VR/AR Global Investment Report & Outlook 2018

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Who Are We?

Formed in 2016, the VRVCA is a close-knit membership comprised of the top VR/AR investors in the world with $18bn+ USD deployable capital. We invest in Virtual Reality, Augmented Reality and Mixed Reality startups of any size from anywhere, and meet four times a year across global locations in United States, China and Europe.

VRVCA members

Blue Run Ventures

Bertelsmann Asia Investments

Cathay Innovation Fund

Colopl Next

China eCapital

CRCM

CRU Capital

DCM

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GGV Capital

Harvest Tech Investments

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HTC Vive

Hyperion Media Group

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Innovation Works

JAZZ Venture Partners

Jiuhe Ventures

K Cube Ventures

Keytone Ventures

Legend Capital

Lightspeed China Partners

Lightspeed Venture Partners

Matrix Partners China

Naspers Ventures

NVIDIA GPU Ventures

Shenzhen Premier Ventures

Presence Capital

Qiming Venture Partners

Qualcomm Ventures

Redpoint Ventures

Sequoia Capital China

Shanda Group

Shasta Ventures

Softbank Ventures Korea

SOSV

Sparkland Capital

UCCVR Ventures

United Talent Agency

Telstra Ventures

The Venture Reality Fund

WestSummit Capital

WI Harper

Yunfeng Capital

Yunqi Partners

ZhenFund

500 Startups

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This report is published in partnership with these partners who have strong coverage of data and information in their core geographies

Co-publishing partners

- Upload is a leading global VR/AR media company based in San Francisco. The company covers global industry financing news extensively on a daily basis
- Upload is also known for its digital publication, education program, industry event, and co-working space operations

- ChinaVenture is a leading capital market information and data company based in Shanghai, China
- The company provides opulent information in equity investment, including news, expert research, consulting, etc. across industries

- MoguraVR is the leading VR/AR media firm in Japan. The company keeps a close track with investment deals and other industry news in both Japan and other countries
- MoguraVR is also an active community leader and played the role of expert advisor of VR/AR startups in the country

*Other data sources including VRVCA proprietary database, data provided by VC members, and public research

Much appreciation to the following key contributors who provided important inputs

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*Also thanks to other VRVCA members and investors who provided shorter point-of-views

- **Executive Summary**
- Fundraising trends
- Key deal highlights
- Investor activities
- VR/AR investments exits
- 2018 Outlook

Executive Summary: 2017 Review (1/2)

Overall:
VR/AR funding surged almost 3x from 2015-2017

- In 2017, **a record high of ~$3B** has been invested in VR/AR globally. Despite perceived slowdown in capital market, the overall investment was still **up 12%** vs. 2016, and 3 times vs. 2015
- Investment is relatively concentrated in seed/angel and late-stage. **Series A share is declining**, caused by long validation cycle for product-market-fit of VR/AR startups, limited bridging capital and deal size inflation of seed/angel round
- Tools/ Enabling Technologies (40%) and Hardware (35%) still account for majority of total investment, partially due to large average deal size (only 25% by volume). There was a **5 times increase in deal count in enterprise/ verticals sector** from'15 to '17, making it the sector where investors were most active. Investors are showing more caution towards Games & Entertainment where funding is heavily tilted towards leaders in the segment
- **US is still the primary location** where VR/AR investment took place (~45%), and **China is following closely** (~25%) with investment opportunities unique to the market (e.g. location-based, supply chain, education). Besides leading as investment destination, Asia is also a key source of outbound funding for the global VR/AR industry

Deals:
Larger deals were made but only those well-positioned can reach Series A

- **Several large deals** (e.g. Magic Leap, Improbable, Niantic) topped the investment headlines and accounted for **~35% of total investment**. Enterprise/ vertical sectors have elicited considerable investments too
- As hardware shipment was growing slower than expectation, **investors' interests shifted from hardware and content** (which rely on consumer penetration) **to tools and technologies** which can apply across content and platforms, and **enterprise services** which have faster product-market-fit validation and monetization cycle
- As an effort to raising their next rounds, some startups are repositioning their company positions (e.g. extend to AR/MR, target enterprise clients) and exploring alternative funding channels rounds (e.g. crowdsourcing, ICO)
- VR/AR startups are advised to raise **larger seed rounds**, be laser focus on growing **specific metrics** and proving **commercial viability in a few verticals** first in order to reach Series A. They should also be agile with new device platforms

Executive Summary: 2017 Review (2/2)

Investors:
Old money are more prudent, new money is flowing in

- The **top 15 investors in 2017 made ~150 deals** in total; The most active names include Vive X, Presence Capital, The Venture Reality Fund, Tokyo VR startups, Outpost Capital, Colopl Next, etc.
- Having made some less successful bets in the last 2 years, the **generalist VCs** (e.g. Sequoia, A16Z) were **relatively prudent** in investing in 2017. VCs who specialize in VR/AR (e.g. The Venture Reality Fund, Presence Capital) were actively tracking new opportunities but facing challenges in finding new attractive deals that don't overlap with their existing portfolio
- **Corporate investors is the rising force** in 2017 as more enterprises were exploring the use of VR/AR technologies to enhance existing business cases. These investors often see the application value of startups' products and can also provide strategic resources. Megafunds (e.g. Temasek, Fidelity, EDBI) who typically invested in large size private equity deals also started participating in VR/AR (e.g. Magic Leap, Improbable) this year
- Unlike traditional LPs (e.g. endowment, pension, FOF), **corporates and governments are the key backers** behind the mainstream VR/AR investors. **Emergence of new funds** brought in new capital which has longer investment horizon, clearer understanding of VR/AR and specific areas that they are more interested in
- **Asian capital is gaining significance** and the way they engage is also changing. After gaining industry knowledge and deal channels as LPs, some are now more active in direct investment. Funds specialized in cross-border investments (e.g. Colopl Next, Outpost, Danhua, etc.) are also very active

Exits:
Talent/ technology acquisition as dominant exit form

- The industry is still in its early stage and there are limited exit channels and limited cases of exits. Most exits were under $100M with <20x return for seed/angel round investors
- **Talent/ technology acquisition** (e.g. Apple-SMI, Google-Owlchemy Lab) is still the **main form of exits** as large tech giants were snapping up their tech/talent reserve. A few cases of strategic acquisition (e.g. Acer-StarVR, Microsoft-Altspace) were also observed

Executive Summary: 2018 Outlook

2018 Outlook:
A more active capital market with better ecosystem

- Most investors expect **2018 total VR/AR funding to increase or remain at a similar level** as 2017:
  - It's foreseeable that tech giants like Apple, Google, Facebook, Microsoft, etc. will continue to invest in and announce new product plan for VR/AR. Continual mass media mention of VR/AR (e.g. Ready Player One) will also draw more consumer and investor interest
  - Further increase in funding is dependent on adoption speed of mobile AR, whether a few large ticket deals will continue to take place and the successes of standalone VR HMDs and AR glasses
- Some of the potential **emerging investment opportunities** in 2018 include:
  - **Mobile AR**: Applications in Social, Games, Retail, etc.; Enabling technologies (e.g. ARCloud); 3D asset creation
  - **AR glasses**: Upstream suppliers (e.g. Optics, cameras, etc.); Industrial solutions
  - **Standalone VR**: Content (light interaction, shorter play-time and higher frequency); Enabling technologies (tracking, compression/ streaming, computer vision); Solutions that solve device fragmentation issue (e.g. middleware and platforms that help develop or consume across devices)
  - **PCVR upgrades**: Premium location-based; Enterprise/ vertical solutions that are user-experience sensitive
  - **5G**: Cloud computing; Streaming content and technologies; Mobility/LBS apps

- Executive Summary
- **Fundraising trends**
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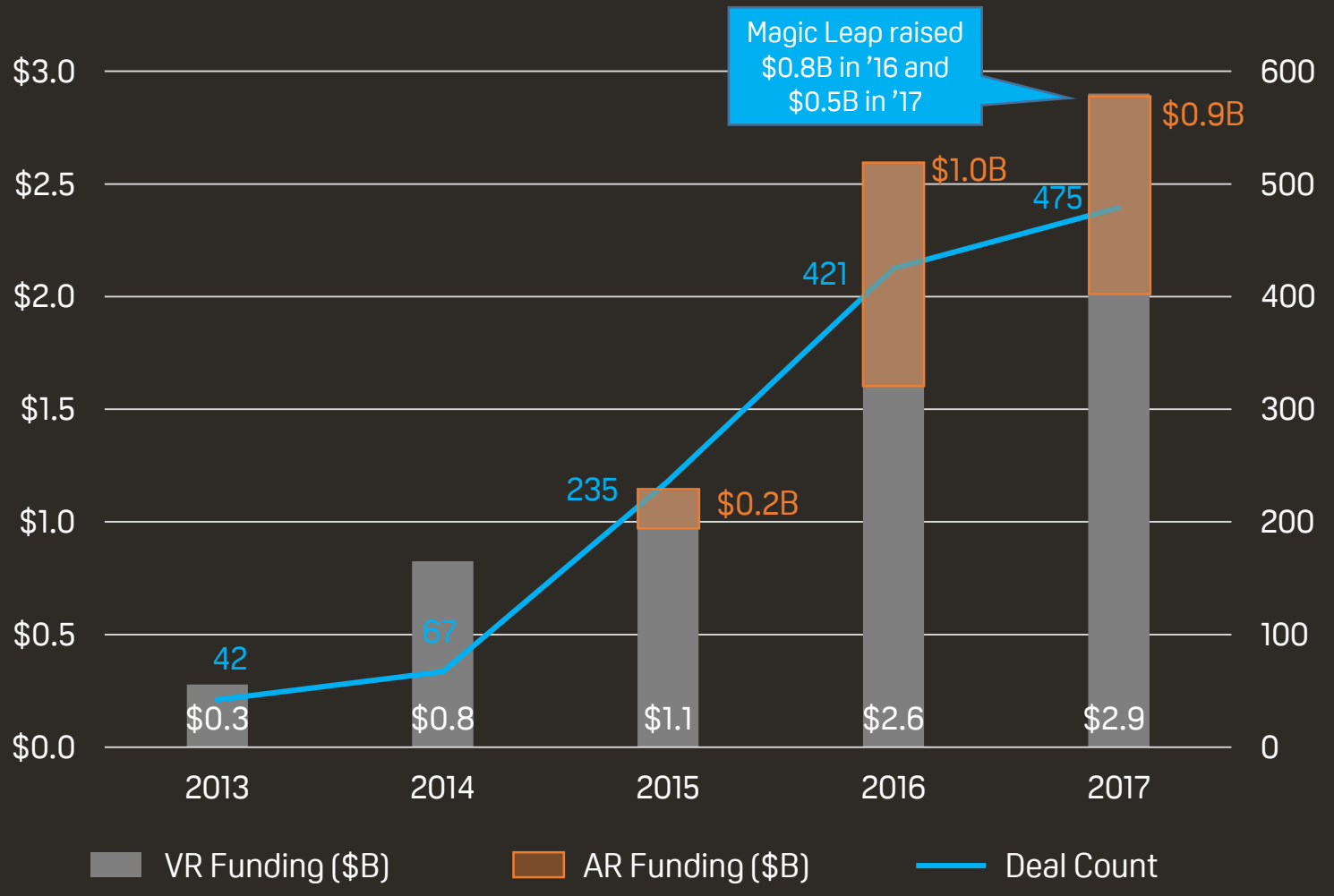
VR/AR funding increased more than 250% from ’15-’17, reaching ~$3B in 2017

VR/AR TOTAL ANNUAL GLOBAL INVESTMENT ($B)



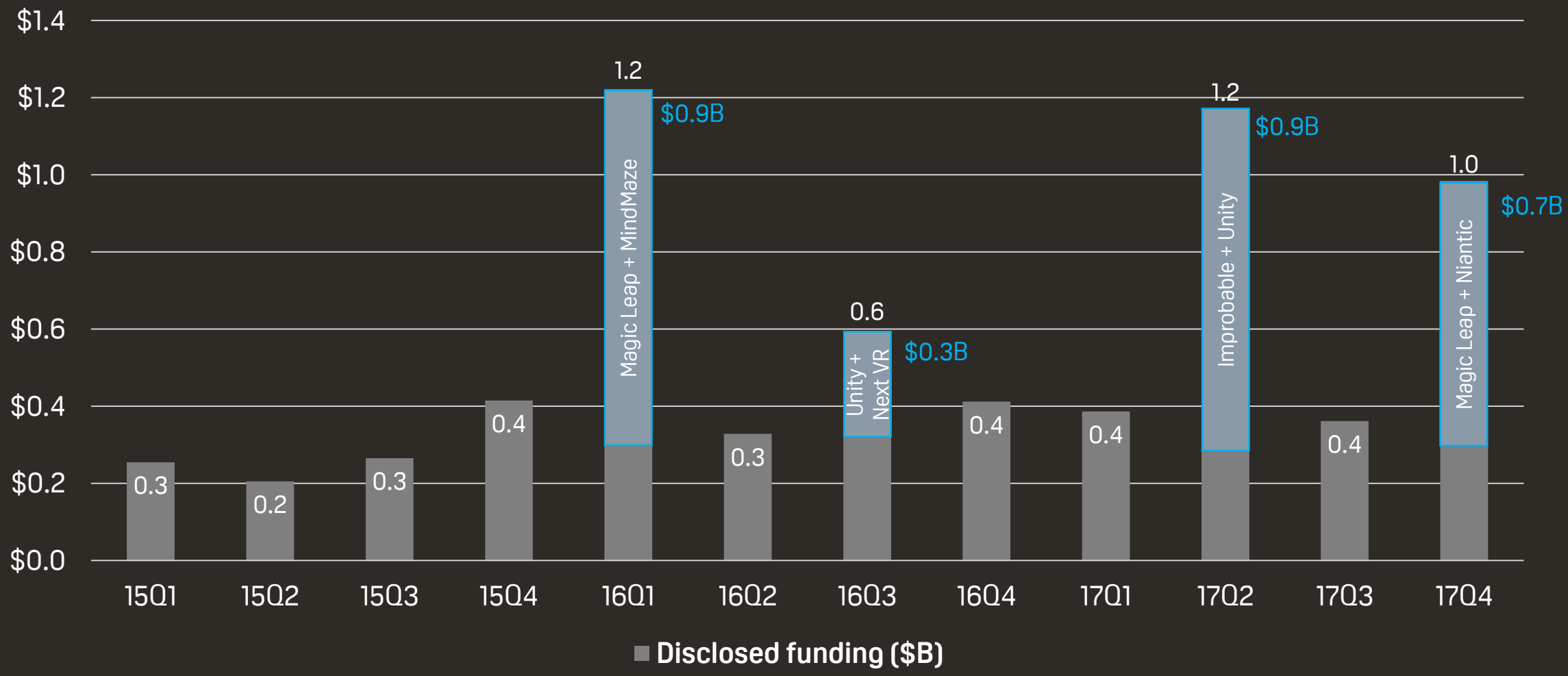
- Despite perceived slowdown in capital market, the **overall funding was still up 12%** from ’16
- Growth in ’17 was fueled by the **rapid development of AR** (~15% in ’15 to ~30% in ’17) contributed by Magic Leap and launch of ARKit
- The total funding has been dominated by **a few key large deals** since ’16:

Year	Top 3 deals (ex. Unity)	% total
2017	Magic Leap, Improbable, Niantic	~35%
2016	Magic Leap, MindMaze, Next VR	~40%

*Startups of which products could be applied to both VR and AR are categorized under which current core business is more closely associated with (e.g. higher revenue %)

Steadily growing with large spikes in 17Q2 & Q4 driven by a few high ticket deals

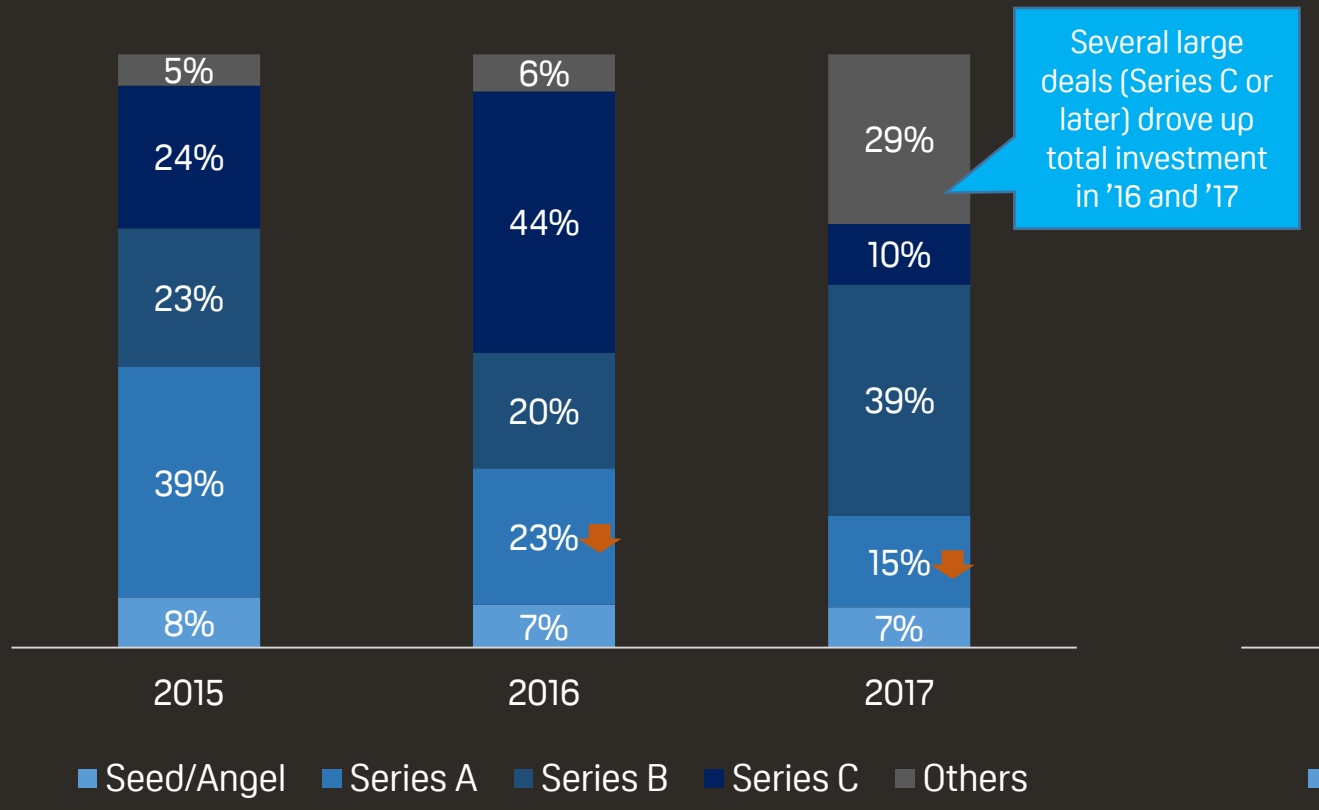
VR/AR GLOBAL INVESTMENT BY QUARTER ($B)



Abundant funding in most stages, with declining share flowing into Series A...

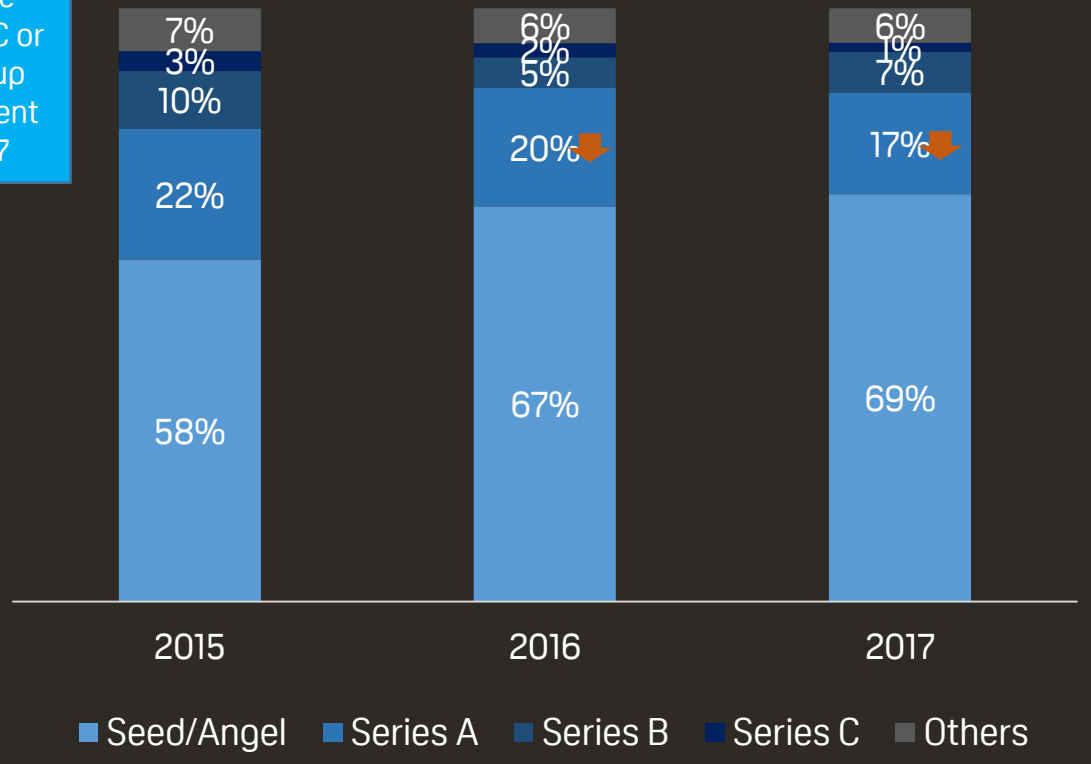
SERIES A FUNDING GREW SLOWER THAN OVERALL ...

VR/AR GLOBAL DEAL **AMOUNT** BY STAGE
(%, 2015-2017)

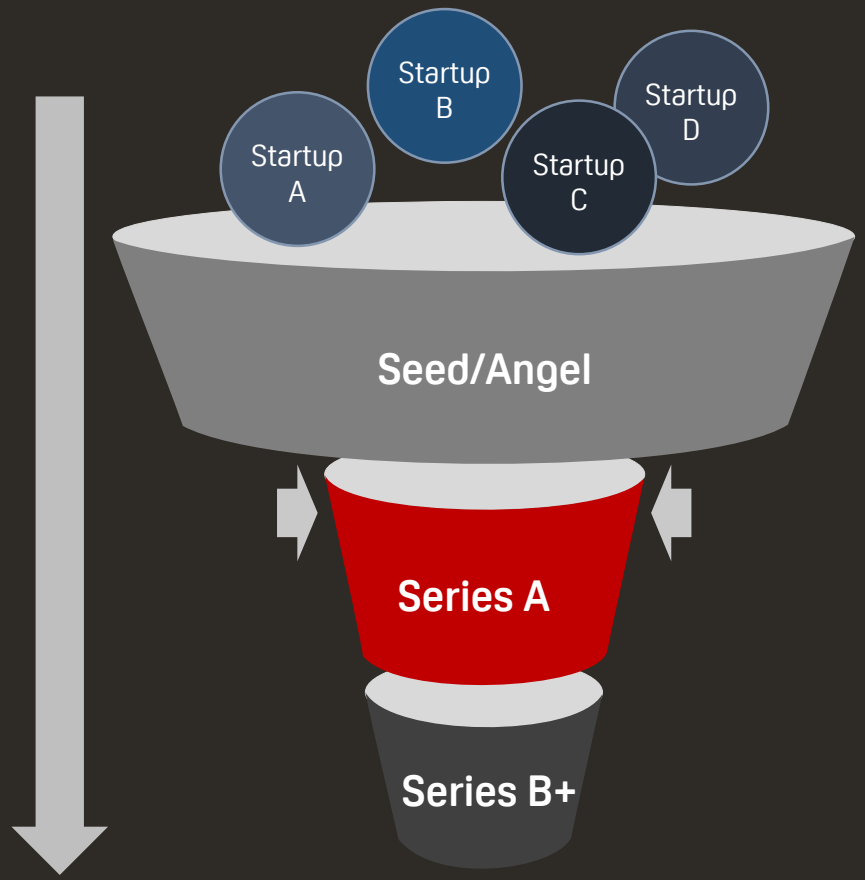


... AND ALSO DECLINED IN SHARE OF DEAL COUNT

VR/AR GLOBAL DEAL **COUNT** BY STAGE
(%, 2015-2017)



...driven by long validation cycle, limited bridging capital and deal size inflation



Avg. seed/angel deal size* ($):

'15	'16
0.8M →	1.3M

- **Long validation cycle for product-market-fit:**

  It takes longer for VR/AR startups to prove the PMF (e.g. DAU, paying customers, revenue) required for Series A given the slow uptake in hardware penetration and limited business models

- **Limited Series A capital:**

  Many of the most active VR/AR investors are focused on early-stage, and have limited appetite for leading Series A or later rounds

- **Deal size inflation:**

  Startups are raising bigger seed rounds and thus delaying Series A funding

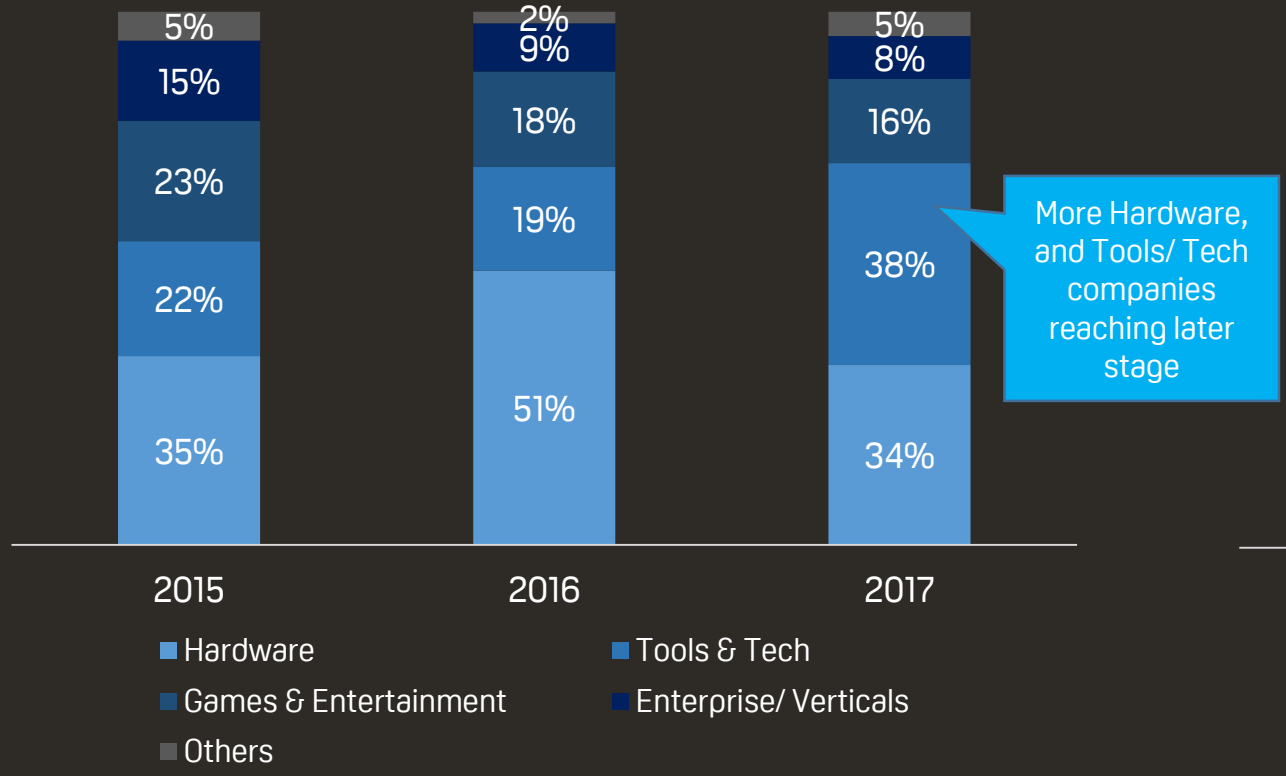
Post-seed startups need to be more flexible in funding strategies

*Exclude incubator financing or alternative instruments (e.g. small bridge loan, options, etc.) in average deal size calculation

Tools & Technologies, as well as Hardware attracted most investment; Enterprise sector is also rising quickly

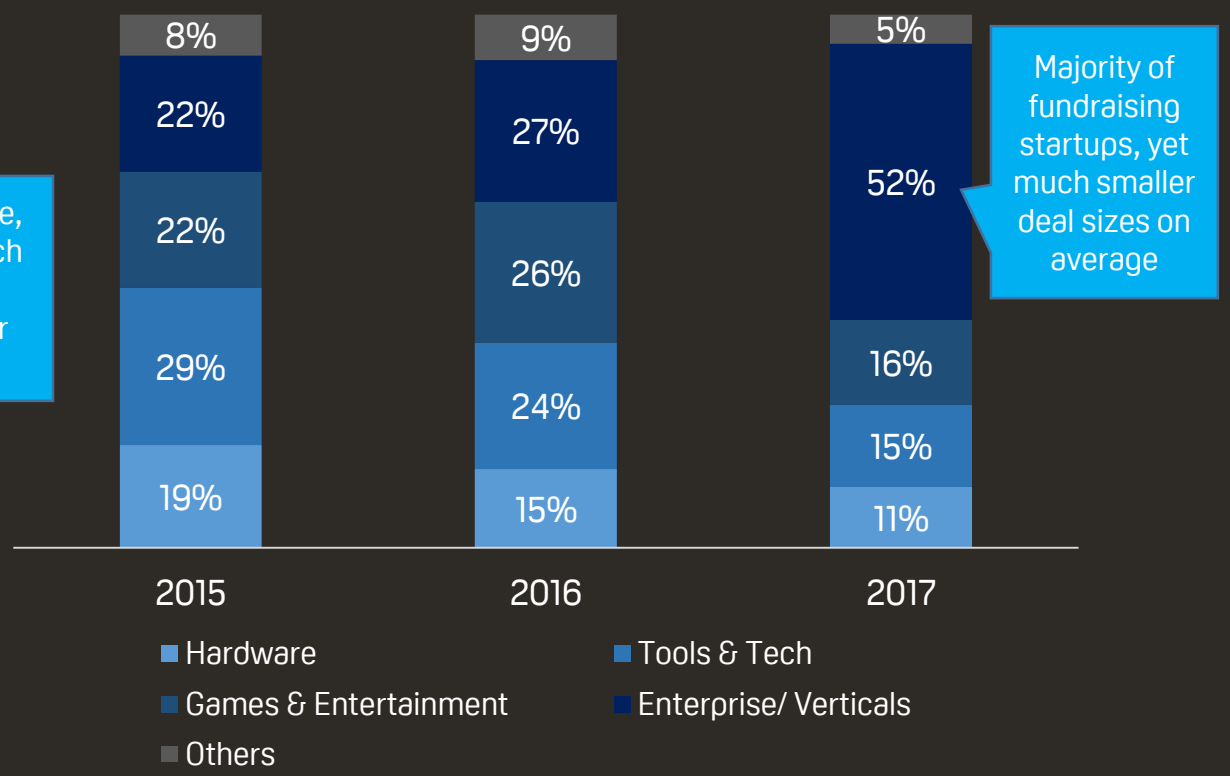
HARDWARE, TOOLS/ TECH DREW >70% OF FUNDING

VR/AR GLOBAL DEAL **AMOUNT** BY SECTOR
(%, 2015-2017)



ENTERPRISE DEAL INCREASED BY 5X

VR/AR GLOBAL DEAL **COUNT** BY SECTOR
(%, 2015-2017)



*Startups of which products could be applied to multiple sectors are categorized per the form most of their products are delivered in (e.g. enterprise services, hardware modules)

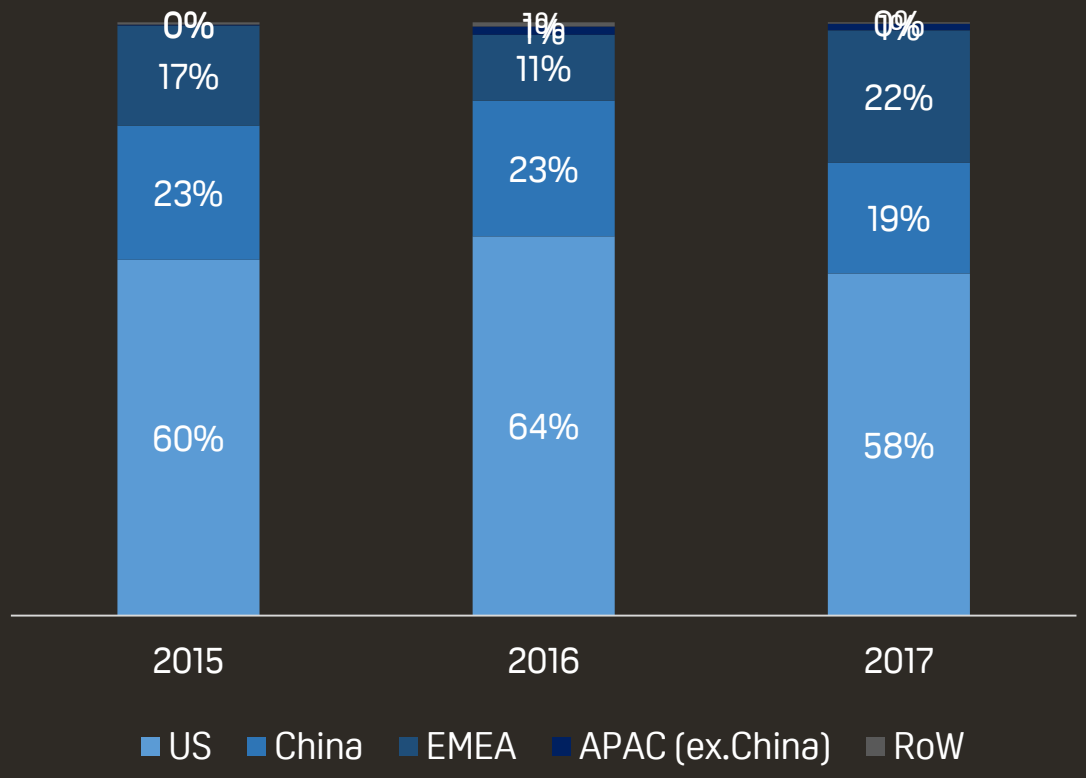
Reference: Company segment categorization

Hardware	• **VR/AR goggles, components, peripherals**, or companies of which technologies are delivered mainly in form of hardware shipment (e.g. chips, sensors, modules)
Tools	• Including **content creation** tools, middleware, **3D conversion**, user interface plug-in, data **visualization**, **user analytics** tracking tools, advertising placing tools, etc.
Enabling Tech	• Fundamental technologies applicable across platforms (e.g. **computer vision, SLAM, streaming and compression**, ARCloud, eye-tracking, etc.), mostly delivered in software
Games	• Studios that produce **VR/AR games or active "experiences"**, or companies with main business in publishing of gaming content
Entertain-ment	• Entertainment other than gaming (e.g. **360 or interactive movie studios**, film publishers, video platforms, etc.)
Enterprise/ Verticals	• **Enterprise services or solutions** (e.g. VR/AR custom project production, productivity tools), or **vertical applications** (e.g. Healthcare, Education, etc.)
Others	• **Social** applications (e.g. VRChat, Rec Room) • **Location-based Enterprises** (e.g. VR arcades, theme parks, etc.) • **Media** (e.g. Upload, RoadtoVR, etc.) • Any other not belonging to the above categories

US is still the key VR/AR investment destination, closely followed by Asia and in particular China

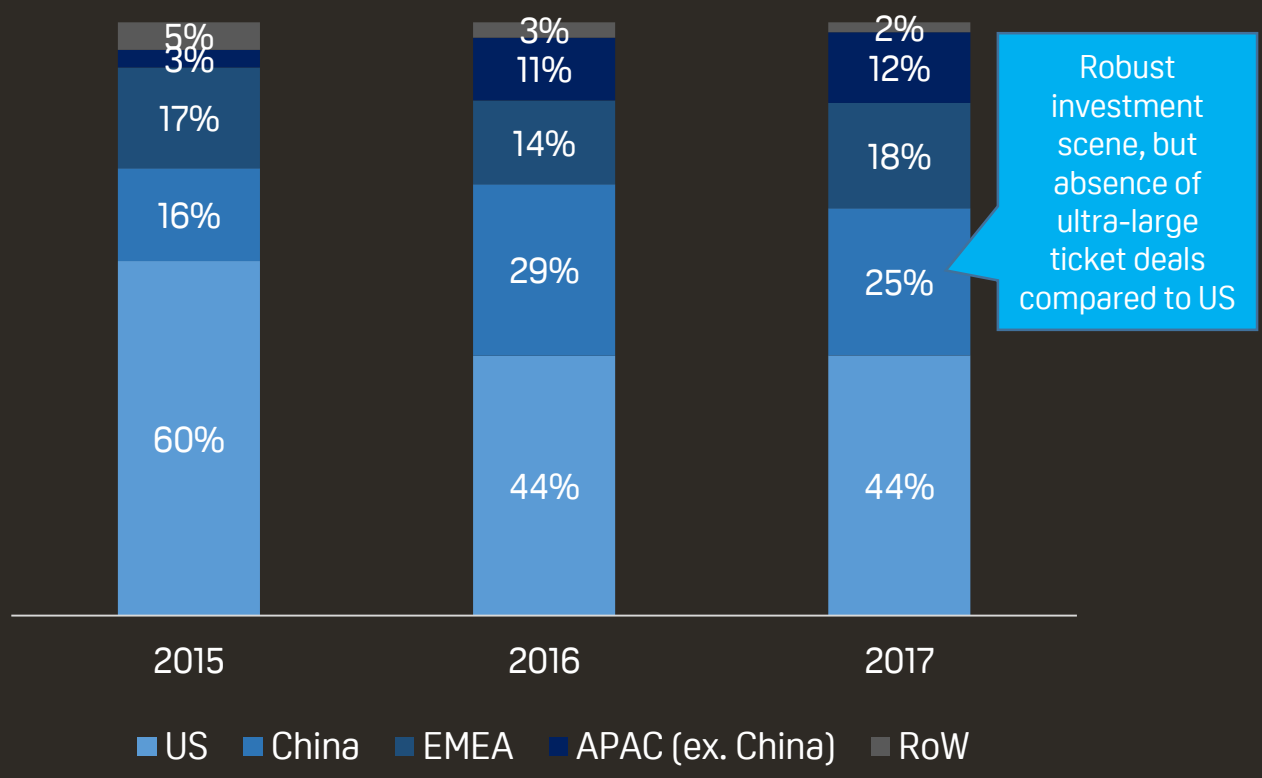
US IS STILL TOP, EMEA IS GROWING QUICKLY

VR/AR GLOBAL DEAL **AMOUNT** BY REGION
(%, 2015-2017)



ASIA DEAL SHARE DOUBLED IN 2 YEARS

VR/AR GLOBAL DEAL **COUNT** BY REGION
(%, 2015-2017)

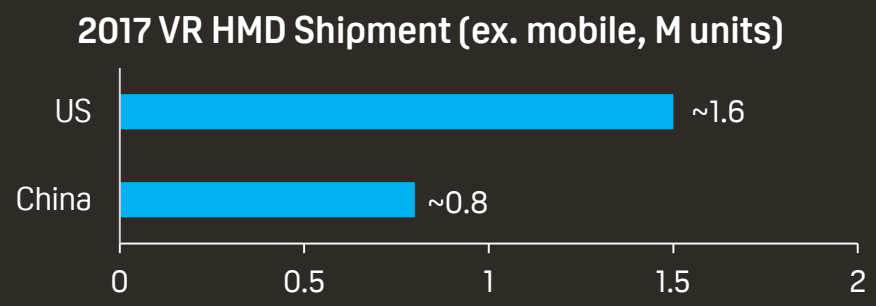


Robust investment scene, but absence of ultra-large ticket deals compared to US

China is a key region for VR/AR with unique investment opportunities

2ND BY SHIPMENT AND INVESTMENT

- **2nd high shipment globally**, high VR/AR penetration and adoption



- Large no. of OEMs for mid-segment products

大朋VR Deepoon | ANTVR 蚁视 | IDEALENS | 3Glasses | HYPEREAL

- Besides #2 investment destination, also a key source of global VR/AR funding with **active outbound investments**

UNIQUE INVESTMENT OPPORTUNITIES

- **Location-based**: >5,000 VR arcades, cinemas, and experience centers (vs. <500 in US)
- **Supply-chain**: Most HMD OEMs are based in China, also the global component sourcing (e.g. cameras, optics, display, IC, etc.) and assembly hub

Goertek | 舜宇光学科技 SUNNY OPTICAL TECHNOLOGY | IDEALENS | TIANMA | BOE | AAC Technologies

- **Education**: Strong government push for tech upgrades in schools (funding and policy initiatives)

> *"**Support schools** at all levels to build **smart campuses** with the use of … **VR technology** to explore new models for future education and teaching"*
> - Jan 17, China National State Department

> *"**Implementation of VR classes** will be carried out in **colleges and universities** from **2017 to 2020**"*
> - July 17, China Education Bureau

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Investor interests were shifting over years along with industry development

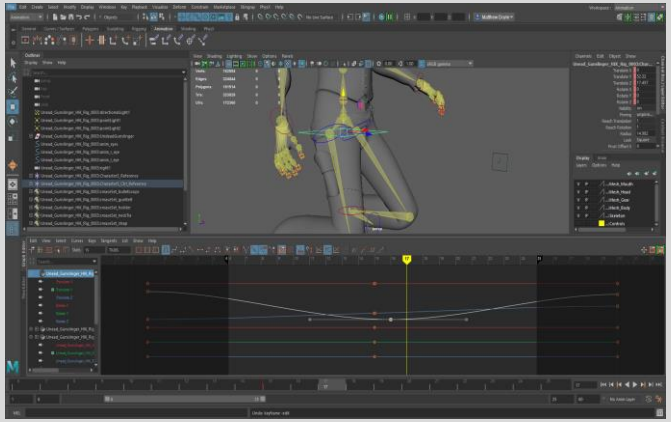
1 **Stage 1 ('13-'16)**

Key area: Hardware, Games, Social

- First generation VR HMD shipped; expecting rapid consumer penetration
- Industry desperate for content to consume

2 **Stage 2 ('16-'17)**

Key area: Tools & Technologies



- Low consumer install base and little consensus on what killer apps are
- "Selling shovels in a gold rush" - Tools and technologies that could profit from other platforms and content makers seen as safer bets

3 **Stage 3 ('17-Now)**

Key area: Enterprise, AR

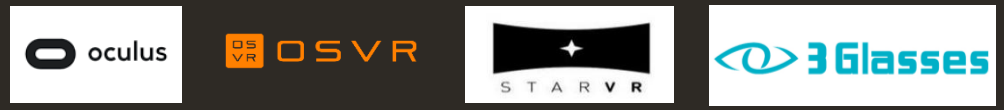
- HMD still slow to penetrate outside pro-users
- Proof of value with early customers and cashflow are strong greenlights to investors
- Launch of mobile AR & smartglasses

1 Hardware and Content: Expecting rapid consumer penetration

KEY DRIVERS

Hardware

- As 1st wave of VR HMD launched, investors expected shipment trend would follow historical pattern of smartphones
- Looking for the "Apple/ Samsung/ Xiaomi for VR"

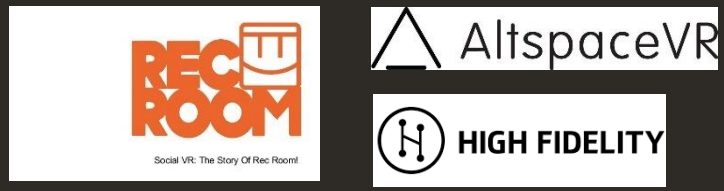


Content

- As HMDs shipped, market was desperate for good content
- Gaming and films as the most natural use cases for VR.

Social

- Potential "killer app" that amasses large consumer users with high stickiness. Searching for the "Facebook for VR"



CHALLENGES

As shipment growth was slower than expected, HMD space was quickly saturated and **OEMs with no ecosystem capability had tough time competing** with the few leaders

Low install base and **slow consumer uptake**, most content had to monetize through offline channel. Only top studios with good track record are funded; tough for new indie makers

Due to low consumer install base, **hard to reach the critical mass** for viral growth. Users were also unclear of "what to do" in virtual worlds with strangers

2 Tools & Technologies: “Selling shovels in a gold rush”

KEY DRIVERS

Tools

- Content gap remains an industry bottleneck, yet the **risk of betting on a single project or studio is high**
- Tools that help developers create better quality content at lower cost perceived to solve huge pain points, with lower investment risk

Technologies

- Many attributed the slow uptake of VR to mediocre user experience limited by hardware (e.g. motion-sickness, tether, haptics)
- Enabling tech are regarded as good investments which are **less dependent on short-term consumer penetration** and the successes of single content or platforms

CHALLENGES

- Most tool/ technology companies expected to monetize by charging license fees from **developers**, which was tough when **not many were making money**
- Some companies found themselves having to spend much effort acquiring and supporting each developer, but the **value per account was much lower than that of enterprise** customers
- Best teams will continue to receive investments from investors who understand the true value of technologies and have patience for longer investment horizon

Enterprise: Faster product-market-fit validation, higher potential to self-sustain

KEY DRIVERS

- Leaders in key segments in tools/ technologies/ platforms already emerged, leaving less space for new comers
- Hardware sales data showing **fast penetration among enterprises**, who are identified as the key early adopters besides hardcore gamers
- Through custom product development for early paying customers, Enterprise companies are able **to validate product-market-fit and monetize quickly**, and less vulnerable to adverse financing environment
- Enterprise market has plenty of low-competition niche. Compared to Consumer/ Tech where "winner takes all", Enterprise also **allows for co-existence of multiple players** and therefore has lower investment risk

Illustration

- Illustrate or pre-view products (e.g. retail, real estate, construction, advertising, etc.)

irisVR, vRetail™, MINDESK, immersv

Training

- Using simulation in trainings (e.g. customer services, maintenance, medical, police, etc.)

Surgical Theater, GOVRED, SoccerDream – The VR Football Training, serious:labs®, opaque space

Productivity

- More efficient business processes (e.g. product design, remote meetings, collaboration, etc.)

DASSAULT SYSTEMES, Teemew, MATRIX WORKS, VIRTUALITICS, TSUNAMI INTELLIGENT AR/VR

Select key VR/AR deals in 2017

Company	Segment	Country	Round	Funding raised ($M)	Select investor(s)
Magic Leap	**Hardware**	United States	Series D	$502	Temasek, EBDI, Alibaba, Fidelity Investments, T. Rowe Price
Improbable	**Enabling Tech**	United Kingdom	Series B	$502	Andreessen Horowitz, Horizons Ventures, SoftBank
Niantic	Games	United States	Series B	$200	Spark Capital, NetEase Capital, Founders Fund
Lytro	**Hardware**	United States	Series D	$60	Blue Pool Capital, Andreessen Horowitz, EDBI
Leap Motion	**Enabling tech**	United States	Series C	$50	Andreessen Horowitz, Founders Fund, JPMorgan, SOSV
Coocaa VR	**Hardware**	China	Series B	$46	Tencent
Within	Entertainment	United States	Series B	$40	Temasek, WPP, 21st Century Fox, Andreessen Horowitz
51VR	**Enterprise**	China	Series B	$32	Modernland, Sensetime, Lightspeed China, Songhe Capital
Plex-VR	**Enterprise**	China	Series A	$30	Alibaba, GSR Ventures, SAIF Partners
Noitom	**Hardware**	China	Series C	$30	Legend Capital, Haitong Kaiyuan
Dreamscape Immersive	**Enterprise**/ Location-based	United States	Series B	$30	AMC
HiScene	**Hardware**	China	Series B	$15	Seekdource Capital, V Star Capital, Meitu
Two Bit Circus	**Enterprise**/ Location-based	United States	Series B	$15	Jazz Venture Partners, Intel Capital, Foundry Group
Atheer	**Enterprise**	United States	Series C	$12	Signatures Capital, Streamlined Ventures, Shanda

Some companies are repositioning and tapping into alternative funding channels in order to raise their next round

COMPANY REPOSITIONING

- **Redefining company scope:**
  - From VR to **3D/AR/MR**
  - From VR/AR company to **vertical solution** company
  - Incorporate other frontier tech (e.g. **AI/ blockchain**)

- **Business model change:**
  - Changing **product form** (e.g. from content to SDK, from technology licenses to enterprise services)
  - Changing **monetization model** (e.g. from SaaS to custom projects)

ALTERNATIVE FUNDING CHANNELS

- **Non-traditional money:**
  Raising from **corporates** in target verticals (e.g. real estate, retail, media); **Cross-border investments** from Asian investors

- **New format of instruments:**
  Besides equity, accept **instruments like convertible notes** which delays valuation to next round upon more growth data

- **Crowdfunding/ ICO:**
  Fit only for certain startup types (e.g. Kickstarter for hardware with clear roadmap)

Advice to founders on fundraising

- Raise **larger seed round** at reasonable valuation, and keep the **burn rate low**
- Even with an ambitious company vision, start with a product that can effectively solve **clear and strong pain points** of a **specific subsets of use cases/ verticals**, and build a dominant position in a vertical first
- Have very **clear and specific milestones and metrics** as **proof of product-market-fit**; and be laser focus on growing these metrics in order to reach Series A
- If you are targeting a group currently limited by install base, **consider developing some enterprise customers** who fit with your product roadmap. It helps extend your runway; Showing early revenue streams and potential to self-sustain can also dramatically increase chance of fundraising
- While staying consistent with your value proposition, technologies and use cases, **be agile with new platforms** that might better serve or reach your target customers (e.g. standalone VR, mobile AR, etc.)
- Consider **alternative channels** for fundraising (e.g. non-tech corporate investors, ICO, etc.)

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Top 15 active VC investors in VR/AR completed ~150 deals in 2017

Ranking	Investor	Key country	Deal no.	Investment (US$)	Deal examples
1	VIVE X (ex. HTC)	Global	56	Undisclosed	7invensun, The Rogue Initiative, Limitless, Neurable
2	Presence Capital	United States	23	~3M	TRIPP, AppliedVR, 6D.ai, Torch3D, Escher Reality
3	(Tokyo, Seoul, Nordic) VR/XR Startups	Japan, Korea, Nordic	16	~2M	Pretia, Graffity, Mikai, HipFire Games
4	The Venture Reality Fund	United States	10	~9M	Torch3D, 8th Wall, Sliver.tv, Immersv, Vizor
5	Outpost Capital	United States	8	~10M	UploadVR, The Rogue Initiative, Fable Studio
6	Colopl Next	U.S./ Japan	6	~3M	Bigscreen, Floreo, 3rd Eye Studio
7	Andreessen Horowitz	United States	6	>100M	Improbable, Lytro, Bigscreen, Within, Leap Motion
8	GFR Fund	U.S./ Japan	5	~2M	Torch3D, Streem
9	Boost VC	United States	5	~1M	Vizor, Karobi, Pixelbug, VRART, Galatea
10	Bertelsmann Asia Investment	China	5	~10M	Hypereal, VeeR, AstroReality, Skybox
11	Songhe Capital	China	5	~6M	Growlib, Vanimals, Chengdu DDD, VRSpy
12	Dingxiang Capital	China	5	~5M	ShapeJoy, Asucat, EscherVR
13	UCCVR	China	4	~4M	Polyarc, Future Chukong, Micosmic, MeetVR
14	Greycroft Partners	U.S.	4	~3M	UploadVR, Camera IQ, The Wave VR, LiveLike
15	Super Ventures	United States	4	Undisclosed	Quantum Capture, Gravity Sketch, Fable Studio

*Based on public data and VC inputs; Exclude corporate direct investments and generalist incubators; Rank in order of deal counts completed in 2017

4 categories of VR/AR investors, each showing different preferences and behaviors

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M Megafund

- Institutions that have **huge AUM**, typically investing in **late-stage** large ticket deals
- **Many manages other fund products** (e.g. private equity, mutual funds, sovereign funds) investing in different asset classes

Temasek Polytechnic
T.Rowe Price Invest With Confidence
J.P.Morgan Asset Management
Fidelity Investments
中国投资有限责任公司 China Investment Corporation
KKR

G Generalist VC

- The **typical VCs** who invest in **wide range of industries** (e.g. tech, consumer, healthcare, etc.)
- Usually **don't have specialized personnel** covering VR/AR, but manage under "Frontier Tech" or "Internet"

Sequoia
KPCB Kleiner Perkins Caufield Byers
SoftBank
matrix Partners
Andreessen Horowitz

S VR/AR Specialist VC

- VCs who are **specialized** in frontier tech or VR/AR
- Most are **early-stage** investors with a **small team**; May cover smaller sub-segments (e.g. technologies, content, enterprise) by expertise
- Usually also active organizers of startup community events

colopl next
The VR Fund
Presence Capital
GFR Fund
VIVEX
Super Ventures
Superpowers to change the world

C Corporate Investors

- Corporates who invest in VR/AR for **strategic** purposes
- Include **tech giants** like Google/ Apple, and also **non-tech companies** (e.g. retail, real estate, enterprise services) who see VR/AR as complementary tech to their core businesses

Google
IKEA
Qualcomm
Deloitte.
Alibaba 阿里巴巴
Walmart

Megafund: Large syndicate investment in late-stage companies

KEY SUMMARY

- Large traditional money managers are turning their eyes to frontier tech e.g. VR/AR, driven by capital liquidity and good historical return in technology sector in recent years
- Mostly funds are financial investors with relatively less technical expertise, and thus tend to participate in syndicates and **rely on lead investors for technical due diligence**
- Relatively short investment horizon (exit in <5 years)
- Investments are **mostly made in Hardware, Enabling Tech and Tools** sectors as only such broad applications could support the **ultra-high valuation** required for future exits

DEAL EXAMPLES

Company	Investor	Core business	Deal size ($M)
Magic Leap	Temasek, Fidelity, KKR, T. Rowe Price	AR glasses	502
Unity	Silver Lake, China Investment Corp.	Game engine	400
Lytro	Allen & Co.	Lightfield camera	60
Leap Motion	JPMorgan	Hand-tracking modules	50
Within	Temasek	VR content platform	40
NextVR ('16)	China Asset Hold., CITIC Guoan	VR production	80
Blippar ('16)	Barclays, Khazanah Nasional Berhad	AR tools and services	54

G Generalist VC: More interested in AR and intersections with other frontier tech

KEY SUMMARY

- Many funds made a few VR investments early on in 15/16. Disappointed as industry grew slower than expectation, some investors **became more prudent with the sector**
- Unlike established platforms (e.g. mobile internet/ wearables/ IoT), VR/AR is still categorized under "frontier tech" by most generalist VC funds and covered by such industry teams. As **other "frontier tech" sectors (e.g. AI/ blockchain)** arise, VR/AR would need to **compete for attention** from the same coverage teams
- Some areas generalist VCs tend to be more interested in:
  - **AR** (mobile/ HMD)
  - Intersection with other frontier technologies (e.g. **computer vision/ machine learning, blockchain**)

DEAL EXAMPLES

Company	Investor	Core business
Improbable	Andreessen Horowitz	Backend for large-scale simulation
Mira	Sequoia Capital	"GearVR" for AR
ObEN	Softbank Next Media Fund	AI-powered virtual avatars
Journey Tech	Sequoia China	AR optics
Plex-VR	GSR Ventures	Reality capture
AstroReality	Bertelsmann Asia Investment	AR education

S Specialist VCs: Actively investing, yet finding new targets outside existing portfolio's business scope is becoming a challenge

KEY SUMMARY

- Predominantly **early-stage** funds (angel/seed) with an average ticket size of less than $1M
- Majority of these funds are founded in 15/16 with a typical fund life of 7-10 years. Some might be facing **pressure to invest before 18/19 to allow enough time for exit**; while those having bigger portfolio would retain money for follow-on rounds and tend less rush to invest
- As portfolios grow, it's becoming **more challenging** for some funds to **identify new opportunities that don't overlap** with their previous investments
- Some areas specialist VCs tend to be more interested in :
  - **Enterprise or vertical** applications (e.g. healthcare)
  - Tools/ Technologies that ride on **new platforms** (e.g. mobile AR, standalone VR)

DEAL EXAMPLES

Company	Investor	Core business
Escher Reality	Presence Capital	AR backend services
8th Wall	The Venture Reality Fund	AR development tool
Quantum Capture	Super Ventures	Reality capture, virtual avatars
Floreo	Colopl Next	VR therapy
Torch3D	GFR Fund	AR prototyping tool
Fable Studio	Outpost Capital	VR content

C Corporate investors: Increasing interests in startups with strategic fits

KEY SUMMARY

- Two main types of investors:
  - Tech companies (e.g. Apple, Google): VR/AR as key product in roadmap, or investing as strategic foothold for potential **disruptive technologies**
  - Vertical companies (e.g. Walmart, Time Warner): VR/AR **tools or applications** for improvement in business processes
- Very **long investment horizon** (10 years+), and some may also offer buyout as exit
- Great investor for early-stage rounds:
  - Securing not only funding but also **early customers**
  - A form of proof of **product-market-fit**
  - Bring industry knowledge and **strategic resources**

DEAL EXAMPLES

Company	Investor	Core business
DigiLens	Sony	AR projection systems
Dreamscape Immersive	AMC Theaters	VR location-based
8i	Time Warner	AR celebrity hologram
Within	21st Century Fox	VR content platform
Spatialand	Walmart	VR retail solution
Strivr Labs	BMW	VR training
Next VR	Comcast	VR live production

Many VR/AR funds are backed by corporates or governments instead of traditional LPs (e.g. endowment, pension, FOF)

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TECHNOLOGIES

Google | Tencent 腾讯 | SAMSUNG | Alibaba 阿里巴巴 | YAHOO! JAPAN | hp

GAMES, MEDIA & ENTERTAINMENT

gumi One Step Beyond. | dentsu | SHANDA GAMES | MTG | colopl | NetEase | YOUZU.COM 游族网络

GOVERNMENT

centre national du cinéma et de l'image animée | EDB singapore | 深圳市汇通金控基金投资有限公司 Shenzhen Huitong Financial Holdings | Ministry of Science and ICT

IMPLICATIONS

- **Longer investment horizon and fund life** (~7-10 years) compared to traditional LPs who expect return of investment in 5-7 years
- May influence GPs' **preferences for investment mandate** types (e.g. games/ entertainment startups for media LP, targets with some local presence for government LP)

> *"In the next 18 months, institutions that invest in **wider frontier tech** (e.g. AI, blockchain, IoT) would receive more favors from LPs than those focusing only in VR/AR"*
>
> - Founding Partner, Specialist VC

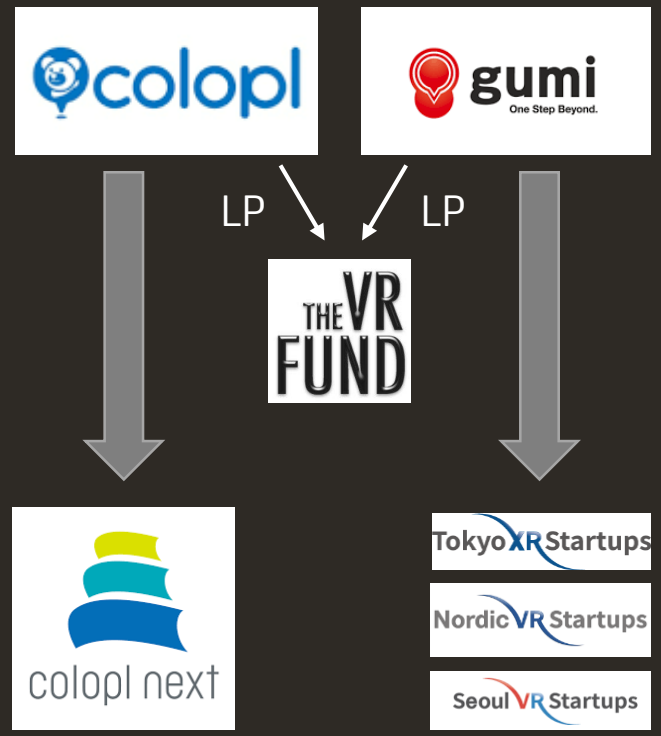
New funds with specific targets within VR/AR are also being set up

Fund name	Fund size ($M)	Investor	Investor type	Target VR/AR segment
Samsung NEXT Fund	150	Samsung	Technology	General
NetEase VR/AR Fund	315	NetEase	Games	US-based, Tech & Games
Colopl VR Fund 2	50	Colopl	Games	General
AET Fund	50	Akatsuki	Games	Entertainment
GFR Fund (previously GREE VR)	18	GREE	Games	AR/MR applications
Kaleidoscope Fund	3	Kaleidoscope	Entertainment	Premium VR content
MTG Fund	30	Modern Times Group	Entertainment	Games
XR Basefund	60	2SQRS, VRBASE, Ariadne Capital	Tech incubators	Europe-based software
Shasta Camera Fund	Undisclosed ($100K per deal)	Shasta Ventures	Venture capital	Camera, Computer-vision
Premier Ventures	150	Shenzhen government, HTC	Government	Mostly China-based
Qingdao Gov't VR Fund	75	Qingdao government	Government	China-based
Korea Gov't VR Fund	35	Korea government	Government	Korea-based

Asian capital is gaining significance and taking more active roles in investment

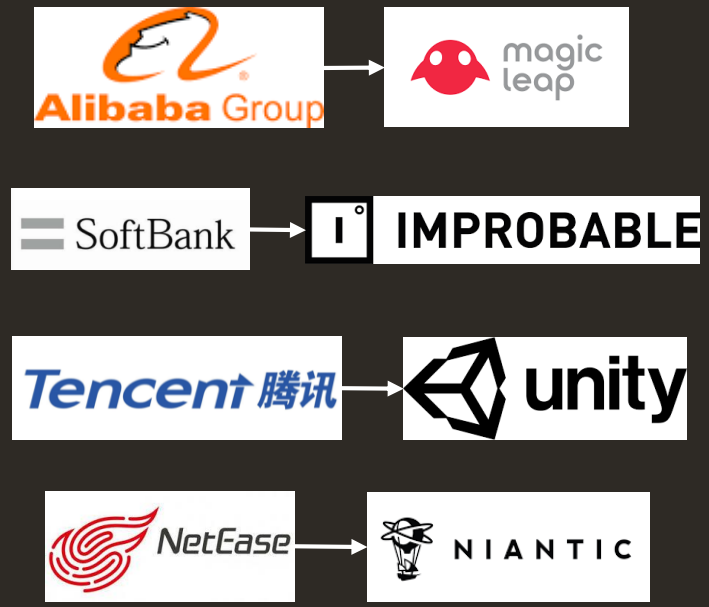
LP/ CO-INVEST

- Leverage GP expertise for exposure to the industry and deal source channel (co-invest or follow-on rounds)



DIRECT INVESTMENT

- Building internal deal sourcing and knowledge capability
- Actively participating in direct investments as key funders



CROSS-BORDER FUNDS

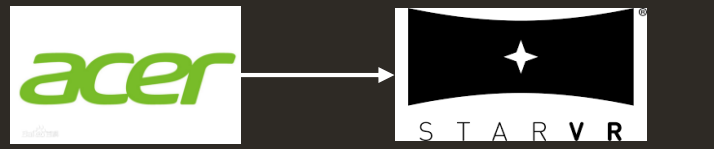
- Specialized funds that are set up for the very purpose of investing in frontier tech overseas

- Executive Summary
- Fundraising trends
- Key deal highlights
- Investor activities
- **VR/AR investments exits**
- 2018 Outlook

M&A is the predominant exit channel, and could be categorized into 3 main types

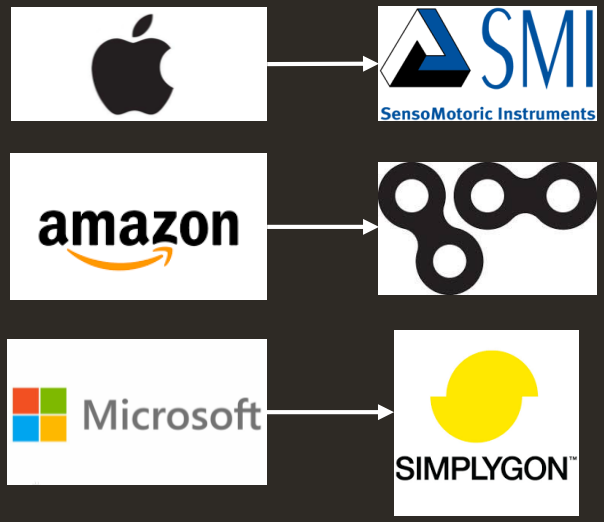
Strategic acquisition

- VR/AR startups being acquired by **large corporations** for strategic synergies or business expansion into VR/AR
- The target's products and business models are **largely intact post-acquisition**



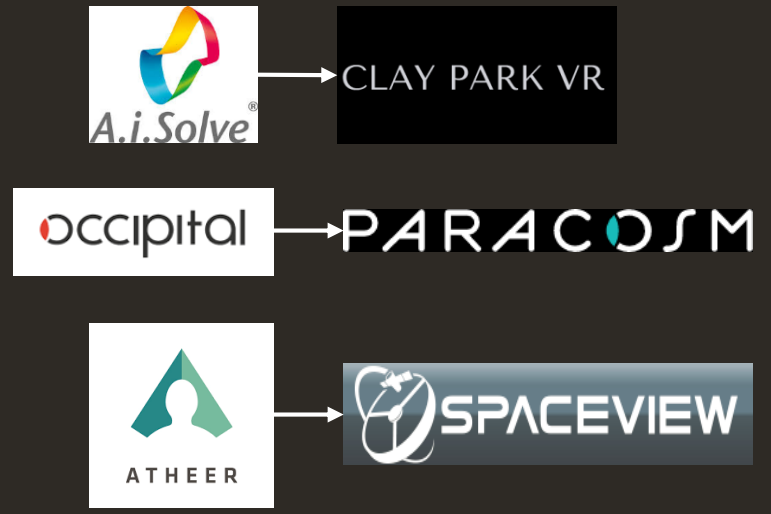
Talent/ technology acquisition

- Large tech corporates acquiring small teams with **unreleased/ early-stage products** mostly for the talent/ technologies
- The target's **business model/ products** usually **change**
- Deep **organizational integration** with the buyer



Merger

- Between smaller and **similar size companies** with similar products, business scope or target customers
- Aim at closing technological or product gaps, gaining scale advantages, or expanding business coverage, etc.



Limited exit channels in the next 2-3 years, talent/ technology acquisition as key form

- The industry is still in its early stage, with very limited channels and cases of exits observed
- **Talent/ technology acquisition** is expected to remain the **dominant form** of exit as giants like Apple and Microsoft are accelerating their VR/AR product roadmap and snapping up technology reserves. Most transactions would be under <$100M for such exits. The key areas they may be interested: **Display and optics, computer vision, tracking, user interactions, VR/AR development tools**
- IPO is possible only for very few large-scale, late-stage (typically hardware) companies who have steady revenue. The companies who might opt for this path either passed their highest growth period, or have a valuation is too high for primary placement to support

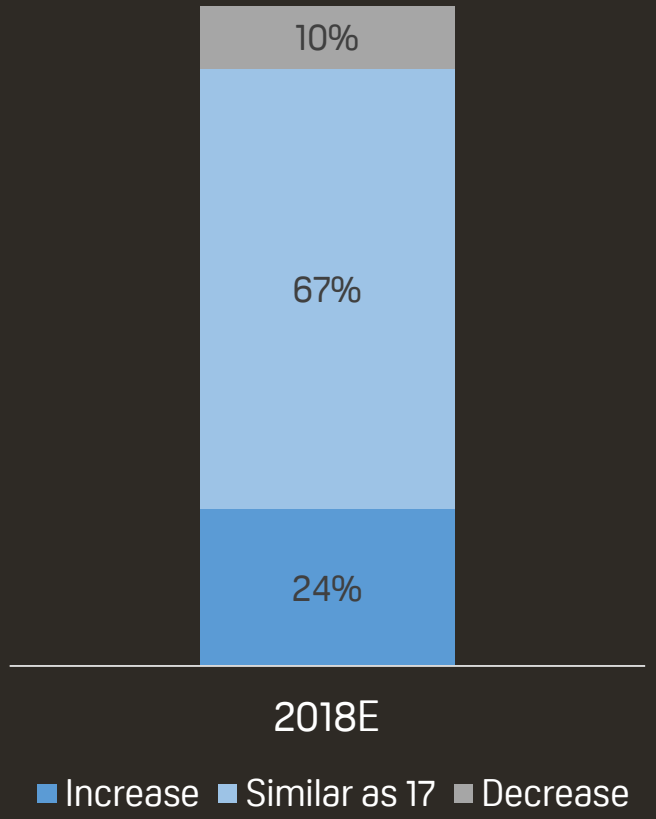
SELECT EXIT EXAMPLES

Target	Core business	Acquirer	Exit type
SMI	Eye-tracking technology	Apple	Technology acquisition
Vrvana	Mixed Reality headset maker	Apple	Technology acquisition
Nitero	60GHz wireless chip maker	AMD	Technology acquisition
Owlchemy Labs	VR games	Google	Strategic/talent acquisition
AltspaceVR	VR social	Microsoft	Strategic acquisition
Kid Neon Studio	VR design and production studio	Deloitte	Strategic acquisition

- Executive Summary
- Fundraising trends
- Key deal highlights
- Investor activities
- VR/AR investments exits
- **2018 Outlook**

Most investors expect total investment in ’18 will further increase or stay at similar level

Q: Would you forecast the 2018 total funding to increase/ stay at par/ decrease?*



		Likelihood
KEY DRIVERS	1) **Tech giants** (e.g. Apple, Facebook, Google, Microsoft, Samsung) **continue to announce new moves** and investments in the industry	●
	2) VR/AR continues to receive **strong attention on mass media** (e.g. movies, TV shows, VR version of blockbuster content, etc.)	●
	3) **Fast adoption of mobile AR** (ARKit & ARCore) in terms of enabling-devices and by developers	◕
	4) A few **high valuation startups** continue to raise **large rounds** in 2018	◕
	5) **Strong sales momentum** from affordable, high performance **standalone VR HMDs**	◕
	6) Several **AR glasses** (e.g. Magic Leap) launch and performance **living up to the high expectation**	◔

● High likelihood ◔ Low likelihood

*We asked 21 active investors whether they expect to see more investments in 2018 & why

Rise of new investment opportunities in the next 12 months

Mobile AR

- Increasing penetration of ARKit & ARCore
- Maturing developer community, and more businesses adopting

AR glasses

- Launches of new smartglasses (e.g. Magic Leap, Meta 2, Lenovo Mirage)
- Proven use cases and increasing penetration among enterprises

Standalone VR

- Shipment of 1st generation 6DoF HMDs
- Fast iteration cycles of powerful mobile chips

PCVR HMD upgrades

- More powerful HMD (e.g. Vive Pro, Pimax) launched with improved resolution and FOV
- Low-cost solution for larger-area tracking

5G

- Network equipment providers (e.g. Huawei, Ericsson) pushing 5G standards
- Telco (e.g. AT&T, China Mobile) planning 5G infrastructure installation

Mobile AR: Fast consumer penetration through large starting install base

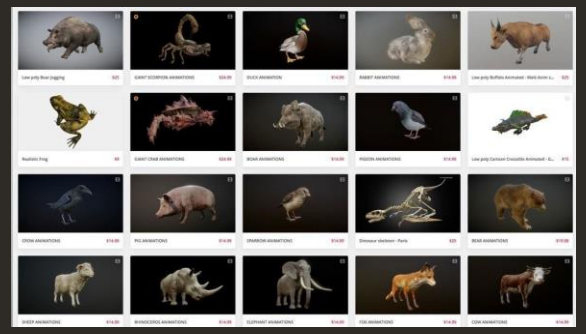
SOCIAL, GAMES AND RETAIL AS PRIMARY APPLICATIONS

- AR **remains a "feature"** in most applications, with proven value in following domains:
  - **Social**: Facial filters and hologram videos
  - **Games**: Multiplayer virtual world, strategy games
  - **Retail**: Product illustration and fitting, cosmetics
  - **Advertising**: Image/ location-based multimedia ads

SOME TECHNOLOGICAL ISSUES STILL YET TACKLED

- ARKit/Core still in 1.0 version, with much technological gap to close for mobile AR to reach full potential:
  - **Multiplayer**
  - **Persistence**
  - **User interactions**
  - Light source detection
  - Object recognition, extraction and layering
  - High quality 3D scanning

IN DIRE NEED OF HIGH QUALITY 3D CONTENT



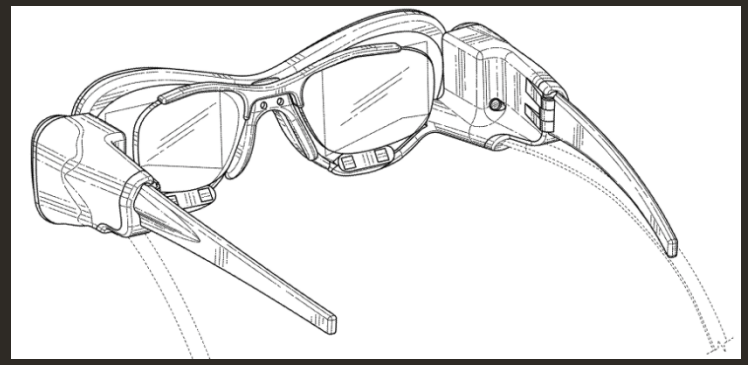
- As consumer demand surges, the industry is in dire need of **3D assets** as the **building blocks of AR content**
- Opportunities exist in:
  - **Reality capture** (e.g. 3D scanning, photogrammetry)
  - Simple 3D asset **creation and sharing** (e.g. Google Blocks and Poly)
  - **Mapping** of 3D assets **to physical objects in reality**

AR glasses: HMD/HUD OEM is getting crowded with more opportunities exist in upstream; Enterprise is still key application area in short-term

COMPETITION INTENSIFIES AS MORE PRODUCTS LAUNCHING

- More AR glasses makers were receiving funding and launching products in ’17 & ’18
- Price competition, fast product iteration cycle and scalability issue pose challenges to new entrants
- Similar to VR, players with limited **scale and ecosystem capability** will find it tough to survive in long-term

UPSTREAM SUPPLIERS TO BE BENEFITED



- More OEMs emerge and shipment expected to grow
- **Relatively less crowded**, room for 2-3 lead players to exist in each niche as buyers tend to diversify supply risk
- Opportunities exist in:
  - Optics
  - Sensors (e.g. camera/ VCSEL)
  - Tech e.g. tracking
  - Leading ODMs

ENTERPRISE RISING AS PRIMARY APPLICATION

- Constrained by the high price point, enterprise expected to remain the main use cases in the next 2-3 years
- Market is fragmented, **success relies on strong channel** capabilities
- Opportunities exist in:
  - Industrials
  - Maintenance
  - Productivity
  - Training

Standalone VR: The right type of consumer-grade hardware at current stage

DIFFERENT USERS, SCENES AND CONTENT NEEDS THAN PCVR

- Wider consumer group than hardcore gamers (e.g. **kids, female**)
- Higher mobility results in wider use scenes, and likely more fragmented use time
- **Videos**, or **light interaction casual** games with **shorter play-time** and **high replayability** will be the key form of content consumed

SOME TECHNOLOGIES ARE MORE IMPORTANT THAN OTHERS

- Different tracking technology stack (**inside-out**), constrained internal graphical computing capability
- Opportunities exist in:
  - Tracking (position and **hands**)
  - **Foveated rendering**
  - **Streaming**/ compression
  - Computer vision

FRAGMENTATION MAY BECOME AN ISSUE

- Lower entry level than PCVR; No dominating platform like Steam
- Fragmentation is likely to be an issue bothering both consumers and developers
- Opportunities exist in:
  - **Middleware** that reduces development complexity
  - **Platforms** bridging different hardware

PCVR upgrades: Enabling scaling of premium location-based enterprises, and better adoption in enterprise/ vertical sectors

UPGRADES IN RESOLUTION AND TRACKING

- Display with **3K/4K resolution** is becoming mainstream; New display tech (e.g. micro-LED, LTPS LCD) to drive up resolution and reduce cost
- **Wireless** becomes readily available
- SteamVR 2.0 lighthouses enable 10m x 10m **large area tracking** at **<5% cost** of traditional optical tracking solutions; increasing quality of inside-out tracking

PREMIUM LOCATION-BASE GROWING ACROSS REGIONS

- Premium **VR arcades** with top quality proprietary content (e.g. The Void, Dream Immersive, VRZone) proven to be wildly successful
- Traditional **offline theaters** (e.g. AMC, IMAX) and theme parks are also adopting VR
- Upgrades in display, wireless and tracking help deliver **better experience** and reduce both **capex and cost of operation**, and thus scaling of LBE

VERTICAL ADOPTION AS EXPERIENCE THRESHOLD MET

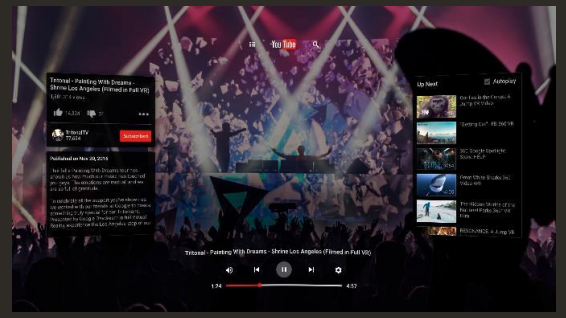
- Many enterprises showed interests in adopting but were deterred by the hardware limitation (e.g. screen door effect, latency, cable), especially for verticals that are **highly user experience sensitive** (e.g. Advertising, Sales tools, Healthcare, etc.)
- The hardware upgrades will help meet the user experience threshold of many verticals and thus result in acceleration of adoption

5G: Removing bottleneck in computing power and making VR/AR available everywhere

CLOUD COMPUTING

- Price and size of high-performance GPU, and limited computing power of mobile chips are barriers to adoption and great user experience
- 5G is moving bulk of computing demand from **on-device to cloud**
- Centralized, cloud computing to be benefited, e.g.:
  - GPU arrays for data center
  - Public IaaS
  - Architecture optimization and management software

STREAMING CONTENT AND TECH



- More **high visual quality content** will be consumed live or over streaming
  - 360, 120fps, 12K stereo videos requiring >1Gps bandwidth only enabled by 5G
- Technologies that can improve **streaming data consumption and performance** will be critical:
  - Compression
  - Streaming
  - Foveated rendering
  - Server load management

LBS/ MOBILITY APPS

- VR/AR use becoming more mobile with high bandwidth network available everywhere
- Enable content and **apps specific to locations** and user scenarios, e.g.
  - Multiplayer LBS AR games
  - Travel apps
  - Located-based 3D ads
  - Spatial navigation guide for automotive HUD

VRVCA Investment Meetings

Occurrence

- Every 3-4 months

Location

- United States
- China
- Europe

Activities

- Startup pitch & demos
- Latest industry trends and data
- Investor discussion

Apply now to participate in VRVCA investment meetings

- VRVCA hosts **regular investment meetings** in United States, China, and Europe. For each meeting, we select ~10 best startups we have seen in the quarter to **pitch and demo to more than 30 top investors**
- Since establishment, we have successfully organized 7 investment meetings, with a successful **fundraising rate of over 30% within 6 months** for participating startups

- The next VRVCA investment meeting will be hosted in around **June 2018**. **Apply today** and get access to the top VR/AR investors at www.vrvca.com/submit before the deadline May 31st, 2018

- Investors interested **in joining as alliance member please email us** at simon@vrvca.com or sean@vrvca.com for enquiries and application

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