Interactive Brokers

in conjunction with

Global X Funds

present:

How Disruptive Technologies are Enabling the Re-Opening Economy

Pedro Palandrani and Andrew Little

Research Analysts

Global X Funds

January 21, 2021

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How Disruptive Technologies are Enabling the Re-Opening Economy

Q1 2021

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Today's Presenters

Pedro Palandrani | AVP, Research Analyst

- Research analyst covering the Thematic Growth ETFs & disruptive technologies
- Former Equity Research Analyst at Cabot Wealth Management
- BA, Universidad Católica Andrés Bello (UCAB) in Venezuela
- MBA, Bertolon School of Business at Salem State University
- Follow on Twitter: @ppalandrani_gx

Andrew Little | AVP, Research Analyst

- Research analyst covering Thematic Growth ETFs & disruptive technologies
- Former Sustainable and Thematic Investing Associate at UBS
- AB, Business Economics, Brown University
- Chartered Sustainable, Responsible and Impact Investing Counselor designation (CSRIC™)
- Follow on Twitter: @alittle_gx

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Our Mission

"Global X was founded in 2008 with the mission of listening to and empowering clients to invest wisely in unexplored and intelligent solutions. It's a mission and responsibility that has endured for more than a decade, and one we carry forward each day through…"

-Luis Berruga, CEO

Our Business

- Exchanged-Traded Funds (ETFs)
- Research & Insights
- ETF Model Portfolios
- Practice Management Tools

Our Team

A diverse collection of more than 60 financial professionals, representing more than five native languages and ten nationalities, bringing together hundreds of years of industry experience

Our Partners

- Global Perspective & Reach
- World-renown Index Providers & Exchanges

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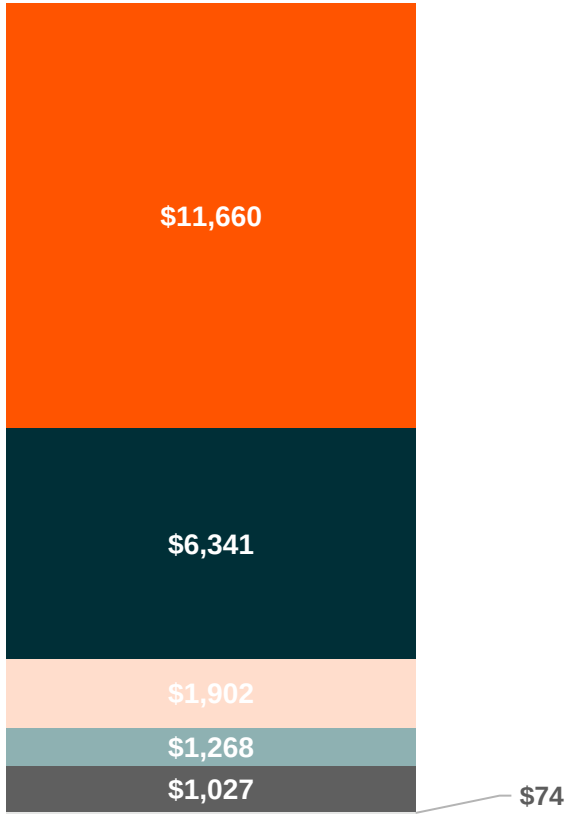
Global X Overview: ~$22.2bn in AUM across 78 ETFs

AUM ($M) by Fund Family as of 1/07/21



Thematic Growth
24 ETFs

Targeting companies that may be poised to benefit from structural shifts in technology, people and demographics, and infrastructure development

Income
21 ETFs

Offering solutions for investors seeking to increase or diversify the yield potential of their portfolio

International Access
23 ETFs

Including targeted sector exposure to China, along with single-country and regional strategies

Core
4 ETFs

Serving as key portfolio building blocks that seek to deliver exposure to specific factors and values, including ones related to ESG considerations

Commodities
4 ETFs

Seeking to align opportunities for exposure to natural resources across a variety of areas, but chiefly in metals, mining, and agriculture

Alpha
2 ETFs

Goal of delivering market-beating total returns by following methodologies backed by academic research

Source: Global X ETFs, January 7, 2021

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Structural Changes are Accelerating During the COVID-19 Pandemic

What is Thematic Investing?

Thematic investing is a forward-looking investment approach that refers to the process of identifying powerful macro-level trends and the companies that stand to benefit from the materialization of those trends.

Two Approaches to Portfolio Construction

1. **Learn from the Past**
   - Backward-looking
   - "History repeats itself"
   - Harvesting factor premia/smart beta
   - Mean reversion
2. **Anticipate the Future**
   - Forward-looking
   - "Next time will be different"
   - Growth-oriented investment approaches

THEMATIC INVESTING ANTICIPATES FUTURE STRUCTURAL CHANGES

PROCESS	CHARACTERISTICS
1. Top Down Identify disruptive macro-level trends ↓ 2. Bottom Up Find investments with high exposure to those trends	Long term **growth-focused** strategy
	Unconstrained by arbitrary geographic and sector definitions
	Often **low correlations** to other growth strategies
	Relatable concepts

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3 Steps for Identifying Powerful Themes

Global X follows a 3-step process for identifying powerful themes and launching ETFs that provide exposure to the companies that are well-positioned to benefit from the materialization of those themes.

1

Conviction

High, due to observable structural changes in demographics, technology, behavior, or politics/regulations

2

Investability

Broad group of publicly traded companies, with high liquidity, that provide targeted exposure to the theme

3

Time Frame

Medium to long term (10 or more years), making market timing less of a factor

GLOBAL X'S 24 THEMATIC ETFS

Technology

- Social Media ETF (SOCL)
- Lithium & Battery Tech ETF (LIT)
- FinTech ETF (FINX)
- Internet of Things ETF (SNSR)
- Robotics & Artificial Intelligence ETF (BOTZ)
- Autonomous & Electric Vehicles ETF (DRIV)
- Artificial Intelligence & Tech ETF (AIQ)
- Video Games & Esports ETF (HERO)
- Cloud Computing ETF (CLOU)
- Data Center REITs & Digital Infrastructure ETF (VPN)
- Cybersecurity ETF (BUG)

Physical Infrastructure

- U.S. Infrastructure Development ETF (PAVE)
- CleanTech ETF (CTEC)

People & Demographics

- Telemedicine & Digital Health ETF (EDOC)
- Millennials Thematic ETF (MILN)
- Longevity Thematic ETF (LNGR)
- Health & Wellness Thematic ETF (BFIT)
- E-commerce ETF (EBIZ)
- Cannabis ETF (POTX)
- Education ETF (EDUT)
- Genomics & Biotechnology ETF (GNOM)
- China Biotech & Innovation ETF (CHB)
- Emerging Markets Internet & E-commerce ETF (EWEB)

Multi-Theme

- Global X Thematic Growth ETF (GXTG)

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The Four Phases of COVID-19

Currently in the Re-Opening Economy phase of the COVID-19 pandemic, economies around the world are carefully working to re-open businesses and schools in a safe and flexible manner, while also setting the stage for the final 'New Normal' phase.

Regional Focus: Examining Phases in the U.S.

We are Here

	The Pre-COVID Economy	The Stay-at-Home Economy	The Re-Opening Economy	The 'New Normal' Economy
Timeframe	Jan 2020 – Feb 2020	Mar 2020 – June 2020	Jul 2020 – Now* (data as of Sep 1)	Unknown
Focus	US-China trade deal	Flatten the curve	Phased re-opening	Back to business
COVID Prevention	Wuhan lockdowns/limit air travel	Shelter-in-place across US	• Compulsory mask-wearing • Temperature checks/distancing	New safety and social norms embedded across society
Monetary Support	None	0% FFR, +2.84T Balance Sheet	• FFR & balance sheet unchanged • Err on the side of lower rates	Unknown
Fiscal Support	None	$2T CARES Act	• Extended CARES Act • LWA implemented • Additional $900Bn COVID-relief package	

Note: Pre-COVID Economy: Jan 1, 2020 to Feb 29, 2020. Stay-at-Home Economy: Mar 1, 2020 to Jun 30, 2020, Re-Opening Economy: Jul 1, 2020 to Sep 1 (for data purposes). FFR = Federal Funds Rate, LWA = Lost Wages Assistance
Source: Bloomberg, Global X ETFs

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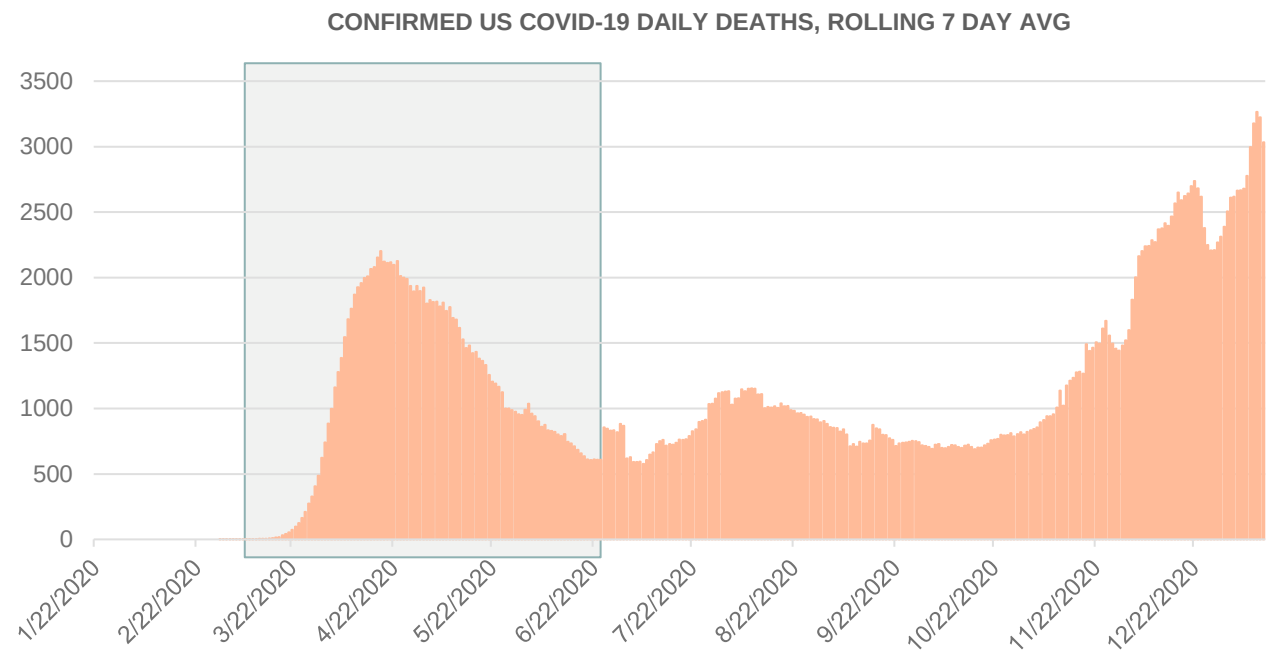
The Stay-at-Home Economy: A Massive Effort to Contain the Virus & Avoid Economic Collapse

The Pre-COVID Economy | **The Stay-at-Home Economy** | The Re-Opening Economy | The 'New Normal' Economy

Timeframe	Mar 2020 – June 2020
Focus	Flatten the curve
COVID Prevention	Shelter-in-place across US
Monetary Support	0% FFR, +2.84T Balance Sheet
Fiscal Support	$2T CARES Act

	Average
US Tests/day	290,747
US Infections/day	19,370
US Deaths/day	936
S&P 500	2,863
Unemployment	10.9%
10 Year Treasury	0.74%

STAY-AT-HOME ECONOMY HELPED REVERSE COVID-19 TRAJECTORY



Source: Bloomberg, Global X ETFs, January 12, 2021.

Note: Stay-at-Home Economy: Mar 1, 2020 to Jun 30, 2020. Source: Bloomberg, Global X ETFs

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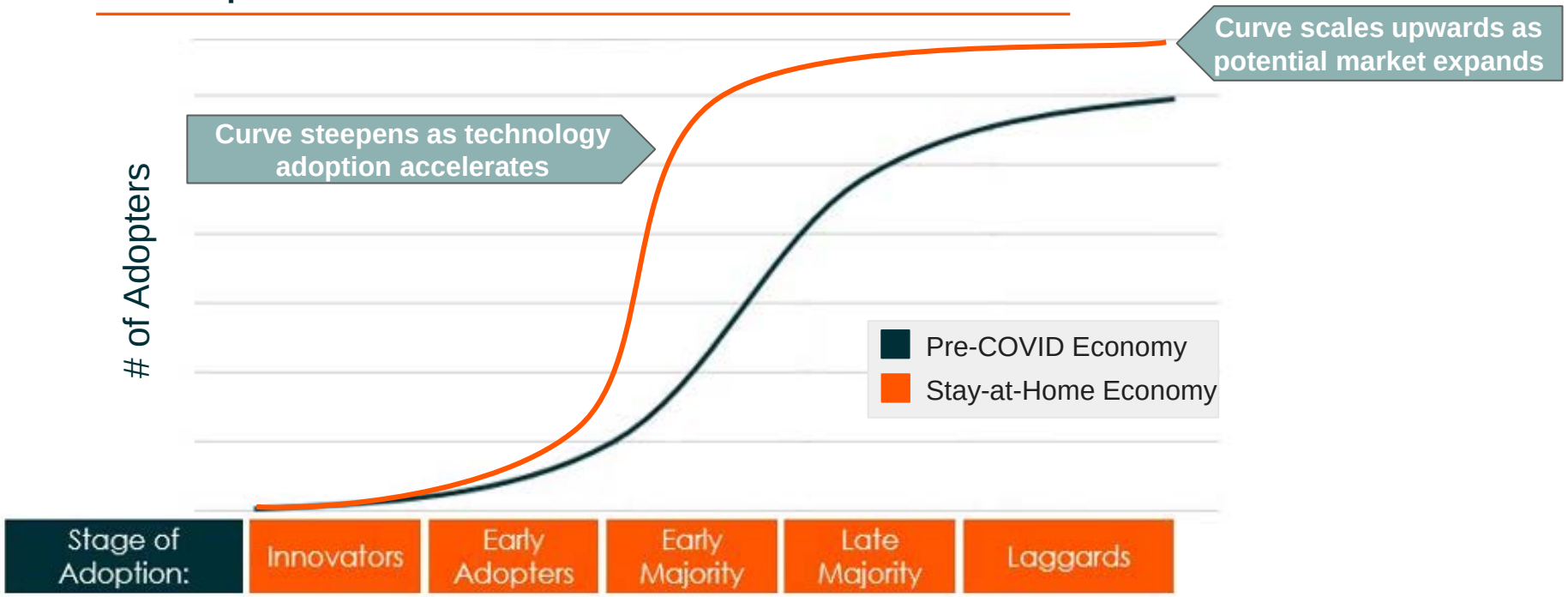
Structural Changes Accelerated & Expanded

The Pre-COVID Economy | **The Stay-at-Home Economy** | The Re-Opening Economy | The 'New Normal' Economy

The *Diffusion of Innovation Theory* holds that the adoption of new technologies tends to follow an S-curve adoption pattern. COVID-19 steepened the adoption rate of certain technologies and trends, while also expanding their total addressable markets.

The Adoption Curve & COVID-19



Source: Global X Research

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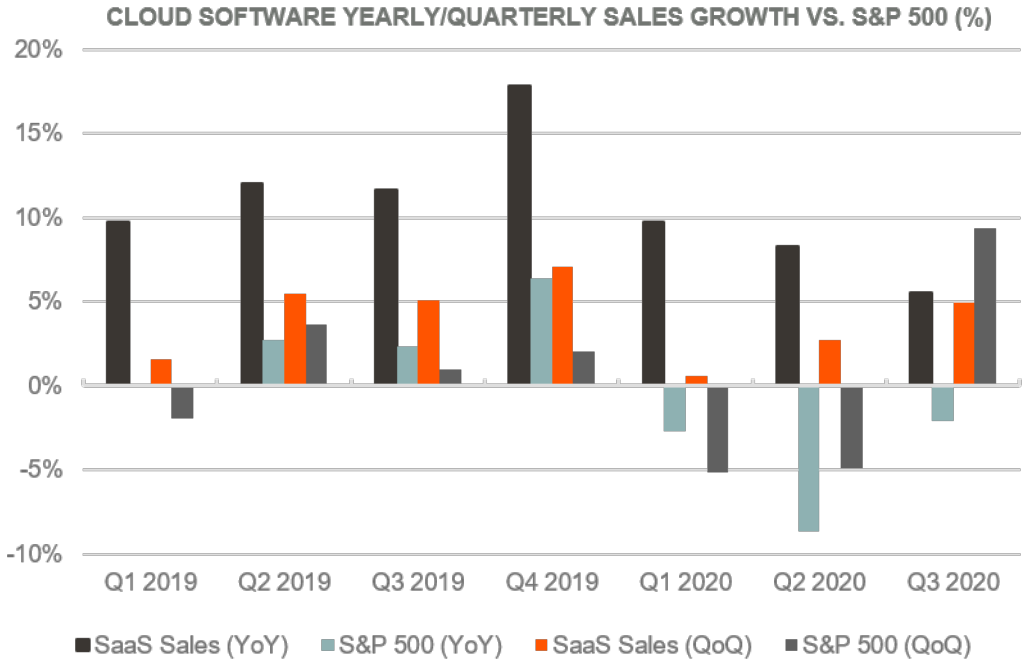
Structural Changes Accelerated & Expanded

The Pre-COVID Economy | **The Stay-at-Home Economy** | The Re-Opening Economy | The 'New Normal' Economy

Cloud computing software sales accelerated as companies and consumers turned to internet-based software-as-a-service (SaaS) solutions like videoconferencing.

REMOTE WORK DRIVES CONTINUED CLOUD-BASED SOFTWARE REVENUE GROWTH DESPITE S&P 500 SALES SLUMP



Note: Reflects GX Research's public SaaS/Cloud universe (161 companies) & S&P 500 members as of Q3 2020.
Source: Global X ETFs, FactSet, January 2021. *YoY = Year-over-Year; QoQ = Quarter-over-Quarter*

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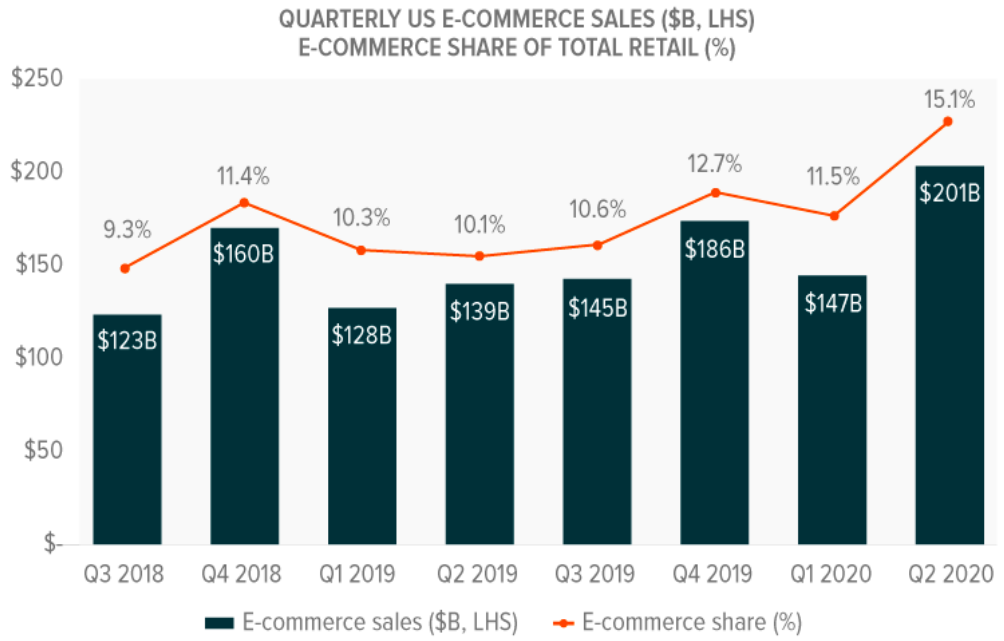
Structural Changes Accelerated & Expanded

The Pre-COVID Economy | **The Stay-at-Home Economy** | The Re-Opening Economy | The 'New Normal' Economy

E-commerce sales in the United States surged 44.5% in Q2 2020 versus the same quarter in 2019 as shoppers turned to online platforms to buy groceries, health care products, and home goods in a safe manner.

E-COMMERCE CONTINUES TO GAIN RETAIL MARKET SHARE AMID PANDEMIC



Note: Using unadjusted data, adjusted figures can be found on quarterly US Census E-commerce report.
Source: Global X ETFs, US Census, August 2020.

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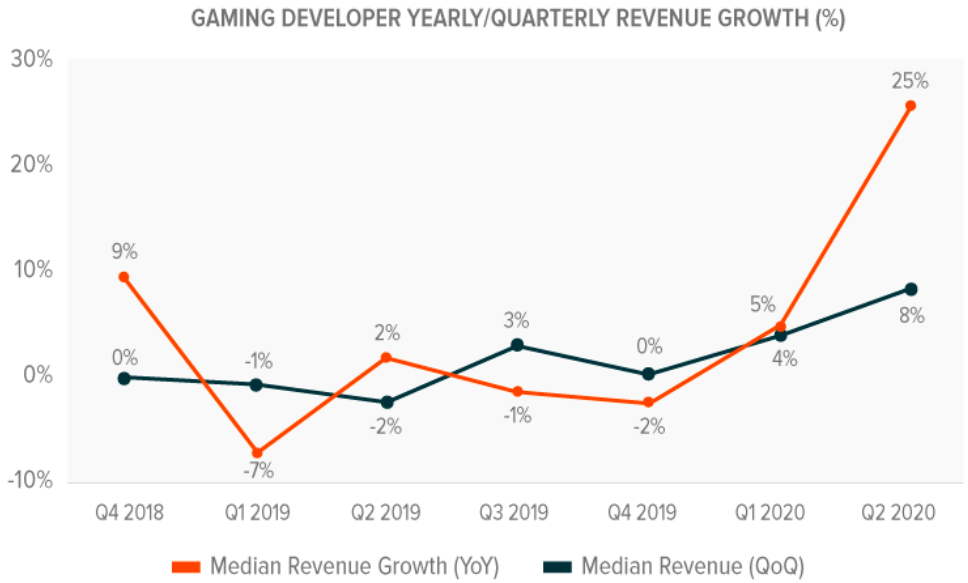
Structural Changes Accelerated & Expanded

The Pre-COVID Economy | **The Stay-at-Home Economy** | The Re-Opening Economy | The 'New Normal' Economy

Video game developer revenues surged 25% year-over-year as both seasoned and new gamers found much-needed entertainment and social interaction in gaming platforms.

GAMING DEVELOPER EARNINGS REFLECT DRASTIC UPTICK IN VIDEO GAME ACTIVITY AND SPENDING



Note: Universe of global companies with gaming software revenue exposure > 50%, market cap > $100M, only including 50 names that reported CY 2Q earnings as of 8/17/20. YoY = Year-over-Year; QoQ = Quarter-over-Quarter
Source: Global X ETFs, Factset, August 2020.

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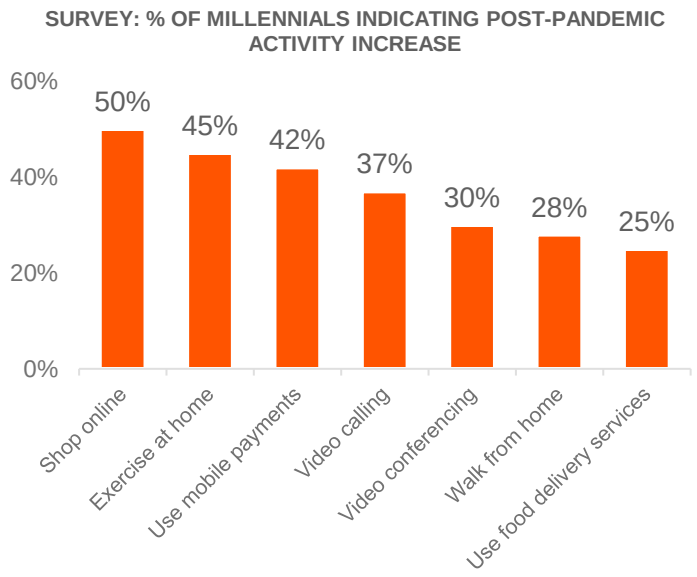
Structural Changes May Have a Permanent Impact

The Pre-COVID Economy | **The Stay-at-Home Economy** | The Re-Opening Economy | The 'New Normal' Economy

These structural changes, and their downstream impacts, will likely have a permanent impact on the economy going forward.

PREFERENCES CHANGED



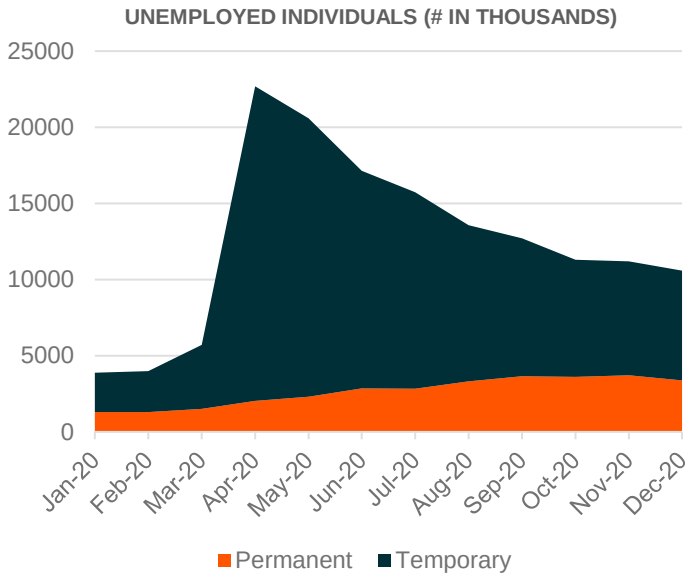
Note: N = 15,271 global internet users surveyed by Global Web Index.
Source: Global Web Index, Global X ETFs, July 2020.

29 RETAIL BANKRUPTCIES IN 2020

Guitar Center	Century 21
Furniture Factory Outlet	Centric Brands
Stein Mart	J.C. Penney
Tailored Brands	Stage Stores
Lord & Taylor	Aldo
Ascena	Neiman Marcus
The Paper Store	J. Crew
RTW Retailwinds	Roots USA
Muji USA	True Religion
Sur La Table	Modell's Sporting Goods
Brooks Brothers	Art Van Furniture
G-Star Raw	Bluestem Brands
Lucky Brand	Pier 1
GNC	SFP Franchise Corp
Tuesday Morning	

Source: Retail Dive, Nov 25, 2020.

10M UNEMPLOYED, WITH PERMANENT JOB LOSSES RISING



Source: Global X ETFs, Bloomberg, Jan 12, 2021.

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What Does The Re-Opening Economy Look Like?

The Pre-COVID Economy | The Stay-at-Home Economy | **The Re-Opening Economy** | The 'New Normal' Economy

The Re-Opening Economy is not a path to return to the December 2019's economy. Structural changes have accelerated, industry practices and landscapes have evolved, and new rules and social norms are commonplace.

Timeframe	Jul 2020 – Now*
Focus	Phased re-opening
COVID Prevention	• Compulsory mask-wearing • Temperature checks/distancing
Monetary Support	• FFR & balance sheet unchanged • Err on the side of lower rates
Fiscal Support	Extended CARES Act, LWA implemented

	Average	Current
U.S. Tests/day	1,206,585	1,934,736
U.S. Infections/day	115,857	208,826
U.S. Deaths/day	1,284	2,397
S&P 500	3,454	3,797
Unemployment	7.8%	6.7%
10 Year Treasury	0.77%	1.13%

Re-opening Economy: Average from 7/1/20-1/12/21, current as of 1/12/21 (for data purposes). Source: Bloomberg, Global X ETFs

KEY CONSIDERATIONS

- COVID-19 not yet eliminated, and continuing to flare-up
- Renewed fiscal stimulus from Washington
- New rules regarding social distancing/density, hygiene, mask-wearing
- Companies and people generally risk-adverse
- Travel bans and compulsory quarantines still in effect
- Uncertainty around school re-openings drives uncertainty around office re-openings

The Re-Opening Economy will be uncertain and non-linear, with an emphasis on safety and flexibility

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Which Themes Stand to Benefit from the Re-Opening Economy?

Four Key Themes Powering the Re-Opening Economy

The Pre-COVID Economy | The Stay-at-Home Economy | **The Re-Opening Economy** | The 'New Normal' Economy

The Re-Opening economy will be uncertain and non-linear, with an emphasis on safety and flexibility. The four themes that we have identified as well-positioned during this phase of the pandemic include:

- Cloud Computing
- Internet of Things
- Genomics
- Telemedicine

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Cloud Computing: A Key Technology for Work-from-Home

Cloud computing describes the on-demand availability of shared computing resources, including data storage, computing power, software and programming environments.

5 CATEGORIES OF CLOUD COMPUTING COMPANIES

CATEGORY	DESCRIPTION
Software as a Service (SaaS)	Licensing and delivery of software over the internet on a subscription basis which is sometimes called as "on-demand software"
Platform as a Service (PaaS)	Providing a platform for creating software application which are delivered over the internet
Infrastructure as a Service (IaaS)	Providing virtualized computing resources over the internet. These services include pooled resources like shared storage, shared servers, etc.
Data Center REITs	Owning and managing facilities that customers use to safety and efficiently store data. They typically offer a range of products and services to help keep servers and data protected, including providing uninterruptable power supplies, air-cooled chillers, and physical security
Cloud and Edge Computing Infrastructure Components	Manufacturing and distributing hardware components like chips that are built into servers, specialized network switches and routers, etc. used in cloud and edge computing devices

Surveying 300+ IT decision makers at large public/private sector companies…[1,2]

- **86%** expect to increase IaaS/PaaS spending
- **81%** expect to increase SaaS spending
- **79%** plan for heavy/moderate cloud adoption

Sources: 1. Flexera, “2020 State of Tech Spend Report,” 2020., 2.Flexera, “2020 CIO Priorities Report,” 2020.

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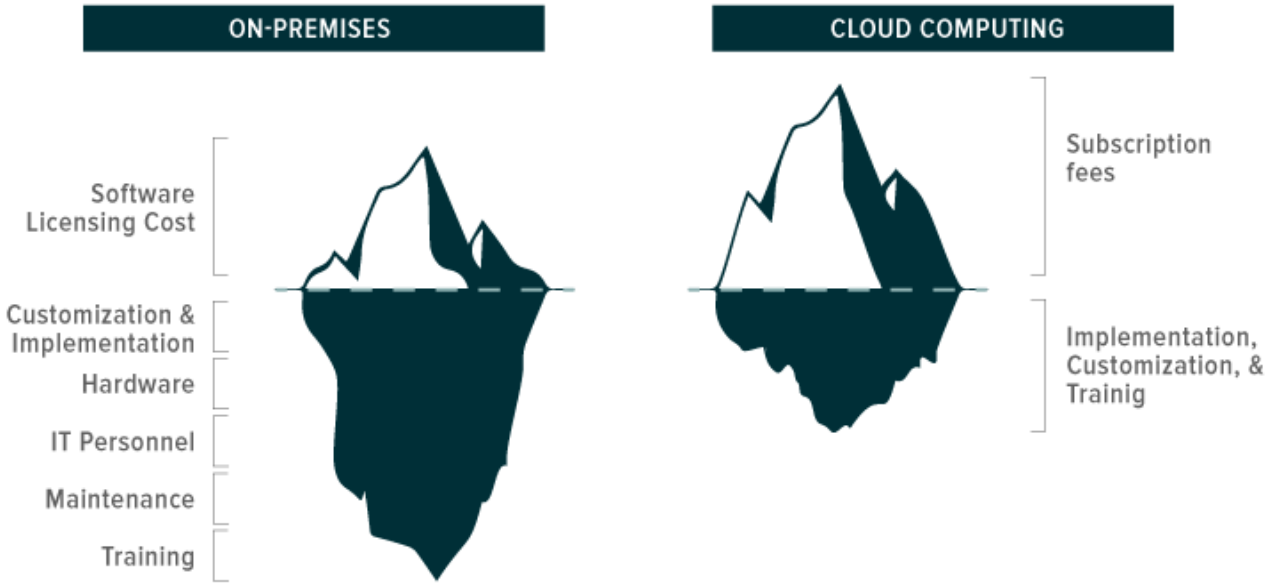
Cloud Computing: Potential Benefits for Multiple Stakeholders

Users of the public cloud generally pay a recurring subscription fee based on usage, offering a more predictable, service-oriented model for consumption of IT resources.

THE TIP OF THE ICEBERG: CLOUD VS. ON-PREMISES INFRASTRUCTURE



ONGOING COSTS

- Apply patches, upgrades
- Downtime
- Performance tuning
- Rewrite customizations
- Rewrite integrations
- Upgrade dependent applications
- Ongoing burden on IT (hardware)
- Maintain/upgrade network
- Maintain/upgrade security
- Maintain/upgrade database

ONGOING COSTS

- Subscription fees
- Training
- Configuration
- System Administration

BENEFITS FOR STAKEHOLDERS

Customers

- Scalable infrastructure
- Outsource IT functionality
- Ongoing upgrades

Cloud Companies

- Recurring revenue model
- Sticky relationships
- Operational leverage

Investors

- High growth potential
- Margin expansion
- Deep moats

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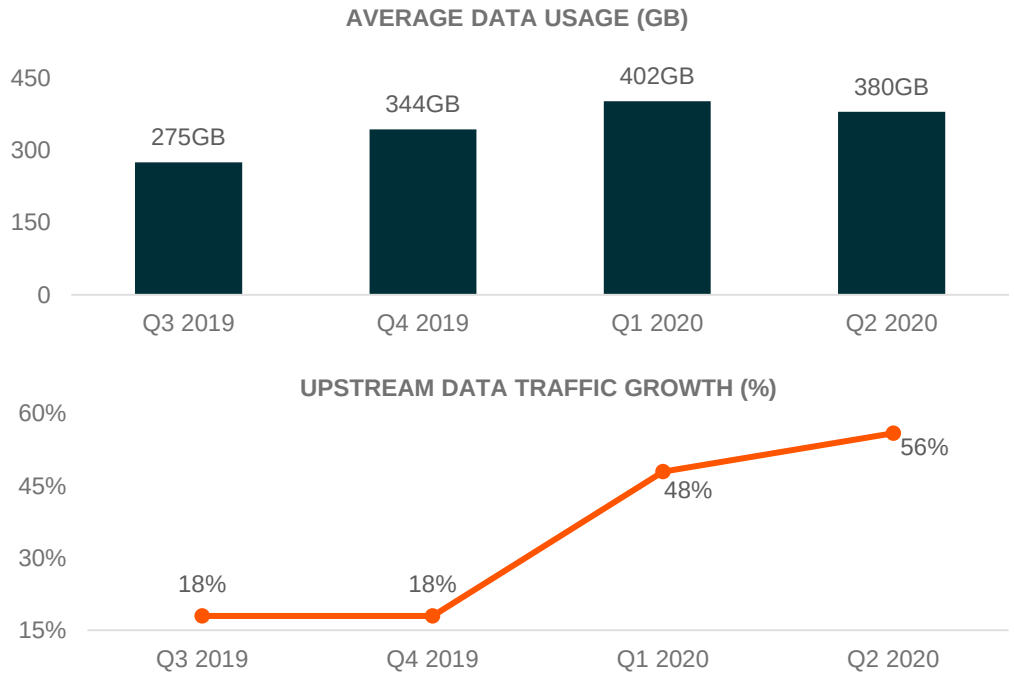
Cloud Computing: A Major Beneficiary of the Stay-at-Home Economy

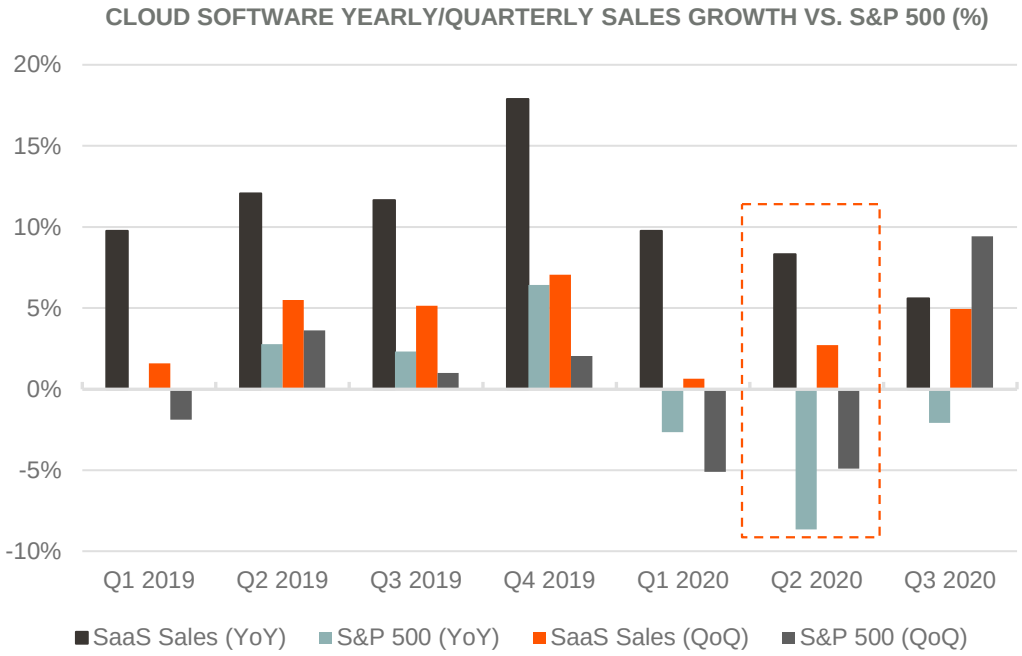
Demand for cloud solutions surged amid the stay-at-home economy as enterprises and individuals relied heavily on cloud technology to remain connected to work, social, education, and entertainment activities.

DATA USAGE SPIKED AS BUSINESSES EMBRACED WORK-FROM-HOME AND HYBRID WORK SETUPS



Source: Global X ETFs, OpenVault, June 2020.

REMOTE WORK DRIVES CONTINUED CLOUD-BASED SOFTWARE REVENUE GROWTH DESPITE S&P 500 SALES SLUMP



Note: Reflects GX Research's public SaaS/Cloud universe (161 companies) & S&P 500 members as of Q3 2020.
Source: Global X ETFs, FactSet, January 2021. *YoY = Year-over-Year; QoQ = Quarter-over-Quarter*

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Cloud Computing: Digital Infrastructure Becoming Increasing Entrenched in Business Operations

In the Re-Opening Economy, enterprises and consumers are likely to continue to depend on cloud computing as flexible work arrangements and social distancing limit a full return to public spaces, like offices and schools. Usually, the longer cloud services remain in place, the more ingrained they become in enterprise, consumer, and government practices.

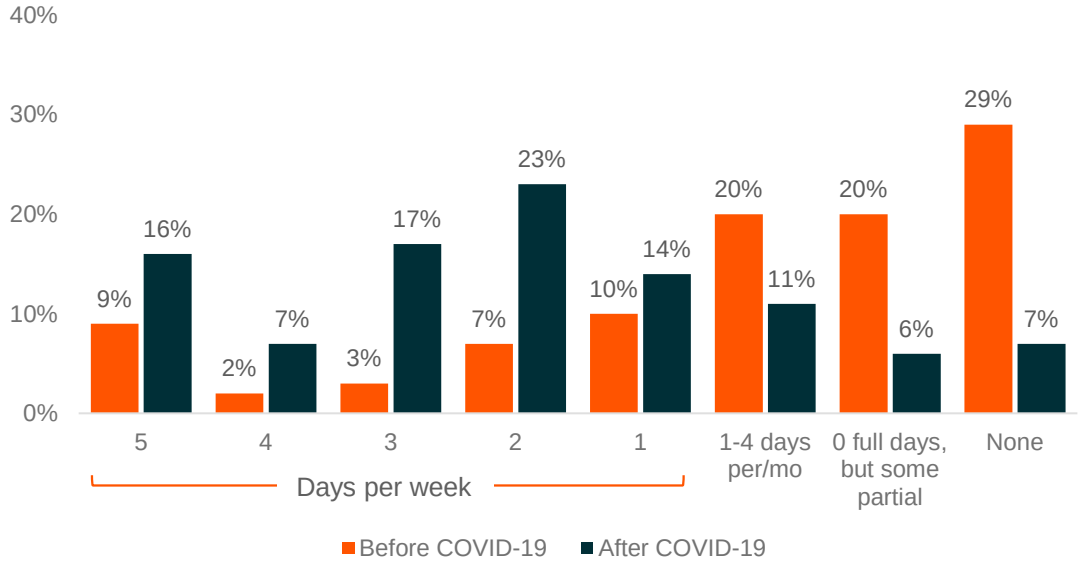
MAJOR EMPLOYERS ARE KEEPING REMOTE WORK IN-PLACE

REMOTE WORK - THROUGH 2021		REMOTE WORK - INDEFINITE	
COMPANY	# EMPLOYEES	COMPANY	# EMPLOYEES
GOOGLE	127,498	FACEBOOK	52,534
WARNER MUSIC	5,400	TWITTER	5,200
AMAZON (SEATTLE CORPORATE)	45,000	SQUARE	3,845
VIACOM	23,990	SLACK	2,045
SCOTIABANK	95,369	SHOPIFY	5,000
UBER (CORPORATE)	22,000	ZILLOW	5,344

Employee data from Bloomberg, accessed on 8/31/2020.

EMPLOYEE PREFERENCES ARE SHIFTING IN FAVOR OF WFH

SURVEY: INDICATED WFH PREFERENCES (% OF RESPONDENTS)



Note: N = 2,865 office-based workers
Source: Iometrics, Global Workplace Analytics, Global Work From Home Experience Survey, 2020.

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Cloud Computing: Digital Infrastructure Becoming Increasing Entrenched in Business Operations

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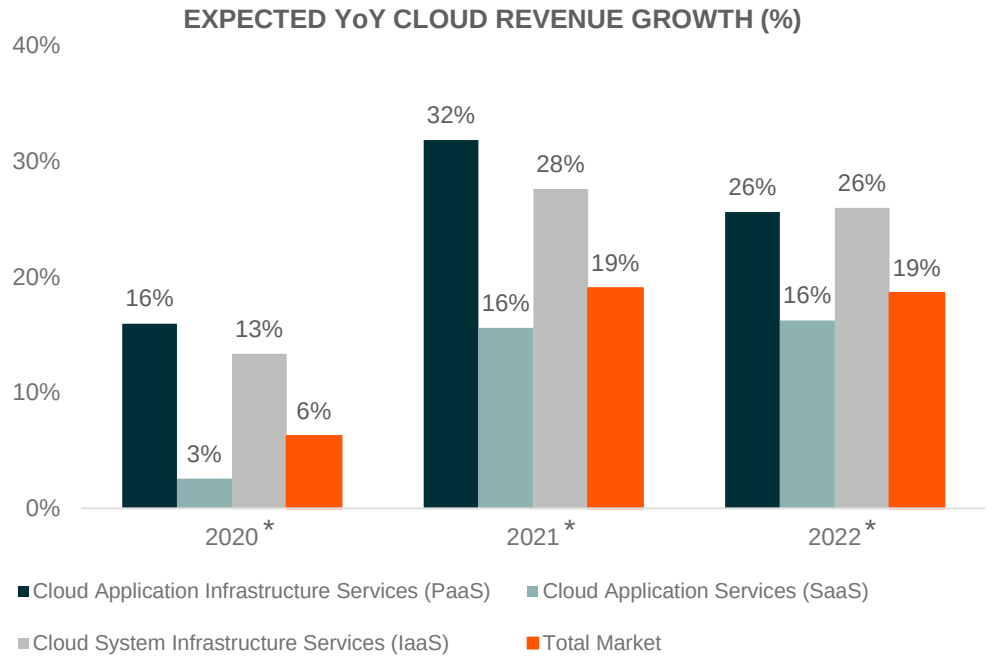
CLOUD COMPUTING REVENUE EXPECTED TO GROW AS FIRMS ADD CLIENTS, RAISE PRICES



*Source: Gartner, July 2020. YoY = Year-Over-Year *Estimate*

HISTORICALLY, CLOUD COMPUTING COMPANIES HAVE ENJOYED INCREASING MARGINS AS REVENUE RISES

Source: Bloomberg, Global X ETFs, March 27, 2020.

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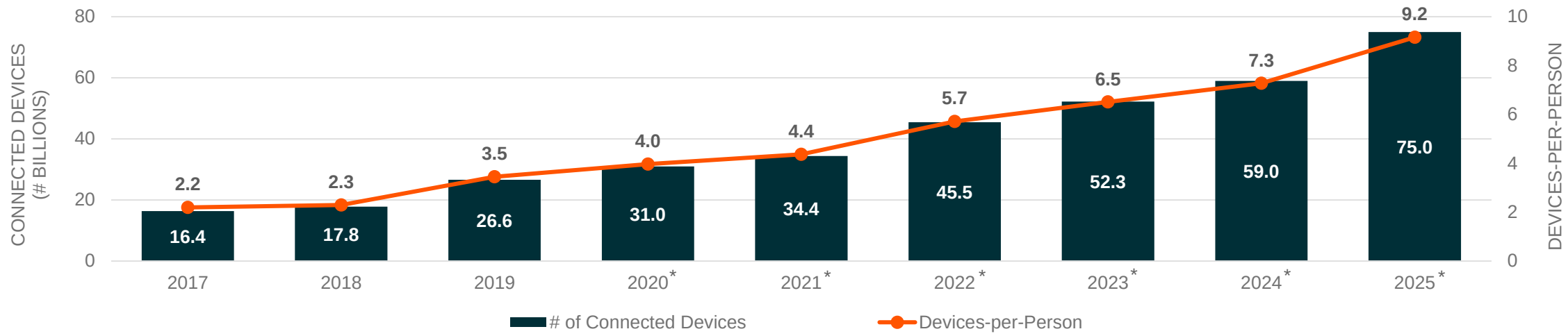
Internet of Things: Connecting Billions of Devices

The Internet of Things (IoT) describes the interconnection of everyday devices via the internet, enabling them to send and receive data.

CONNECTED DEVICE GROWTH SHOWS NO SIGN OF SLOWING, DESPITE MASS GLOBAL ADOPTION



*Source: Gartner, IHS Markit, McKinsey, Sharif University of Technology, SecurityToday, Global X ETFs, 2020. *Estimates. Some estimates derived by regression.*

KEY SEGMENTS

- **Connected IoT Products**
- **Networking Infrastructure/Software**
- **Equipment, Vehicle, & Infrastructure/Building Tech**
- **Semiconductor Manufacturers**

CURRENT DRIVERS

- **Rapidly falling costs** for chips that can connect devices to the internet
- **Growing commercial adoption** in industrial settings, infrastructure, and health care
- **Strong consumer demand** for IoT products like wearables & smart home devices
- **Improved internet speed and coverage** allows for more data transmission from more devices

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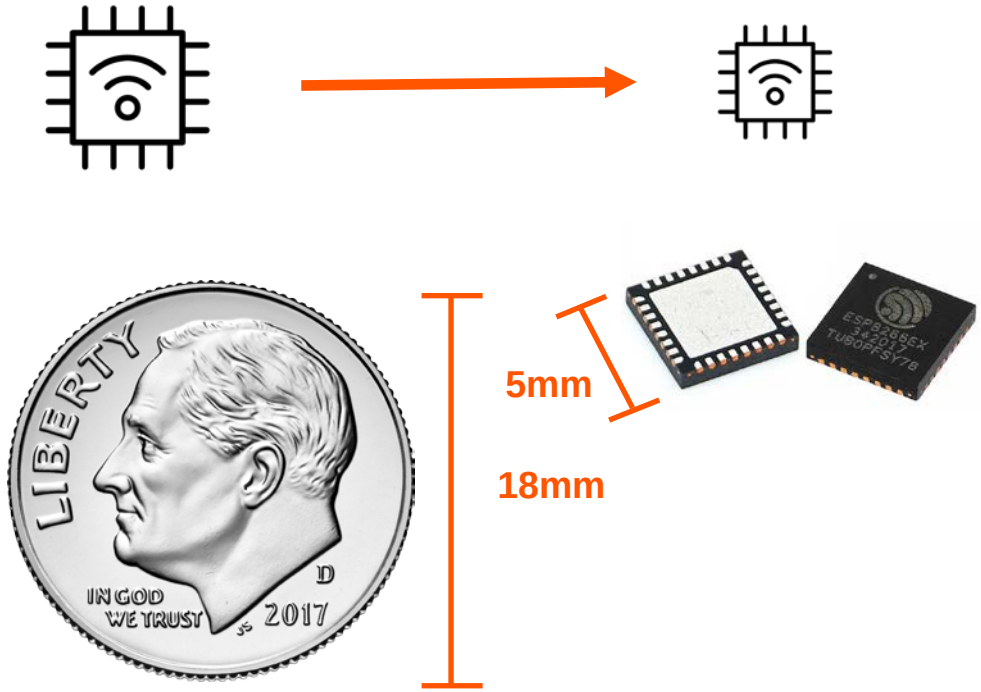
All numbers are approximate

Internet of Things: Becoming Smaller & Cheaper, Leading To More Use-Cases

Chips that connect devices to the internet are becoming smaller and cheaper than ever before. As such, they are increasingly being used to connect devices involved in the re-opening economy, such as sensors that measure occupancy/density, take temperature readings, and wearables that may detect early signs of COVID-19 infection.

Marvell Wi-Fi Chip (2007)
$7.40 per unit (AFI)

Integrated Circuits Wi-Fi Chip (2019)
$0.10 per unit



MEANINGFUL IoT USE-CASES COME TO LIGHT DURING PANDEMIC, SUPPORTING FUTURE ADOPTION ACROSS MYRIAD SETTINGS

Technology	Description	Pandemic Relevance	Reopening Application	Example
Sensors	Connected sensors transmit data about local environment.	•Proximity sensors •Occupancy sensors •Thermal imaging	Proximity/occupancy sensors can ensure employees remain distant, thermal imaging can track symptoms.	Proximity sensors in Australia
Wearables	Connected devices worn by individuals that transmit/ process data about health & surroundings.	•Smart thermometers •Connected oximeters •Contact tracing wearables	Connected wearables can help track general health and symptoms, also helping wearers contact trace.	Wearable thermometers in Irish hospitals
Drones	Connected aircraft that use sensors, cameras, GPS to navigate & transmit/process data.	•Medical delivery drone •Surveillance drone •Disinfectant drone	Connected drones can deliver medical supplies/ samples, reducing human contact.	Chinese medical drones in action
Robots	Programmable connected machines that receive instructions via data transmission and act on them.	•Medical robots •Disinfectant robots •Collaborative robots •Public health robots	Medical robots can autonomously monitor patients and disinfect hospitals. Robots can limit human interaction across industries.	Use of connected robots during COVID-19

Source: Global X ETFs, August 2020.

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All numbers are approximate

Internet of Things: Connected Tech Can Help Re-Opening Efforts

IoT USE CASE #1 – WEARABLES MAY HELP DETECT COVID-19

- Wearable devices monitor one's health over time, allowing them to notice deviations or anomalies that could be associated with COVID-19 infection

Health Measurements
Heart Rate Variability (HRV)
Temperature
Blood Oxygen Saturation (SpO2)
Respiration Rate

Individual Health

- Early detection of disease prior the onset of severe symptoms
- Monitor disease progression in patients

Population Health

- Identify at-risk communities
- Monitor spread of disease
- Measure effect of public health intervention

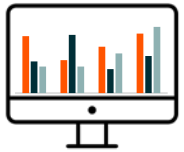
Source: Seshadri DR, et al. June 2020

IoT USE CASE #2 – SENSORS HELP ENFORCE SAFE PRACTICES

- Digital contact tracing and proximity sensors can control infectious disease outbreaks
- Sensors can alert and remind employees to maintain social distancing, while also creating records of proximity events

Increase Awareness with Proximity Alerts
Proximity sensor alerts allow workers to separate from others if proximity is reached for periods that may compromise their health

Enforce Social Distancing
Authorized managers can gain insights to remind workers to maintain distance



Identify Exposure with Contact Tracing
Sensors can record proximity data and inform about potential infected employees based on historical data

Source: Zebra MotionWorks Proximity

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Internet of Things: Connected Tech Can Help Re-opening Efforts

IoT USE CASE #3 – TEMPERATURE SENSORS

Fever is a common symptom of COVID-19, typically appearing 2-14 days after exposure.[1] Temperature sensor systems are able to determine surface skin temperature as a first assessment in high throughput areas like airports, businesses, warehouses, and others)

BUSINESSES

Employee Kiosks with Temperature Check
Can read temperature in seconds, displaying reading to allow access to business facilities

AIRPORTS

Bi-Spectrum Cameras (Thermal & Optical)
These systems detect passengers with high temperatures, alerting airport operations

SCHOOLS

Handheld Thermal Scanners
Prior entrance to school, staff member can measure temperature

Sources: 1. U.S. FDA. Images sources from: LamasaTech, HikVision, William Floyd School District

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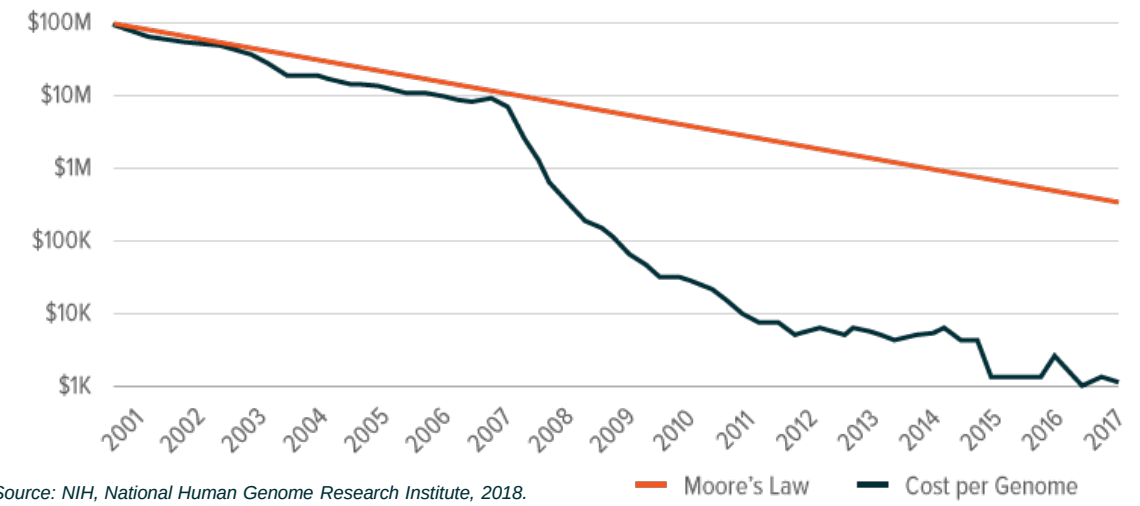
Genomics: Using Genetic Data to Identify and Treat Disease

The genomics industry is comprised of several subsciences that revolutionize the way we identify and treat illness ranging from infectious disease, genetic disorders, and chronic conditions.

Genomic Subsciences
Genomics sequencing is the process of determining the exact order of genetic material
Computational genomics uses computational analysis to decipher insights from genome sequences
Gene therapies seek to cure or treat diseases via interaction with/modification of genetic material
Gene editing inserts, deletes or replaces DNA at a specific site in the genome of an organism

MORE AFFORDABLE GENOMIC SEQUENCING LED TO CURRENT SCALE



Source: NIH, National Human Genome Research Institute, 2018.

Factors Driving Genomics' Growth

- **Rapidly falling costs** for genomic sequencing and genetic testing
- **Treating previously unaddressed diseases** with innovative therapies and treatments
- **Rise of precision medicine** to personalize health care and improve patient outcomes
- **More and better data** improves R&D process for new treatment development

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Genomics: The Rise Of Precision Medicine

Precision medicine uses information from genome sequences to help select/design custom treatment courses for patients.

HIGH THROUGHPUT NEXT-GENERATION SEQUENCING (NGS) ENABLES PRECISION MEDICINE

1977 — Sanger Sequencing Developed

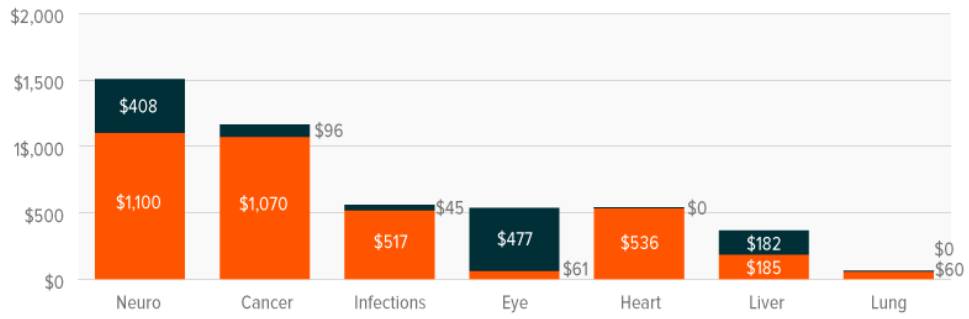
2003 — Human Genome Sequenced

Now — NGS Enables Precision Medicine Era

Method	Origin	Process	Comparison
Sanger Sequencing	• Developed in 1977 by Frederick Sanger • Used to sequence whole human genome for the first time in 2003 as a part of the human genome project (1990–2003, $5.1B in 2020 dollars)	1. Break DNA into fragments which are copied 2. Break copies into smaller fragments 3. Read fragment DNA sequences one at a time 4. Assemble overlapping fragments to get whole genome sequence	ADVANTAGES: • High-quality sequences for portions of DNA DISADVANTAGES: • Expensive and inefficient for whole genome sequencing • Limited in ability to discover new genomes
Next Generation Sequencing (NGS)	• Early versions existed in mid-90s, becoming commercially available in the early- to mid-00s • Brought cost of sequencing whole human genome to below $1,000 today	1. Break DNA into fragments 2. Read millions of fragment DNA sequences at the same time (parallel reads) 3. Align fragmented DNA sequences to get whole genome sequence	ADVANTAGES: • Efficient and rapid sequencing due to parallel reads • Lower-cost • Requires less space DISADVANTAGES: • Requires more exact work to ensure accuracy

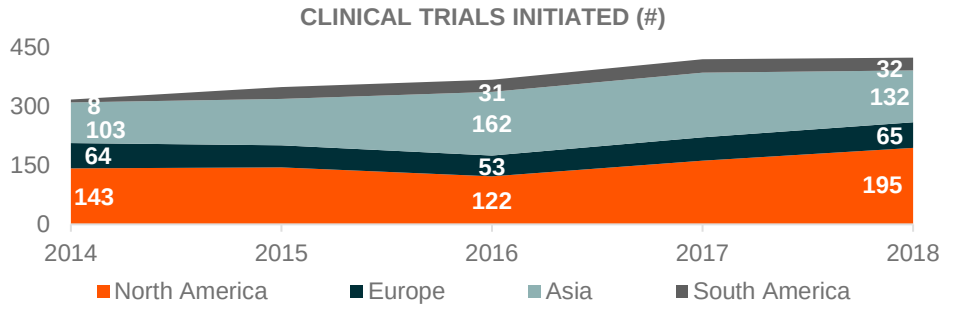
Source: National Human Genome Research Institute, Khan Academy, BioCompare, Global X ETFs, June 2020

GENOMIC MEDICINES REPRESENT A $4.8T ADDRESSABLE MARKET, 73% COULD COME FROM CURRENTLY UNTREATED CONDITIONS



Source: Goldman Sachs Global Investment Research, 2018.

CLINICAL TRIAL VOLUMES ILLUSTRATIVE OF FUTURE LANDSCAPE



Source: NHGI, 2018.

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Genomics: COVID-19 Catalyzes Genomics' Next Era

"It's the first time genomic sequencing is being used on such a large scale. It means the technology is being tested." –Pavel Skums, GSU

Genomic Approaches to COVID-19

- **Diagnostic Testing**
  - Molecular testing (RT-PCR, CRISPR)
  - Serological (antibody) testing
- **Surveillance Testing**
  - Transmission paths
  - Mutation tracking and prediction
- **Treatments**
  - Antivirals and antibodies
  - RNA and cell-based therapies
- **Vaccines**
  - mRNA and DNA vaccines
  - Traditional vaccine

SURVEILLANCE TESTING VIA (NGS) REVEALS EVOLUTION/TRANSMISSION OF SARS-CoV-2

SARS-CoV-2 TRANSMISSION PATHS (12/2019 – 06/2020)

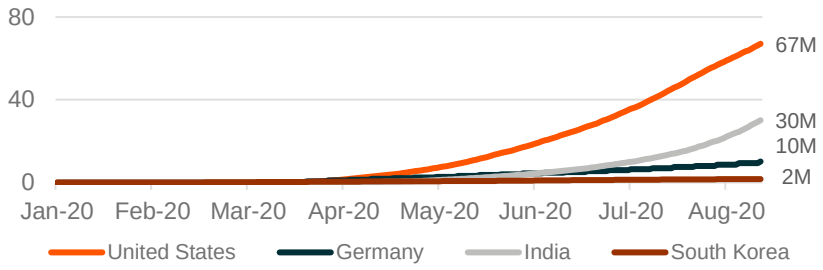
- Genome sequences of the virus derived from patient samples used to generate map
- Circles indicate size of the outbreak over given date range in a particular region
- Colored lines indicate where the virus traveled from

Note: Showing 4178 genomes sampled between 12/2019 and 6/2020. The data presented here is intended to rapidly disseminate analysis of important pathogens. Unpublished data included with permission of data generators, and does not impact right to publish. Visualizations licensed under CC-BY.

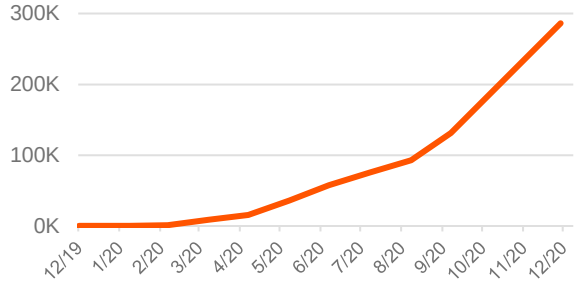
Source: Hadfield et al., Nextstrain: real-time tracking of pathogen evolution, Bioinformatics (2018); NextStrain.org, Aug 2020.

COUNTRIES/ORGANIZATIONS RAMP UP COVID-19 TESTING TO LIMIT SPREAD & ENABLE REOPENING

CUMULATIVE COVID-19 TESTS BY COUNTRY (# IN MILLIONS)



SARS-COV-2 GENOMES UPLOADED TO GISAID (#K)



Source: Global X ETFs, Our World in Data, GISAID, Dec 2020.
Note: Countries report testing across/with various methods/accuracy; best effort representation. (Left); GISAID is predominant SARS-CoV-2 genome-sharing database. (Right)

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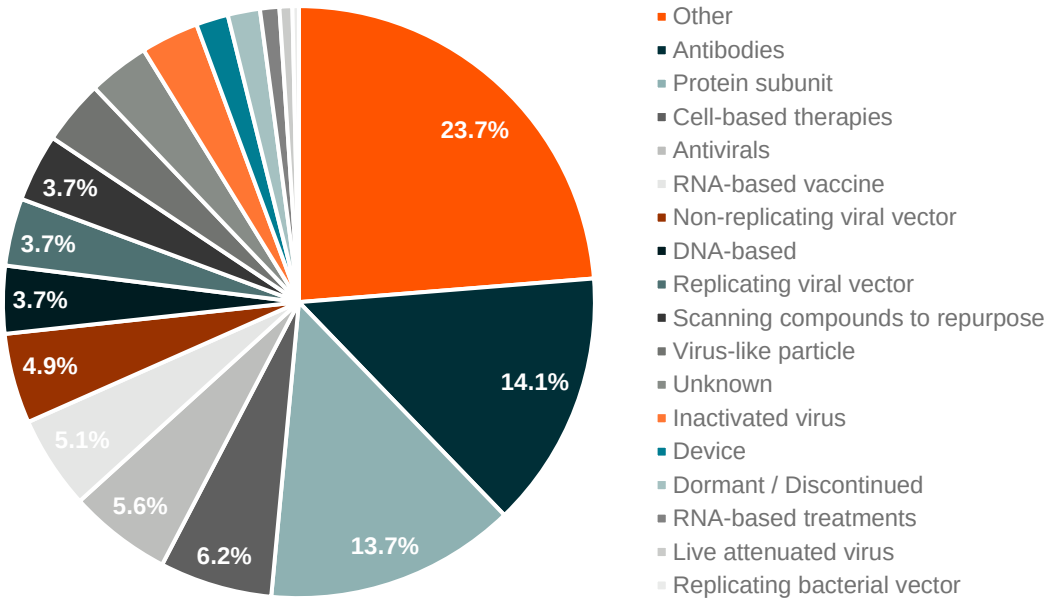
Genomics: Developing Potential Treatments & Vaccines for COVID-19

Genomics benefitted from the massive mobilization of resources for virus mitigation efforts throughout 2020. From the discovery of the virus and surveillance to the development of diagnostics and pharmaceuticals, the recent advancement of genomics-related science and technology gave the world tools to fight COVID-19.

GLOBAL EFFORTS TO TREAT AND CURE COVID-19 SPAN DIVERSE APPROACHES AND METHODS RELATED TO GENOMICS

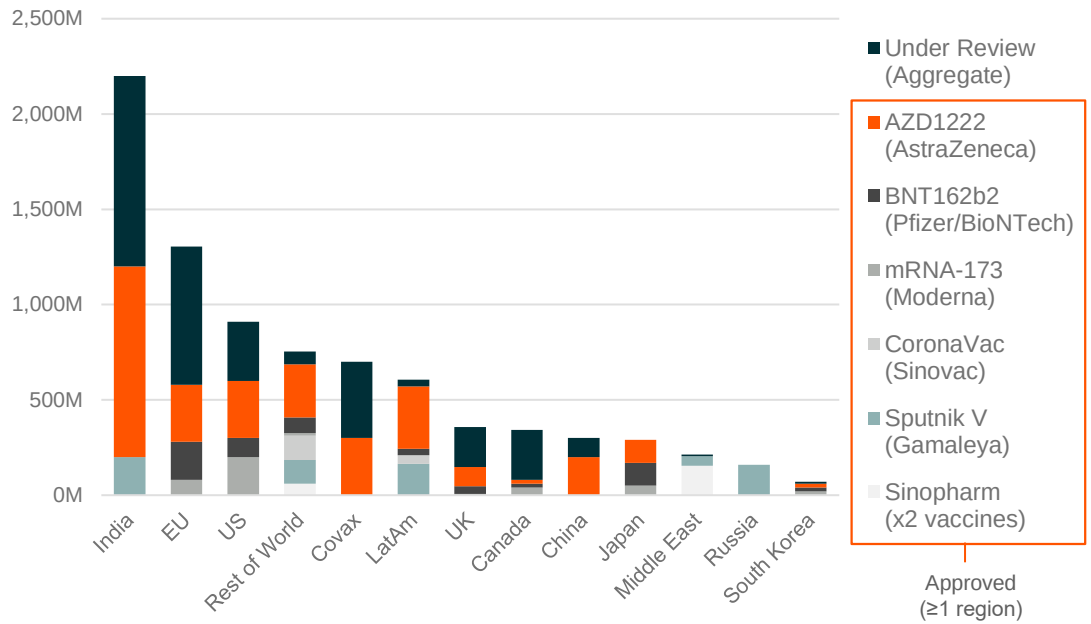
BREAKDOWN OF COVID-19 TREATMENTS AND VACCINES, BY CATEGORY (% OF TOTAL)



Note: 569 COVID-19 treatments/vaccines in development, categorized by Milken Institute - covid-19tracker.milkeninstitute.org
Source: Global X ETFs, Milken Institute, Jan 13, 2021.

MULTI-OMICS APPROACHES LED TO DEVELOPMENT OF MULTIPLE APPROVED VACCINES IN RECORD TIME

DISCLOSED DEALS FOR VACCINES BY REGION (#M OF DOSES)



Note: Approved = used in inoculations as of 1/13/21, may not reflect country-level approval; excludes undisclosed doses.
Source: Global X ETFs, Bloomberg, Regulatory Affairs Professionals Society, Jan 13, 2021.

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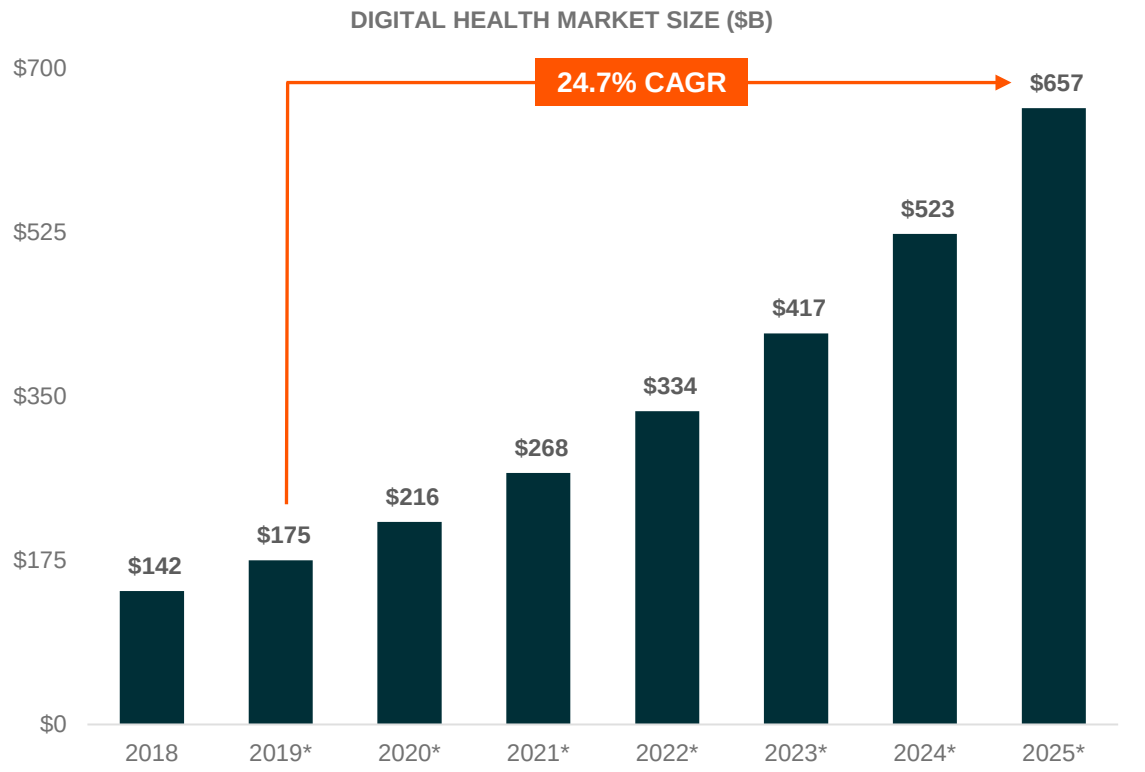
Telemedicine & Digital Health: Key Segments and the Drivers Behind Them

The Digital Health market reached an estimated $175B in 2019 and is expected to grow to over $657B by 2026, a 24.7% CAGR from 2020 to 2026.[1]

ESTIMATED DIGITAL HEALTH MARKET COULD GROW ~ $500B OVER NEXT 5-6 YEARS



*Estimate; CAGR = Compound Annual Growth Rate
Source: Roland Berger, Global X ETFs, 2020.

Key Segments

- **Telemedicine**
- **Connected Health Care Devices**
- **Health Care Analytics**
- **Administrative Digitization**

CURRENT DRIVERS

Addressable Conditions and Disparities: Technology could address/mitigate excess deaths, inadequate care, non-utilization, financial constraints

Current and Future Longevity: Aging populations and increasing life expectancy will require innovation in health care

Inefficient Health Care Systems: Tech-based intervention could help limit systemic inefficiencies in health care, leading to better outcomes for stakeholders

Technology Gap and Capabilities: Increased access to internet and an abundance of health care data make tech transformation in health care possible

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Telemedicine & Digital Health: Making Truly Global Health Care a Reality for All

Telemedicine & Digital Health could surmount financial & geographic obstacles, untapping previously unaddressed health care market segments.

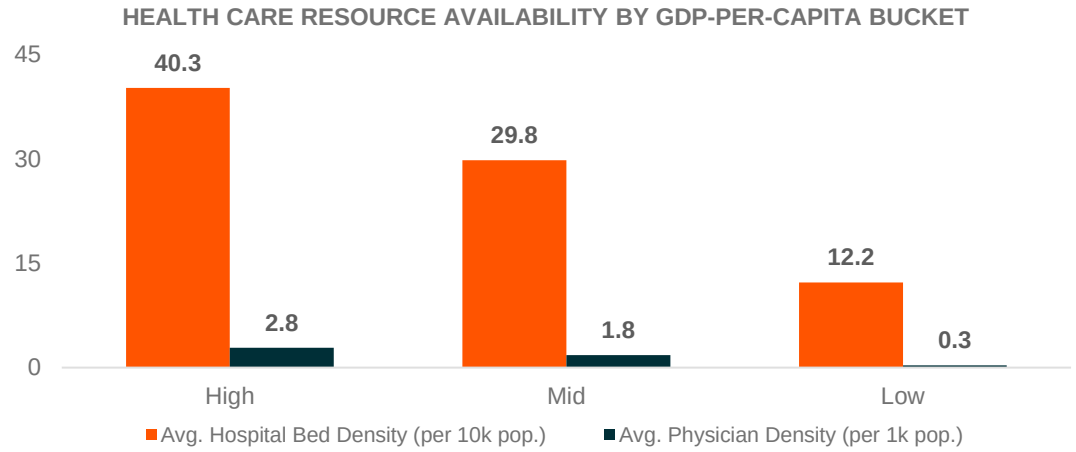
Bringing Health Care Resources to Unserved Areas

- 50% of the global population lacks access to essential health services[1]
- Reduced Mortality: Remote intensive care units (ICU) consultations likely reduce ICU and total hospital mortality[2]
- Accessible Diagnostics: Health workers in Sub-Saharan Africa found teledermatology to be useful in diagnosing 82% of patients with skin ailments[3]

Offering More Affordable Health Care Solutions

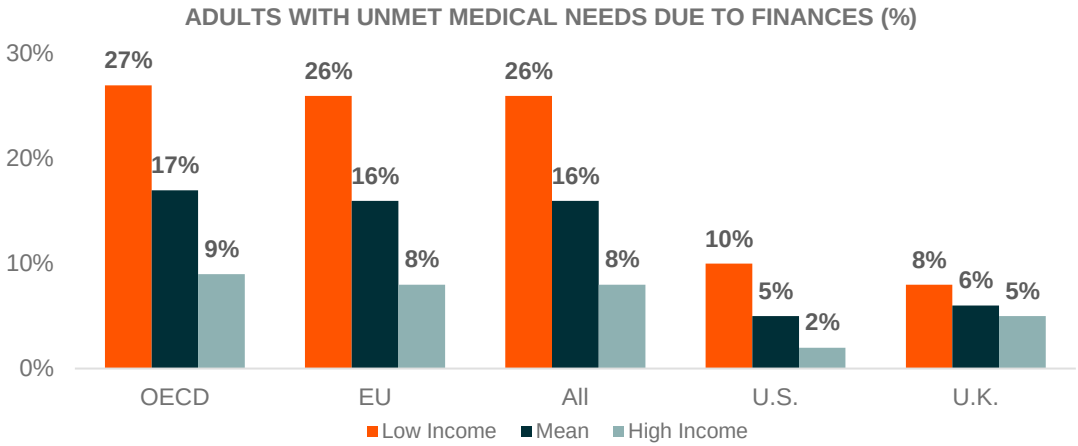
- 100M people fall into extreme poverty every year due to health expenses[4]
- Care Savings: U.S. Veterans Health association estimates $6,500 annual savings for each patient participating in telehealth[5]
- Travel Savings: University of California Davis Health System found that travel avoided due to telemedicine saved its patients $2.9M & 9.0 years (1996-2013)[6]

MANY COUNTRIES LACK ACCESS TO RESOURCES LIKE DOCTORS & HOSTPITALS



Note: 169 countries, using most recent available data. GDP per capita in Current USD, Low < $3,243 < Mid < $10,966 < High
Source: WHO, World Bank, Global X ETFs, 2020.

FINANCES CAN LIMIT ABILITY TO OBTAIN NECESSARY CARE



Note: Income groups describing top and bottom income quintiles. Low Income = Q1 and High Income = Q5.
Source: OECD, Global X ETFs, 2019.

Sources: 1. World Economic Forum, 2019.; 2. AHRQ, "Telehealth for Acute and Chronic Care Consultations,"2019.; 3. Acta Dermato-Venereologica, "Mobile Teledermatology in Sub-Saharan Africa," 2013.; 4. WHO/World Bank, "Tracking universal health coverage: 2017 Global Monitoring Report," 2017; 5.The Department of Veterans Affairs, "mHealth Case Study," 2012.; 6. Value in Health, "Impact of a University-Based Outpatient Telemedicine Program…,"

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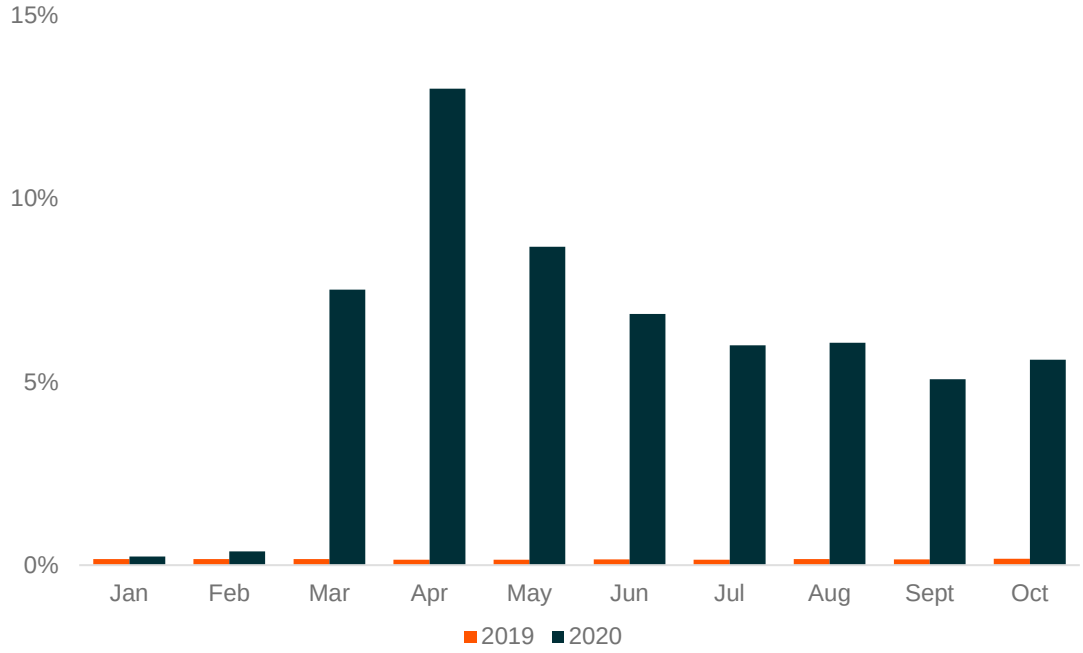
Telemedicine & Digital Health: COVID-19 Set Disruption in Motion

During stay-at-home orders, technology-based tools that facilitate remote communication with doctors and enable patient monitoring became critical. As we move beyond the pandemic, we expect many of these technologies to see continued adoption across global health care systems due to their cost efficiencies and improved patient outcomes.

PANDEMIC DRIVING RAPID ADOPTION & FREQUENT USE OF VIRTUAL HEALTH CARE SERVICES

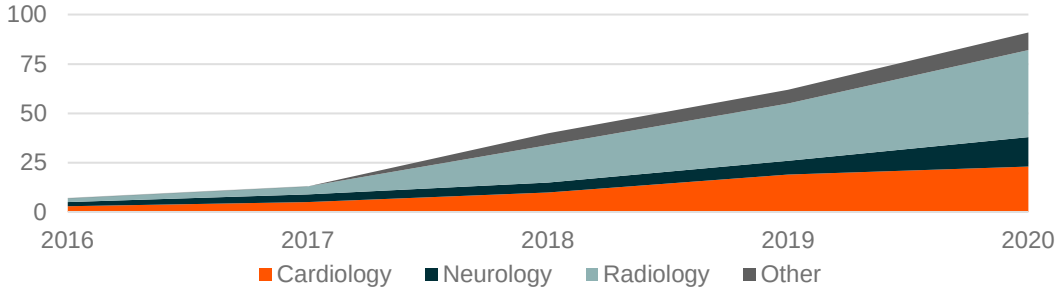
TELEHEALTH SHARE OF MEDICAL CLAIM LINES (%)



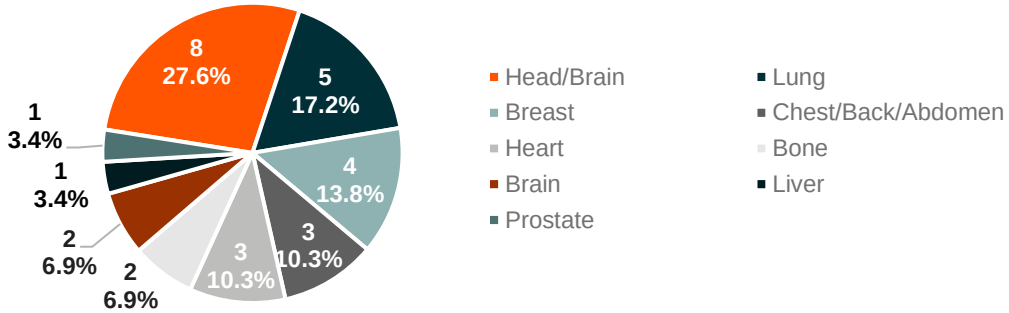
Source: Global X ETFs, Fair Health, January 2021.

DIGITAL TRANSFORMATION IN HEALTH CARE EXTENDS BEYOND VIRTUAL APPOINTMENTS TO DIAGNOSES & TREATMENTS

CUMULATIVE FDA-APPROVED AI-BASED ALGORITHMS (# OF APPROVALS)



BREAKDOWN OF 2020'S AI ALOGRITHM FDA APPROVALS (#,%)



Source: Global X ETFs, Medical Futurist, American College of Radiology, September 2020.

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Telemedicine & Digital Health: Streamlining & Improving Health Systems

Administrative digitalization and health care analytics could optimize health systems, passing cost and time savings down to providers and patients.

Better Health Systems = Better Health Outcomes

- **Optimized Processes**
  - Efficacy: Minimizing risks and driving outcomes

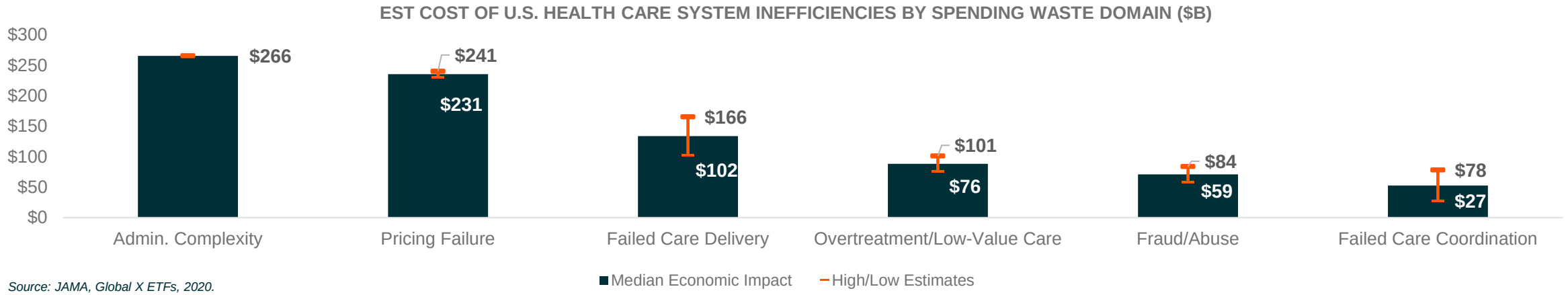
    EX: Telemedicine helps treat COVID-19 while minimizing risk of infection[1]
  - Efficiency: Streamlined resource allocation

    EX: Smart hospital triages patients and doctors, saving time/money/labor and improving operations faced with pandemic-driven pressures
- **Improving Care and Innovating:** Digital administration means accessible and useful data for providing care, enhancing processes, and developing treatments

McKinsey Survey: 60 health systems leaders on key areas for substantial investment over next 5-10 years…[2]

- **93%** – Synchronous Telemedicine
- **93%** – Remote Monitoring
- **91%** – Patient Engagement
- **83%** – Asynchronous Telemedicine
- **77%** – Treatment Optimization
- **77%** – E-Triage

TECHNOLOGICAL TRANSFORMATION IN HEALTH CARE COULD HELP MINIMIZE COSTLY INEFFICIENCIES



Source: JAMA, Global X ETFs, 2020.

Sources: 1.NEJM, "Virtually Perfect? Telemedicine for Covid-19," April 2020.; 2. McKinsey, "Virtual Health: A look at the next frontier of care delivery," 2020.

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Key Takeaways

Structural Changes Accelerated

Amid the stay-at-home economy, certain structural changes accelerated, like e-commerce, video games & esports, and cloud computing

Flexibility and Safety

As governments and businesses around the world look to re-open local economies, there will be a heavy emphasis on maintaining flexibility and high safety standards

Transformed Economies & Adoption Patterns

Certain technologies are well-positioned in this re-opening economy and beyond, including Cloud Computing, the IoT, Genomics, and Telemedicine

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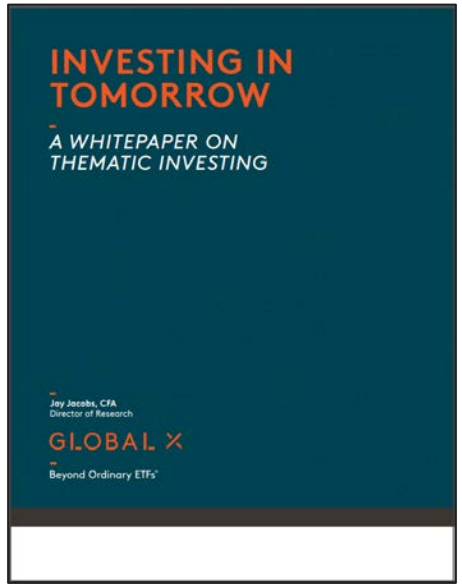
globalxetfs.com/research, *or on twitter:*

- ***@JayJacobsCFA***
- ***@PPalandrani_gx***
- ***@ALittle_gx***



Video Game Industry Hits Reset in 2020

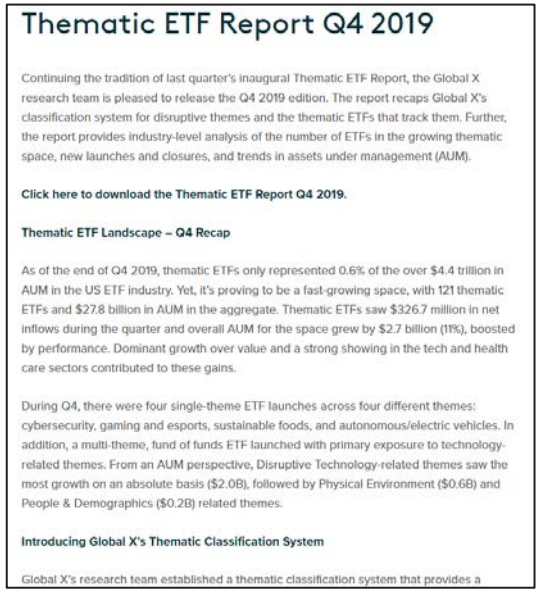
Today's videogame industry has come a long way since the days of Atari consoles and video arcades. Yes, technological improvements now enable hyper-realistic 3D graphics that look nothing like the flat, jagged-edged 8-bit characters of the 1980's. But just as meaningfully, the preferences of a new generation of gamers are evolving, and so too are the companies seeking to meet those demands. For an industry that typically moves linearly from each console generation or game edition to the next, 2020 may seem like just another incremental improvement as next-generation consoles launch later this year. But underneath the veneer of even more polished graphics, the industry is preparing for long-term transformation that could upend the sale of consoles and games.

In this piece, we explore what the 2020 console upgrade cycle means for the industry and how advancements in cloud gaming may mean this is the last PlayStation and Xbox.

New Consoles Improve Graphics and Speed

Both Microsoft and Sony are expected to release the new Xbox and PlayStation consoles this upcoming holiday season, representing the first major hardware upgrades since 2013. The new consoles are expected to feature 8K TV support, ray tracing, and solid-state drive (SSD) storage – enhancements that will bring unprecedent realism to games and faster load times. Other details are still kept under a tight lid by the manufacturers.

Despite the growth in PC gaming, consoles still make up a larger portion of the gaming market. Consoles account for 30% of the 2019 global gaming market at $45.3 billion.[1] PCs fall slightly behind with 24% market share or $35.3 billion.[2] Mobile, which we'll discuss shortly, represents the biggest market with 46% share or $68.2 billion.[3]



Thematic ETF Report Q4 2019

Continuing the tradition of last quarter's inaugural Thematic ETF Report, the Global X research team is pleased to release the Q4 2019 edition. The report recaps Global X's classification system for disruptive themes and the thematic ETFs that track them. Further, the report provides industry-level analysis of the number of ETFs in the growing thematic space, new launches and closures, and trends in assets under management (AUM).

Click here to download the Thematic ETF Report Q4 2019.

Thematic ETF Landscape – Q4 Recap

As of the end of Q4 2019, thematic ETFs only represented 0.6% of the over $4.4 trillion in AUM in the US ETF industry. Yet, it's proving to be a fast-growing space, with 121 thematic ETFs and $27.8 billion in AUM in the aggregate. Thematic ETFs saw $326.7 million in net inflows during the quarter and overall AUM for the space grew by $2.7 billion (11%), boosted by performance. Dominant growth over value and a strong showing in the tech and health care sectors contributed to these gains.

During Q4, there were four single-theme ETF launches across four different themes: cybersecurity, gaming and esports, sustainable foods, and autonomous/electric vehicles. In addition, a multi-theme, fund of funds ETF launched with primary exposure to technology-related themes. From an AUM perspective, Disruptive Technology-related themes saw the most growth on an absolute basis ($2.0B), followed by Physical Environment ($0.6B) and People & Demographics ($0.2B) related themes.

Introducing Global X's Thematic Classification System

Global X's research team established a thematic classification system that provides a

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Investing involves risk, including the possible loss of principal. There is no guarantee the strategies discussed will be successful. International investments may involve risk of capital loss from unfavorable fluctuation in currency values, from differences in generally accepted accounting principles or from economic or political instability in other nations. Emerging markets involve heightened risks related to the same factors as well as increased volatility and lower trading volume. Narrowly focused investments may be subject to higher volatility. The investable universe for thematic ETFs may be limited. The Funds are non-diversified.

Thematic companies may have limited product lines, markets, financial resources or personnel. They typically engage in significant amounts of spending on research and development, capital expenditures and mergers and acquisitions.

The risks related to investing in cloud computing companies include disruption in service caused by hardware or software failure, interruptions or delays in service by third-party data center hosting facilities and maintenance providers, security breaches involving certain private, sensitive, proprietary and confidential information managed and transmitted by cloud computing companies, and privacy concerns and laws, evolving Internet regulation and other foreign or domestic regulations that may limit or otherwise affect the operations of such companies.

Investing in securities engaged in the social media industry include disruption in service caused by hardware or software failure; interruptions or delays in service by third-parties; security breaches involving certain private, sensitive, proprietary and confidential information managed and transmitted by social media companies; and privacy concerns and laws, evolving Internet regulation and other foreign or domestic regulations that may limit or otherwise affect the operations of such companies.

Information Technology companies can be affected by rapid product obsolescence, and intense industry competition. Risks include disruption in service caused by hardware or software failure; interruptions or delays in service by third-parties; security breaches involving certain private, sensitive, proprietary and confidential information managed and transmitted; and privacy concerns and laws, evolving Internet regulation and other foreign or domestic regulations that may limit or otherwise affect the operations. Healthcare, Pharmaceutical, Biotechnology and Medical Device companies can be affected by government regulations, expiring patents, rapid product obsolescence, and intense industry competition.

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Appendix