

VR360 in Industry & Standards



Rob Koenen

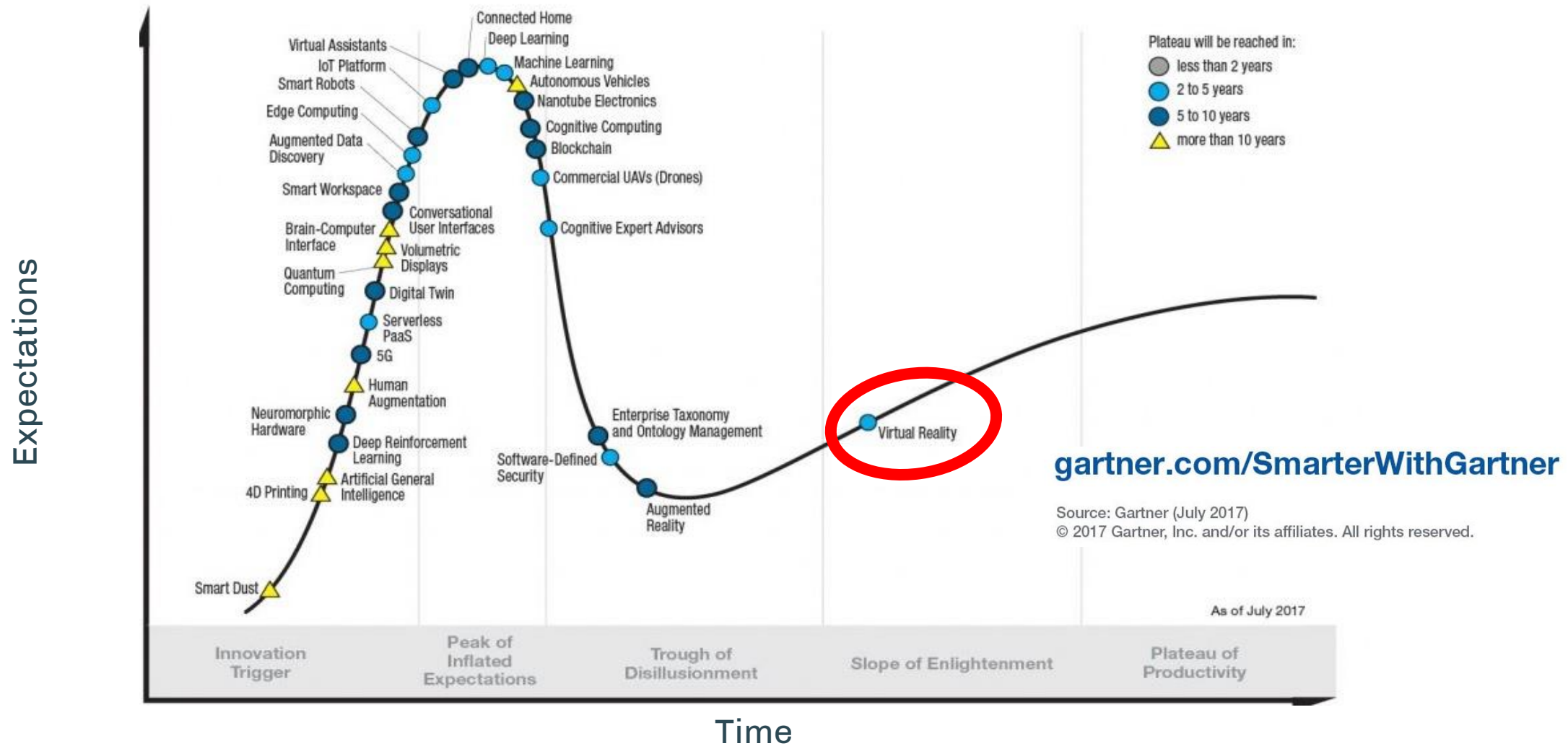
- Co-Founder and Chief Business Officer, Tiledmedia
- Principal Consultant, TNO
- President, VR Industry Forum
- Chair, MPEG Roadmap Activity



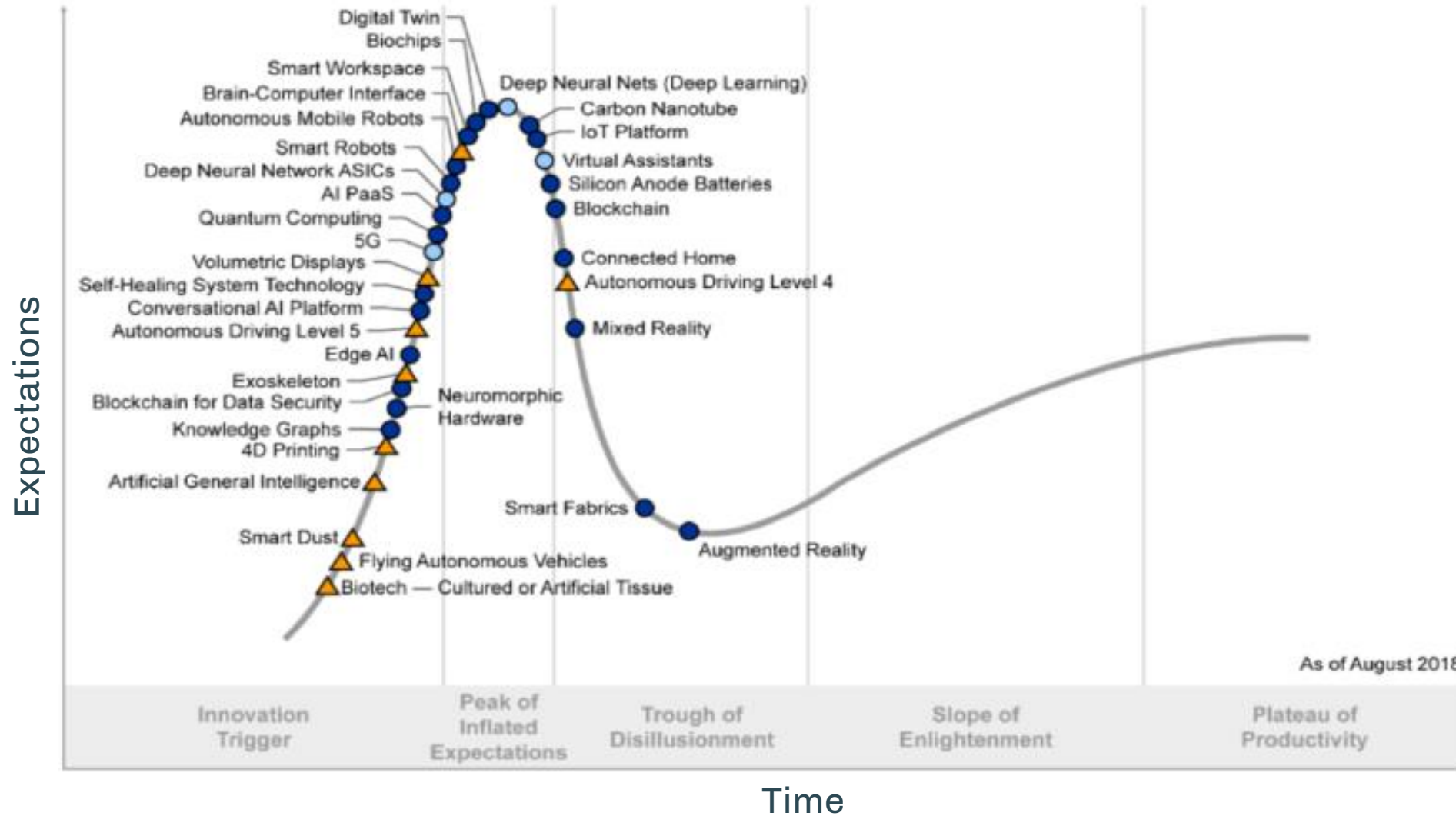
State of VR

- Hype is over
- Outlook is good
- Plenty is happening
- Live is key
- 5G will be enabler and driver
- High quality and interoperability remain key
- “Immersive” is only just beginning

Gartner Hype Cycle 2017



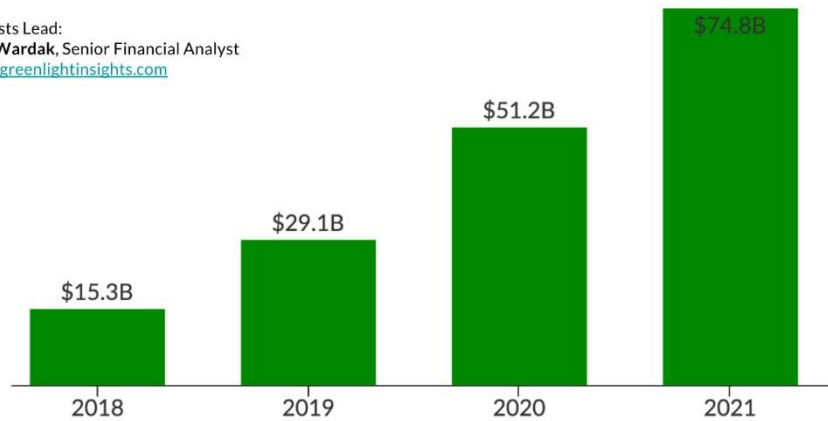
Gartner Hype Cycle 2018



Outlook is Healthy

By 2022, VR will grow to \$74.8B global marketplace, including all hardware, content, software and services

Forecasts Lead:
Omar Wardak, Senior Financial Analyst
omar@greenlightinsights.com



Source: 2017 Virtual Reality Industry Report, Greenlight Insights
Note: data as of March 2017

PRESENTATION ©

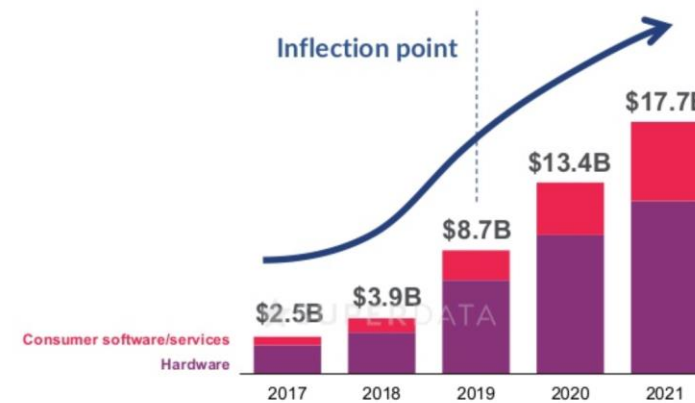
Greenlight
Insights

Greenlight Insights (Alexis Macklin, CES 2018, at VRIF Masterclass): Total Revenue

Superdata (Stephanie Llamas, at VRX Europe2018): Consumer Revenue

The Virtual Market's Slow Start

Virtual Reality consumer revenue by segment: 2017-2021
Billions of USD, worldwide



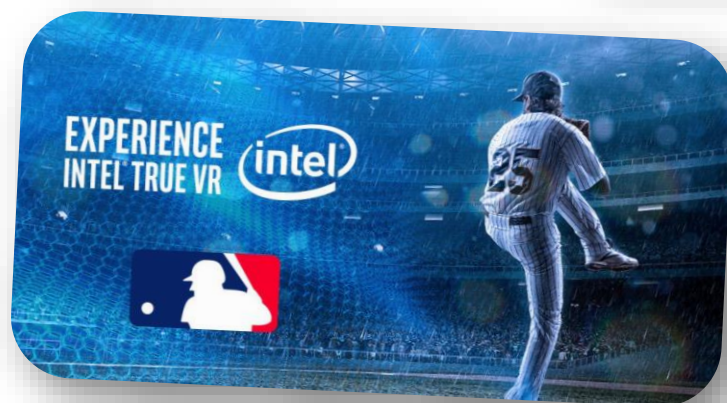
2019 = major turning point:
revenue will more than
double year over year.

State of the XR Industry, VRX EU | © 2018 SuperData Research Holdings, Inc. All rights reserved.

@stephinaners | @VR_Intelligence | #VRX2018 ★ SUPERDATA

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Services



And many, many more ...

But also non-entertainment

- Training and Education
- Healthcare
- ...



Early Adopters ...



After the Hype



- Stand-alone devices, no strings attached
- Tracking built in 3DoF or 6 DoF

- But: most of VR consumption is still on flat devices!

Ecosystem is developing



mistika VR



Ecosystem is developing



Ecosystem is developing



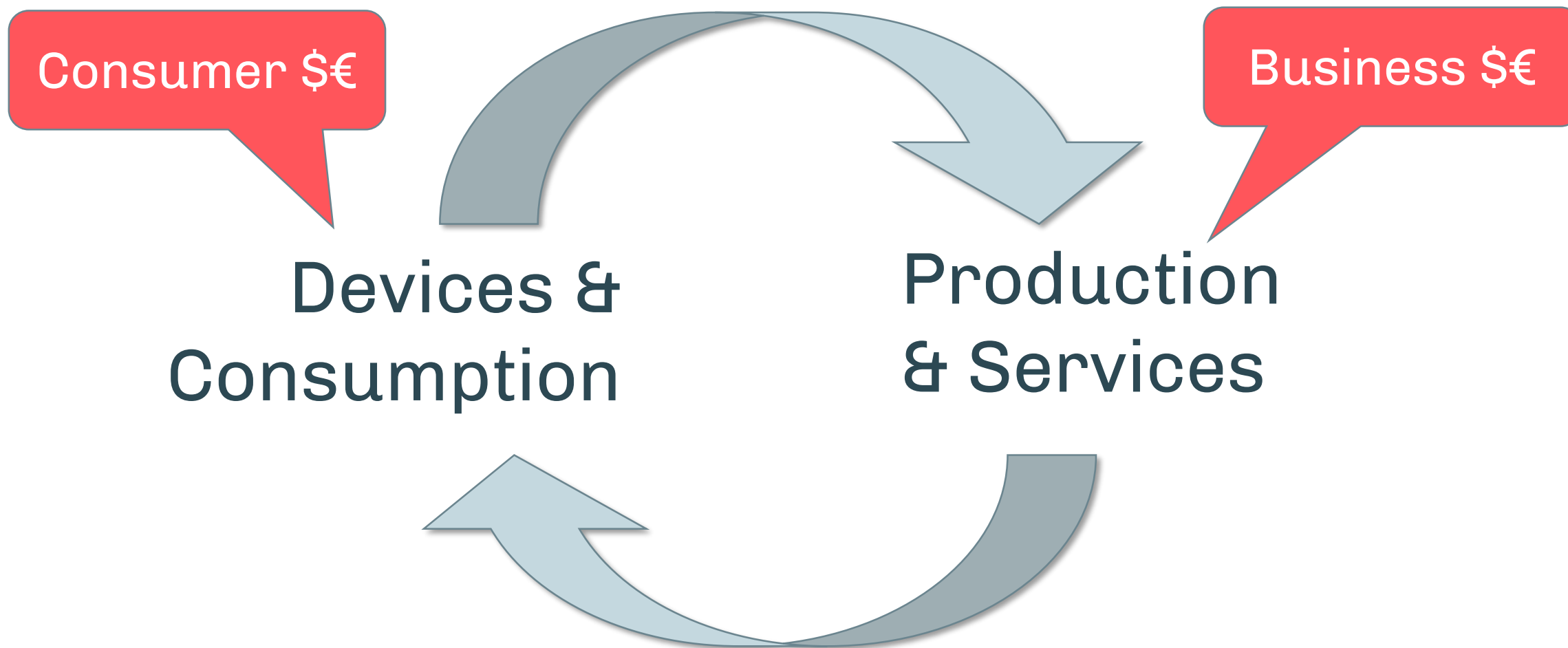
imeve



mistika VR



Growing the Ecosystem

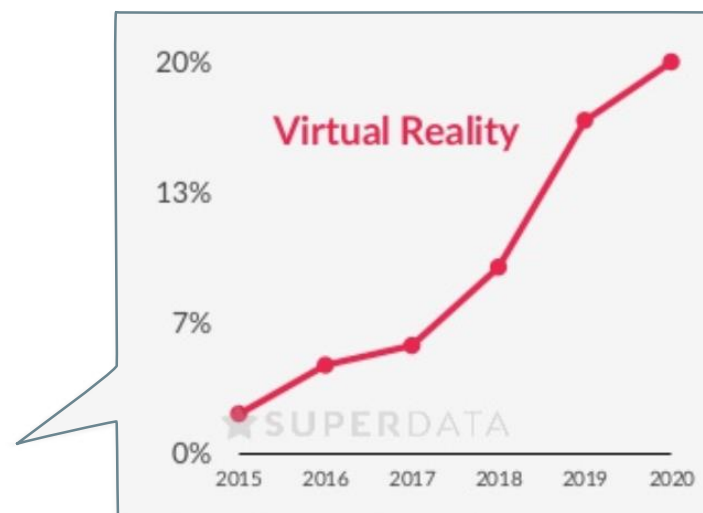
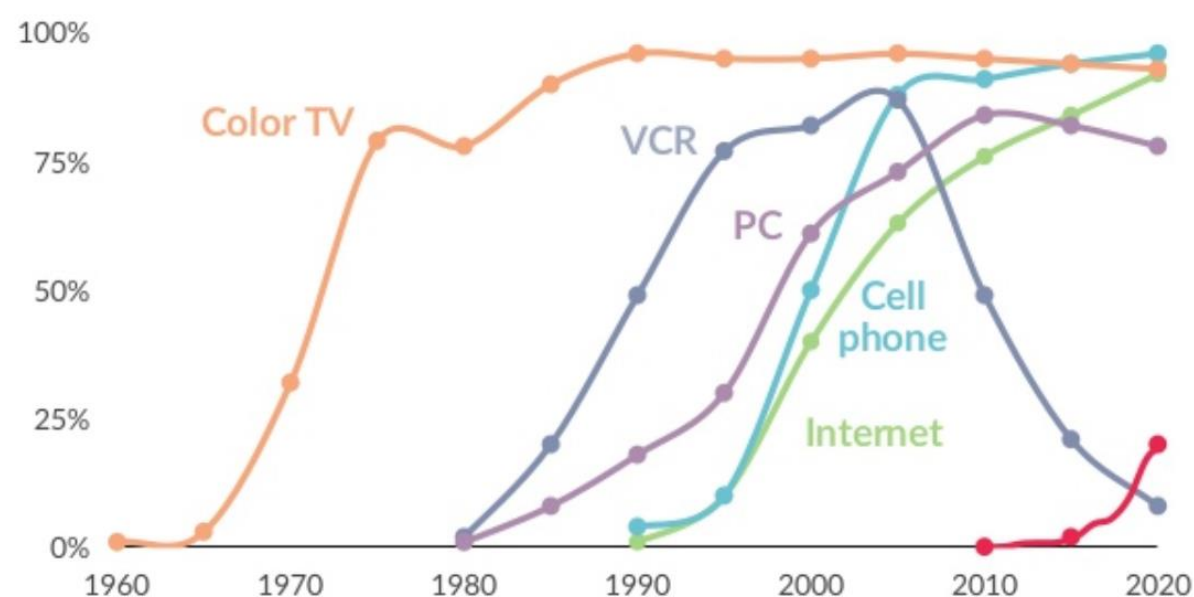


Growing the Ecosystem



VR Adoption is on schedule




Technology adoption rates
Share of U.S. households, 1960-2020



*Includes Google Cardboard-based devices.
Sources: Michael Felton, The New York Times; Pew Research Center; Gallup; U.S. Census; SuperData Research

VR360: A BRIEF WORD ON STANDARDS

Standards

- MPEG finished Omnidirectional Media Format (OMAF) 
- 3GPP approved first set of media profiles VR360 Streaming in September 2018. Includes VR in the first Release of 5G 
- VRIF Published “Guidelines” in January 

VR Industry Forum (VRIF)

*To further the widespread availability of
high quality audiovisual VR experiences,
for the benefit of consumers*

VRIF Membership



Creating a Market for 360VR

- **Consumers**: high-quality, cross-platform experience with great content
- **Content and service providers**: single format with wide reach
- **Device makers**: wealthy, premium quality content pipeline
- **Advertisers**: drive creation of broad, unique & innovative sales channel



VRIF Guidelines

- Guidelines January 2018
 - Production
 - Distribution
 - Security
 - Human Factors
- Guidelines Planned of Jan 2019
 - Live VR
 - HDR
 - Text & Fonts
 - Watermarking
 - Presentation APIs?
- Software & Tools



MPEG's 5 year Roadmap Focuses on Immersive Media



Jan 2017

2018

2019

2020

2021

2022

Jan 2023

Genome Compression

Genome Compression v.2

Descriptors for Video Analysis (CDVA)

6 DoF Audio

Point Cloud Compression

PCC Extensions?

Versatile Video Coding

3DoF+ Video

Dense Representation of Light Field Video

Scene Description for Immersive Media

Network-Based Media Processing

6 DoF Application Format?

OMAF v.1

OMAF v.2

Media Orchestration

MIAF

Web Resource Tracks

IoMT

Coding

Systems and Tools

Jan 2017

2018

2019

2020

2021

2022

Jan 2023

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Network-Based Media Processing

OMAF v.1

**VR360, on-demand
and live (3 DoF/+)**

OMAF v.2

Media Orchestration

MIAF

Web Resource Tracks

IoMT

Coding

**Immersive Media
with 6 Degrees of Freedom**

**Combining Natural
and Synthetic content**

**Systems
and Tools**

Jan 2017

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ding

Systems
and Tools

Up Next ...

Marius Preda

Advances and Standardization in Point Cloud Compression

Break

Adrian Murtaza

Immersive Audio Technologies for VR Applications

Jon Karafin

State of the Art in Light Field technology