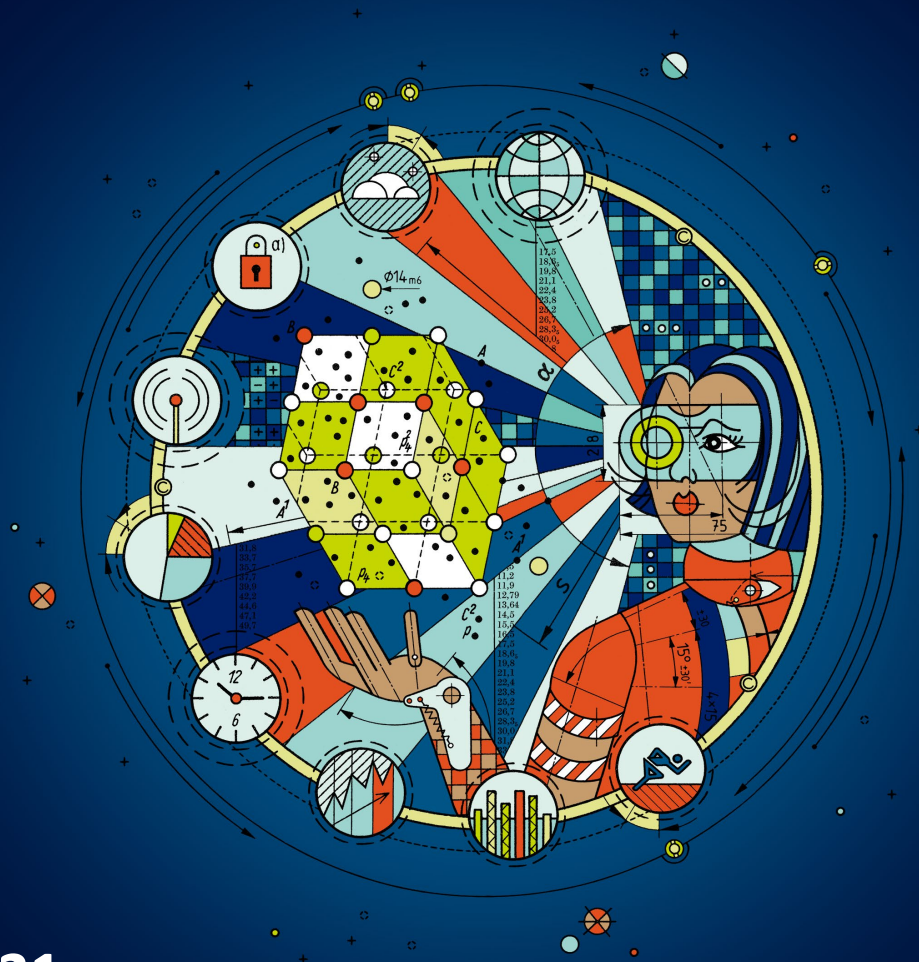
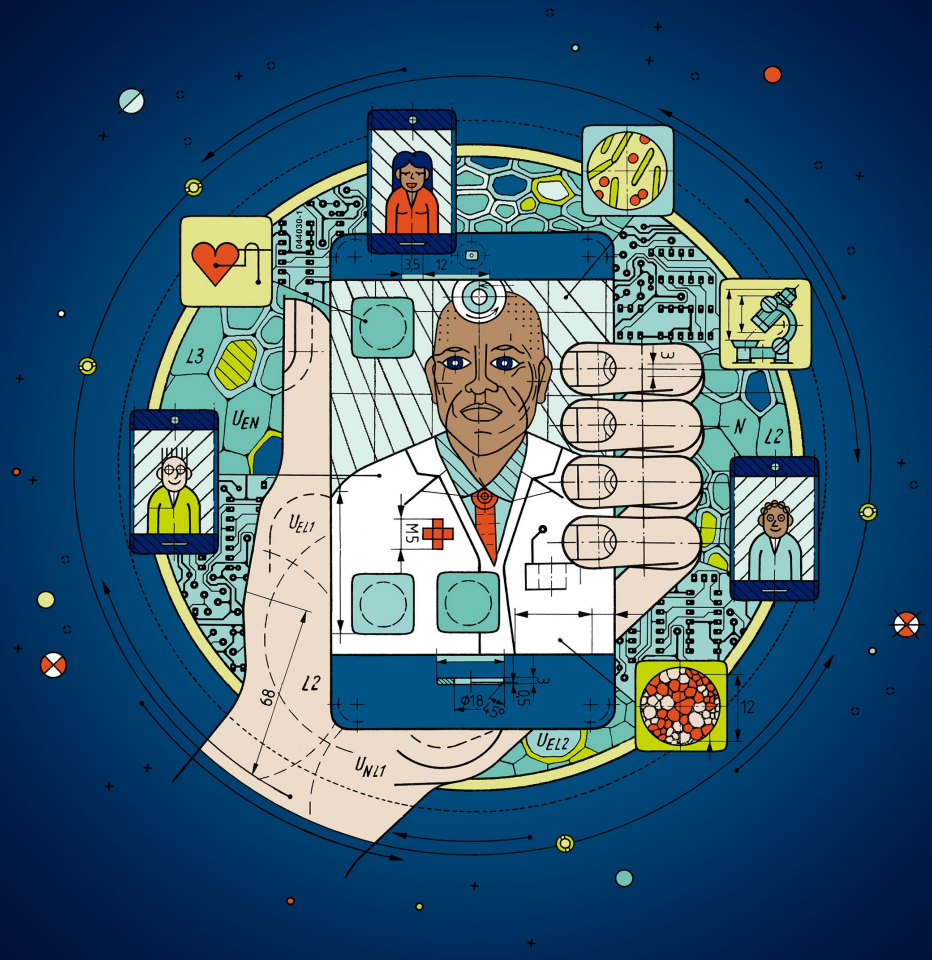


Global TMT Predictions 2021

February 2021



Video visits go viral

COVID-19 sparks growth in video doctor's visits

What's the prediction?

- We predict that the percentage of virtual video visits to doctors will rise to 5% globally in 2021, up from an estimated 0.1% in 2019.

- There were 8.5 billion doctor's visits, worth a total of approximately US$500 billion, in the OECD 36 countries in 2019 alone. Denmark is 22 million visits, worth about US$2B.

- Five percent of that would translate into more than 400 million video visits and about US$25 billion in value. For Denmark, 1.1 million video visits and US$100 million.

- We predict that the market for pure-play telehealth virtual visit solutions will reach US$8 billion in 2021. Partially driven by the growth in virtual video visits, we also expect that more than US$33 billion of medical-grade home health care technology (mainly therapeutic and monitoring solutions, and including FDA approved smartwatches) will be sold in 2021, up almost 20% over 2019.

Data points

- In April 2020, 43.5% of all US Medicare primary care visits were via telehealth; pre-pandemic, this figure stood at just 0.1%.

- The number of people using the Department of Veteran's Affairs Video Connect system rose to 120,000 per week, compared to 10,000 per week in the same period in 2019

- In France, Doctolib saw video consults rise from 1,000 per day pre-COVID to 100,000 per day. France has 400 million doctor visits annually, or 1.1 million daily. There are other video visit providers in France, but Doctolib alone would have been 9% of daily visits at the peak.

- In a May 2020 survey, 14% of Canadians said they would choose a video doctor's visit where possible going forward.

Original Paper

Telehealth as a Bright Spot of the COVID-19 Pandemic: Recommendations From the Virtual Frontlines ("Frontweb")

J Nwando Olayiwola[1], MD, MPH; Candy Magaña[1], MPA; Ashley Harmon[1], MPH; Shalina Nair[1], MD, MBA; Erica Esposito[2], MPH; Christine Harsh[2], MHA; L Arick Forrest[3], MD, MBA; Randy Wexler[1], MD, MPH

Table 1. Summary of COVID-19 telehealth visit acceleration in the Department of Family Medicine, Ohio State University Wexner Medical Center (the denominator for all percentages is defined as the number of total visits [in person + video + telephone]).

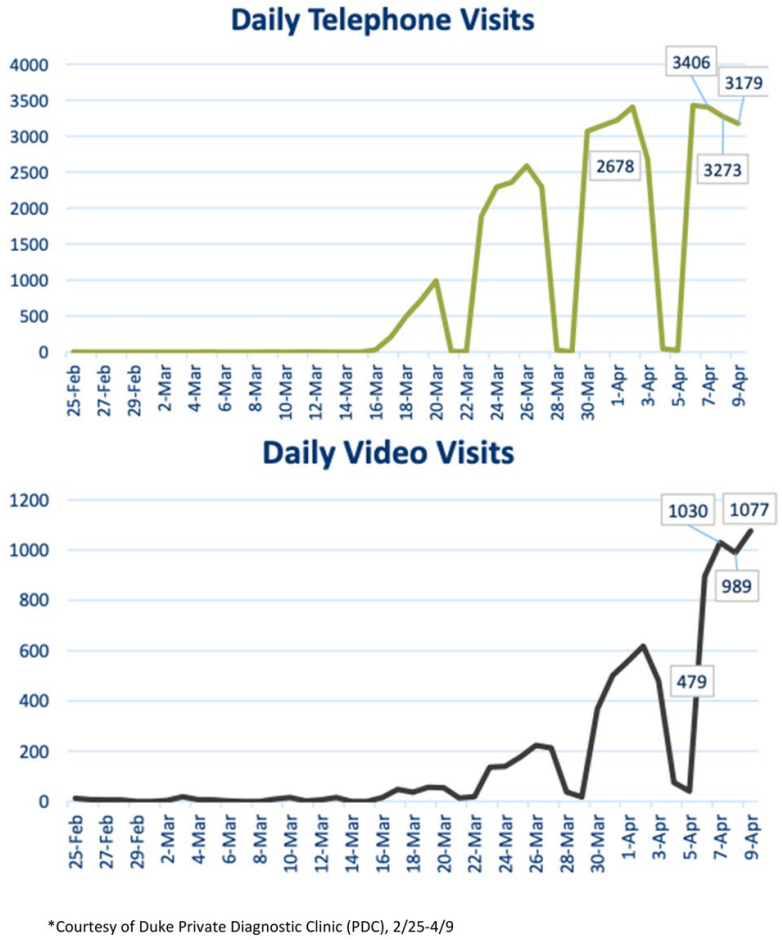
Week[a,b]	Visits, N	Telehealth visits[c], n (%)	In-person visits, n (%)	Video visits, n (%)	Telephone visits, n (%)
03/01/20	2822	4 (0.1)	2818 (99.9)	4 (0.1)	0 (0)
03/29/20	1814	1666 (91.8)	148 (8.2)	386 (21.3)	1280 (70.5)
04/26/20	2104	1947 (92.5)	157 (7.5)	1481 (70.4)	466 (22.1)

[a]Data shown here represent 4-week intervals.

[b]Week 03/01 represents pre-COVID operations data. Week 3/29 represents the official launch of video visits across the entire medical center. Weeks 03/01 to 03/29 represents a shift from majority in-person visits to majority virtual telehealth visits overall (phone and video). Weeks 03/29 to 04/26 represents a shift from majority phone visits to majority video visits for all virtual telehealth visits overall.

[c]Telehealth visits include patient visits conducted by Family Medicine physicians and nurse practitioners through tVisits or vVisits (telephone or video); does not include data from Behavioral Health, Clinical Pharmacy, Nutrition or other clinicians.

Figure 2. Duke institutional operations data of telehealth visits: telephone and video.



*Courtesy of Duke Private Diagnostic Clinic (PDC), 2/25-4/9

J Am Med Inform Assoc, Volume 27, Issue 6, June 2020, Pages 957–962, https://doi.org/10.1093/jamia/ocaa067

OXFORD UNIVERSITY PRESS

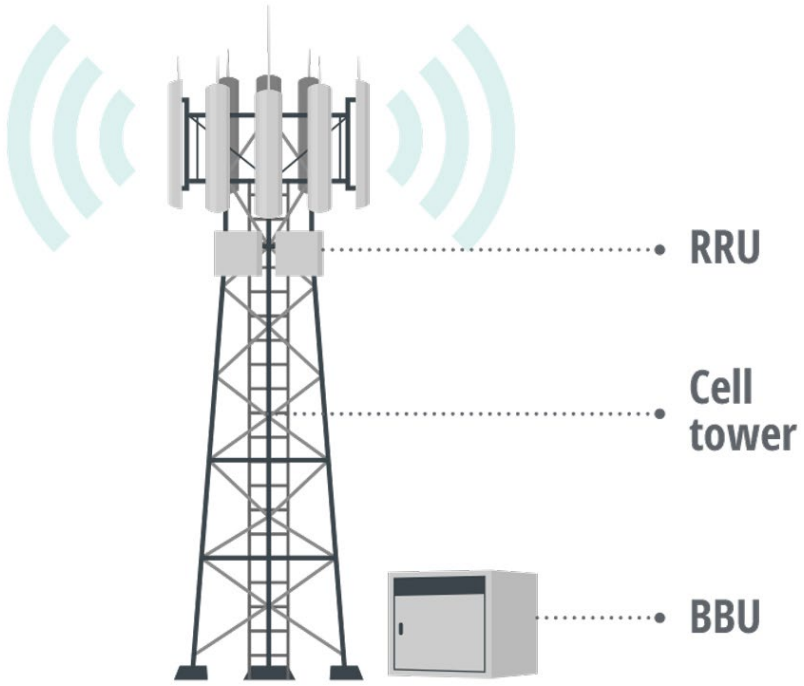
Why this prediction now?

- COVID acted as a catalyst for all telemedicine, but video visits as well
- Everybody expects video visits to go back down post-pandemic, but nobody expects it to go back to 2019 levels – what's the next normal?
- Is a Zoom call the new phone call?
- Rural/remote access for video visits could be a bottleneck: LEO sats and "true" rural broadband (50 Gbps down/10 Gbps up) could become hot topic

The next generation radio access network

Open and virtualized RANs are the future of mobile networks

Traditional RAN: Integrated and proprietary



Note: RRU = remote radio unit; BBU = baseband unit

Source: Deloitte analysis.

Internet speed test

313.5
Mbps download

39.8
Mbps upload

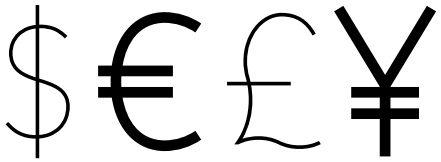
Latency: 32 ms
Server: Washington

Your Internet connection is very fast.

Your Internet connection should be able to handle multiple devices streaming HD videos, video conferencing and gaming at the same time.

LEARN MORE TEST AGAIN

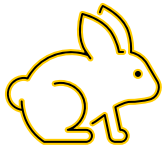
Open RAN: the catalysts



Cost savings for CAPEX and OPEX

Mandated supplier swap-out

New suppliers / traditional suppliers with new approaches



Greater business agility / higher risk taking / increased competition

Greenfield operators with no legacy networks, disruptive deployment

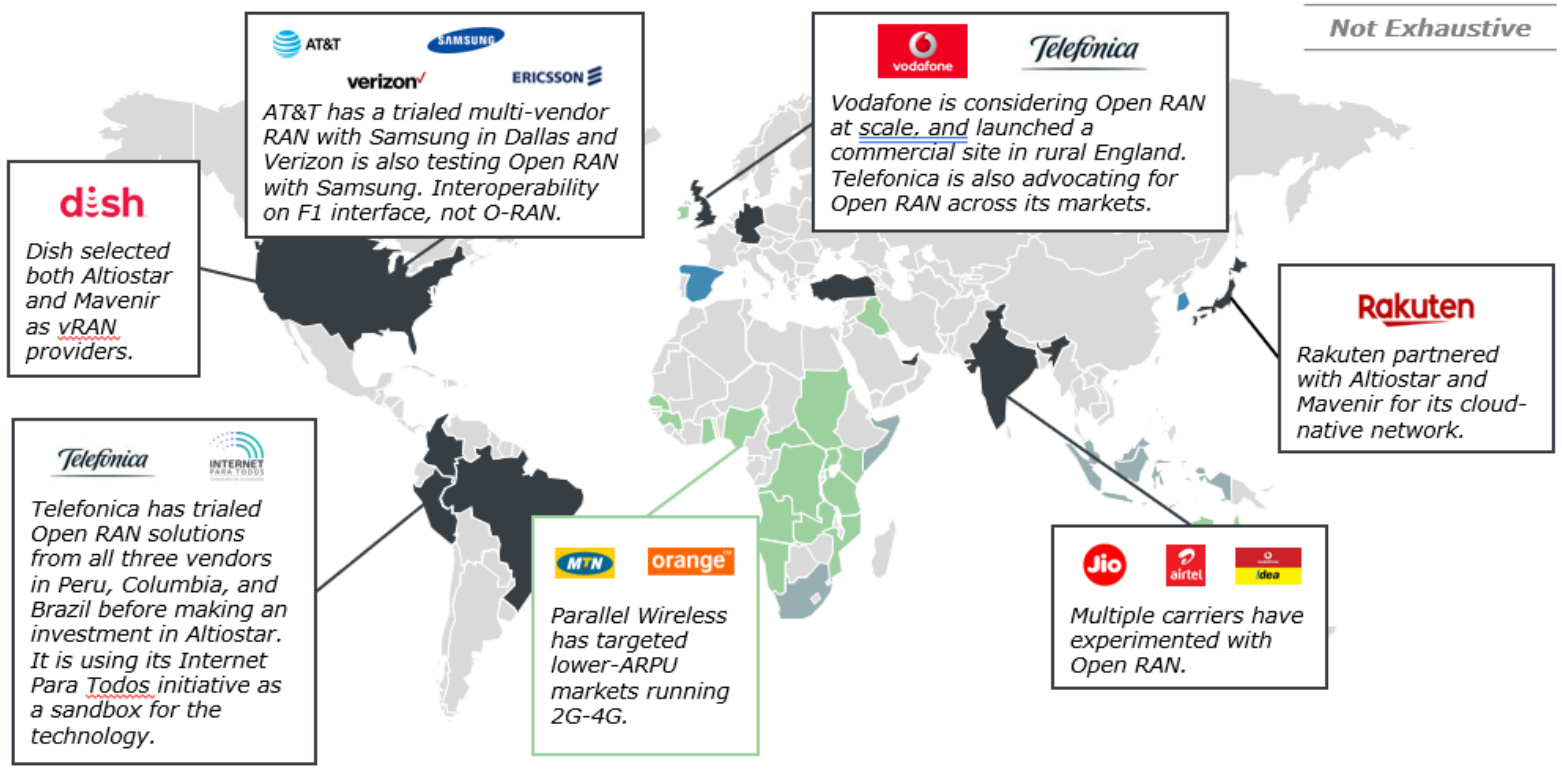
Towers companies pivoting

The next-generation radio access network

We expect open RAN deployments to double in 2021 from 35 current active deployments

Open RAN Trials

Operators across the world are cautiously experimenting with RAN vendors and open architectures



Sources: Deloitte analysis of publicly available information (e.g., press releases, company websites, and industry newsletters), not exhaustive.

Open RAN: Rakuten

Buyer

Vendors used include: Cisco, Nokia, Altiostar, Intel, Red Hat (now part of IBM), OKI, Fujitsu, Ciena, NEC/Netcracker, Qualcomm, Mavenir, Quanta Cloud Technology, Sercomm, Tech Mahindra, Allot, Innoeye, and Viavi.

Rakuten **is acting as systems integrator.** "if we didn't act as the systems integrator we would never accomplish such a thing."

Mobile Operator

Launches: 4G (Apr '20) and 5G (Sep '20) launched. Target of 3m users by end '20 likely to be missed. Pricing 70% lower than competitors.

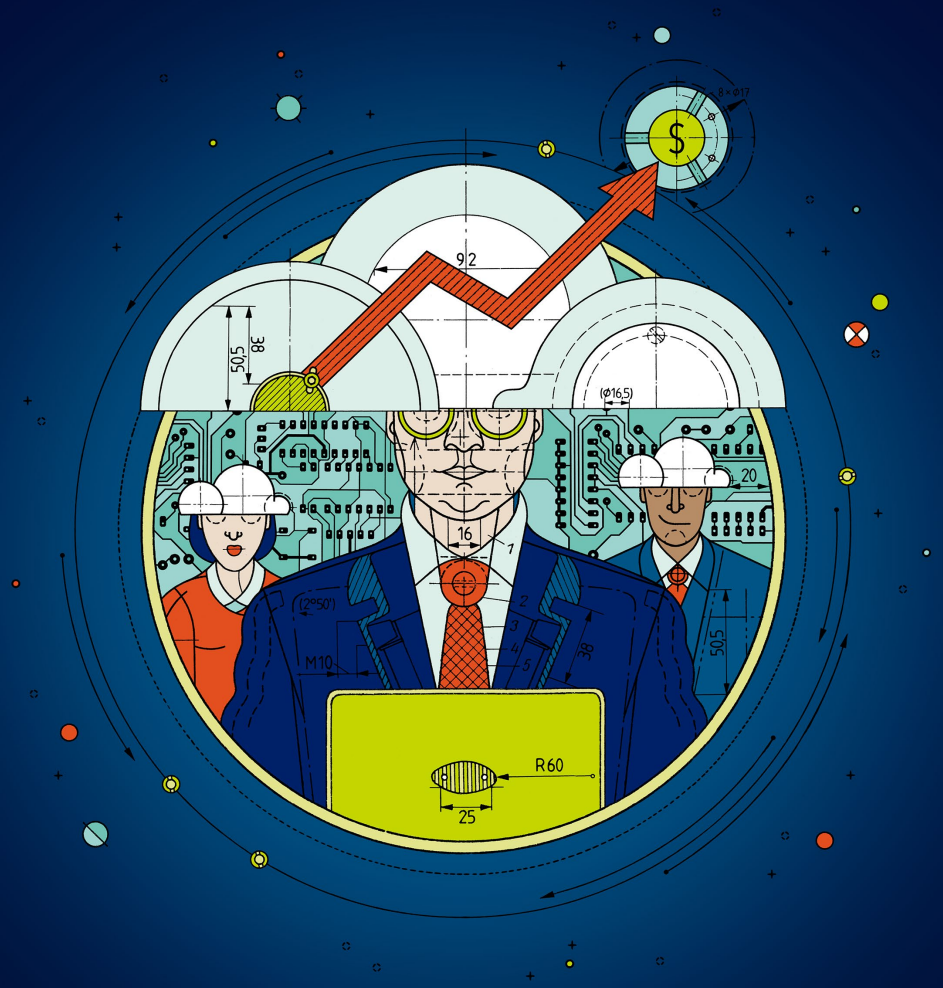
Network: 5,739 base stations active end June; needs c. 50k to cover country. Accelerating network roll out by 5 years. As of Dec '20 deploying 1,500 base stations per month.

Ambition: **"**We have scaled out and tested and validated this virtual machine ability to handle infinite capacity, largely tied to commodity servers… **we'd love to see customers consume an average of 30GB/day**'

Vendor

Offering: Rakuten Communications Platform. Functions (network), Automator (operations) and Marketplace (storefront).

Acquired: Innoeye, US developer of operational support systems. Major stake in **Altiostar**, SW company used in radios built by Airspan

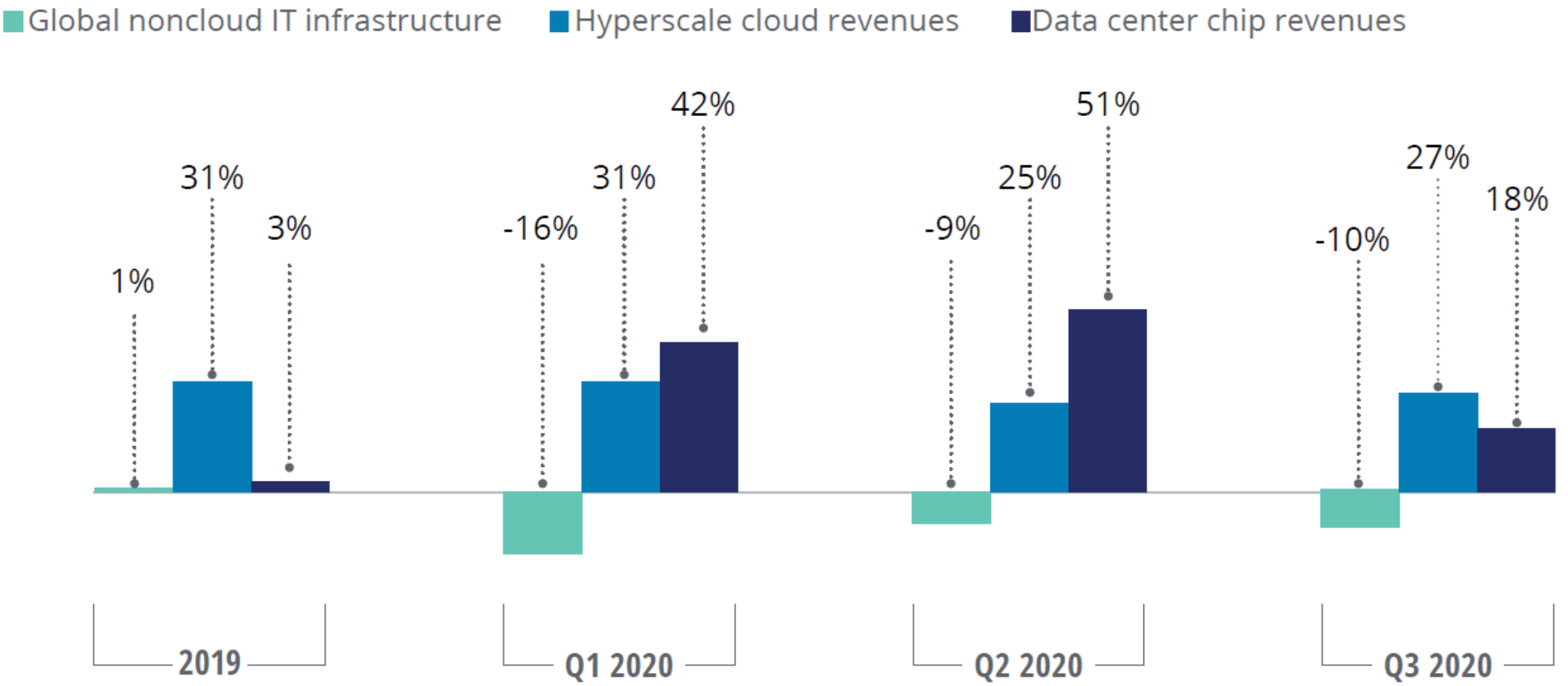


Cloud migration forecast

Cloudy with a chance of clouds

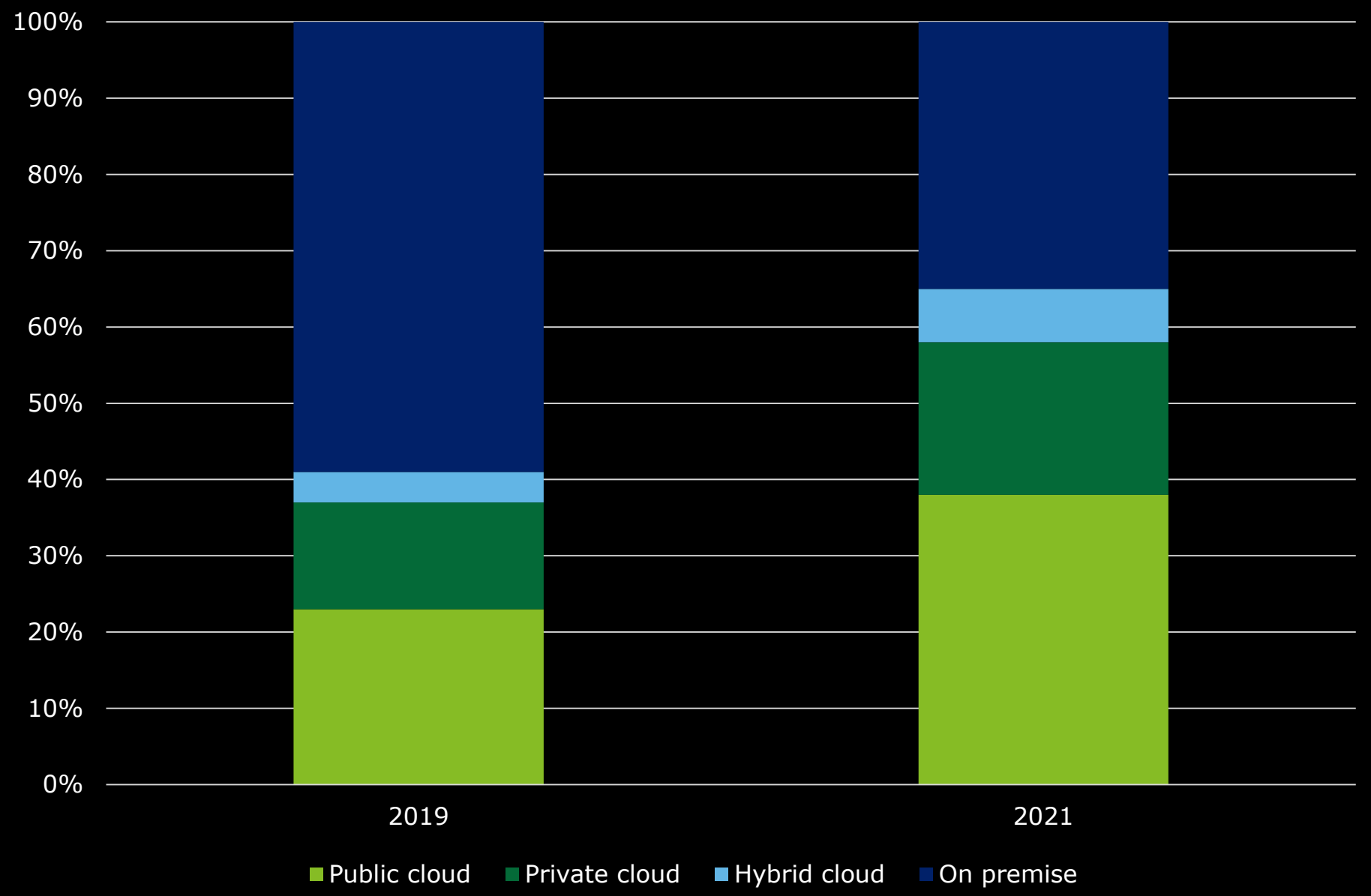
Cloud spend has done better than overall IT spend

YoY growth in spend, percent



Source: Deloitte analysis of quarterly and annual financial statements.

Computing forecast: Cloudy with a chance of clouds



- Cloud data traffic on the global internet up 100% yoy due to COVID
- Cloud ETFs up 81% in 2020, compared to NASDAQ up 46% and S&P500 up 18%
- Hyperscale capex about $150B in 2022
- Cloud is more sustainable: cloud office productivity suite via the cloud is 6-7 kg of CO_2 annually, non-virtualized on-premise is 30 kg of CO_2 annually

"We've seen two years of digital transformation in two months."

Microsoft CEO Satya Nadella, April 2020

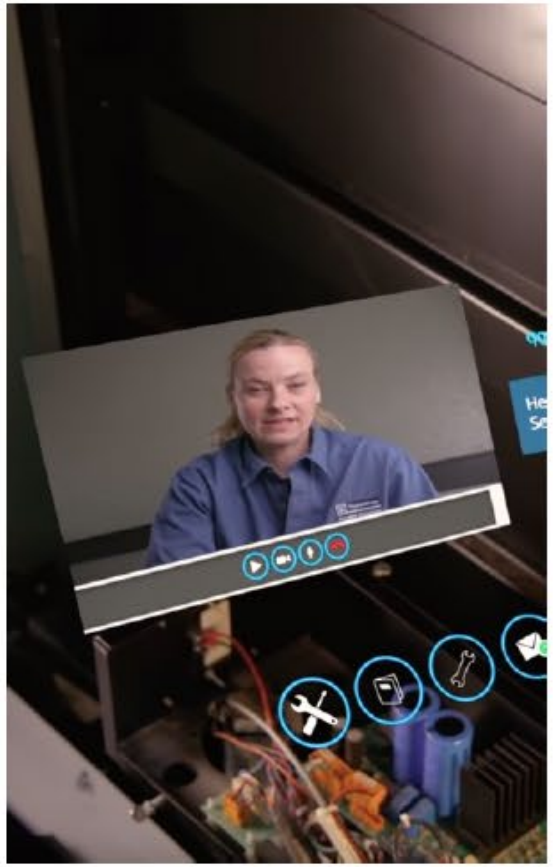
From virtual to reality

Digital reality headsets in enterprise and education


Deloitte.
Digital
Digital Reality changes everything
Step into the future

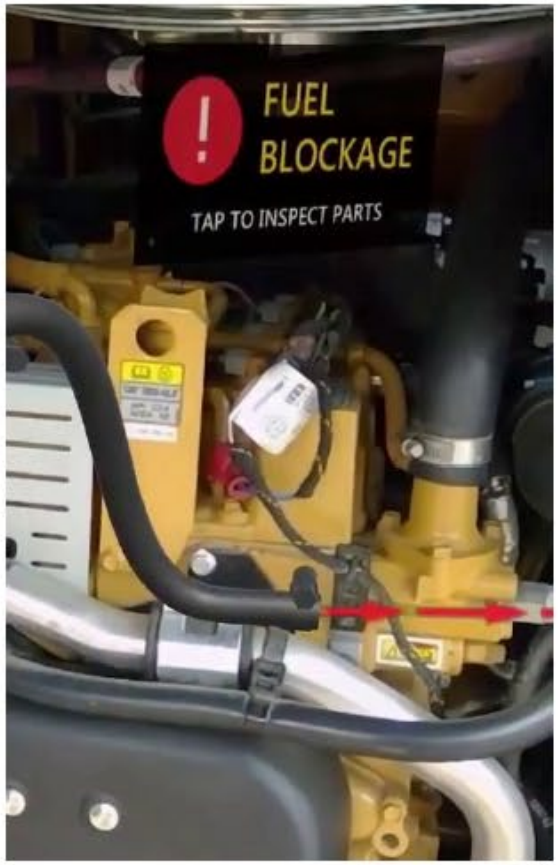
Industry Examples

Remote assist



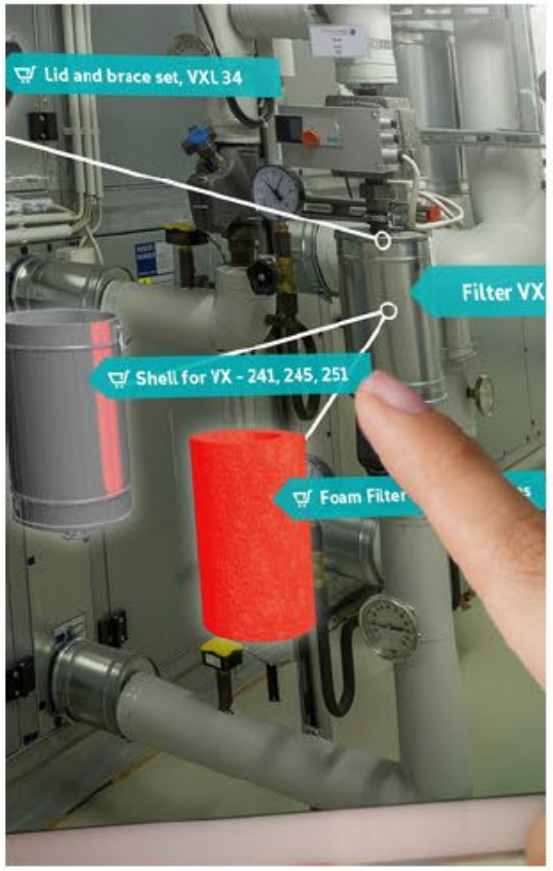
thyssenkrupp

Machine Maintenance tasks



CAT

IOT - Digital twin



IBM

Collaboration with robotic arm

OPEL

Industry Examples

Employee Training in VR

Walmart

Training employees without travel

Volkswagen

Employee Training in VR

Insurance

“If it’s too dangerous, too difficult, or too expensive to train in the real world, why wouldn’t you train in a virtual one?”

Headsets are shared devices and not personal:

Walmart trained over a million employees with 17,000 (low end) headsets, or 60 employees/headset. Headsets are more like printers or projectors, not computers or smartphones.

Not every worker needs a headset:

Often only for “new hires and subcontractors.”

Not every location needs headsets:

Province of Saskatchewan has 1.2 million residents, 40% in rural areas. They deployed a pair of headsets to each of 11 of the most remote community medical centres. That’s 22 headsets for the whole province.

Headsets are only part of the (augmented) picture:

The US Army had a 2018 $480 million deal with Microsoft for customized Hololenses. Big deal…but only 2,500 headsets. Even at $30K each (speculation on my part) that would only be $75 million or 16% of total deal value.

What are the discussion points?

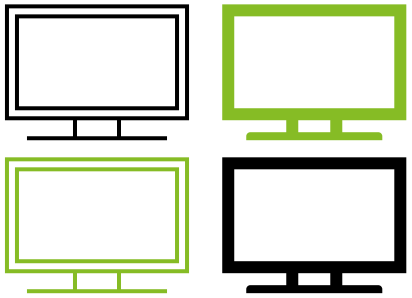
- “This should have been a [consumer] VR moment, and it isn’t.” Ben Evans on COVID and consumer VR
- Multi billion-dollar XR market for enterprise…but headsets are a small part of that.
- Lots of good research showing that XR is a good training tool…so why is adoption so low?
- Education market is expected to grow, but (even with the pandemic) is still tiny, tiny, tiny.

TV’s New Year’s resolution

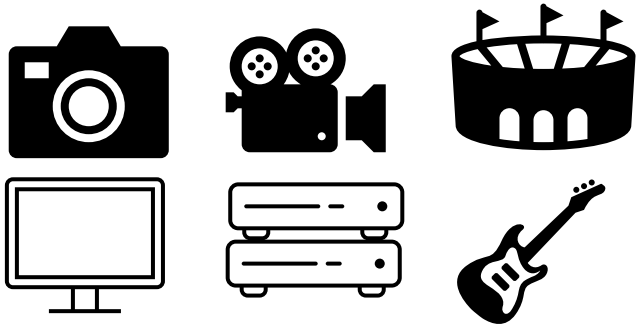
The start of the 8K wave

8K panels: What's the prediction?

Sales of 8K TVs (33 million pixels vs 8 million for 4K) are likely to reach US$3.3 billion in 2021.

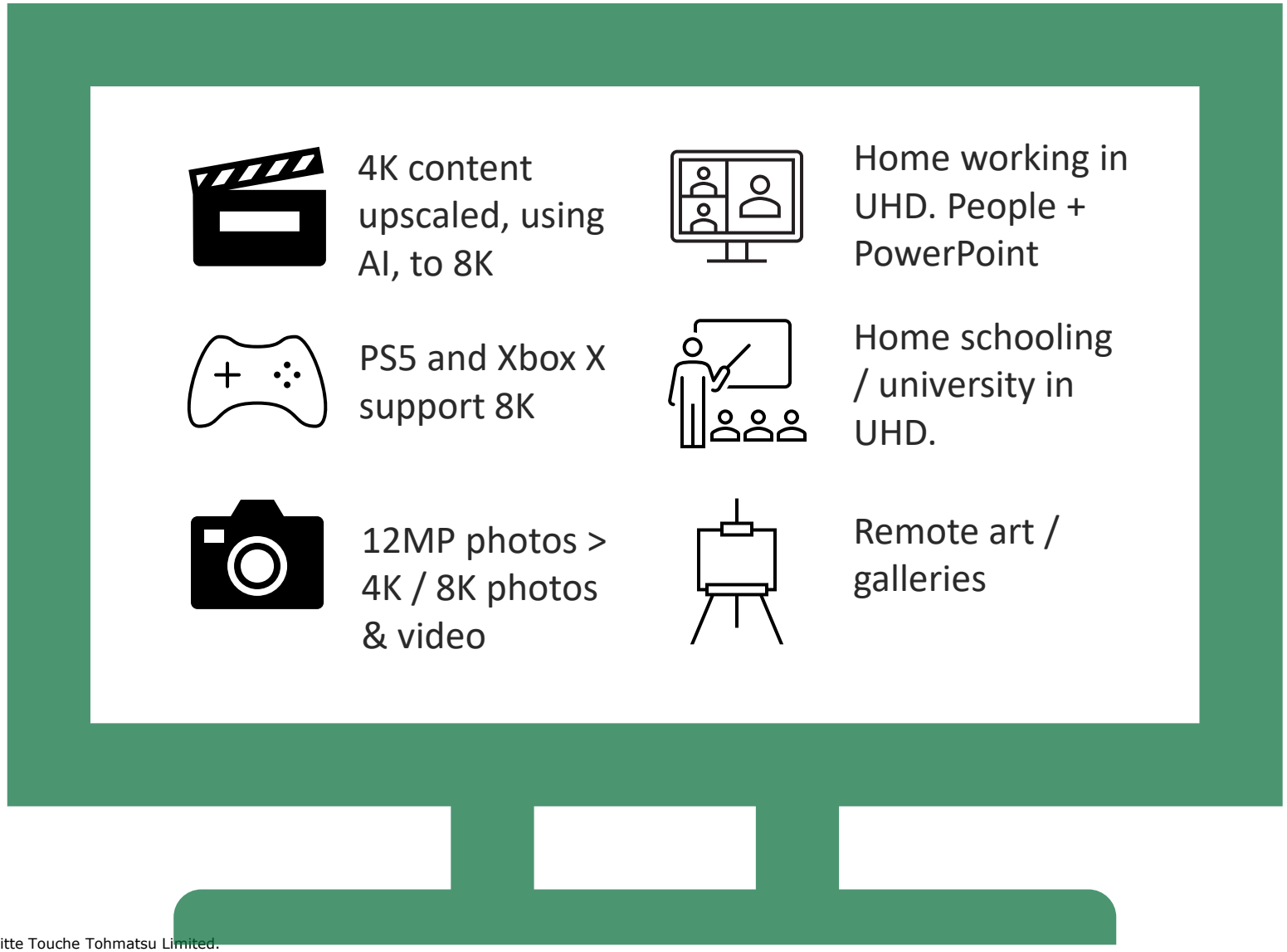


Revenues will come predominantly from sales of 8K TV sets to consumers (an anticipated 1 million units with an average selling price of US$3,300), with the standard becoming increasingly popular for the largest television set sizes. China and the US are likely to be the largest markets.



In addition, sales of 8K equipment (such as cameras, monitors, massive displays, data storage, and computers), should generate hundreds of millions of dollars globally for the year.

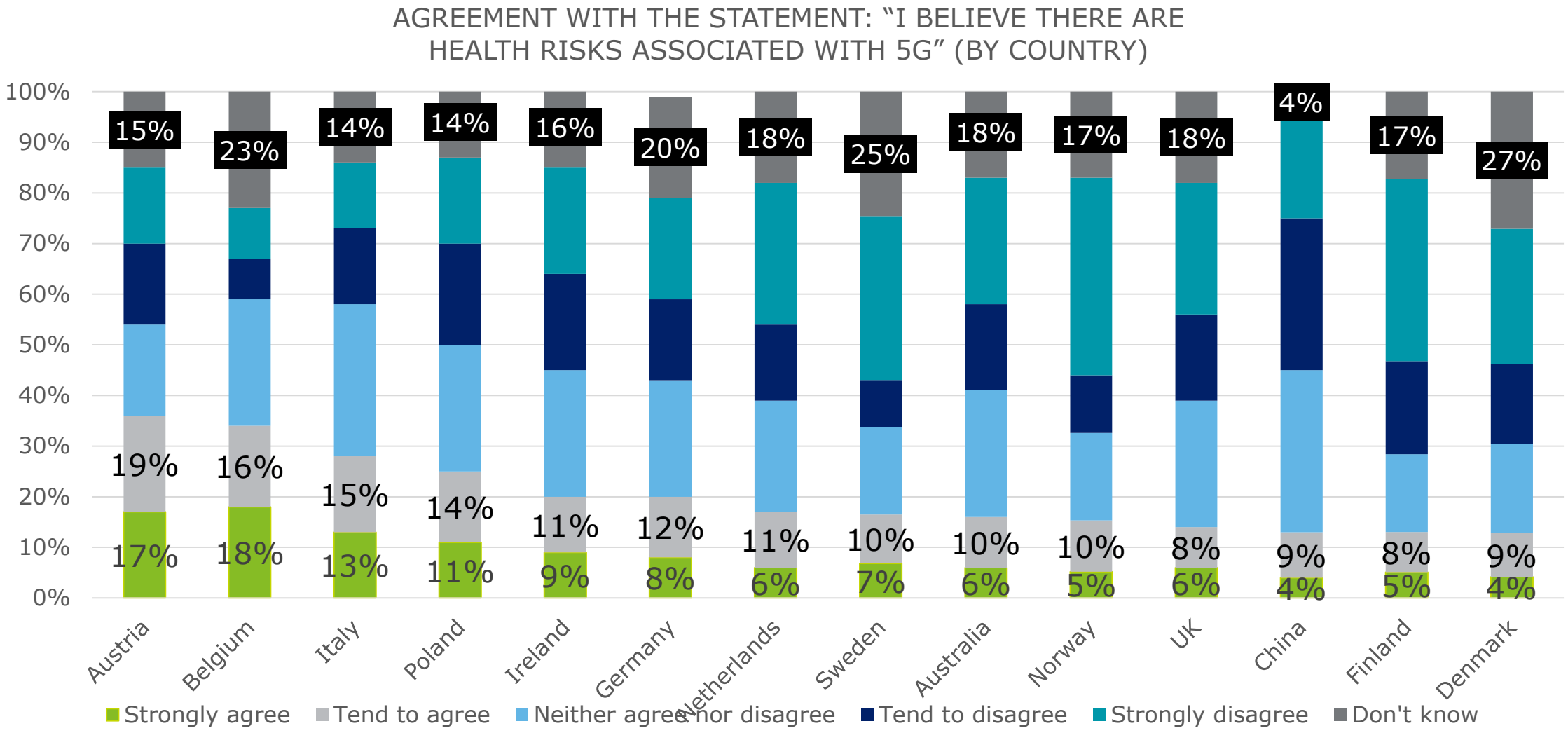
8K panels: sources of content



5G is not hazardous to your health

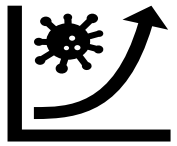
Busting the radiation risk myth

Who's afraid of 5G? Up to a third of adults in advanced economies

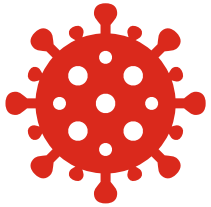


Who's afraid of 5G? :What are the key concerns?

5G and other wireless tech cause radiation sickness

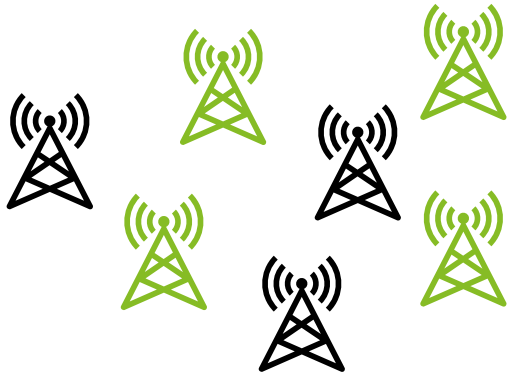


5G weakens the immune system

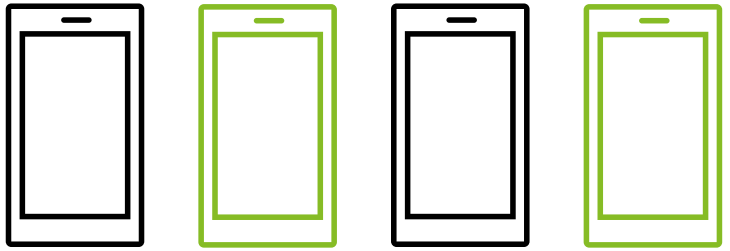


5G towers spread COVID-19

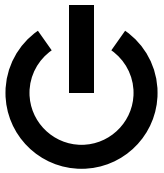
Why be afraid of 5G? 5G has lower power outputs than prior technology and other radio wave based services



0.1 watt output for pico-cells (200 watts for most powerful towers, up to 100,000 watts for long-range TV and radio towers)



0.001 – 1 watt emissions for 5G phones in regular modes, due partly to proximity to base stations.



No power emission from 5G base stations when not in use. This is not the case with earlier generations.

Beam-forming, a transmission technique new to 5G, lowers chance of passive exposure to (low-power) radio waves.

Women’s sports gets down to business

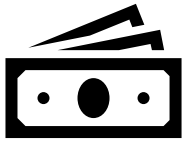
On track for rising monetization

Women in Sports: in numbers

84% of sports fans (half of which are women) are interested in least one women's sport.

86,174 fans watched the 2020 T20 World Cup final between Australia and India at the Melbourne Cricket Ground, the largest crowd ever for a women's sports event in Australia.

The 2019 FIFA Women's World Cup in France was watched by a record 993 million on TV, with a further 482 million accessing it via digital platforms. The final was watched live by 260 million viewers, including 14.3 million in the United States.



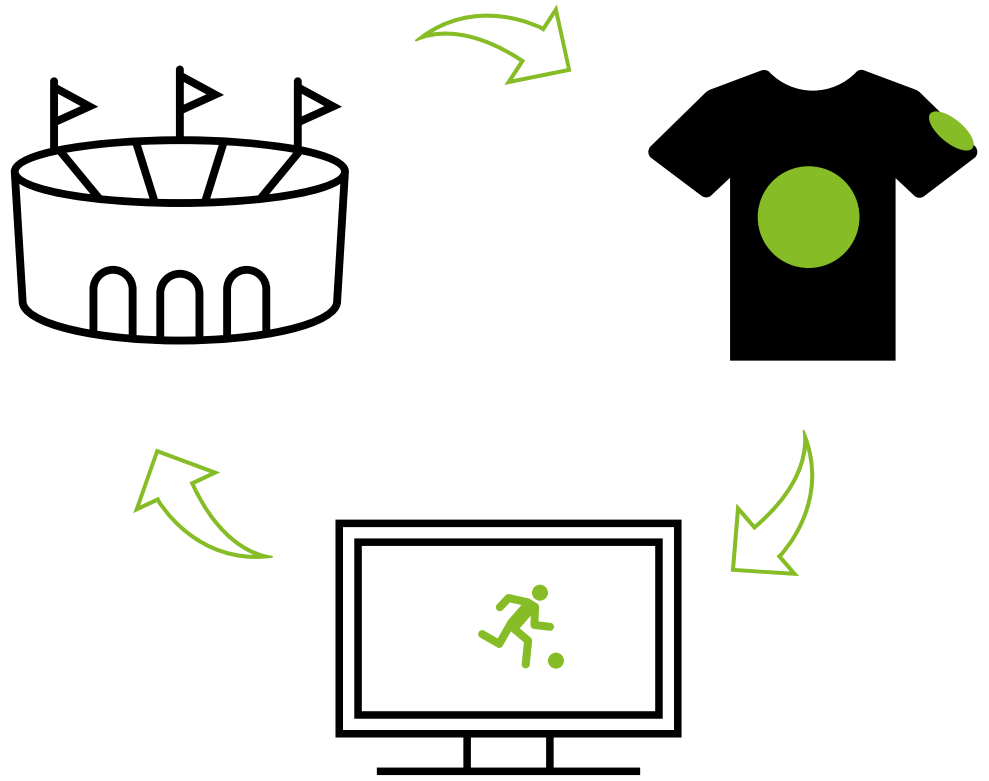
Yet in 2021, we predict women's sports revenues will be well under a billion dollars—a fraction of the global value of all sports (men's, women's and mixed), which in 2018 reached US$481 billion in 2018, an increase of 45% over 2011.

Women in Sports: the prediction

We predict that women's sports will grow to be worth a great deal more than a billion dollars in the years ahead.

Its ability to generate substantial TV audiences, deliver value to sponsors, and draw tens of thousands of fans per event has been demonstrated on multiple occasions over the past decade.

The challenge in 2021 and beyond will be for women's sports to pull in substantial TV and stadium (as permitted) audiences consistently across multiple sports



Women in Sports: time to get in early

In the United States, ESPN pays US$25 million for its TV deal with the WNBA. In comparison, the value of the rights for US men's basketball was US$2.6 billion as of 2019, or 104x larger. 2020 Finals rating for men was 17x larger.

In North America, the National Women's Hockey League (NWHL) agreed to a three-year deal with Twitch for its games to be live-streamed. The NWHL will be receiving a media rights fee for the first time in its history.

In Spain, the Women's Association of Football Clubs (ACFF) announced a three-year deal worth €9 million for the rights to Liga Iberdrola, the first Spanish women's football division. The men's games TV domestic rights are worth over €3 billion for the three seasons in 2018-2022.

In the United Kingdom, Barclays has a three year sponsorship deal with the Women's Super League, worth 'multi-millions'. Front of short sponsorship for the Premier League generates $400M annually. The top 5 European football leagues generate over $1 billion per year.

The hyperquantified athlete

Technology, measurement, and the business of sports

The era of the hyperquantified athlete

Over the past decade, **the use of data and analytics** has slowly transformed sports

Today, **hundreds of different metrics** can be analyzed through video analytics and wearables

However, data collection and analysis in sports are:

- Becoming increasingly **real-time**
- Happening **around the clock**
- Measuring indicators **outside and inside** the body
- Being driven by advancements in **computing power, cloud technology, machine learning algorithms, and high-speed video capabilities**

PREDICTION:

By the end of 2021, multiple professional sports leagues will establish new formal policies around the collection, use, and commercialization of player data

The current state of play – Technology has greatly expanded the ways in which athletes can be tracked and measured

Positional/tracking data

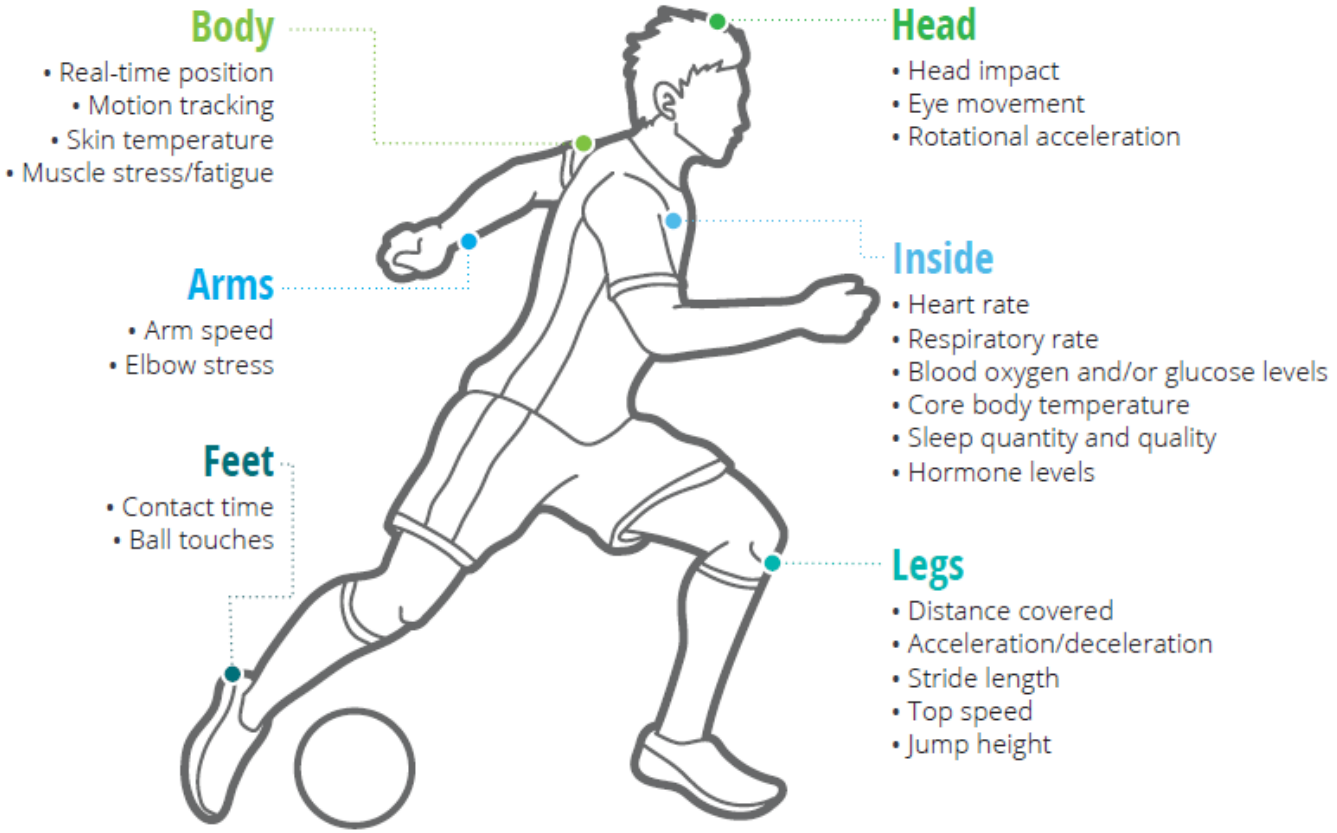
Where a player – or ball, puck, or other object – is located on a field or court

Position, acceleration, lateral motion, speed, jump height, etc.

Biometric data

Any kind of biological information from an individual player

Pulse rate, blood glucose or oxygen levels, sweat rate, sleep rhythms, etc.



Note: This list is not exhaustive.
Source: Deloitte analysis.

Gaining a competitive edge though hyperquantification

	Talent identification	In-game decision-making	Injury reduction
What?	Using automated video analysis, positional and tracking data, and biometric data in scouting	Using real-time analytics in actual games for coaching decisions – it is not yet common	Predicting when conditions during training or in-game may heighten the risk of injury
Benefits	Expanding the pool of potential professional players (not limited to where scouts can travel)	Who might be at risk of injury, getting close to exhaustion, out of position, primed to make a big play	For teams: more wins and more revenue For athletes: having information that can help extend their careers
Example	*A pro football hopeful could not attend traditional scouting events, so he submitted his player-tracking data from college games to prove his real-world speed*	*In-game positional and tracking data is already used by the NFL, NHL, and the Mexican football league Liga MX*	*One study estimated that the NFL lost more than US$500 million in 2019 due to injuries*

Key questions to address - Putting the athlete at the center of every decision and conversation

1. How will advances in **automated video analysis, sensor technologies, and machine learning** accelerate the state of the art?

2. Would **players benefit enough financially** from sharing their personal and performance data to entice them to do so?

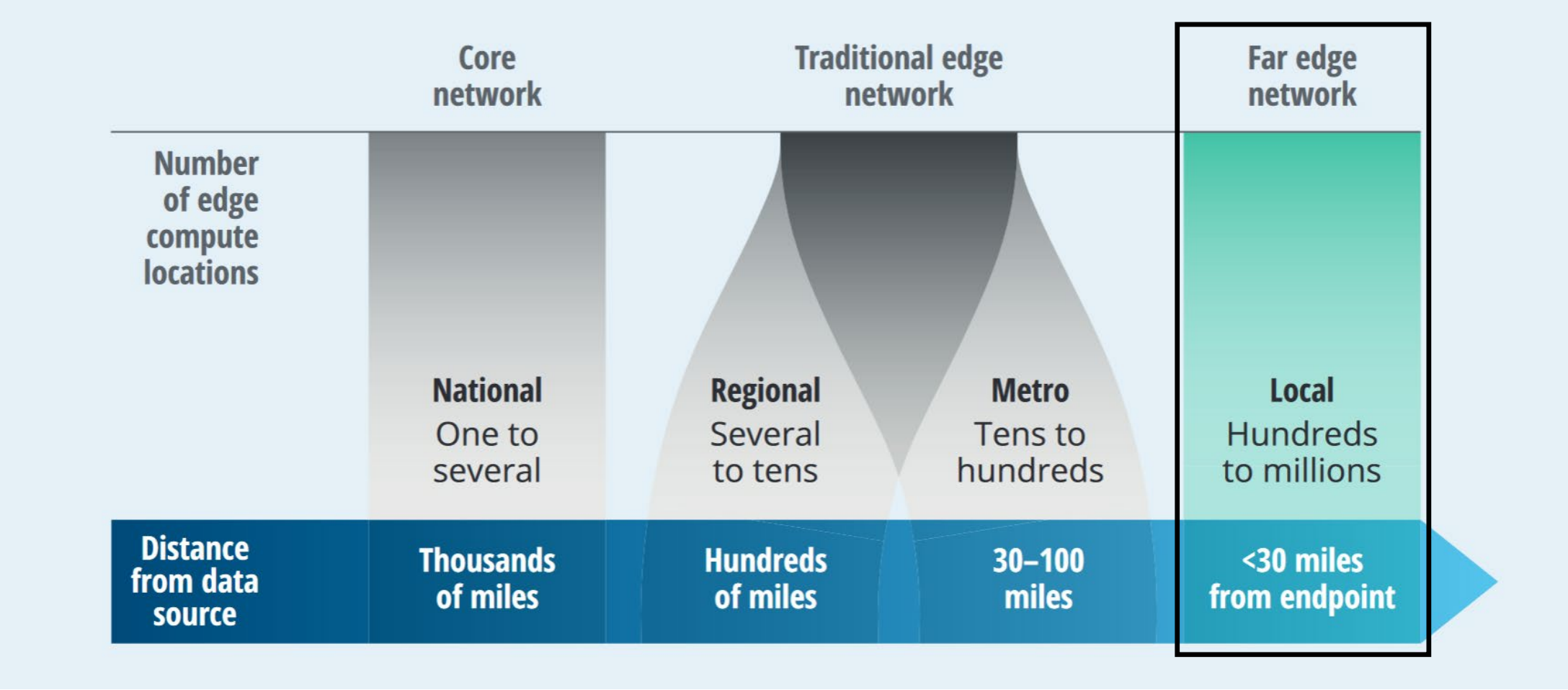
3. Will **a standard agreement emerge** between players and leagues across sports around the collection, use, and monetization of private and sensitive information?

4. How will performance data ultimately be used to **enhance the in-stadium and remote fan experience**?

Gaining an intelligent edge

Edge computing and intelligence could propel tech and telecom growth

The Intelligent edge moves processing power close to network endpoints



Source: Technology Business Research, Inc., *Telecom Edge Compute Market Landscape*, 2019

Gaining an intelligent edge:
Edge computing and intelligence could propel tech and telecom growth

In 2021, the global market for the intelligent edge will expand to US$12 billion.

Growth in 2021 will be driven by telecoms and hyperscale cloud providers.

Beyond 2021, the market will expand into manufacturing, industrial, and supply chain.

No single provider owns the intelligent edge: deployment requires coordination between telecoms, hyperscalers, and technology companies.

Gaining an intelligent edge:
Edge computing and intelligence could propel tech and telecom growth

What is the intelligent edge and why is it important

Brings computation, data analytics, and AI to the edge of networks.

Designed to quickly operate on incoming data.

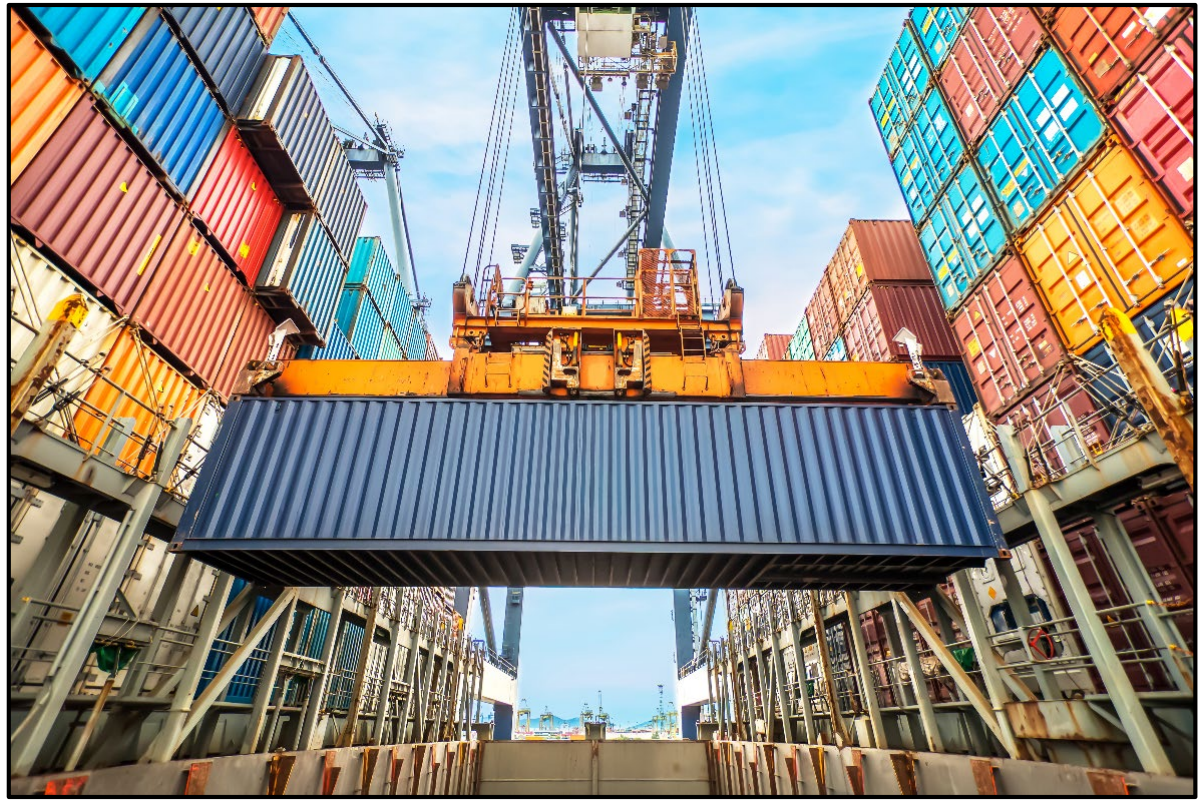
Decades in the making.

Complementary to cloud, not a replacement.

Enables service architectures to become distributed based on component needs.

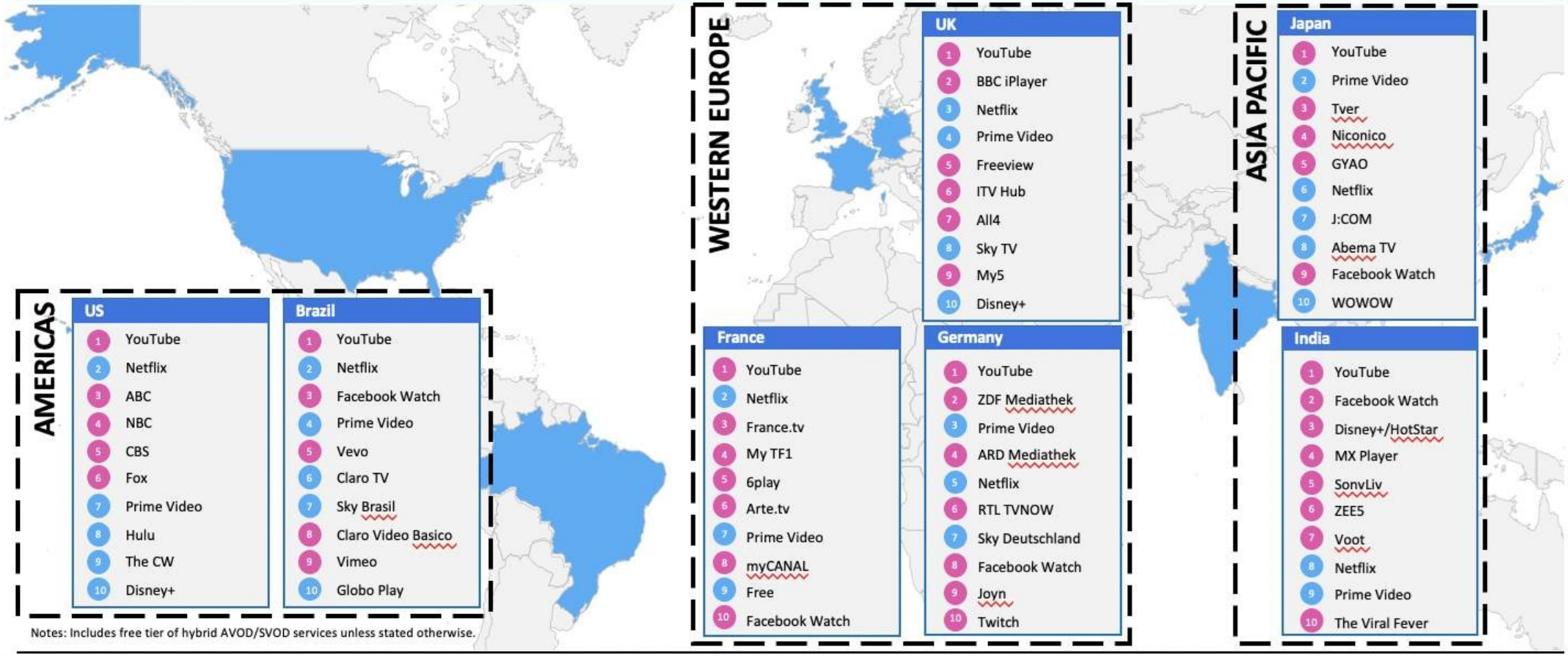
More responsive, flexible, and autonomous.

Leading Asian Port: Automation and efficiency



- Load and unload ships more efficiently
- Used connectivity and edge AI to automate cranes and trucks in the container port
- Reduced labor costs by 70% and increased operational efficiency by 30%

Top 10 video services by country by monthly users – November 2020



AMERICAS

US

1. YouTube
2. Netflix
3. ABC
4. NBC
5. CBS
6. Fox
7. Prime Video
8. Hulu
9. The CW
10. Disney+

Brazil

1. YouTube
2. Netflix
3. Facebook Watch
4. Prime Video
5. Vevo
6. Claro TV
7. Sky Brasil
8. Claro Video Basico
9. Vimeo
10. Globo Play

WESTERN EUROPE

UK

1. YouTube
2. BBC iPlayer
3. Netflix
4. Prime Video
5. Freeview
6. ITV Hub
7. All4
8. Sky TV
9. My5
10. Disney+

France

1. YouTube
2. Netflix
3. France.tv
4. My TF1
5. 6play
6. Arte.tv
7. Prime Video
8. myCANAL
9. Free
10. Facebook Watch

Germany

1. YouTube
2. ZDF Mediathek
3. Prime Video
4. ARD Mediathek
5. Netflix
6. RTL TVNOW
7. Sky Deutschland
8. Facebook Watch
9. Joyn
10. Twitch

ASIA PACIFIC

Japan

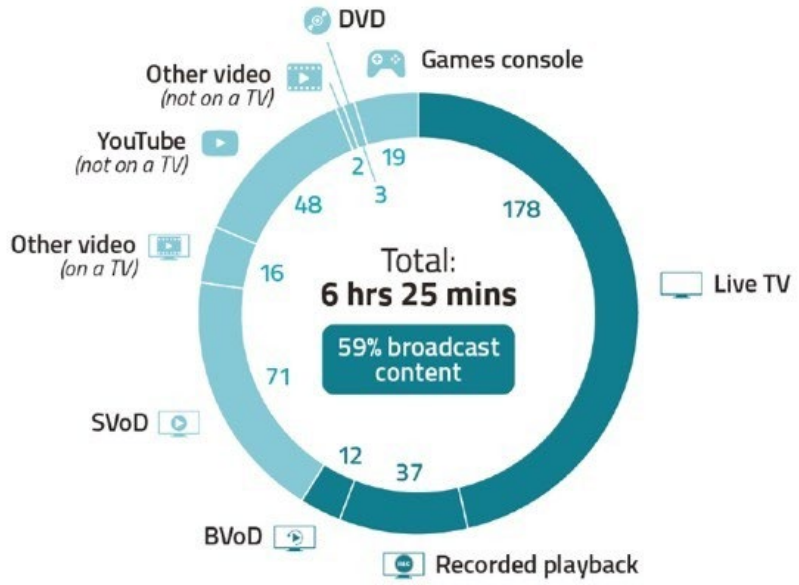
1. YouTube
2. Prime Video
3. Tver
4. Niconico
5. GYAO
6. Netflix
7. J:COM
8. Abema TV
9. Facebook Watch
10. WOWOW

India

1. YouTube
2. Facebook Watch
3. Disney+/HotStar
4. MX Player
5. SonyLiv
6. ZEE5
7. Voot
8. Netflix
9. Prime Video
10. The Viral Fever

Notes: Includes free tier of hybrid AVOD/SVOD services unless stated otherwise.

Figure 1.2: Average minutes of viewing per day in April 2020: all individuals, all devices



Source: Ofcom estimates of total audio-video viewing. Modelled from BARB, Comscore and TouchPoints data.

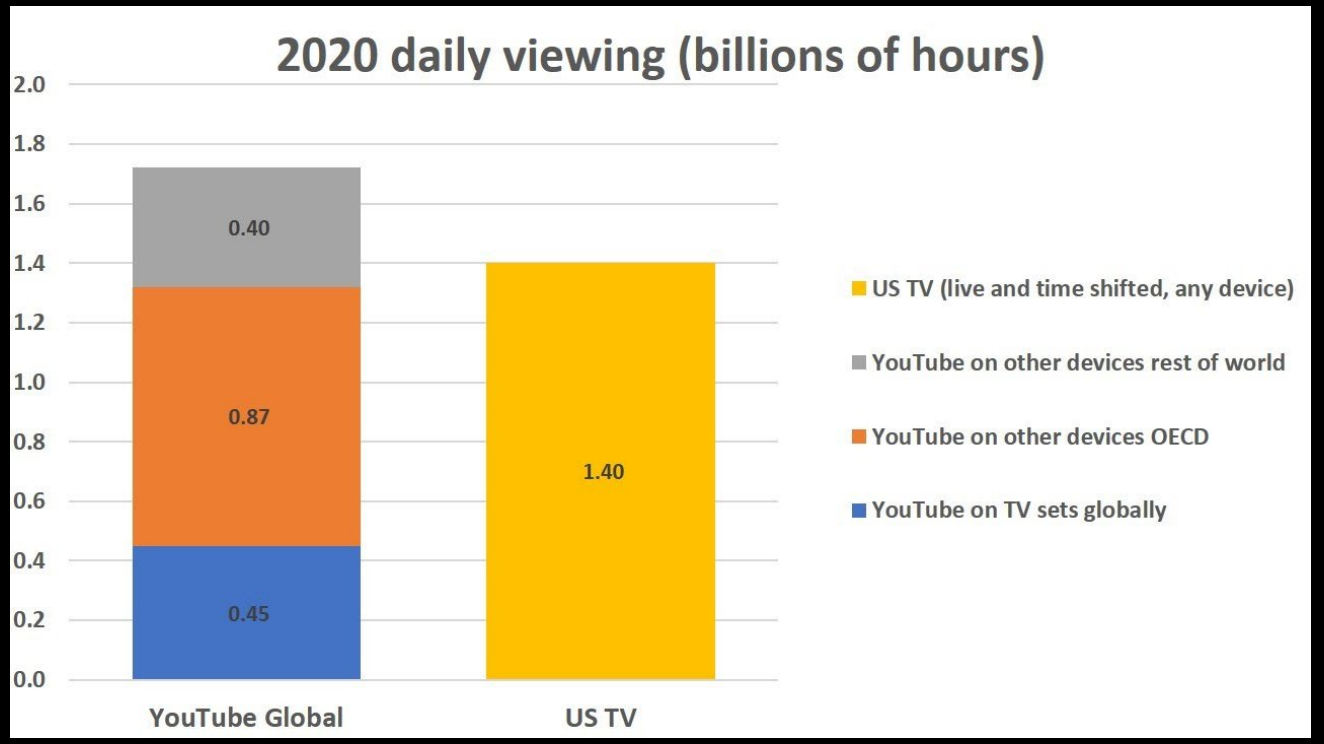


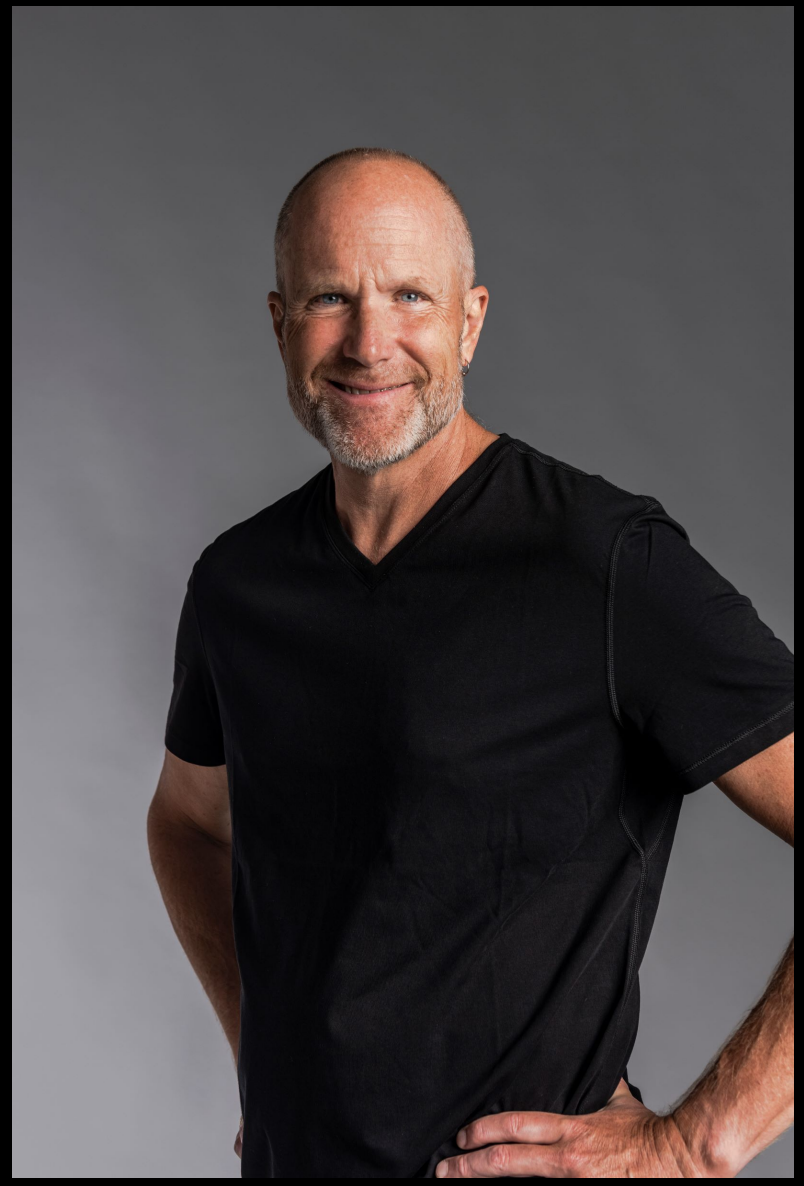
FIGURE 2

Consumers now have more streaming video subscriptions, but there's been more churn since COVID-19 began

Changes made to paid subscriptions since the COVID-19 pandemic began

Sources: Digital media trends COVID-19 pulse survey, May 2020; Digital media trends COVID-19 pulse survey, October 2020.

TMT Predictions: custom events



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