Charting Disruption
Insights into the World’s Most Powerful Disruptive Themes

Q3 2020
E-Commerce: Rethinking Retail in the Reopening Economy

E-commerce became the keystone of retail sales and consumption at the height of the pandemic and stay-at-home economy. Faced with closed physical store fronts, consumers and retailers turned to digital commerce channels with many embracing the technology as an enhancement. Early signs show e-commerce could sustain and grow its newly acquired market share even as reopening continues, as the safety and convenience offered by e-commerce remains in favor.

**E-COMMERCE CONTINUES TO GAIN RETAIL MARKET SHARE AMID PANDEMIC**

![Chart showing quarterly US e-commerce sales and share of total retail](chart.png)


**MANY INDIVIDUALS ARE SHOPPING ONLINE MORE DURING THE PANDEMIC, EXPECT TO SHOP ONLINE MORE FOLLOWING**

![Survey results showing online shopping behaviors](survey.png)

Note: N = 4,045 globally surveyed by Salesforce (Top); N = 15,271 globally surveyed by GWI (Bottom). Source(s): Salesforce, Aug 2020 (Top); Global Web Index, July 2020 (Bottom).
Cloud Computing: The Engine Behind Work-From-Home & Remote Work

Businesses around the world quickly embraced cloud-based work-from-home (WFH) technologies to facilitate continuing operations amid the pandemic. Looking to reopening and beyond, cloud computing’s importance to facilitating remote operations should remain extremely relevant amid changing attitudes towards work-from-home, reduced density in offices, and the potential for reinstated lockdown orders.

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

DATA USAGE REMAINS HIGH AS BUSINESSES EMBRACE HYBRID REMOTE/ON-PREMISE APPROACHES

Note: Including 142/163 of GK Research’s public SaaS universe & 498/505 S&P 500 members that reported 2020 earnings as of 9/1/20.
Source: Global X ETFs, Factset, September 2020

Source: Global X ETFs, OpenVault, June 2020.
Internet of Things: Connected Tech Can Help Reopening Efforts

Connected sensors and wearables are likely to play an important role in the reopening economy as they are used to measure occupancy/density, take temperature readings, and even detect early signs of COVID-19 infection.

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

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

Source: Global X ETFs, August 2020.

### MOORE’S LAW PERSISTS IN 2020 AS GPU TRANSISTOR COUNTS CONTINUE TO RISE

**Transistors-per-chip, 1972-2020 (log. scale); Moore’s Law**

- **05/2020 - Nvidia GA100**
  - 54B Transistors

**Intel 4004**
- 1971 - 2,250 Transistors

Education: An Industry Ripe for Tech Transformation

With reopening coinciding with the start of the 2020/21 school year, educators, students and parents alike are seeking effective and safe ways to continue education efforts. Many are looking to leverage digital mediums as the world strives to reduce in-person interactions.

Note: Figures correspond to number of learners enrolled at pre-primary, primary, lower-secondary, and upper-secondary levels of education (ISCED levels 0 to 3), as well as tertiary education levels (ISCED levels 5 to 8) (per UNESCO Data) cross referenced with school closure data. Source: Global X ETFs, UNESCO, August 2020.

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.

Source: Global X ETFs, Fair Health, August 2020.

Note: 2020 approvals are as of 7/30/2020. Source: Global X ETFs, Medical Futures, American College of Radiology, 2020.
Video Games & Esports: Gaming Sales Soar

Stuck at home and without their accustomed entertainment mediums, individuals across the world and generations turned to gaming to fill the void. Sales of video games and consoles reflect how the environment served as a tailwind for the space. We expect these pandemic-trends to continue through and after reopening... (next slide)
Video Games & Esports: Audiences Remain Above Pre-Pandemic Levels

Even as reopening expands which leisure activities are permissible and as increasing employment means more time spent at work, individuals still indicate that they are spending more time playing video games and watching esports than before the pandemic. This likely reflects increased interest among casual/new audiences that re-engaged with gaming during stay-at-home orders and is illustrative of how the space has become an environment for socialization.

**Video Games & Esports Engagement Remains Sticky and Above Pre-COVID Levels as Economies Reopen**

![Survey: Respondents indicating increased time playing video games, watching esports vs. pre-COVID (%)]

<table>
<thead>
<tr>
<th>Date</th>
<th>Video Games</th>
<th>Esports</th>
</tr>
</thead>
<tbody>
<tr>
<td>3/16/2020</td>
<td>36%</td>
<td>9%</td>
</tr>
<tr>
<td>3/31/2020</td>
<td>34%</td>
<td>9%</td>
</tr>
<tr>
<td>4/22/2020</td>
<td>33%</td>
<td>9%</td>
</tr>
<tr>
<td>5/15/2020</td>
<td>32%</td>
<td>8%</td>
</tr>
<tr>
<td>6/29/2020</td>
<td>33%</td>
<td>10%</td>
</tr>
</tbody>
</table>

**Size of Video Game Streaming Audiences Continues to Eclipse Pre-COVID Levels**

![Average Concurrent Twitch Viewers (# in Millions)]

Source: Twitch Tracker, August 2020.

Note: Composite analysis of 5 iterations of Global Web Index surveys. For most recent survey, N = 15,271 global internet users. Source: Global X ETFs, Global Web Index, August 2020.
Cybersecurity: Securing Technology Critical to Reopening

Cyber-attacks are increasing, and with dispersed work forces amid work-from-home and/or hybrid remote work arrangements, there are more points of entry for cyber-criminals. Growth in distance learning, telemedicine, digital health, and the internet of things creates additional challenges that cybersecurity seeks to address.

GROWING NUMBER OF SYSTEM VULNERABILITIES ILLUSTRATES CURRENT ENVIRONMENT’S HEIGHTENED CYBER-RISK

Common Vulnerabilities and Exposures by severity (üp)

Source: Global X ETFs, National Vulnerability Database, August 2020.

RANSOMWARE IMPACTS MANY SECTORS CRITICAL TO NAVIGATING REOPENING ECONOMY

Organizations detecting ransomware in Q1 2020 (% per industry)

Source: Fortinet, August 2020.

Note: 2020 data up to 8/16/2020, projected out to end of year. Severity determined by CVSS V2 base score.
Genomics: Genome Sequencing Key to Surveillance, Diagnostics

Genomic subsiences like genomic sequencing and computational genomics are foundational to COVID-19 surveillance and diagnostics. Equipped with viral genomes and patient testing data, governments, businesses, and organizations can understand the virus and track the way it spreads and mutates to inform their mitigation efforts.
Genomics: Developing Potential Treatments & Vaccines for COVID-19

COVID-19 mobilized the global medical community to collaborate and pool resources to limit the devastating impacts and loss of life caused by the disease. Treatments and vaccines derived from genomic data could present our most immediate hopes of treating those afflicted, making reopening successful and thwarting future outbreaks.

Note: 527 different COVID-19 treatments and vaccines, categorized by the Milken Institute - covid-19tracker.milkeninstitute.org
Source: Global X ETFs, Milken Institute, Aug 21, 2020.
Millennials: Pandemic Accelerated or Reversed Certain Behaviors

COVID-19 accelerated Millennials’ adoption of disruptive technologies like e-commerce, digital payments, video communications and more. Additionally, the pandemic is pausing or reversing Millennials’ migration to cities with many moving to the suburbs or to temporary living situations as the crisis runs its course.

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

Note: N = 1,000 millennial renters in cities across the US; all indicating future move included in “moving in the next year” bucket. Source: Global X ETFs, Quicken, 2020.
Electric Vehicles & Lithium Battery Tech: Current Resilience & Future Demands

Despite pandemic-driven economic woes negatively impacting the overall market for automobiles, electric vehicles continued to gain market share versus their internal combustion engine counterparts. This demonstrates the resilience of EV demand and should have upstream impacts that include increased manufacturing capacity for lithium-ion battery manufacturers.

**DESPITE COVID’S NEGATIVE IMPACT ON OVERALL AUTO SALES, EV PENETRATION CONTINUES TO RISE**

**WITH EV BOOM IN MIND, LITHIUM BATTERY MANUFACTURERS PLAN TO SCALE CAPACITY**

Source: Global X ETFs, IEA, August 2020.

FinTech: Contactless Payment Volumes Rise as Adoption Increases

FinTech solutions like digital and contactless payments have seen increased adoption as individuals seek to limit physical touchpoints that could lead to infection and prolong the pandemic. We think that contactless payment adoption will continue to grow in a post-pandemic reality and that other fintech solutions that enable/streamline virtual finance and commerce will similarly benefit.

Note: Mastercard survey; N = 17,000 consumers in 19 countries, surveyed in mid-April 2020. Source: Mastercard, April 2020.
Robotics & Artificial Intelligence: Enhancing Business Continuity & Enabling Supply Chain Reshoring

Robotics, artificial intelligence, and other automation technologies have gained favor as businesses look for solutions that allow for continued operations if workers are unable to be physically present. Further, disruptive macro events like trade conflicts and the pandemic at-hand are pushing firms to reshore their supply chains; a trend that is likely to propel automation as firms look to affordably maintain/increase production.

AUTOMATION HAS PROVEN ITS WORTH TO MANY ENTERPRISES DURING THE PANDEMIC

AUTOMATION SPENDING SHOULD TICK UPWARD IN CURRENT AND POST-PANDEMIC ENVIRONMENT

Note: N = 434 US senior corporate decision makers.
Source: Global X ETFs, Honeywell, KRC Research, August 2020.

Note: N = 160 global corporate decision makers; numbers may not add up to 100% due to N/A
More Research On Thematic Investing

See our latest research on thematic investing for more information on these powerful trends, or visit globalxetfs.com/research

• Introducing the Global X Telemedicine & Digital Health ETF (EDOC)
• Thematic ETF Report Q2 2020
• Introducing the Global X Education ETF (EDUT)
• Genomics: How a Cutting-Edge Field is Fighting COVID-19
• Can Lithium Keep Up With the EV Boom?
• Video Game Industry Hits Reset in 2020
• Thematic Disruption Accelerates & Expands Amid COVID-19 Pandemic
• Global X ETFs: 2020 Second Half Outlook
• How the Cannabis Industry is Coping in 2020
• An Infrastructure Plan for the 21st Century
• Theme Lab: A Look Inside An Amazon Fulfillment Center
• How Supply Chain Disruptions Are Accelerating Robotics Adoption
• Mapping the Cloud: A Look at the Segments Driving Growth
• Thematic Growth Valuation Analysis
• How Cybersecurity Will Accelerate IoT’s Growth

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Global X has 19 ETFs designed to target companies that may benefit from disruptive structural changes in technology and innovation, people and demographics, and the physical environment, in addition to 1 multi-theme, single-ticker ETF1. To see individual ETF holdings across the Global X Thematic Growth Suite, click the below links:

**Disruptive Technology**
- Global X Social Media ETF (SOCL)
- Global X Lithium & Battery Tech ETF (LIT)
- Global X FinTech ETF (FINX)
- Global X Internet of Things ETF (SNSR)
- Global X Autonomous & Electric Vehicles ETF (DRIV)
- Global X Future Analytics Tech ETF (AIQ)
- Global X Cloud Computing ETF (CLOU)
- Global X Robotics & Artificial Intelligence ETF (BOTZ)
- Global X Video Games & Esports ETF (HERO)
- Global X Cybersecurity ETF (BUG)

**People & Demographics**
- Global X Millennials Thematic ETF (MILN)
- Global X Longevity Thematic ETF (LNGR)
- Global X Health & Wellness Thematic ETF (BFIT)
- Global X E-commerce ETF (EBIZ)
- Global X Cannabis ETF (POTX)
- Global X Genomics & Biotechnology ETF (GNOM)
- Global X Education ETF (EDUT)
- Global X Telemedicine & Digital Health ETF (EDOC)

**Physical Environment**
- Global X U.S. Infrastructure Development ETF (PAVE)

**Multi-Theme**
- Global X Thematic Growth ETF (GXTG)

1As of 08/28/2020
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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. Education companies may be affected by changes in demographics and consumer demands, and government regulations, programs and policies.

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. Health Care and Information Technology sectors can be affected by government regulations, rapid product obsolescence, intense industry competition and loss or impairment of patents or intellectual property rights.

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