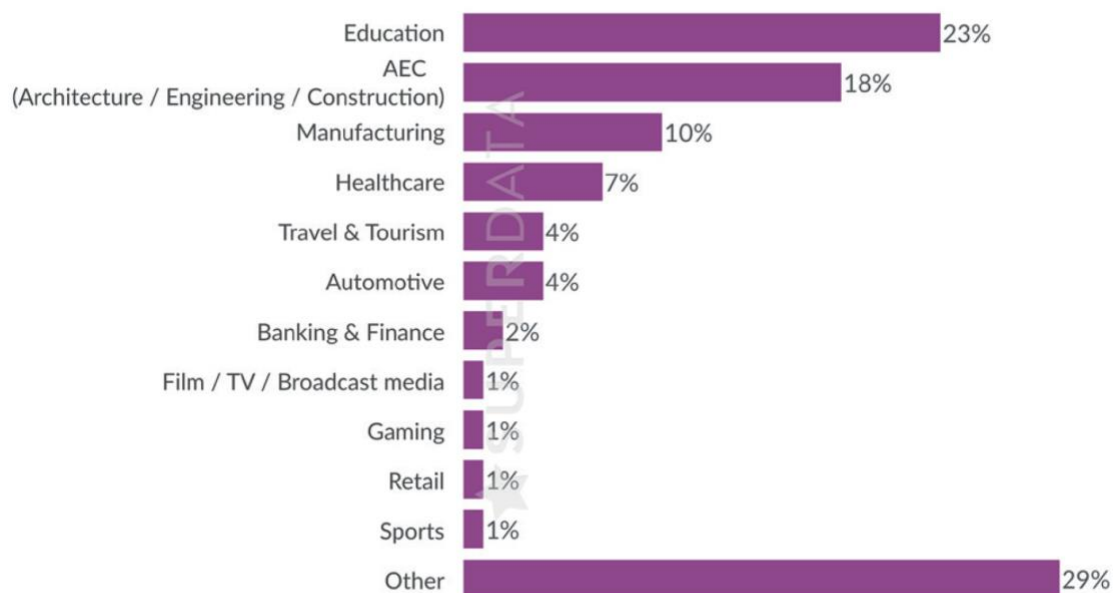- **EDUCATION** $7 MILLION

Note: Includes AR & VR (use for directional perspective)

Superdata survey of XR industry executives

Full report here

Projected share of 2020 enterprise investment and spending

	■ VR	■ AR/MR
AEC and Design	57%	43%
Healthcare/medicine	48%	52%
Manufacturing/industrial engineering	47%	53%
Automotive and other transportation	42%	58%
Education	32%	68%
Retail	25%	75%
Travel and leisure	20%	80%
Other	34%	66%

Businesses already using XR technologies

Industry	%
Education	23%
AEC (Architecture / Engineering / Construction)	18%
Manufacturing	10%
Healthcare	7%
Travel & Tourism	4%
Automotive	4%
Banking & Finance	2%
Film / TV / Broadcast media	1%
Gaming	1%
Retail	1%
Sports	1%
Other	29%

Graph: Industries of current and prospective XR end-users

Note: Includes AR & VR (use for directional perspective)

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 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.**

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.**