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Can the Coronavirus Contagion Economically Infect the Global Pharmaceutical Industry?

March 2020

Can the Coronavirus Contagion Economically Infect the Global Pharmaceutical Industry?

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Update (as of end of day March 2, 2020)

An earlier version of this white paper starting with section 1 below went into production on February 25, 2020. Then, with events changing so rapidly, we thought it would be a good idea to pause production and provide a brief update since a week had passed to see what predictions were correct (virtually all of them) and which ones were incorrect (only one noted that was partially true). The major source for the updated information came from various articles in *The Wall Street Journal (WSJ)* (March 2, 2020 issue) and the Internet:

1) The coronavirus continues to expand rapidly around the world, now in over 60 countries, up from the 28 noted in the original version. About 85,000 cases worldwide have been reported with deaths now approaching 3,000. Cases in Italy are expanding (largest outbreak in Europe) with South Korea being the country with the largest number of cases outside China. The situation in Japan is improving due to precautionary and control measures put in place. Concerns about the spread of the virus in Iran and surrounding countries persist. Large populated events and gathering places (like major tourist sites in Europe) have been halted and closed, respectively. Business conferences have been postponed in affected countries where large outbreaks exist.

2) Virus cases are growing in the US, with a deadly outbreak in the state of Washington. Expansion of the virus around the US is expected. Expanded travel bans have been instituted, with controls at the borders and checks at major airports for incoming passengers have started.

3) A bipartisan spending bill from Congress, exceeding the President's requested amount, will reach his desk for signature for the resources needed, at this time, to mitigate the spread of this outbreak. Vice President Pence was selected by President Trump to lead a governmental task force to control and limit the scope of the outbreak. Pharmaceutical company CEOs met with the President to discuss developments of a vaccine for the virus. The US is in a much better position than other countries in developing a breakthrough vaccine by having many of the world's largest pharma companies based here, as noted by the *WSJ*, illustrating the power of the private sector to help solve this problem.

4) Drug shortages are being seen in older generics not produced here but in China, and with single-sourced generic drugs that are reliant on China for key ingredients. Our prediction downplayed the virus effect of drugs produced here because China is not seen as a key source for materials. Our prediction was largely true. The extent of this problem will be dependent on the length of the outbreak.

5) The virus is taking an economic toll on companies, disrupting supply chains, canceling travel, delaying investment plans, and stopping hiring. The economic effects of the outbreak continue. The Dow Jones Industrials Average (DJIA) index fell by 14% the week of February 24-28 (a fall of 20% from the market high would be considered moving into "bear" market territory). The DJIA rebounded by rising over 5% on March 2, 2020, on the hope that the Federal Reserve may step in with a rate cut to prevent an economic contraction. The European central bank may consider a similar action. Economists are expecting a V-shaped pattern of effect and recovery, though this prediction relies on the coronavirus not turning into a longer-term event. A great deal of uncertainty still exists about this virus, with comparisons to previous outbreaks likely not valid. Therefore, predictions about the coronavirus not causing a recession are likely still premature at this time.

1. The Spreading Coronavirus Contagion (completed the end of day February 24, 2020)

Events surrounding the coronavirus contagion, which started in China (officially named COVID-19), remain very fluid and are changing daily. No one really knows what the future holds and what if any long-term global effects may result from this latest contagion. A big question is whether the coronavirus will become a pandemic? Recent events suggest we are on the brink of such a declaration at the writing of this paper. If so, this will dramatically affect the global economy in ways previous pandemics have not due to numerous economic system structural changes, such as China's emergence as a global economic superpower and the ease at which people can travel around the world. The two pandemics involving the influenza virus (H1N1) from 2009-2010, also called the swine flu, is estimated to have caused global deaths between 284,500 and 575,400 people based on statistical models.[1] The high degree of viral contagiousness of H1N1 and its dissemination facilitated by the ease of modern global travel, similar to what we see today with the coronavirus, were key factors in causing the H1N1 pandemic.[1] However, attempts to use previous virus outbreaks as a model for how the coronavirus will impact the global community (e.g., the Severe Acute Respiratory Syndrome (SARS) outbreak and recovery in the 2002-2003 period), are likely misguided. There is much we still do not know about the coronavirus. What we do know is that the virus appears to be spreading well beyond China (details are outlined below).

Therefore, this paper is about expanding on two themes that are of importance to the successful long-term operation of pharmaceutical companies:

1) What are the possible economic effects of this contagion on the global pharmaceutical industry that we can surmise at the time of writing this paper? This paper will outline in a structurally logical fashion demand-side and supply-side pharma industry effects. The depth and extent of effects will depend on whether the coronavirus is geographically contained and length of time (will it last for a relatively short time like the SARS outbreak), or will it become a global pandemic lasting for a much longer time period. The reality is we currently do not know about the depth, extent, and time length of the coronavirus outbreak.

2) The other key related theme is that the coronavirus illustrates that pharma companies, as complex global organizations, are subject to numerous risks and uncertainties. This requires a pharma company to have a sophisticated culture of "competing on analytics" as identified by Davenport and Harris[2] to mitigate effects when these surprise events occur.

Below is a list of news items in chronological order happening in just the last three weeks concerning the coronavirus at the time of this article being written on February 24, 2020, demonstrating the extent and speed at which this virus has already affected the global community:

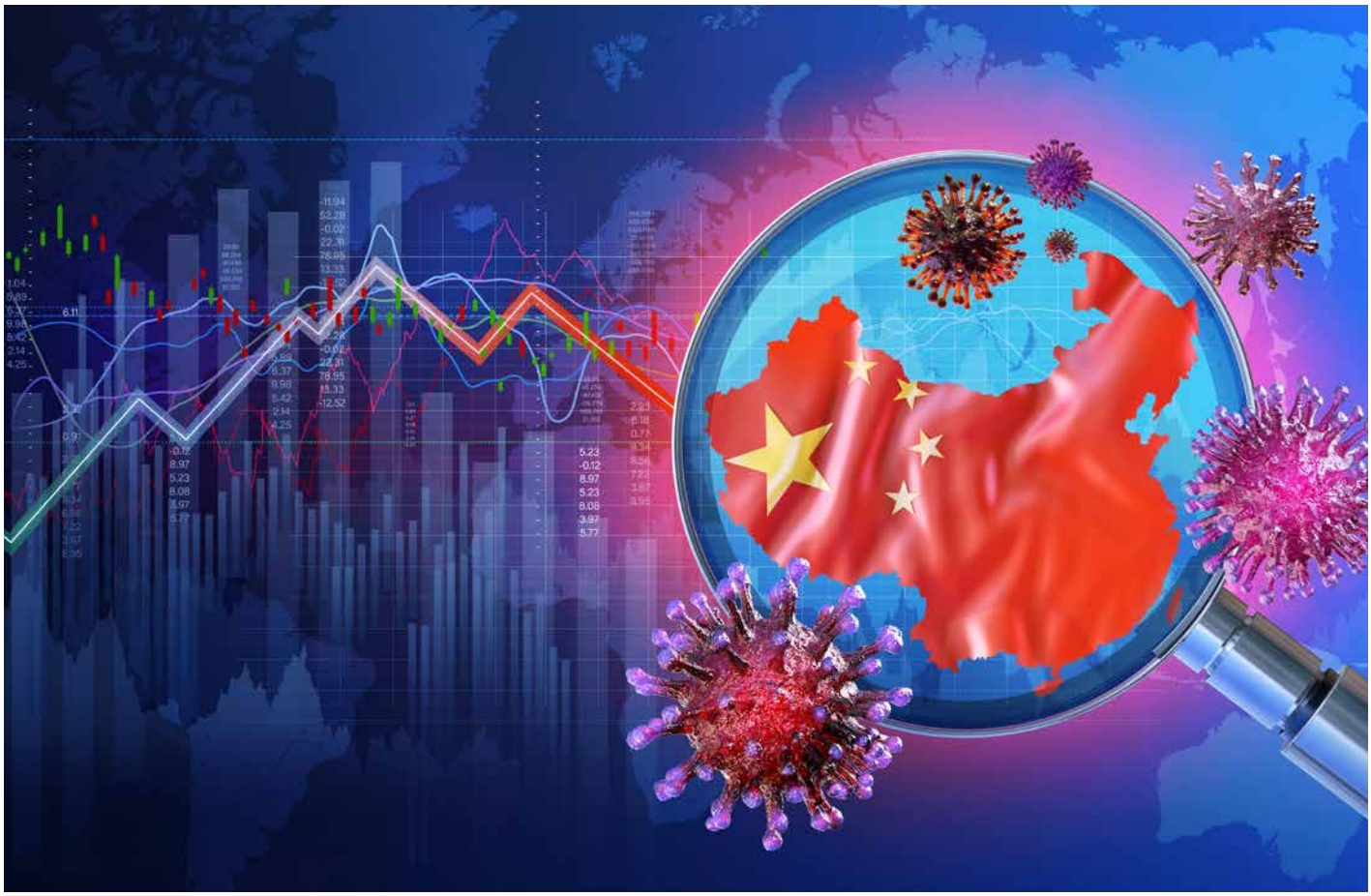
a. The DJIA fell 1,031.61 points on February 24, 2020, or 3.56% on expanding coronavirus concerns affecting the global economy.[3] While history shows markets generally rebound quickly from such significant one-day pullbacks, the dramatic drop in global financial markets illustrates the uncertainty and fear that currently exists due to the coronavirus.

b. As of February 22, 2020, there were more than 75,000 confirmed cases, more than 2,350 deaths globally, and the countries hit by the virus had risen to 28 according to data from the World Health Organization (WHO).[4] The virus has expanded to Iran, where concerns are that the country does not have the facilities to contain the virus properly, and it could easily spread to neighboring Pakistan, given the high volume of cross-border traffic, causing an ever-expanding outbreak.[4] South Korea has become the hardest hit country outside of China,[4] where concerns are mounting regarding the rising number of cases there.[5] Meanwhile, Italy has seen the largest outbreak in Europe near Milan, the economic center of Italy.[6] Lastly, the fluctuations of daily numbers from China have raised concerns about the accuracy and collecting methods of data coming from this country.

c. The global economy shows signs of adverse effects from the expanding virus outbreak, with finance ministers and central bankers from the G-20 countries meeting in Riyadh, Saudi Arabia on February 23, 2020, regarding the economic risks and what actions should be taken, the International Monetary Fund (IMF) reducing China's annual growth projection to 5.6% below the crucial 6.0% target rate of importance to Chinese leaders, and major producers around the world feeling the supply chain disruptions from China on their own operations.[7]

d. Travel bans instituted by other countries against the movement of Chinese into their own has had negative effects on commerce, culture, and Chinese studying abroad.[8]

e. US stocks that have high exposure to China have significantly underperformed relative to broader market indices, showing the spillover effects that China has on the global economy.[9]



f. Similarly, the coronavirus has shown how vulnerable US companies are to disruptions happening in China due to this outbreak.[10]

g. Apple reported the coronavirus will adversely affect the company meeting its revenue projections, illustrating the effect the virus has had on limiting production and demand for iPhones in China.[11]

h. The virus is adversely affecting the economy in Japan, through numerous channels (e.g., tourism and production), along with the imposition of a sales tax increase, that now may put the world's third largest economy into recession.[12-13]

i. The carmaker Volkswagen AG reported that some factories in China may remain closed due to the virus, illustrating the challenges companies are having to reopen their operations.[14]

j. The previous point is illustrated in the broader problem that China has to reopen its factories under medical protocols that must be followed to limit the spread of the virus.[15-16]

k. Concerns have been expressed about whether the outbreak has reached a "turning point" where health officials are unable to contain the contagion to China.[17] Similar concerns have been expressed about what the US needs to do now to prevent the outbreak from hitting and spreading here.[18]

l. The virus is expected to affect US growth according to a survey of economists, though the impact is predicted to be small.[19] How much the US economy can remain immune from effects from the virus seen elsewhere around the world remains to be seen. Federal Reserve Chairman Jerome Powell has warned of coronavirus risk to the US economy.[20]

m. IMF Chief Kristalina Georgieva spoke about the uncertain impact the virus would have on the global economy, which was sluggish (outside the US) even before the virus hit. Her prediction was that the most likely scenario was for a V-shaped economic impact, noting a sharp decline followed by a rapid recovery.[21] The reality is that no one really knows what will happen and are making predictions based on the SARS outbreak and recovery in the 2002-2003 period, which may not be applicable here given differences in the transmission and dynamics of SARS versus the coronavirus. Also, the role China's economy plays in the global economy is very different between then and now, rising from 4% to 15% of global GDP in 2003 versus today respectively.[22]

n. The global supply chain has been adversely affected by the virus illustrating the importance the Chinese economy now exerts in this area, with key commodity prices, such as oil, also taking a hit from the outbreak, extending the effects of the contagion.[23]

o. The virus has increased the price of many household goods in China, causing the inflation rate to be the highest in eight years.[24] This trend in domestic prices can have spillover effects on the demand of other consumer goods, putting added downward pressure on global economic growth.

The preceding events suggest broad economic effects stemming from the coronavirus. While much of the news has been about aggregate and some sectoral effects from the outbreak, the remaining part of this article looks at how this latest contagion may potentially affect the global pharmaceutical industry and the critical role of analytics to mitigate effects from such surprise events.

2. Coronavirus Contagion Potential Effects on the Global Pharmaceutical Industry

The coronavirus contagion likely classifies as a "black swan" surprise (low-probability) high-impact economic event like other 21st century events that have preceded it as noted by this citation (e.g., 9/11, Ebola, SARS, Trump's election, Brexit).[25] Though not mentioned in this specific citation, the 2007-2009 Great Recession and the 2009-2010 H1N1 (Swine Flu) pandemic could also likely classify as "black swan" events. Lastly, depending on China's response to this latest virus and its future policies to learn from and clamp down on commercial practices that provide the breeding ground for such outbreaks, the coronavirus may also likely not be the last one to materialize from China.[25] If so, then such future events may indeed be predictable and thus lose being called "black swan" events. Pharma companies may take actions to limit their exposure and risk from such future events, as explained below.

Given this preceding background, this paper will continue addressing two key questions important to the successful operation of a pharma company:

1) What are the potential effects from this latest "black swan" event on the global pharmaceutical industry? The potential effects are broken down into two possible pathways characterized as creating demand-side and supply-side pharma industry impacts.

2) What important role does analytics play in a complex global pharma organization to mitigate the effects from a "black swan" event like the coronavirus outbreak?

2.1 Demand-Side Effects

The demand-side effects from the coronavirus can be broken down into the following impacts, with suggestions on how to measure such effects noted:

1) The coronavirus directly decreases Chinese drug spending. As noted earlier, the virus has caused a spike in domestic inflation, which means the cost of consumer goods is rising, thus causing less demand for drug spending. China is the second largest drug market (behind the US) in the world, with 2018 spending at $137 billion.[26] However, the vast majority of that spending affects domestic Chinese drug companies that serve the China market, not non-China based branded pharma companies, where their share of global sales coming from China is still relatively small.[27] The focus on and increase in specialty medicines (e.g., oncology) has been the driver of spending growth in developed markets,[26] an area where there is an emerging market presence in China,[26] though it is still relatively small for pharma companies.[27] Empirical analysis can be undertaken on how decreases in China's economic growth and domestic spending caused by the outbreak affect Chinese drug spending.

2) Another suggested effect is a reduction of sales rep activity, in order to reduce personal contact, necessary to promote new drugs, that in turn could reduce sales.[27] There is a long and well-established body of pharma promotion-response modeling literature on how changes in sales rep activity affect sales. We also know from historical empirical industry evidence that new drug sales uptake in the beginning months of launch is a strong predictor of long-term sales. These two effects can be brought together to determine the longer-term sales implications if the outbreak persists.

The following demand-side effect refers primarily along the pathway of the coronavirus increasing the likelihood of a global recession via an economic shock to the system, the other two recessions causes noted are "overheating" and an "asset bubble":[28]

3) The coronavirus decreases China's economic growth → increases the risk of a global recession (as previously noted is the world's second largest economy) → which in turn decreases global aggregate demand for drugs. Also seen with the Great Recession of 2007-2009, as governments faced declining tax revenues, higher entitlement spending for health programs, higher stimulus spending to reduce recessionary effects, higher budget deficits caused cuts in healthcare spending and branded drug demand through substitution to generics, tighter restrictions on prescribing and funding the utilization of patented drugs, and institution of price controls. The relationship between a recession and effects on drug demand has been recently noted in detail in *The Medicine Maker* and *Axtria Research Hub*.[29] Also and importantly, these relationships can be empirically predicted and measured, along with the effects from pharma company countermeasures to mitigate recessionary effects on drug demand and revenue forecasts.[29]

2.2 Supply-Side Effects

The supply-side effects from the coronavirus can be broken down into the following impacts, with the severity of the outbreak dependent on the length and geographic breadth of the contagion:

1) The coronavirus disrupts the global supply chain of active pharmaceutical ingredients (APIs) developed in China and sent to other drug companies. Indian generic manufacturers are particularly dependent on raw materials from China (about 70% according to one reference).[30] The global implications of supply chain disruptions starting in China affecting US and European drug companies are still unknown. Companies are likely to buffer any effects through stockpiling and finding alternative supplies.[27] Lastly, confidence could be weakened in the longer-term stability of the Chinese supply chain system to deliver on pharma company needs. Events like the coronavirus, if repeated with other outbreaks and "black swan" shocks, rather being seen as an isolated situation, could cause companies to seek out alternative and more reliable sources of APIs, thus creating longer-term adverse effects for China. However, this could mean opportunities for other countries that fill in the gap left by companies looking beyond China as a more reliable course of materials, dampening adverse economic effects. This redundancy might bring about longer-term beneficial effects by not being so overly reliant on China for APIs.

2) The coronavirus could adversely affect the conduct of current clinical trials in China, with greater effects, the longer and geographically spread the outbreak becomes.[31] A number of international pharmaceutical companies have heavily invested in China in the hopes of conducting less expensive clinical trials, obtaining access to large patient populations, and serve an ever-growing Asian market.[31] This may also cause pharma companies to reconsider long-term investment plans to leverage China as a major source to conduct clinical trials. Again, this adverse effect on China could mean a positive effect elsewhere, reducing any future risk by geographically spreading the conduct of clinical trials. so the system is less susceptible to a shock in any one country, like China. The length of the outbreak,

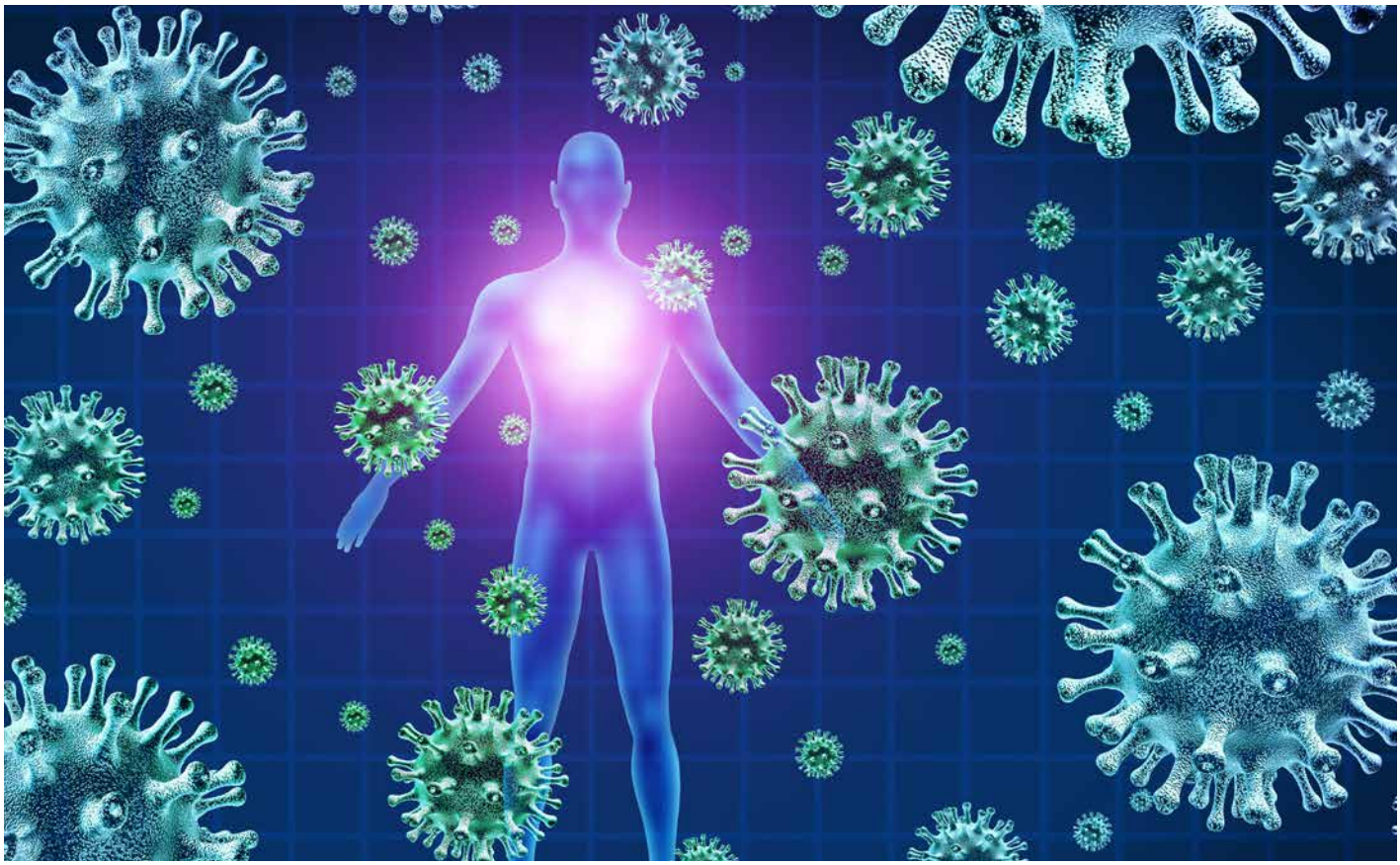
how China responds to it, the degree to which China modernizes the drug and healthcare sector, and the confidence from investors that such shocks like the coronavirus will be minimized in the future, will determine the trajectory of future foreign drug company investments.[31] This is likely the result from a pandemic scenario. However, any longer-term effects from the coronavirus are still uncertain at this time.

3) The outbreak could also affect the launch of testing on new experimental drugs, especially those developed from within the Chinese pharmaceutical industry, delaying efforts for China to supply drugs for its own market and globally deliver against the competition.[31] The effects outlined in this item and in 2), if the outbreak continues, could mean significant effects in the longer-term for China to develop its own pharmaceutical industry and compete against global companies.[31] If the outbreak becomes a pandemic, it may also shift R&D priority efforts toward addressing future virus pandemics, such as finding vaccines to handle future epidemics, and thus "crowd-out" investments on developing drugs for other conditions needed by society. Similarly, a pandemic would exert significant pressure on global healthcare systems, affecting the supply of medical care for other conditions, that could result in negative spillover effects on the utilization of drugs via demand-side effects.

2.3 Important Role of Analytics to Mitigate the Effects from "Black Swan" Events

True "black swan" events by their nature are difficult to anticipate. However, it does not mean a pharma company is powerless to mitigate effects from a surprise event like the coronavirus. This latest contagion strongly demonstrates the need for pharma companies to invest in creating a culture of analytics to prepare themselves for the risks and uncertainties inherent in operating a global pharma company. A few important analytics steps can be taken by companies to reduce the instability and uncertainty caused by such "black swan" disruptions:

a. Engage in simulations and wargames to map out the possibility of surprise events and their potential effects. This means creating a culture of "blue-sky" or "possibility" thinking beyond normal internal group thinking and traditional boundaries of thought. Going beyond traditional boundaries of thought is likely facilitated by creating interdisciplinary teams and processes to foster new thinking, having the right incentives and culture for people to generate new ideas, and having the right people who are open to new thinking.



b. Attach risk coefficients and the nature of uncertainty to future events that could bring significant harm to the company. This means having a "risk register" of potential events, attribute a likelihood of occurrence, and attach a degree of company impact to each event. Future events can then be prioritized for continued monitoring and contingency plans developed for possible implementation.

c. Create robust empirical platforms to detect and measure quickly the existence and potential effects of these unexpected events when they occur. This means the applications of artificial intelligence (AI) and machine learning (ML) can be very useful here as identification and prediction mechanisms.

d. Generate robust empirical models that can measure the effect of mitigation efforts through business policies implemented if and when that future event does indeed occur. Creating a library of past empirical models applied and their usefulness would be very helpful. In addition, having a culture of experimentation is essential to develop new ideas for implementation.

e. Translate empirical insight on the nature and extent of effects into actions based on empirical-driven business decisions. This means having a strong operations orientation and trust to execute plans based on analytics.

f. Develop a well-designed data architecture to supply the analytical engines necessary to do the above functions. This means eliminating data silos through integration since interdisciplinary analysis is likely required, meaning having data structures that cut across traditional organizational boundaries.

g. Promote an organization-wide culture of analytics used in all decision-making that is strongly advocated by senior leadership.

3. Concluding Remarks

The outbreak of the coronavirus illustrates the inherent risks and uncertainties that are prevalent in the operation of a complex and global business, as seen in the pharmaceutical industry. By their very nature, "black swan" events are difficult to anticipate by business. Much of this paper spent time identifying the potential effects of the coronavirus on pharma companies. However, the coronavirus also illustrates the need for companies to have empirical systems in place to act quickly to mitigate the effects from such events when they do occur. This means having detection systems that can quickly identify the existence of a problem, predict and measure the depth of effects, and then estimate the effect of implementing management control policies to mitigate the business impacts from such "black swan" events. The existence of these analytic processes and systems is crucial for the long-term success and stability of a pharma company. Proper risk/uncertainty-mitigation controls in place, along with being prepared for the application of analytics to gather insight on the effects of such events, are essential to developing evidence-based countermeasures to minimize adverse impacts on business operations and to limit disruptions on patients and the healthcare system served by pharma companies.

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