The Future Was Bright – Then COVID-19 …
What a Difference a Week Makes

*Dramatic Changes on the Global Stage*

- Declaration of *Global Pandemic* adds fuel to the fire
  - Will it burn down the economic house?
- US strategy shifts from “Containment” to “Mitigation”
- Stock market lurches from “Correction” to “Collapse”
- Impact no longer limited to challenge of China supply chain disruption and demand loss
- Leaders now scrambling to avoid a potential global recession
- Losses no longer limited to travel, automotive, pharmaceutical, etc.
- It seems every dimension of the economy is in jeopardy
- “This too will pass” BUT – Will it pass like a kidney stone?
The Global Spread of COVID-19

Source: Johns Hopkins, the Lancet, AP, WSJ
### The Global Spread of COVID-19

- **Confirmed cases in 117 countries/territories**
- **These countries represent 6.8 billion people; 87% of the global population**
- **Typically spreading to 4 new countries/territories each day**
- **Strongest presence in northern hemisphere where it is colder**

<table>
<thead>
<tr>
<th>Country</th>
<th>Confirmed Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liechtenstein</td>
<td>0</td>
</tr>
<tr>
<td>Poland</td>
<td>0</td>
</tr>
<tr>
<td>Saint Barthelemy</td>
<td>0</td>
</tr>
<tr>
<td>Tunisia</td>
<td>0</td>
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<tr>
<td>Bosnia and Herzegovina</td>
<td>0</td>
</tr>
<tr>
<td>Palestine</td>
<td>0</td>
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<tr>
<td>Slovenia</td>
<td>0</td>
</tr>
<tr>
<td>South Africa</td>
<td>0</td>
</tr>
<tr>
<td>Bhutan</td>
<td>0</td>
</tr>
<tr>
<td>Cameroon</td>
<td>0</td>
</tr>
<tr>
<td>Colombia</td>
<td>0</td>
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<tr>
<td>Costa Rica</td>
<td>0</td>
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<tr>
<td>Peru</td>
<td>0</td>
</tr>
<tr>
<td>Serbia</td>
<td>0</td>
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<tr>
<td>Slovakia</td>
<td>0</td>
</tr>
<tr>
<td>Togo</td>
<td>0</td>
</tr>
<tr>
<td>Vatican City</td>
<td>0</td>
</tr>
<tr>
<td>French Guiana</td>
<td>0</td>
</tr>
<tr>
<td>Malta</td>
<td>0</td>
</tr>
<tr>
<td>Martinique</td>
<td>0</td>
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<tr>
<td>Bangladesh</td>
<td>0</td>
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<tr>
<td>Bulgaria</td>
<td>0</td>
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<tr>
<td>Maldives</td>
<td>0</td>
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<tr>
<td>Moldova</td>
<td>0</td>
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<tr>
<td>Paraguay</td>
<td>0</td>
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<tr>
<td>Republic of Ireland</td>
<td>0</td>
</tr>
<tr>
<td>Albania</td>
<td>0</td>
</tr>
<tr>
<td>Brunei</td>
<td>0</td>
</tr>
<tr>
<td>Cyprus</td>
<td>0</td>
</tr>
<tr>
<td>St. Martin</td>
<td>0</td>
</tr>
</tbody>
</table>

*Cruise ship docked in Japan
Note: Data begins when Johns Hopkins and WHO began publishing daily global case numbers. China first reported a pneumonia cluster in Wuhan in early December 2019.
Sources: Johns Hopkins Center for Systems Science and Engineering, the Lancet, Associated Press
Vivien Ngo/THE WALL STREET JOURNAL
TOTAL CONFIRMED CORONAVIRUS CASES

Source: WHO
NEW CORONAVIRUS CASES (DAILY)

Source: WHO
NEW CORONAVIRUS CASES BY COUNTRY OUTSIDE CHINA (DAILY)

Source: WHO

NEW CORONAVIRUS CASES BY COUNTRY OUTSIDE CHINA (DAILY)

Source: WHO
NEW DEATHS (DAILY)

Source: WHO
DEATHS BY COUNTRY OUTSIDE CHINA

Source: WHO
## Placing Viruses in Perspective

<table>
<thead>
<tr>
<th>VIRUS</th>
<th>YEAR IDENTIFIED</th>
<th>CASES</th>
<th>DEATHS</th>
<th>FATALITY RATE</th>
<th>NUMBER OF COUNTRIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marburg</td>
<td>1967</td>
<td>466</td>
<td>373</td>
<td>80.0%</td>
<td>11</td>
</tr>
<tr>
<td>Ebola</td>
<td>1976</td>
<td>33,577</td>
<td>13,562</td>
<td>40.4%</td>
<td>9</td>
</tr>
<tr>
<td>Hendra</td>
<td>1994</td>
<td>7</td>
<td>4</td>
<td>57.1%</td>
<td>1</td>
</tr>
<tr>
<td>H5N1 Bird Flu</td>
<td>1997</td>
<td>861</td>
<td>455</td>
<td>52.8%</td>
<td>18</td>
</tr>
<tr>
<td>Nipah</td>
<td>1998</td>
<td>513</td>
<td>398</td>
<td>77.6%</td>
<td>2</td>
</tr>
<tr>
<td>SARS</td>
<td>2002</td>
<td>8,096</td>
<td>774</td>
<td>9.6%</td>
<td>29</td>
</tr>
<tr>
<td>H1N1*</td>
<td>2009</td>
<td>1,632,258</td>
<td>284,500</td>
<td>17.4%</td>
<td>214</td>
</tr>
<tr>
<td>MERS</td>
<td>2012</td>
<td>2,494</td>
<td>858</td>
<td>34.4%</td>
<td>28</td>
</tr>
<tr>
<td>H2N9 Bird Flu</td>
<td>2013</td>
<td>1,568</td>
<td>616</td>
<td>39.3%</td>
<td>3</td>
</tr>
<tr>
<td>COVID-19**</td>
<td>2020</td>
<td>125,048</td>
<td>4,613</td>
<td>3.7%</td>
<td>117</td>
</tr>
</tbody>
</table>

* Between 2009 and 2010;  ** As of March 12, 2020

Sources: CDC; UN; World Health Organization; New England Journal of Medicine; Malaysian Journal of Pathology; CGTN; The Lancet

In 2020 alone, so far there have been 18,000 deaths and 32 million infected with the flu in the United States.

Source: CDC
Risk Factors

• Location of Treatment
• Age
• Pre-existing Health Conditions
• Weak Immune Systems
COVID-19 Cases in North America as of March 12

Canada - 117
Mexico - 12

Source: CDC
Mitigation is Now the U.S. Strategy

“A shift from containment to mitigation would be wrong and dangerous. This is a controllable pandemic.” ~ WHO Situation Report, March 12, 2020

Source: CDC

Setting Expectations

"Most of us are going to get this virus. It's undeniable. You won't find a single expert out there who is saying that this is going to be contained."

"And, the more we learn about it, the more we see that the spread is going to be global and, for the most part, that's OK because the data we know from China shows that roughly 98 to 99 percent of us are going to do very, very, well."

- Dr. James Philips; George Washington University School of Medicine

• More testing kits and increased availability of tests will identify a growing number of infected individuals

• How will markets, government officials and company leaders respond? – Perception is Reality
Coronavirus

Economic Impact
Bears Maul Wall Street Starting
Feb 24
Mar 12 – Worst Day Since 1987

• The definition of FUD
• “Known Knowns, Known Unknowns, Unknown Unknowns”
Record Setting Market Correction – Feb 24, 2020

Fastest 10% declines in the S&P 500 from an all-time high since 1980

- Sep. 29, 1999
- Nov. 23, 2018
- Oct. 15, 1987
- Nov. 26, 2007
- Aug. 17, 1990
- Aug. 14, 1998
- Apr. 14, 2000
- Oct. 27, 1997
- Feb. 1, 2018
- Thursday

Source: Dow Jones Market Data
A Stunning Collapse

The S&P 500's cumulative decline from its Feb. 19 peak through Mar. 11 compared to each of the six corrections that have occurred in the current bull market.

Note: Current decline is through Wednesday, March 11, at 3:20 p.m. ET.
Source: Dow Jones Market Data
The Impact is Global

Benchmark stock indexes of Germany, France and Italy since their recent peaks

Source: FactSet

Japan's Nikkei 225 Index

Recent high

Bear-market level

Source: FactSet
FUD Drives Volatility

Dow Jones Industrial Average, daily moves

Source: FactSet
Global Stock Performance Following Epidemics

Notes: Global stocks refer to the MSCI World Index. Charles Schwab determined when each epidemic began for its analysis. Data as of Jan. 21. Source: Charles Schwab analysis of FactSet data and news reports
The Scope of Electronics Component Manufacturing Impact in China

| Electronic Component Mfr Sites in China Impacted | 5,057 |
| Electronic Component Mfr Sites Completely Shutdown | 43 |
| Electronic Component Suppliers Impacted | 3,855 |

* According to X2Data, these are the statistics of companies which have been effected due to the virus (as of Feb 18)

- Many impacted sites only operating at 50% to 60% manned capacity
  - Many suppliers only operating on 1 to 2 months cash
  - No banking access – financially viable?
- Supply AND Demand are both impacted
- High volume manufacturers production declines for different reasons
  - Xiaomi, Huawei, etc – Collapse of China demand
  - Apple, Microsoft, etc – Supply limitations
- China production resuming with government support
  - Due to diminishing concerns about health crisis?
  - Or due to government concerns about economy?
- China deployed AI and Big Data to combat virus spread?

Shipping & Logistics Challenges

- February Air Cargo Down 9% Compared to Year Ago
- Chinese Trucking Still Crippled by Coronavirus; Trucking in China Moves 73% of Its Freight
  - Citywide lockdowns/quarantines are keeping half of China’s truck drivers off the roads
  - Trucking in the south is closer to pre-virus levels of activity, operating at 60%
- Chinese Ports Resume Normal Activity
  - Workers moving cargo that was set to be shipped after the Lunar New Year
  - Could be idled again if there are continued supply chain disruptions or reduced demand
  - Canceled containership sailings are also down
- U.S. Ports Expect Activity to Drop
  - Expecting a 20% drop in cargo
  - Expecting recovery after several weeks
  - Over 100 transpacific ships to North America have been canceled between February and April

Source: Thomasnet.com
Shipping & Logistics Challenges

**Slump in international shipping volume**
Percentage decrease in small parcel volume post Coronavirus outbreak across FedEx, UPS and DHL

- FedEx: 41.5%
- UPS: 65.5%
- DHL: 23.9%

**Increase in international delivery delays**
Percentage increase in late deliveries due to Coronavirus outbreak across FedEx, UPS and DHL

- FedEx: 4.32%
- UPS: 7.40%
- DHL: 6.94%

**Retail industries impacted the most due to Coronavirus**
- Auto Parts
- Aviation Parts
- Electronic goods
- Apparel
- Healthcare
- Hardware

Source: AuditShipment.com

What is the impact level of the Coronavirus on your company’s ability to supply your customers on time? - CATEGORY AVERAGE

- Electro-Mechanical Average (3/6/20)
- Electro-Mechanical Average (2/21/20)
- Electro-Mechanical Average (2/7/20)
- Passives Average (3/6/20)
- Passives Average (2/21/20)
- Passives Average (2/7/20)
- Semiconductors Average (3/6/20)
- Semiconductors Average (2/21/20)
- Semiconductors Average (2/7/20)

Legend:
- Severe
- Serious
- Moderate
- Minimal
- None
- Do Not Know
How much will the loss of supply in your markets due to Coronavirus increase overall lead times (not just for your company)? - CATEGORY AVERAGE

- Electro-Mechanical Average (3/6/20)
- Electro-Mechanical Average (2/21/20)
- Electro-Mechanical Average (2/7/20)
- Passives Average (3/6/20)
- Passives Average (2/21/20)
- Passives Average (2/7/20)
- Semiconductors Average (3/6/20)
- Semiconductors Average (2/21/20)
- Semiconductors Average (2/7/20)

Legend:
- None
- More than 2 Weeks
- Less than 1 Week
- More than 1 Week; Less than 2 Weeks
- More than 3 Weeks
- No Visibility
The latest ECIA survey on the Coronavirus/COVID-19 impact on the electronic components supply chain starts today

Please Support This Survey!!
Have you seen any additional negative impact to component demand and/or production due to the COVID-19 over the last 2 weeks?

Survey Date: March 5-8   Respondents: ~4000   Location: Worldwide/China focus (~85% China)   Who: Active Electronics Industry Professionals

Source: TPC
What % do you think this will impact C1Q’s electronics production vs. previous plans?

Survey Date: March 5-8  Respondents: ~4000  Location: Worldwide/China focus (~85% China)  Who: Active Electronics Industry Professionals

Feb’20
- No Impact: 13%
- Down 1-5%: 39%
- Down 6-10%: 48%
- Down >10%: 0%

Mar’20
- No Impact: 18%
- Down 1-5%: 47%
- Down 6-10%: 33%
- Down >10%: 0%

Source: TPC
When do you think this shortfall in production delta will be made up?

Survey Date: March 5-8  Respondents: ~4000  Location: Worldwide/China focus (~85% China)  Who: Active Electronics Industry Professionals

Source: TPC
If production delta will not be recovered in C2Q, why? (multiple answers OK)

Survey Date: March 5-8  Respondents: ~4000  Location: Worldwide/China focus (~85% China)  Who: Active Electronics Industry Professionals

Source: TPC
Inventory Status

(Using a scale of 1 to 5 with 1 being extremely low inventory, 3 being the normal amount, and 5 being extremely high; how do you view inventory levels for the following products?)

Source: TPC
North America Sentiment Survey Trends Turning Down

Market Outlook for coming month compared to current month

Source: ECIA Electronic Component Sales Trends Survey
The Annualized Semiconductor Growth Cycle
40 Years of History

Source – WSTS

June 2016 – Start of the tenth semiconductor cycle

Most cycles last roughly four years

Source – WSTS
Semiconductor Revenue Growth Cycle

- Strong annual market downturn started 26 months ago
- Quarter-over-Quarter trend solid indicator of recovery
- Positive Q-over-Q growth trending toward Q1 2020
- But then Coronavirus hits

Source – WSTS
Overall Semiconductor Growth Cycle Aligned

- Memory ICs pull out of their steep dive
- Other Semiconductors break into positive growth by end of 2019
- Likely dip/pause in Q1 with potential to resume growth by summer

Source – WSTS
Semiconductor Revenue Growth Cycle

GDP Relationship

- Current Cycle – Continues 20-year pattern of alignment with GDP
- Technology/Market forces aligning to support growth in 2020+

Source: IHSM Global Insight and Informa Tech

Semiconductor Market Outlook
Semiconductor / Electronics Components Market Outlook – Near-Term

Multiple potential scenarios:

• “Containment” of virus by March / April
  • Market dip through H1
  • Market snapback in H2 that could drive revenue growth up to 3% to 5%

• Large, regionally focused outbreaks extend into Q3
  • Market will not recover in 2020 and potential for revenue collapse by 20%

• Global pandemic continues into Q4
  • Global economic decline could suppress semiconductor market for multiple years
  • Potential for multiple company failures and market consolidation
Market Outlook – Long Term Future Still Bright!

The Developing Technology Triumverate

IoT

Perfect Storm

Cloud

Waves of Amplified Growth

2020 / 2022

5G
“5G mobile technology will, like electricity or the automobile, benefit entire economies and benefit entire societies. This is because the global 5G standard (5G New Radio) will advance mobile from largely a set of technologies connecting people-to-people and people-to-information to a unified connectivity fabric connecting people to everything.”
Opportunities Go Beyond 5G

**MIT Technology Review**

Annual list of technological advances that we believe will make a real difference in solving important problems. How do we pick? We avoid the one-off tricks, the overhyped new gadgets. Instead we look for those breakthroughs that will truly change how we live and work.

1. Unhackable Internet
2. Hyper-personalized medicine
3. Digital Money
4. Anti-aging Drugs
5. AI-discovered Molecules
6. Satellite Mega-Constellations
7. Quantum Supremacy
8. Tiny AI
9. Differential Privacy
10. Climate Change Attribution

“We only have so many productive mental calories to burn a day.

Fear burns more than any.

So, we need to focus them on what we can control, what is in our immediate control.”
Thank you!