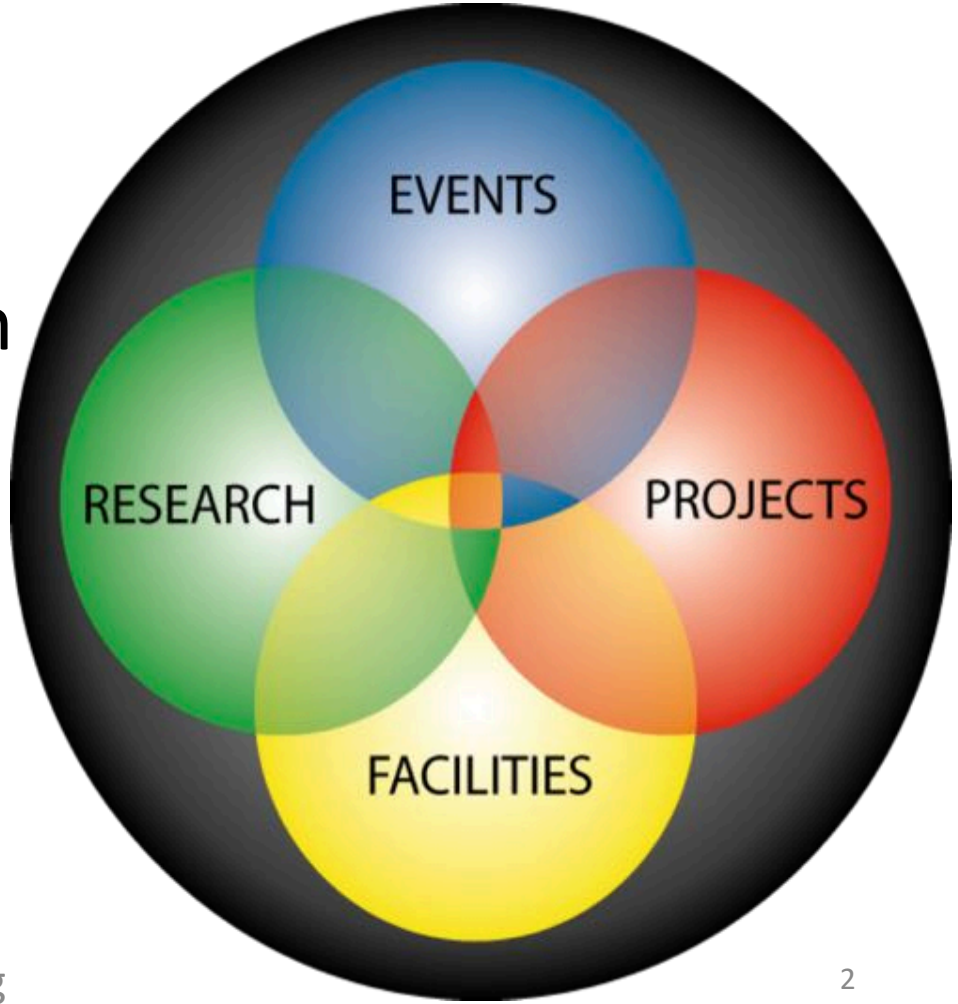
Hollywood's Journey into VR

Phil Lelyveld
University of Southern California
Entertainment Technology Center

USC School of Cinematic Arts

etc SM ENTERTAINMENT TECHNOLOGY CENTER

Founded 1993 by George Lucas to bring together technology and entertainment visionaries to collaborate on the future of entertainment technology



Adamantly neutral

- Discussions
- Collaborations
- Research
- Coverage

Current Member Companies

Agenda

1. Basic concepts
2. Language of VR
3. Importance of Social VR
4. A few brief digressions
5. Pain-points, opportunities, issues to address
6. AR and story
7. The business of VR and AR
8. Close

Basic concepts

In Augmented Reality, the world that you would normally see if you walked down the aisle without the screen is being augmented – enhanced, supplemented, added to - with additional data and experiences.

In Virtual Reality you are virtually – nearly, almost – but not really there in the grocery store aisle.

The AR – Reality – VR Continuum

Augmented Reality

Reality

Virtual Reality

Transitional
Mixed Reality
Blended
Reality

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Commercial Definition

VR – Blocks out world

AR – see-thru overlay

Different ways to have a VR experience

Magic Window

Cellphone-based viewer

Head Mounted Display (HMD)

Group VR

Virtual Reality on Cellphone or Tablet
"Magic Window"

Swipe

Tilt and wave

Near $0 cost of entry

Cellphone-Based Viewer with Headphones

Near $0 cost of entry

Head Mounted Displays with Peripherals

Oculus Rift with Oculus Touch

VR 人机互动模式
单纯头部转动的 VR
CARDBOARD,
GEAR
坐或站着玩的 VR
RIFT, PSVR
空间走动式/
精确三維定位的 VR
全球唯一的
HTC VIVE

Location Based Entertainment

The Void opens Times Square VR Center

First attraction: “Ghostbusters: Dimensions”

Opens July 1, 2016, developed in cooperation with the movie

$30M joint venture with China's Songcheng Performance Development to build VR and MxR attractions

Location Based Entertainment

China's Suning Commerce Group plans to open 300 9D VR experiences in the next 3 months

Aspirational (long R&D history)

Core Characteristics of Virtual Reality

Dr. Brenda Laurel, PhD

1. Complete surround environment.
2. Affordances for depth perception and motion parallax.
3. Spatialized audio, not just stereo.
4. Affordances for tracking the participant's direction of motion distinct from the direction of gaze.
5. The participant's sensorium as the camera.
6. Natural gesture and movement.
7. Affordances for narrative construction.
8. The principle of action (to take action in the world and perceive the effects).

Commercial

Different ways to have a VR experience

Magic Window

Cellphone-based viewer

Head Mounted Display (HMD)

Group VR

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Consumers don't buy technologies, they buy the experiences that the technologies deliver

Storymaking

Gaming

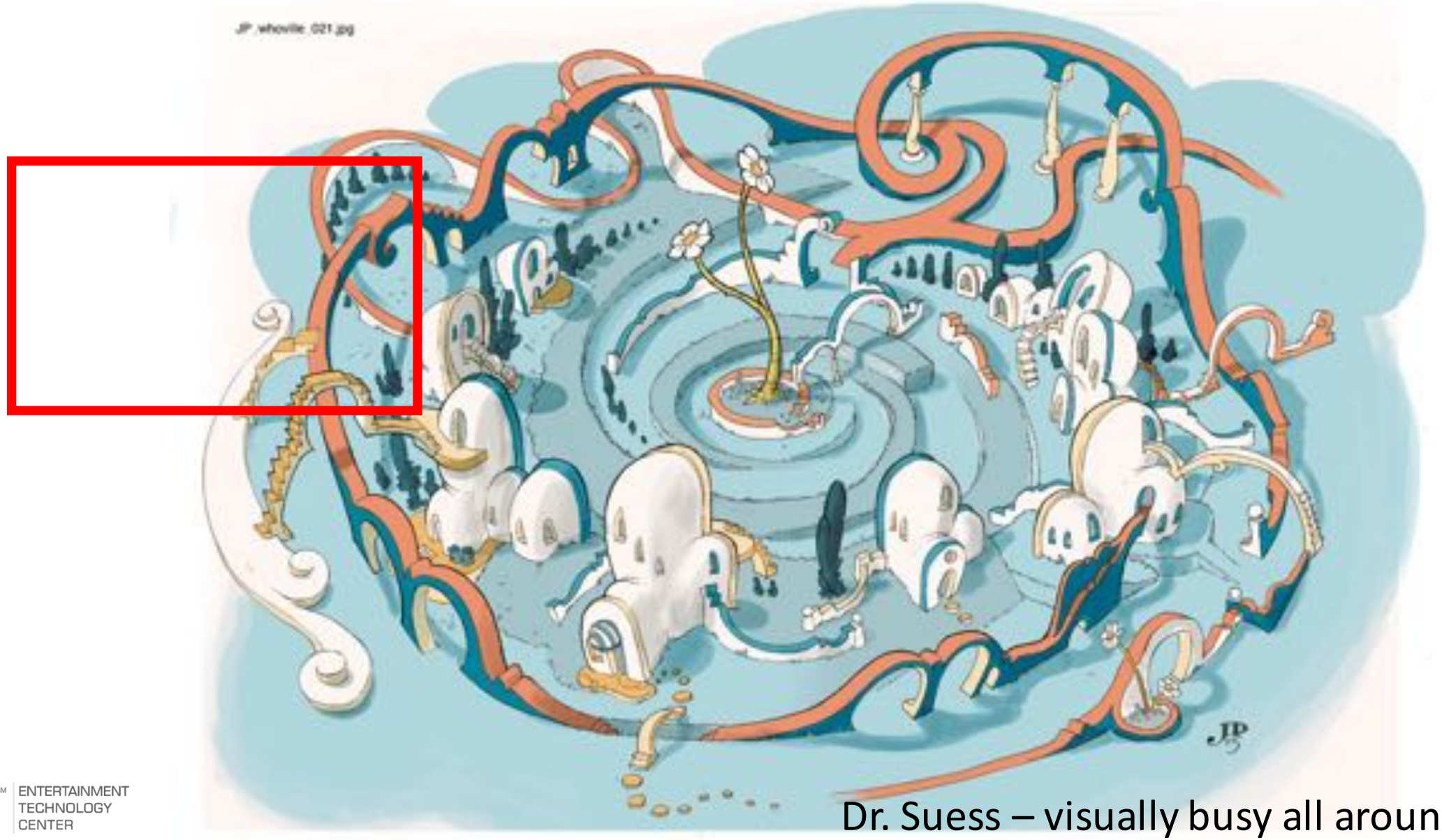
Education

Social

Business

Language of VR

Have a reason to do VR!



Dr. Suess – visually busy all around

Sense of ‘Presence’

International Society for Presence Research

- Definitions
- Tools to measure presence
- ispr.info

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Heightened Sense of Empathy

Henry

Oculus Story Studio

Grand Theft Auto video-game designer Joseph Delgado, upon experiencing the VR version of GTA:V

"I feel horrible about making this," …"You actually feel guilty. My mouth dropped the first time I shot someone in my GTA:V VR setup."

Heightened Sense of Empathy

3D facial expressions evoke stronger emotions than their 2D counterparts due to the illusion of non-mediation

Source: 11/24/15 research from Aalto Univ. & Univ. of Helsinki

Agency

“Hunger” (Virtual Food Bank) by Nonny de la Pena

Psychology of VR
Dr. Kimberly Voll*
GDC 2016

"Fidelity Contract"

- the rules, typically unspoken, of the VR experience
- the brain anticipates consistency
- simplicity and fidelity produce a better flow state
- break the contract and the brain immediately notices

"Presence is proportional to the amount of immersion"

Jean-Pascal Beaudoin, Headspace Studio

* Dr. Kimberly Voll, cognitive scientist, programmer, game developer at Riot Games and Radial Games

ETCentric article by Don Levy, 3/16/16

etc SM ENTERTAINMENT TECHNOLOGY CENTER

VR Code of Ethics

By Michael Madary and Thomas Metzinger*

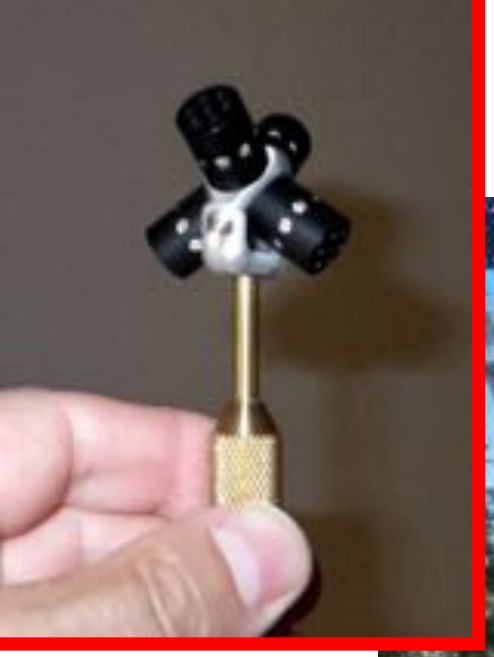
1. Do not cause lasting or serious harm to the subject
2. Inform the subjects of potential lasting and serious behavioral effects, including unknown impact
3. Avoid over-hyping the benefits of VR, especially in the context of medical treatment
4. Be aware that VR experiences can be used for both good and negative goals
5. Adopt procedures that ensure a commercial VR user's privacy, especially when it comes to personal tracking data
6. Adopt procedures that ensure that privacy is maintained i
   we move toward detailed personal data tra
   influence.

Easier to establish ethics early than transition to them after business practices are established
- Standardization efforts -

*two philosophers from Germany's Johannes Gutenberg U
http://journal.frontiersin.org/article/10.3389/frobt.2016.0000
http://motherboard.vice.com/read/vr-code-of-ethics

Sound

Sound



Wild – The Experience, VR short from Fox (Reese Witherspoon, Laura Dern)

Spatial Audio

Pain Points

- Sound capture and x/y/z tracking

Live VR Production
NY Philharmonic – Concerts in the Park

Sound

SVRA
Seattle VR Audio Meetup

AUDIOVR
AudioVR.com

2016 AES International Conference
Audio for Virtual and Augmented Reality
September 30 - October 01 | Los Angeles, USA
Co-located with the 141st AES Convention

A few more thoughts on VR storytelling

Music Videos

“Old Friend” by Tyler Hurd

Split Screen

$360^0 = 2 \times 180^0$

From “Water Poverty” by Andrick Bregman

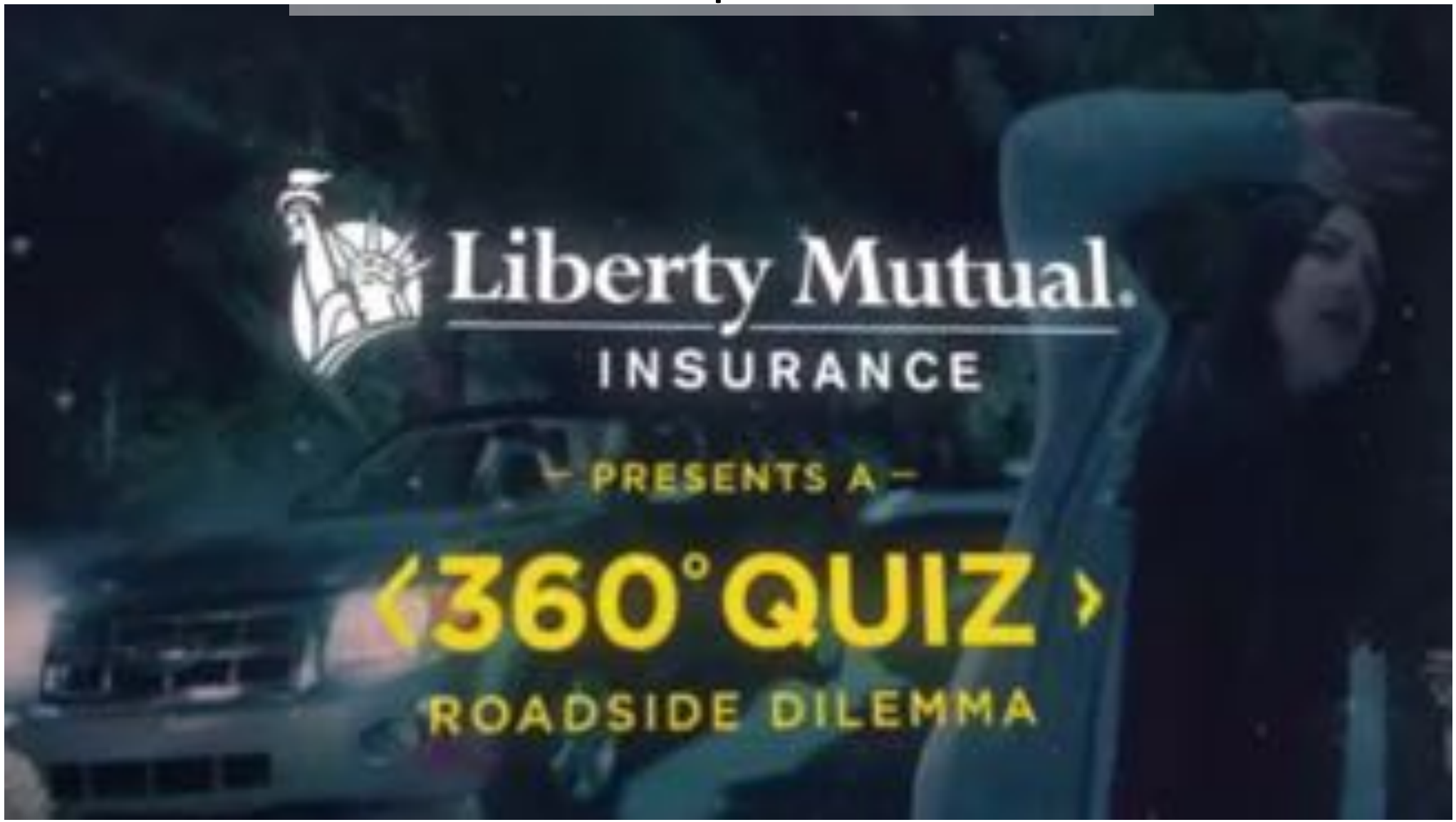
Abel Gance's Napoleon
1927

Narrative live-action storytelling in a gaming world

Game mechanics ?versus? Linear storytelling

CTRL

Consumer & Corporate Education



VR Quiz: What info to capture after an accident.

All Software > Utilities > Disney Movies VR

Disney Movies VR

Community Hub

Transport yourself into the wonderful world of Disney from your very own living room with Disney Movies VR. This app is a fully-immersive Disney experience where you can visit themed worlds, including Disney, Marvel, and Lucasfilm, and interact with some of your favorite characters in their natural environments.

User reviews:
OVERALL: No user reviews

Release Date: May 16, 2016

Popular user-defined tags for this product:
Utilities

Storymaking - letting go, acknowledged shared responsibility between creator and audience

"The story can emerge afterward in the head of the audience"

Jacki Morie, pioneering VR/AR artist

The Martian VR Experience

The ultimate VR experience will be a story that knows you are in the story.

Mark Bolas

News

Perceived as ”objective”
because 360^0,
but someone is choosing
camera placement

VR on planes
(constraints drive creativity)

Cars are rolling entertainment centers

Planes are flying entertainment centers with restricted passenger motion

Develop or modify VR content for primarily forward-looking, limited motion experiences

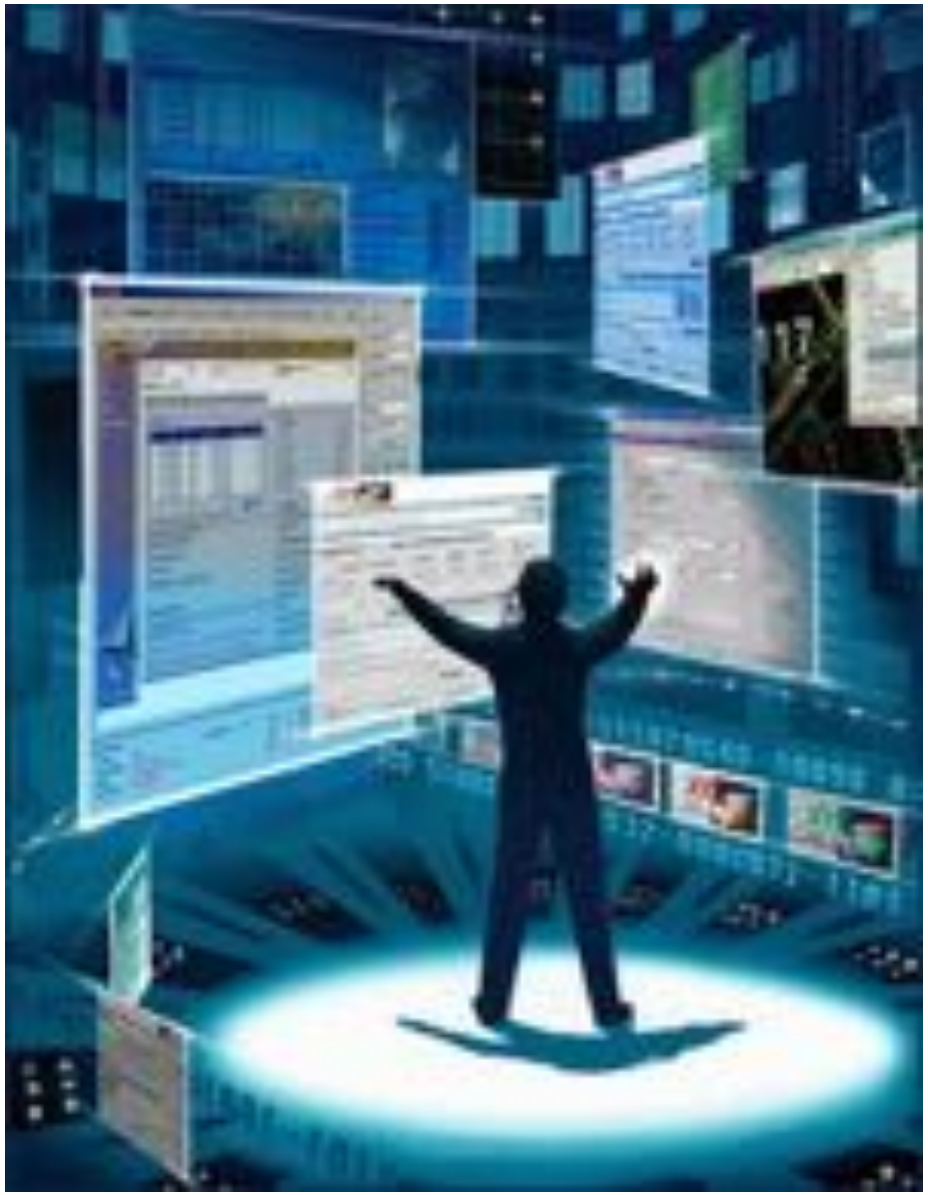
User Interface Design

Head Position Tracking

User Interface Design

Hand Tracking

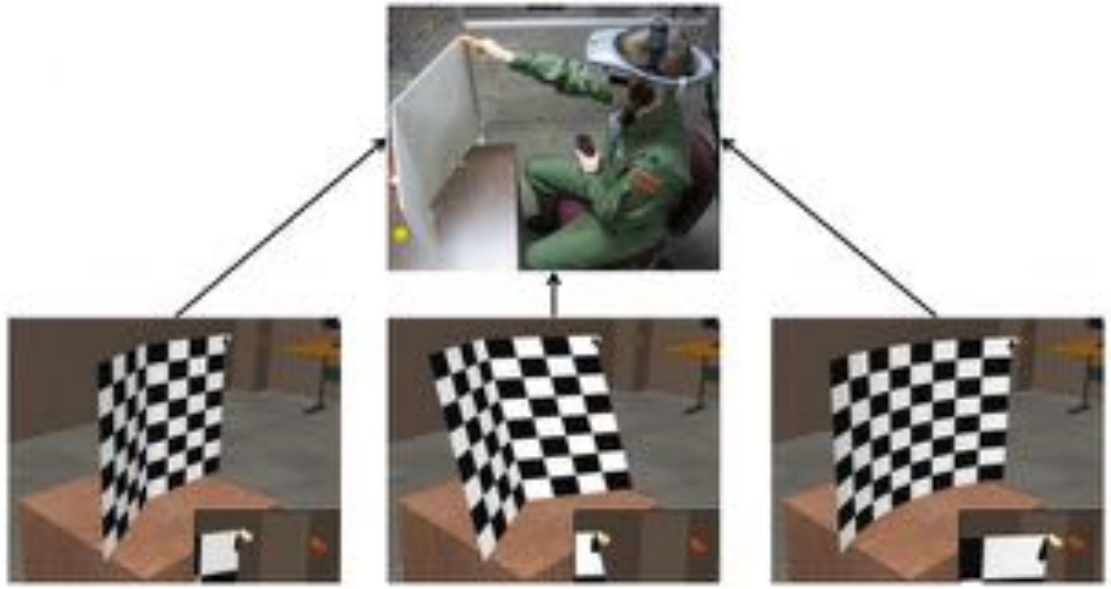
Intel RealSense



User Interface Design

Hand Tracking

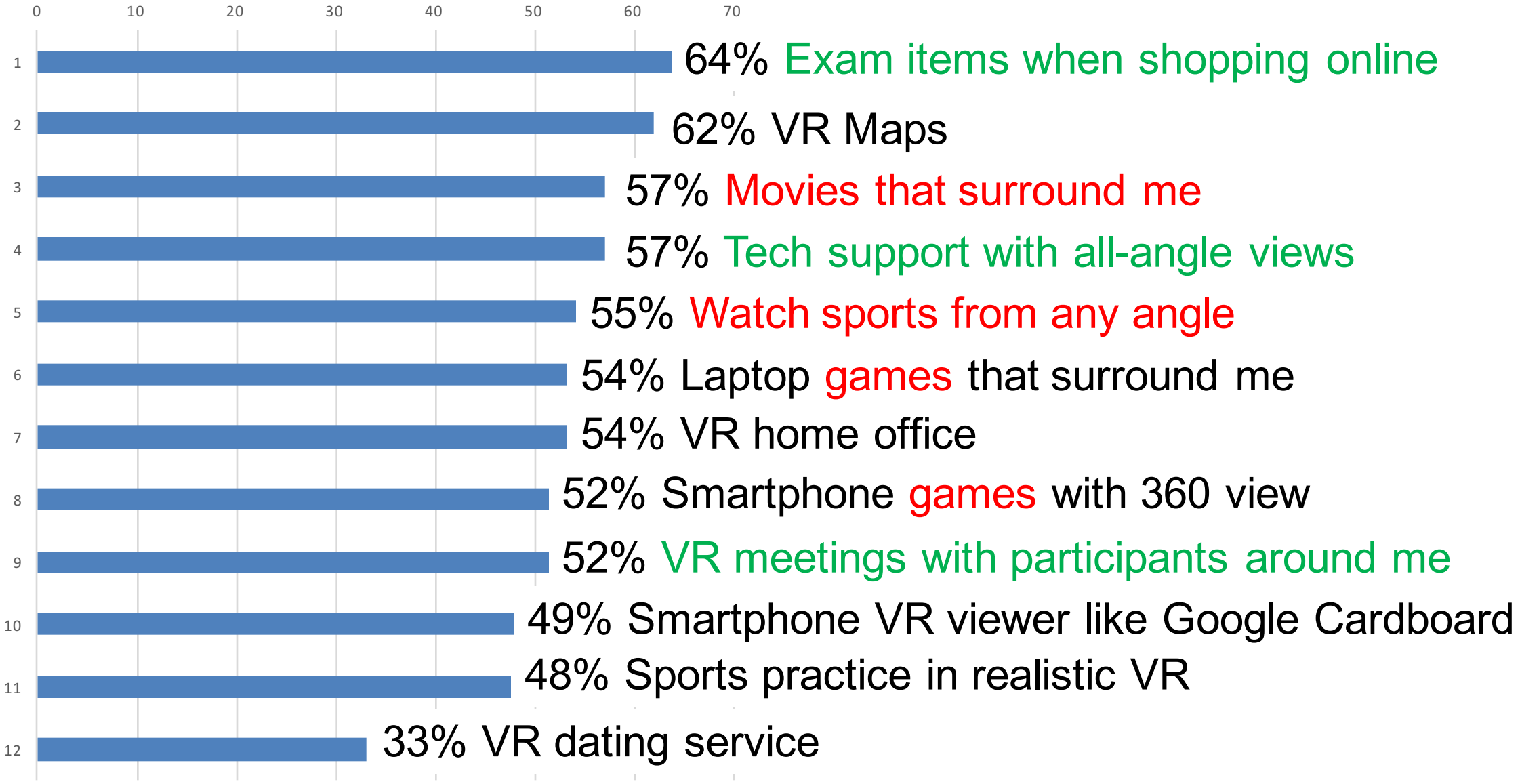
Redirected Touching



Need instructional videos / role-models for **in-seat passenger etiquette** and social norms

Produce videos and articles

VR activities that interest smartphone users worldwide



Source: Ericsson ConsumerLabs, "10 Hot Consumer Trends 2016," Dec. 8, 2016 (n=6,649, ages 15-69)

Retail

Myer, eBay Australia Launch World First VR Department Store

Up-sell opportunities

In-VR Advertising

LA-based Immersv Launches Video Advertising Platform for Virtual Reality Apps

Stare at an ad to unlock bonus features

Business Productivity
Infinite Desktop

EnvelopVR

Anticipates AR infinite desktop

Federated Security – to allow secured organic team formation in flight

Shared Infinite Desktop

Network and shared experience with family and other passengers – not just gaming, but notes for shared explorations

<u>Vendors</u>
Bluescape
Oblong

Importance of Social VR

Language

story telling + engagement design elements

You are in a snow storm
You must get warm in 5 minutes or you will die

Audio is a key ‘presence’ component
Players ‘feel’ colder as they play
Your body moves slower as time goes on

From “Storm” by Andrick Bregman

Social VR

Social VR may be VR's killer App

…people want to share experiences with others…

PLel Business Insider, 7/20/15

Social VR

Altspace FrontRow

Mirrors avatars to enable up to 40,000 avatars to share an experience

Pittsburgh@Home

Social VR

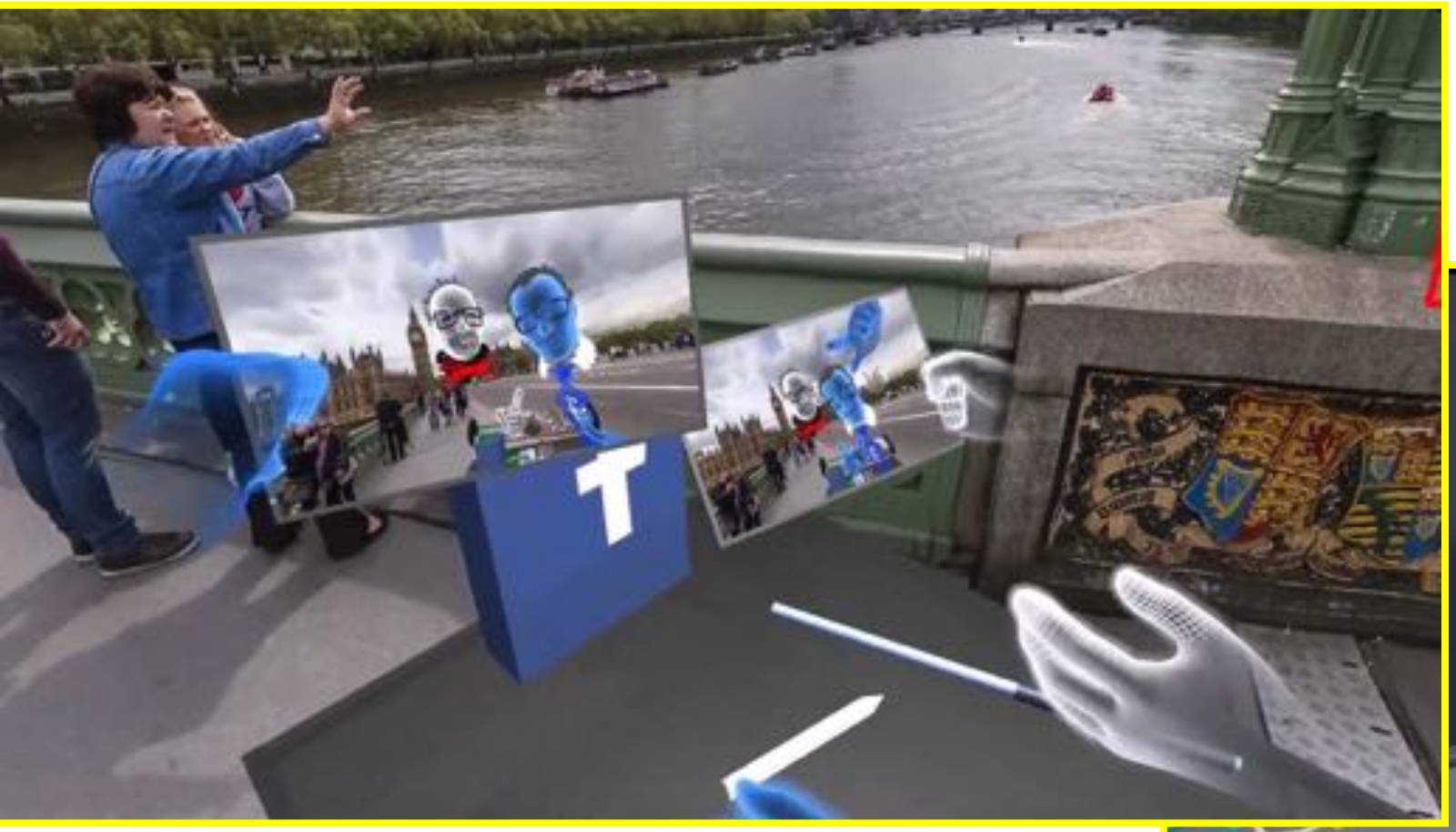
Dante's Inferno

When you share an experience, you feel safer to be vulnerable.

Altspace may be a Trojan horse into more sophisticated VR.

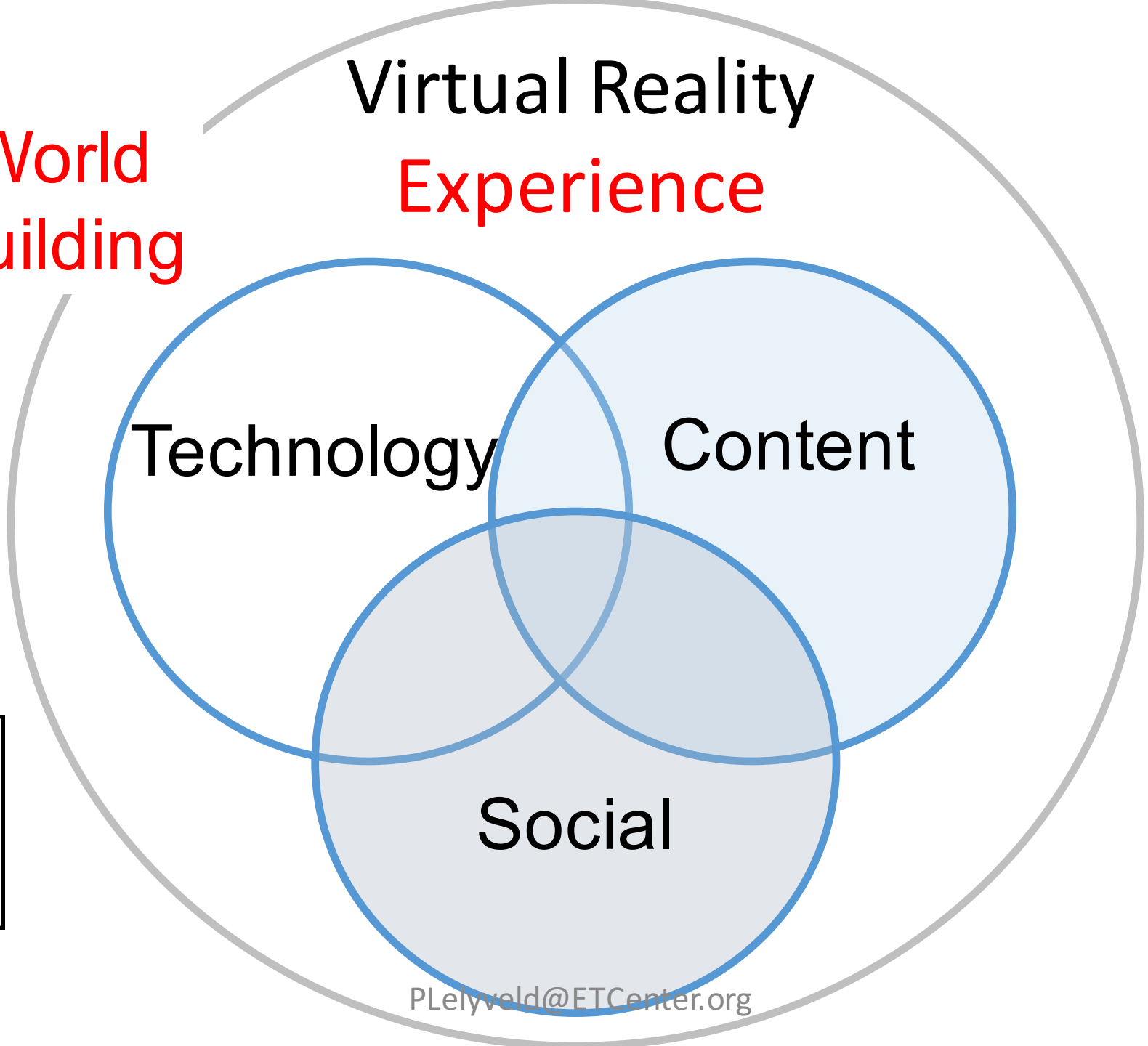
Social VR
BigScreen
Desktop mirroring in VR
Everyone can see and hear each other's screens
Game of Thrones viewing parties, group e-sports competitions

Social VR



VR OS?

Facebook's Social VR Could Be The Killer App For Virtual Reality



Engagement
+
Story

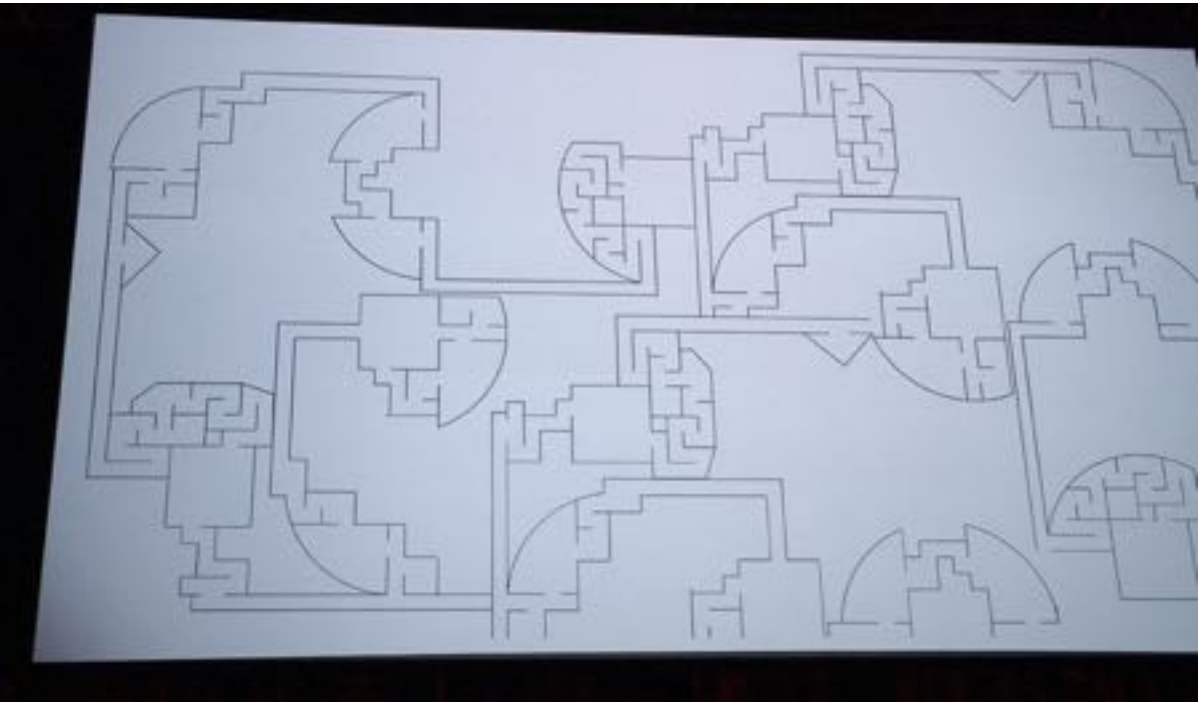
A brief digression - location-based room-scale VR

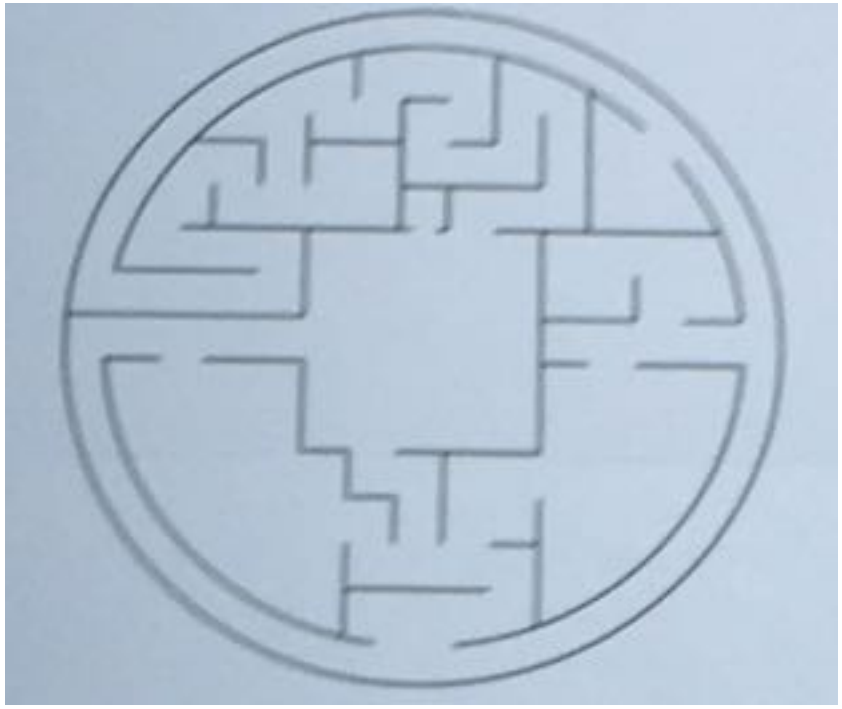
From Magic
VR storytelling depends on ‘misdirection’

Misdirection is guiding the audience’s attention
toward what you want them to experience,
and away from how you are creating that experience

By Curtis Hickman, Chief Creative Officer of The Void, at AWE 2016

Physical Misdirection





Redirected walking

By Curtis Hickman, Chief Creative Officer of The Void, at AWE 2016

Psychological Misdirection

Hot lamp and spider web

By Curtis Hickman, Chief Creative Officer of The Void, at AWE 2016

A brief digression
- Production process

Decision

Camera-captured VR

Locked to camera position

The Director's Journey

Computer Rendered VR

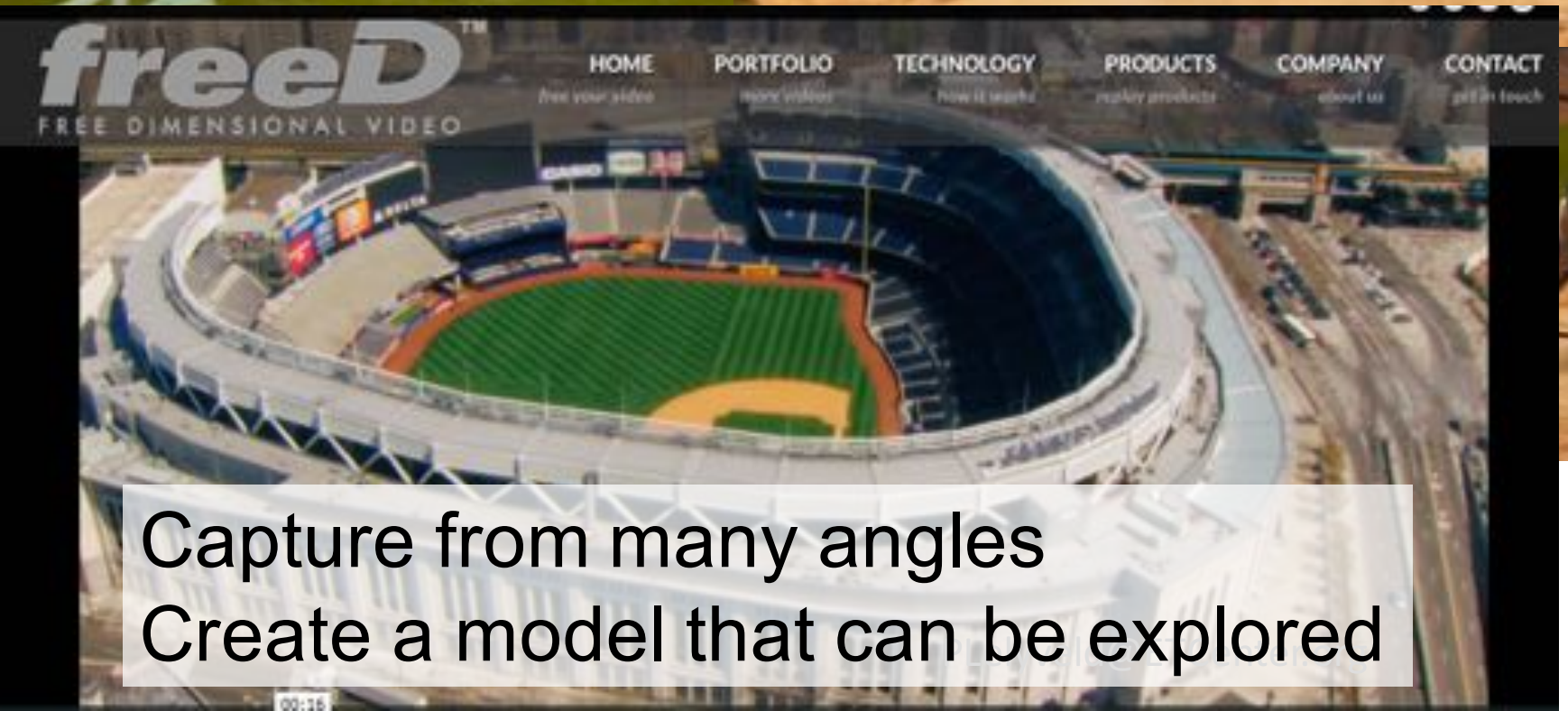
Free to wander (Story world)

Subtle coercion

Mixed Reality
Spherical capture live and insert into CGI

"Volumetric capture will change everything." Chris Edwards, The VR Company

Hybrid - Outside to Inside ‘Volumetric VR’



Capture from many angles
Create a model that can be explored

Pain-points, opportunities, and issues to address

Lack of **standardization** slows consumer adoption

How would you define a “great VR experience”?

Winning VR experiences will shape hardware development

Plural
A variety

What can we standardize?

Digital Cinema Initiative

What fundamental aspects of the technology are;

1. **Necessary for a good consumer experience?**
2. **Don't impact competitive advantage?**
3. **Help build the market for everyone?**

Brightness
Frame rate
Color bit depth
….

To 3D or Not to 3D: Buy the Right Ticket

CinemaBlend.com

<u>Scores (1-5)</u>

3D Fit

Planning and Effort

In Front of Screen

Behind the Screen

Brightness

The Glasses-Off Test

<u>Audience Health</u>

Total Score (7-35)

Consumers don't buy technologies, they buy the experiences that the technologies deliver

How would you define a "great VR experience"?

What fundamental aspects are;

1. **Necessary for a good consumer experience?**
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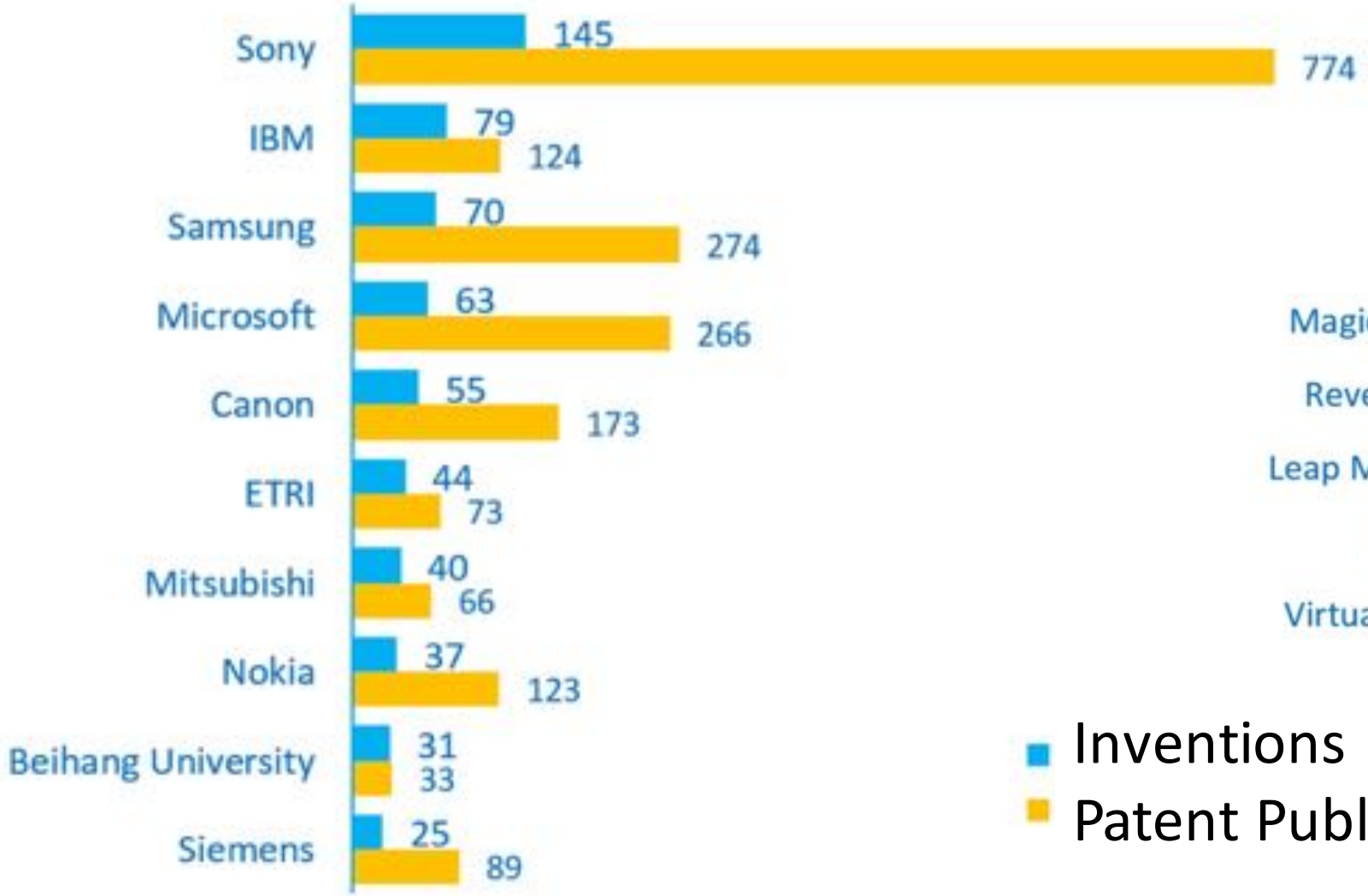
3. **Help build the market for everyone?**

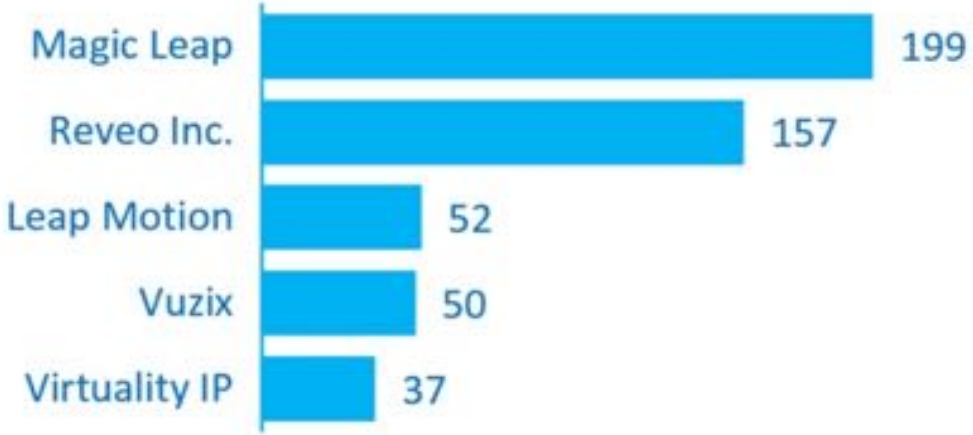
Standardization before standards

Everyone benefits

Top 10 patent holders of VR



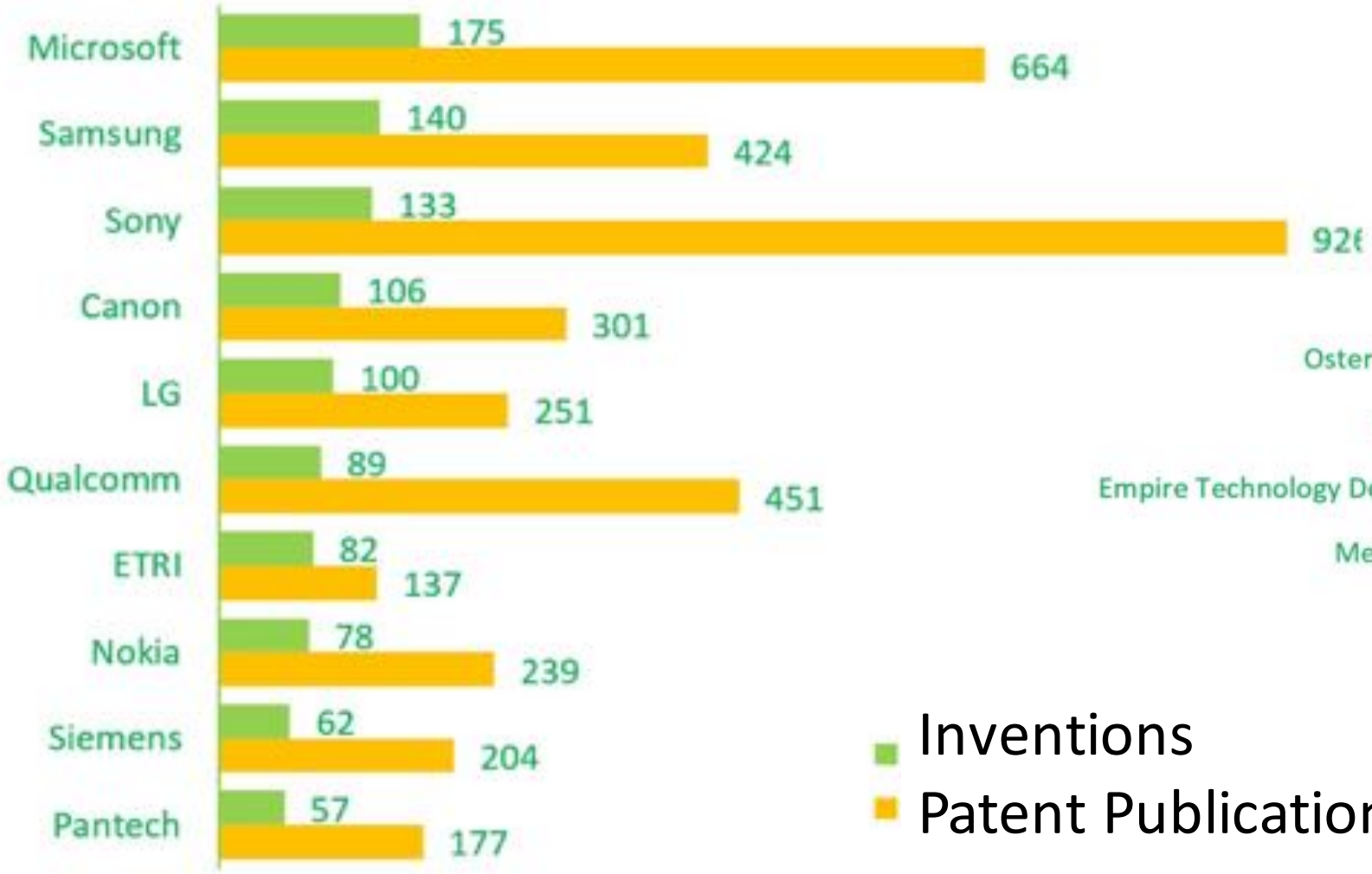
Published patents by top 5 smaller players



- Inventions
- Patent Publications

Source: Technology Startups: The Game-changers of Virtual and Augmented Reality, by Vivek Sharma, June 18, 2016

Top 10 patent holders of AR



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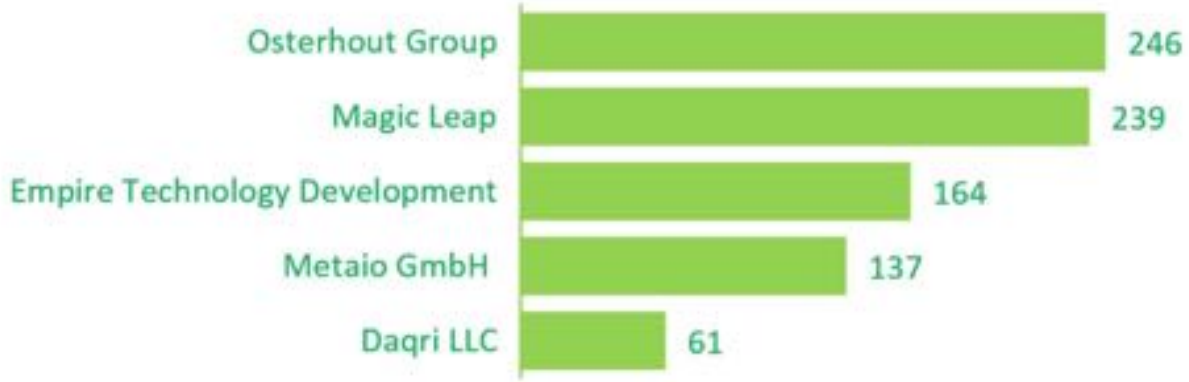

Inventions

Patent Publications

Source: Technology Startups: The Game-changers of Virtual and Augmented Reality, by Vivek Sharma, June 18, 2016

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How would you define a "great VR experience"?

What fundamental aspects are;

1. **Necessary for a good consumer experience?**
2. **Don't impact competitive advantage?**
3. **Help build the market for everyone?**

Without standardization discussions as a base, click-license terms of a few consolidated players will define the Code of Ethics

Understanding Sim-sickness

E3 Demo
" ...on the verge of puking while playing *Resident Evil 7: Biohazard* -- ...barely managing ...the minimum 60 frames per second required for PSVR."*

Technical
Language / Artistic
Population

*E3 was secretly terrible for the future of virtual reality, Engadget, 6/17/16

Samsung Entrim 4D Headphones
Galvanic Vestibular Stimulation (GVS)

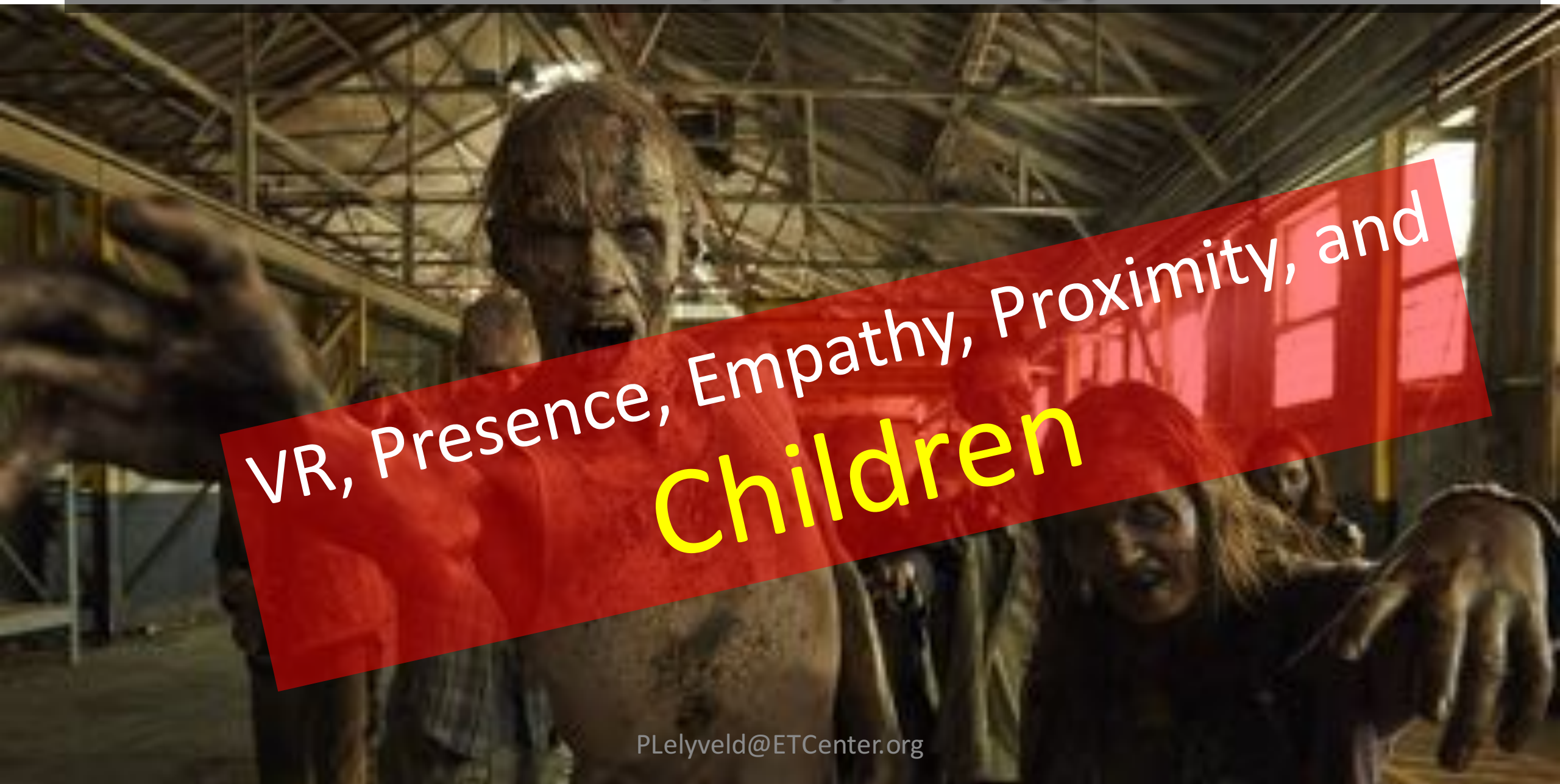
GVS uses tiny electrical impulses to stimulate your vestibular system into thinking you're moving when you're not.

Entrim 4D has been declared "safe",

- 1500 human guinea pigs,
- 30 'movement patterns'

3/24/16 Demo at SXSW

Ethics / Psychology



VR, Presence, Empathy, Proximity, and Children

PLelyveld@ETCenter.org

Ethics / Psychology

‘Emotional intensity’ controls or ratings?

PLelyveld@ETCenter.org

Social / Psychology

Personal space controls or ratings?

Security

Could someone hijack your VR experience?

Hygiene

Location-based VR

AR and story

"AR & MR will impact all aspects of life."
Justin Herz
SVP, Warner Bros Digital

Sesame Street interactive AR sets 2011

Disney villains take over Time Square, NYC 2011

The Witness

“The first movie in the outnet” (Germany)

2011

NBC Universal

Ingress

AR massively multiplayer online location-based game
2012 Android, 2014 iOS, created by Niantic, Inc.

AR

Every studio experimenting

Looking for interns with ideas
Hosting hackathons
In-house accelerators at
Disney, NBC/U, WB

Los Angeles, CA
Founded Nov 25, 2009

Welcome to ARLA

+ Suggest a new Meetup

Upcoming 1 Past Calendar

ARLA
1,146 members

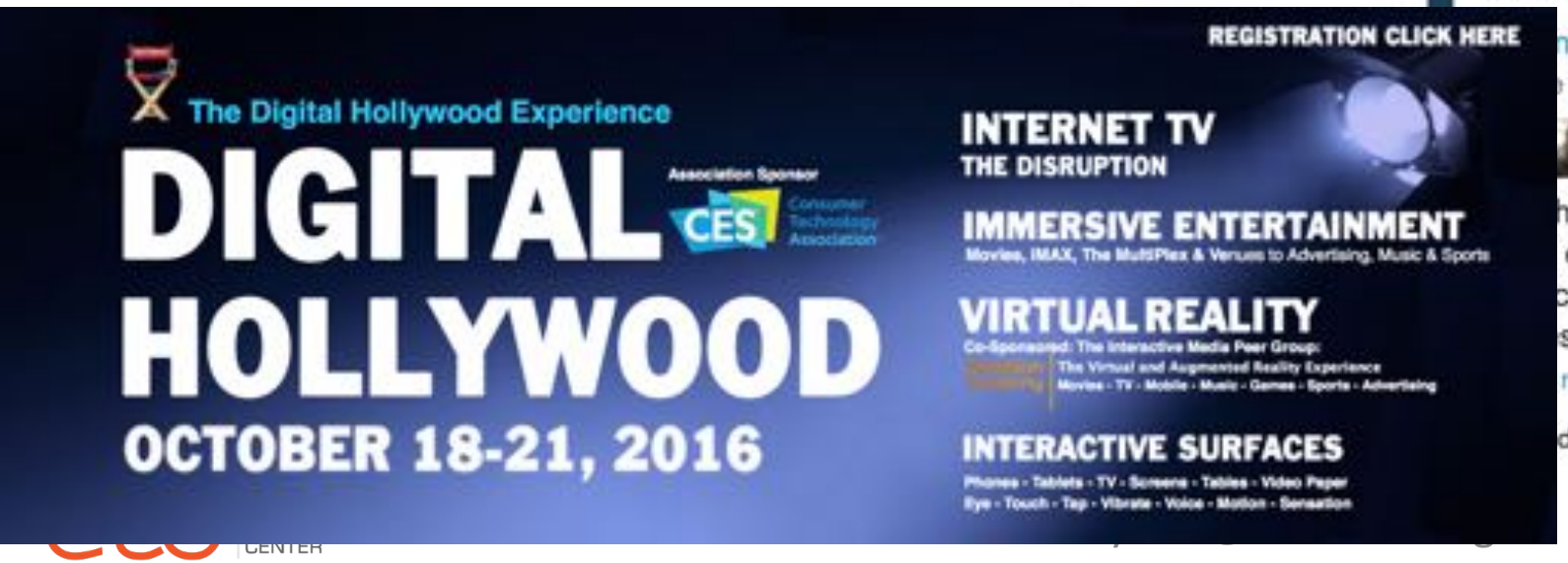
Demo and Pitch Night Virtual Reality and Augmented Reality ARcade

ntown LA
go to eventbrite, Los Angeles, CA (map)

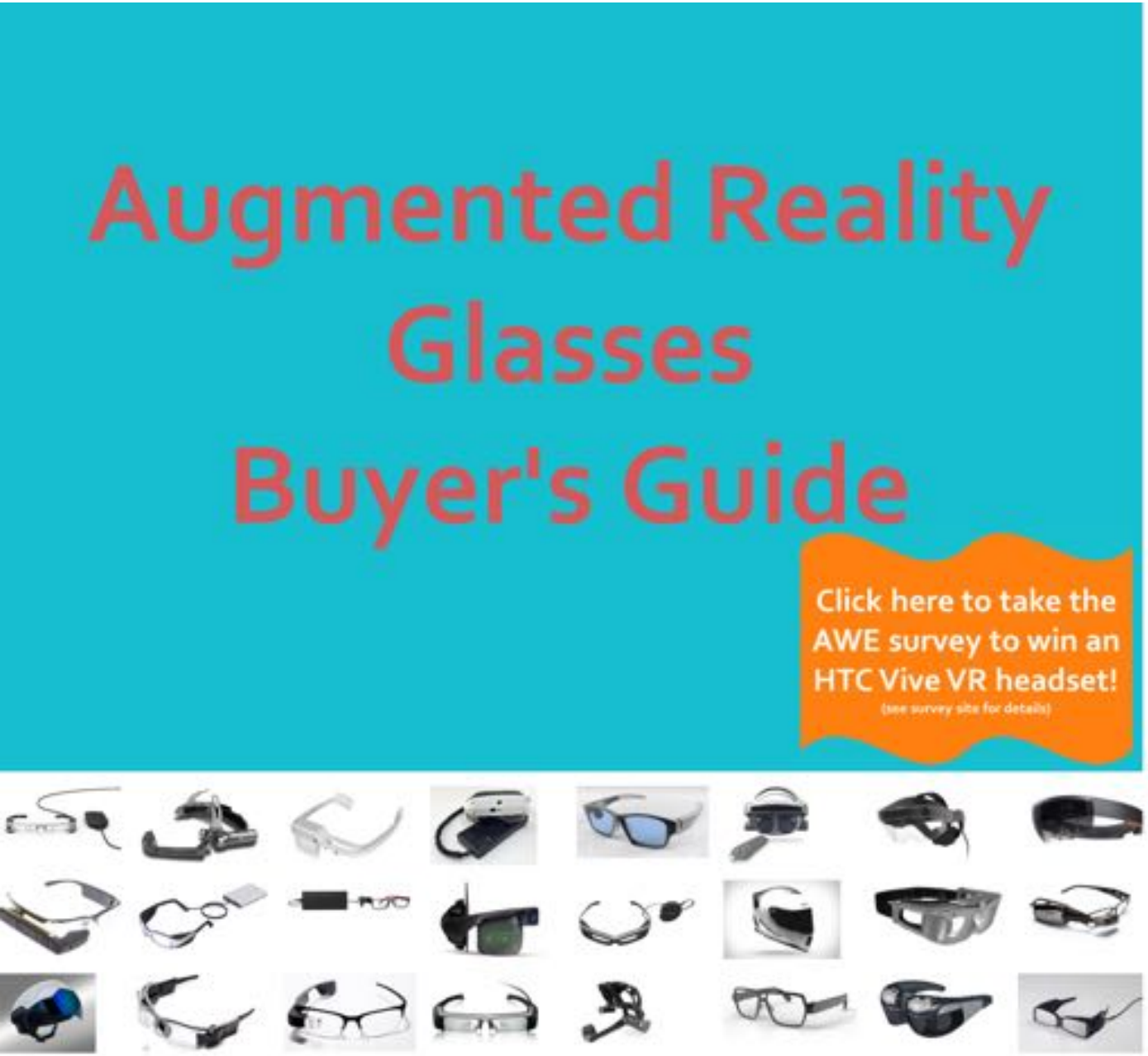
Wed Jul 20
6:00 PM
RSVP
28 going
0 comments

hase tickets on Eventbrite. This is our
event as part of a series of Meetups
cated to exploring the amazing experi-
s and products created through...
more

d by: Paul (Organizer), and Paul (Co-Organizer)



www.ARGlassesBuyersGuide.com



ODG/OTOY partnership

Augmented World Expo 2016

AR Sports

Pokeman GO

AR MMPG for July2016

Fielding testing now
Japan, Aust., N.Z.

Bracelet alerts when creatures are nearby

Nintendo, The Pokémon Company and Google have invested $30 million on Niantic Inc. "

Legal Issues in VR, MR, and AR

Liability

AR on a fixed base

Perceptoscope
Historic recreations & reenactments
http://perceptoscope.com

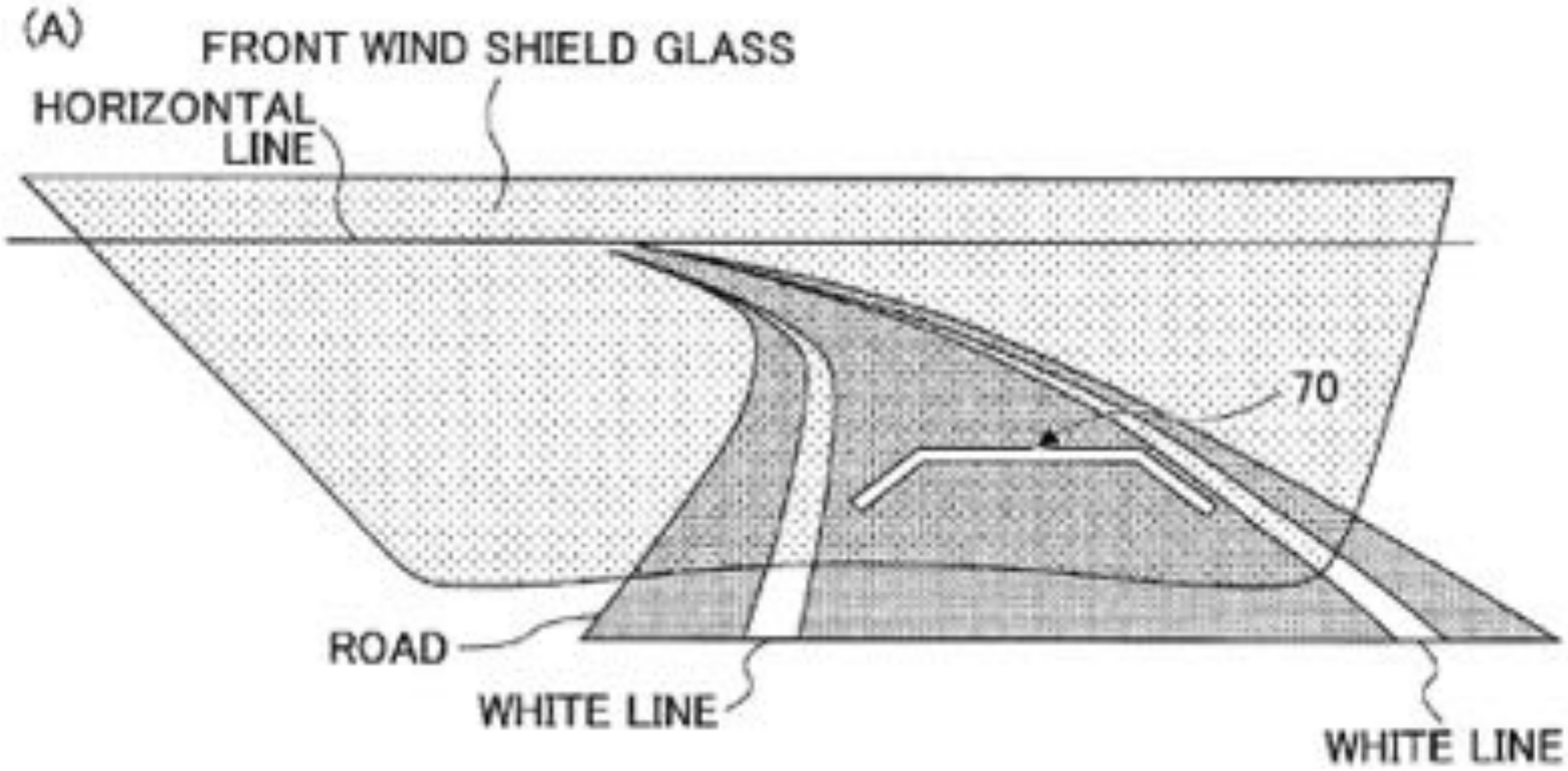
PTC Vuforia

The Zoo!

New western Sydney Australian Zoo to use drones, robots, and augmented reality

How can BMW's Head-Up Display support driving?

Toyota AR heads-up windshield Patent



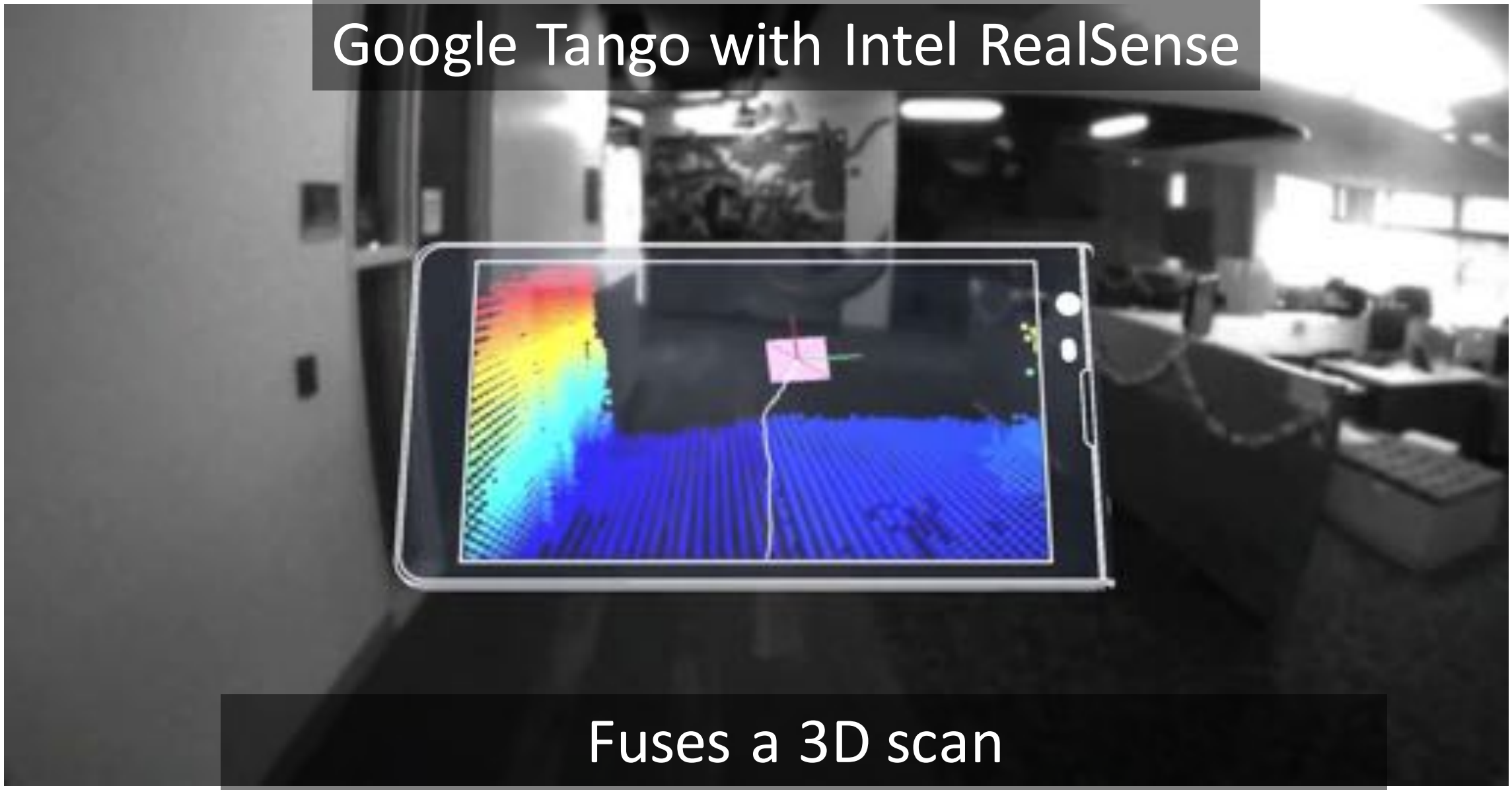
Cameras track driver's head position and car lane position and adjusts image for proper positioning in real time

F-35's $400,000 AR HMD Helmet

Full spherical view around jet

Identifies, zooms in on, and can target objects of interest

Phab 2 AR camera from Lenovo
Google Tango with Intel RealSense



Fuses a 3D scan

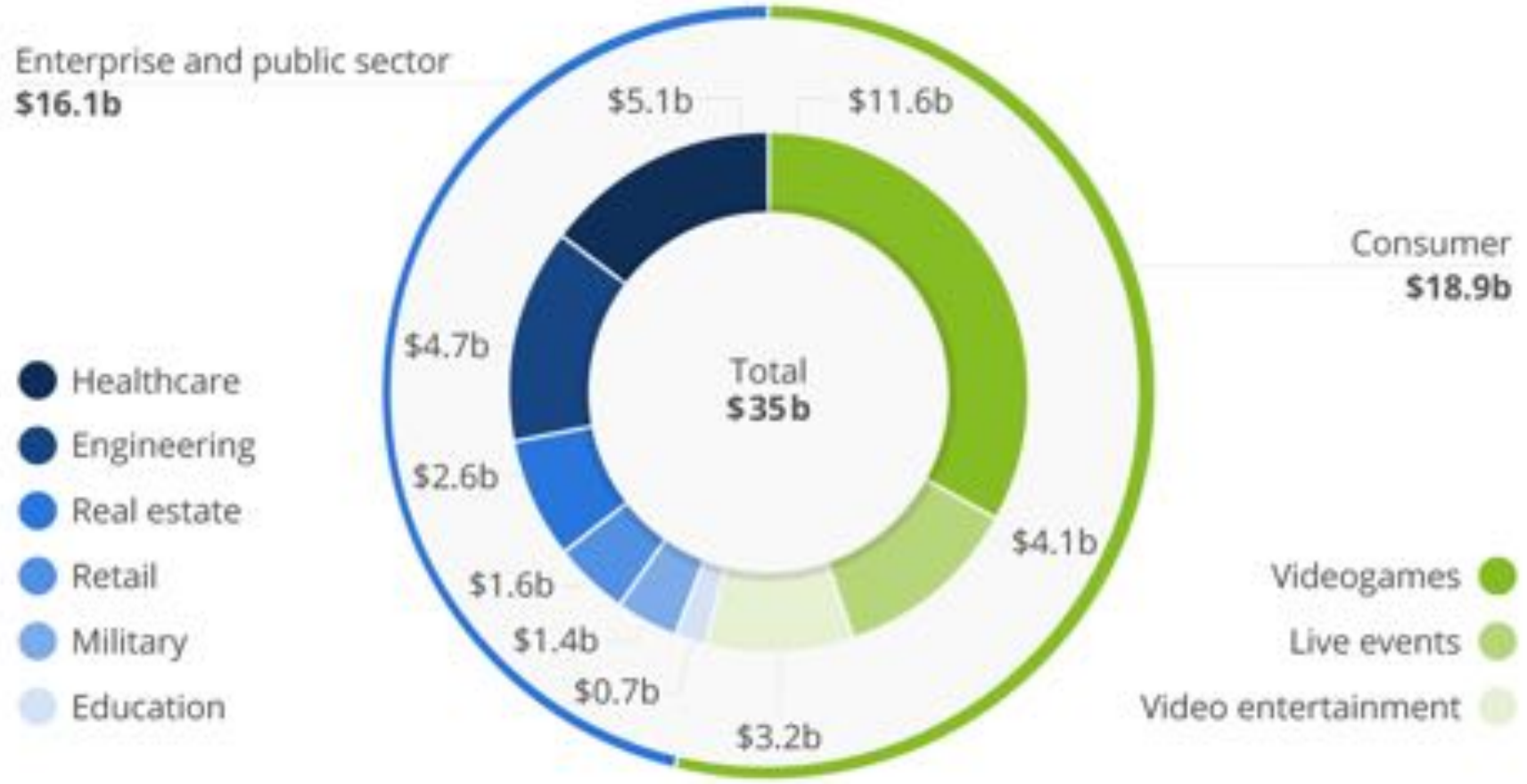
Into a single 3D model of the environment

Business of VR and AR

Tech Chart of the Day

The Diverse Potential of VR & AR Applications

Predicted market size of VR/AR software for different use cases in 2025*



* Base case scenario

BUSINESS INSIDER

Source: Goldman Sachs Global Investment Research

statista

1/13/16

etc ENTERT TECHN CENTER

THE VR FUND 2016 VR INDUSTRY LANDSCAPE v1.1

www.thevrfund.com

etc SM ENTERTAINMENT TECHNOLOGY CENTER

Big Bang Disruption

Online Survey
Sample: 1000 US consumers who expressed interest in VR
Published 5/25/16

54% think VR is here to stay (not a fad)

31% have tried VR

77% are willing to pay for VR gear

18% are willing to pay more than $250

Source: Interactive Broadband Consulting Group

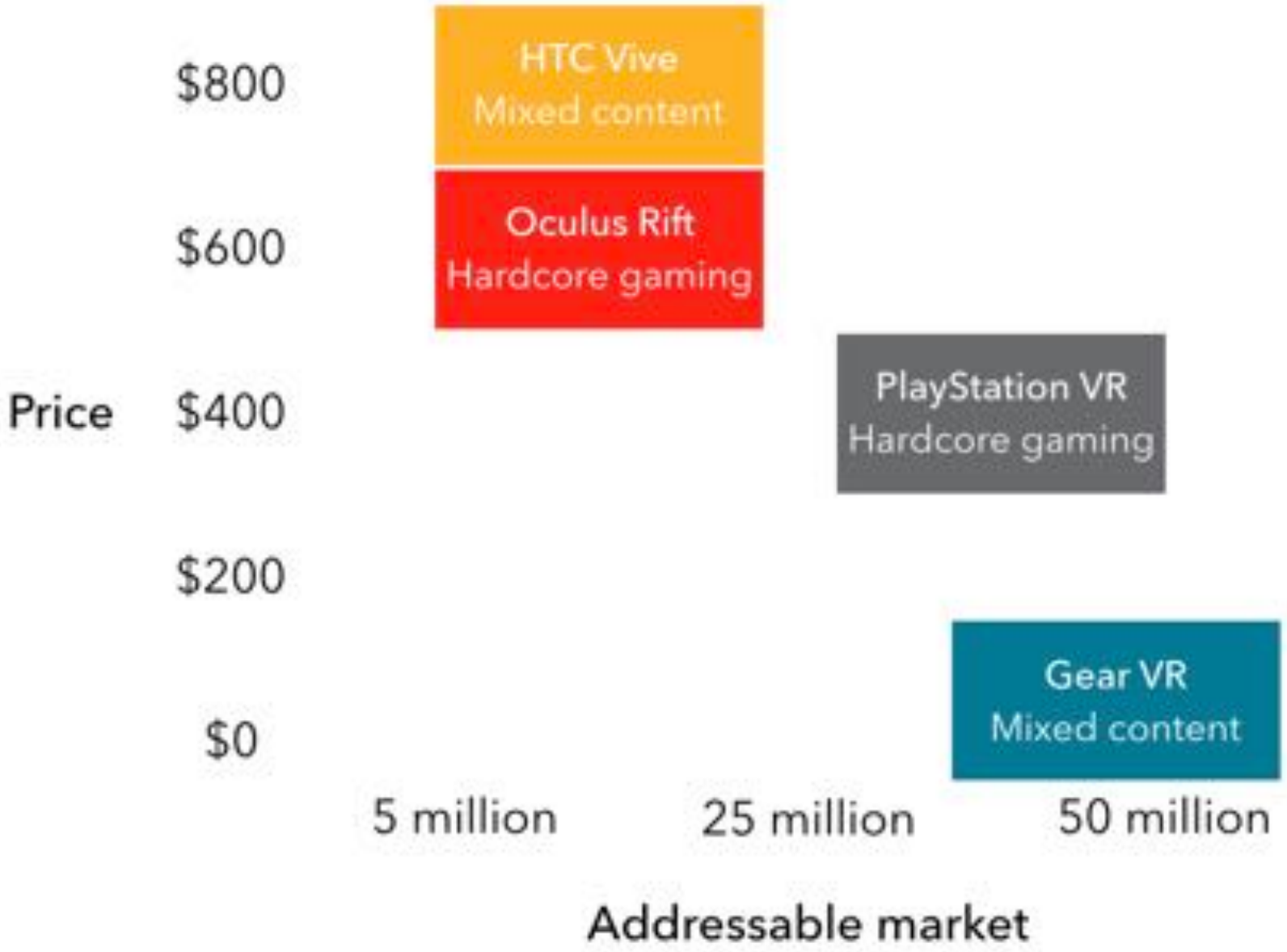
Maximum Amount that US Internet Users Would Be Willing to Pay for a Virtual Reality Device, Oct 2015

% of respondents

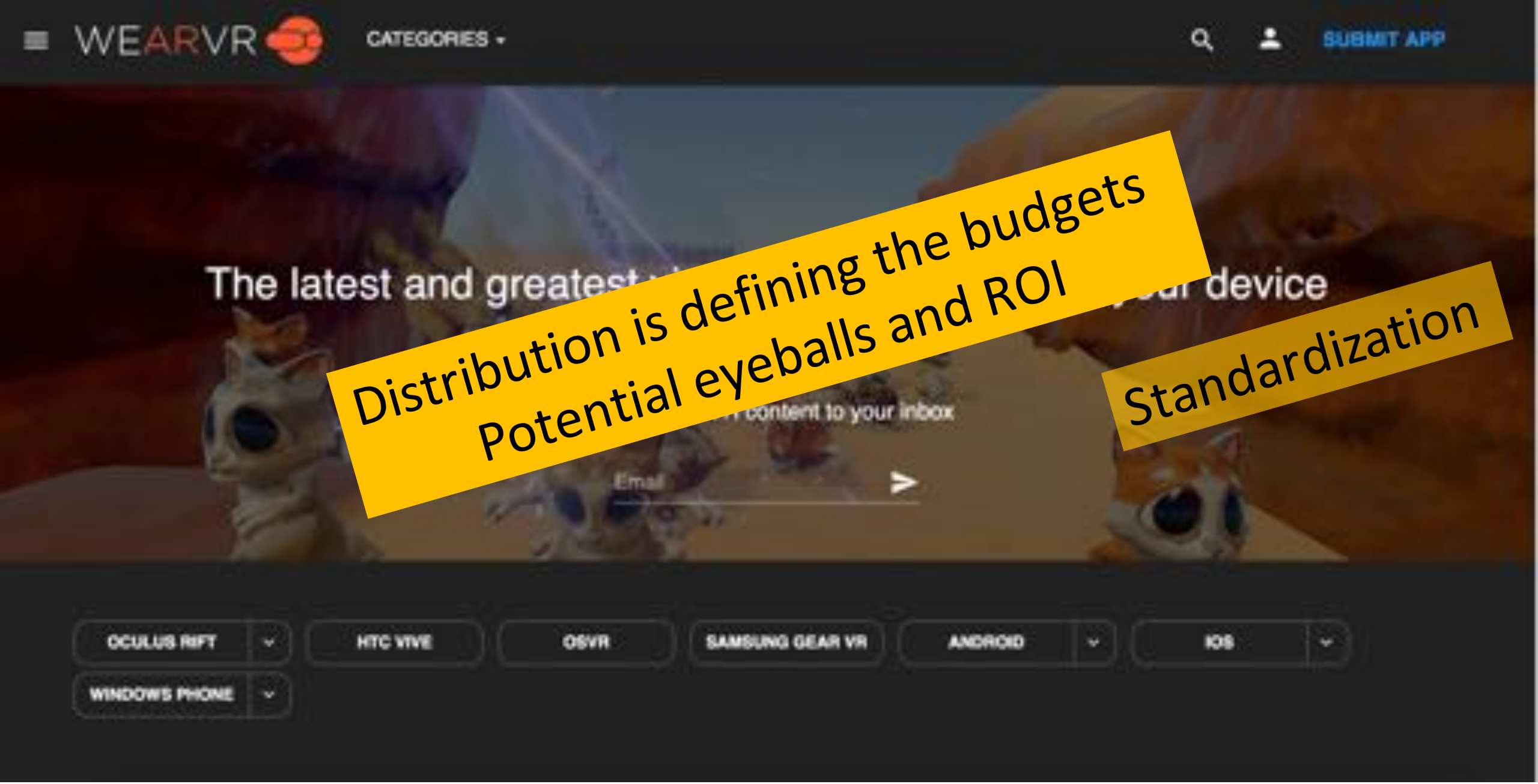
Note: n=1,781 ages 18+
Source: Greenlight VR, "Virtual Reality Consumer Report October 2015" conducted by Touchstone Research, Nov 23, 2015

etc℠

Virtual Reality HMD price versus market size



Source: Jackdaw Research



Distribution is defining the budgets
Potential eyeballs and ROI

Standardization

Sustainable Business Model at Scale

The Martian VR Experience

"Hollywood Quality"

Standardization will accelerate market growth

Financing VR

- Budgets – advertisers don't see the value yet; no installed base, no metrics/ROI

Research on VR and memory retention needed!

- VR appears to trigger strong memory retention
- Some people recall VR experiences as real memories

Time Warner and Nielsen Will Study How Virtual Reality Affects the Subconscious

By measuring eye-tracking, facial movement, heart rate and brain activity to better understand how consumers think and feel at a deeper level

HTC Just Earmarked $100 Million to Invest in VR Content, Applications Open Today

One of the biggest VR-dedicated funds yet

By Ben Lang - Apr 26, 2016 2

HTC Chairwoman, Cher Wang on stage at the company's event in Beijing |

Brands

Fortune Mag.
10/13/15

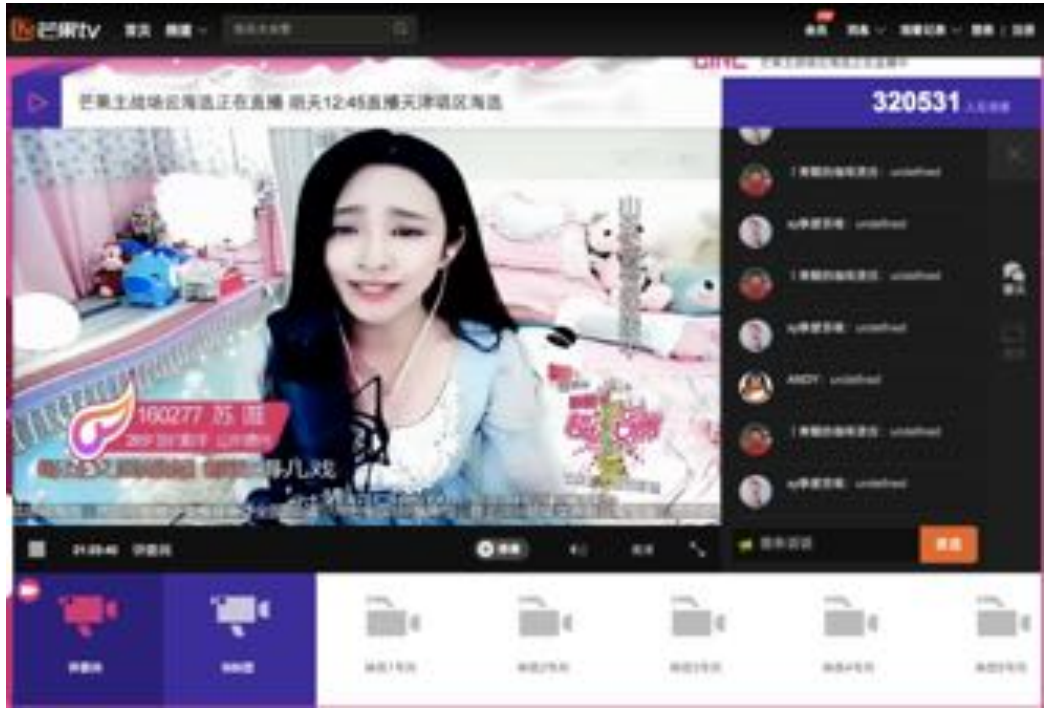
China

China will account for 40% of the projected 6.3M VR HMDs sold in 2016

Baufeng sold 1M $30 headsets thru 20,000 brick-and-mortar store in 1Q16, Project 10M sold in 2016

Baidu, Alibaba and Tencent all funding Chinese VR content start-ups

Shanghai Media Group & Jaunt will fund 500 VR productions in the next 2 years



China

Mango TV (Hunan.tv) is producing 4 weekly VR reality shows

Hardware mftrs looking for ‘build’ standards

Chinese VR Game Alliance presentation points

- hardware gating creative’s revenue
- currently creators can’t make “good money”
- a good ecosystem can’t rely on hardware alone!
- ‘high quality content must be paid for by consumers

UTA Signs Digital Content Studio *Secret Location*

UTA will work with Secret Location

- to expand its business in both non-traditional and traditional media
- to advise on its social and digital media strategy

Source: Hollywood Reporter, 10/20/15

Close

Best Buy
“2016 is the year of mass market demos”
Bob Vickery, Stage Venture Partners

Consumers don't buy technologies, they buy the experiences that the technologies deliver

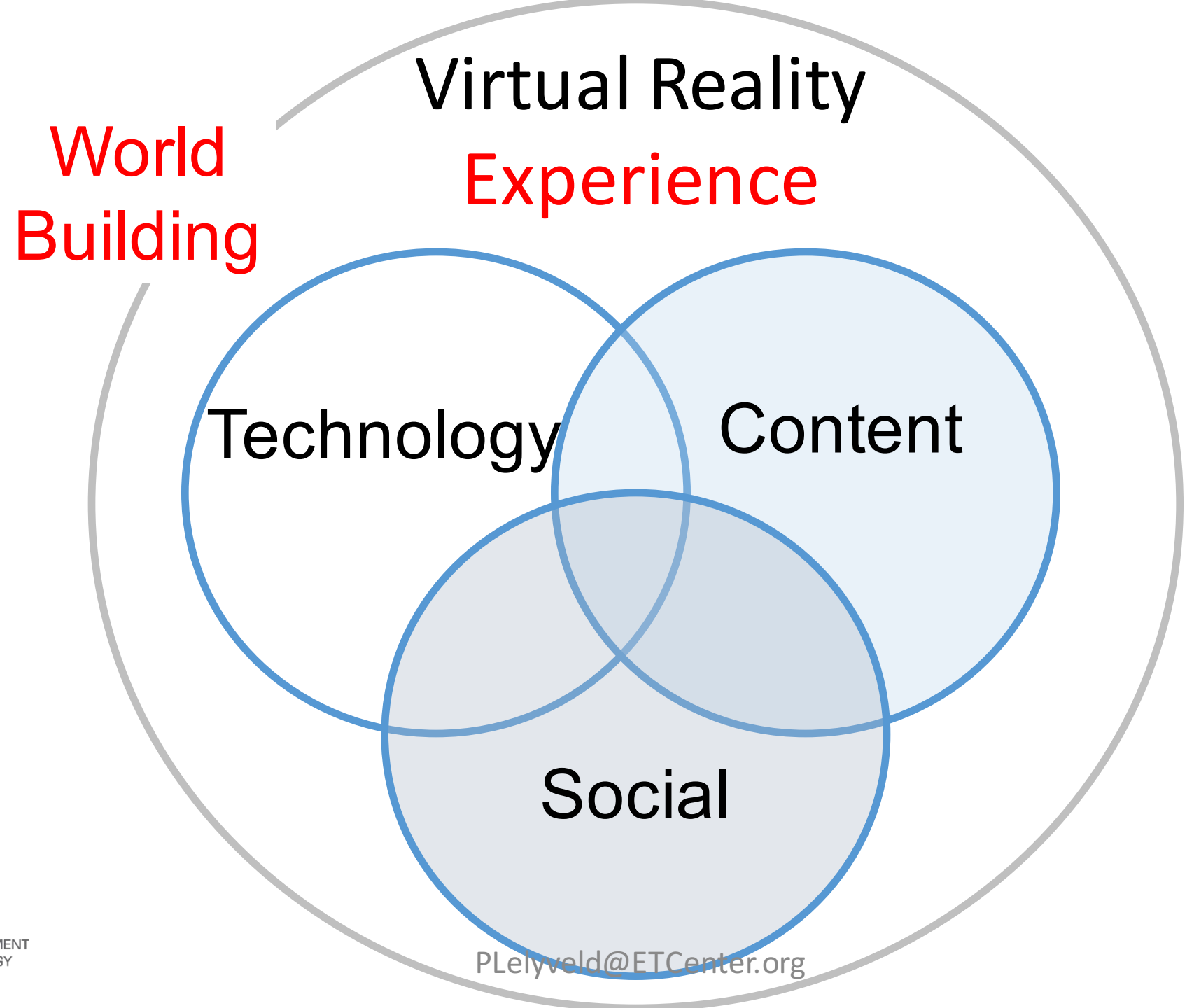
Storymaking

Gaming

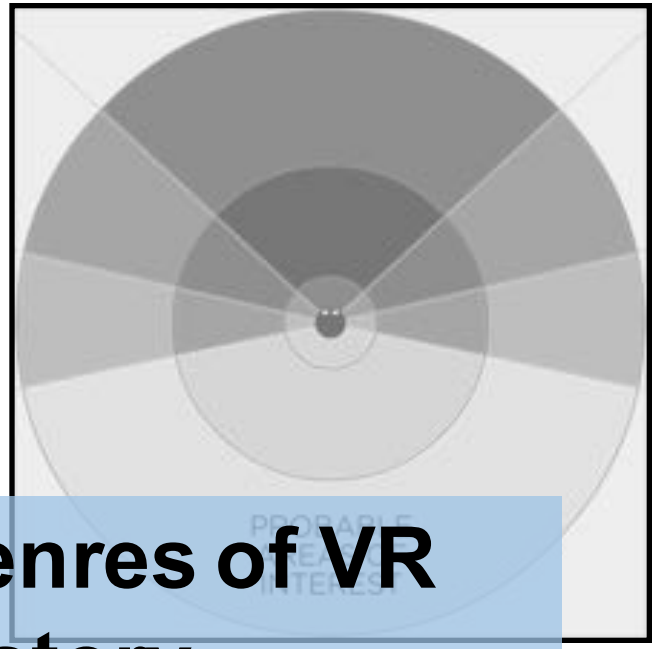
Education

Social

Business

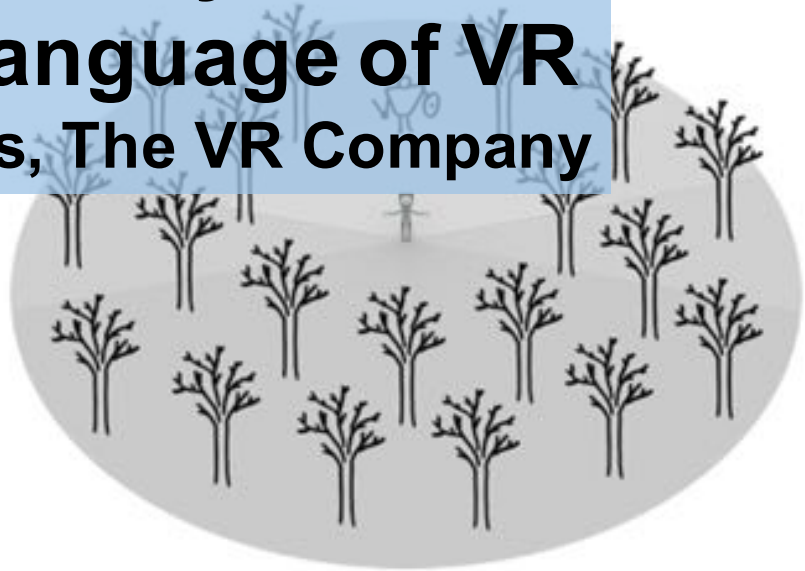

Virtual Reality
World Building
Experience
Technology
Content
Social

Storyboarding in VR



We're at the cusp of creating subgenres of VR - sports, news, travel, education, story, … - each will contribute to defining the language of VR

Chris Edwards, The VR Company



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Source: Storyboarding in Virtual Reality, by V McCurley

"The culture is ready for [VR] now,
given the amount of tech that we touch right now
and the devices that we use daily."

Ted Schilowitz, Futurist, Fox Studio

Thank you

Phil Lelyveld

University of Southern California

Entertainment Technology Center