

## Building a Blockchain for Global Distribution of a COVID-19 Vaccine

(Source: An article by Punit Shukla, Amey Rajput and Sid Chakravarthy for the World Economic Forum)

While development of a successful coronavirus vaccine is key, finding a way to distribute it on a global scale will be equally crucial and will involve building a manufacturing and supply chain capacity larger than ever before, and at warp speed. That success also requires leveraging tools and capabilities – such as blockchain – in a way never seen before in the history of fighting pandemics.

Decades of running immunization programs by UNICEF and the Gavi Alliance tell us that vaccine supply chain and delivery takes years to stabilize depending on the geography. UNICEF, world's largest vaccine buyer for children, procured 2.43 billion doses of vaccines in 2019 to reach approximately less than half of the world's children under five for an effort covering a range of diseases (including measles, diarrhea, pneumonia and polio).

The unique challenge of scale is greater in the COVID-19 pandemic and that challenge is precedent setting. This vaccine must cover every country in every continent and every person in every age group. Assuming the approved vaccine requires just one dosage per individual, at least 7 billion doses of the vaccine will need to be in the hands of healthcare workers. Assuming a 20-30% loss during transit and storage, this could mean close to 10 billion doses in the supply chain. Should the vaccine administration require two dosages per individual, the volume needed could top 19 billion vials.

A supply chain for COVID-19's vaccine will also be unique. While multiple geo-political, economic and nationalistic interests will influence who discovers the cure, who manufactures it, who funds it and who needs it, the supply chain must be "equitable." There must be a global consensus on who should get it first, one not based on who can buy it first. Such an equitable supply chain can only be built on a doubtless, openly verifiable, consensus-driven system having indisputable integrity of data with no single source of control. To achieve the global optimum, instead of a national or regional optimum, vaccine access will critically depend on an information system with the highest possible integrity, capable of alluding forces with vested interests. Therefore, blockchain and distributed ledger technology will be essential for an equitable COVID-19 vaccine distribution.

The COVID-19 vaccine supply chain information system must be built with real-time tracking capability and updates on parameters such as vaccine storage levels, temperature control, stock-outs, and quantities of ancillary supplies. This becomes imperative in calculating the most important parameter, vaccine wastage rate – a key input to anticipate demand and reducing stock-outs/over-stocks. At the scale of ~10 billion units, estimates of wastage at every stage of the supply chain and its accuracy can be the key in ensuring or denying access to the vaccine for large segments of population. Here again, blockchain will be critical.

(continued on page 2)

## In Brief...

♦ **AmerisourceBergen Corporation (ABC)** reported its financial results for Q3 2020 ended June 30, 2020, with revenue 0.3 percent year-over-year to US\$45.4 billion. The company posted GAAP diluted earnings per share (EPS) of US\$1.41 compared to US\$1.43 in the prior year quarter. Adjusted diluted non-GAAP EPS increased 5.1 percent to US\$1.85 in the fiscal third quarter. "In the third quarter of the fiscal year, we saw the resilience of our business as our associates worked diligently to ensure continued patient access. Our updated outlook for fiscal 2020 reflects the continued execution by our teams and the strength of AmerisourceBergen's value proposition, deep partnerships and strategic positioning," said *Steven H. Collis*, ABC's Chairman, President and Chief Executive Officer.

♦ **McKesson Corporation** report first-quarter revenues of US\$45.1 billion, up 2%, attributable to market growth and higher volumes from retail national account customers, and partially offset by branded to generic conversions and overall lower prescription volumes. Q1 Segment Operating Profit was US\$589 million, down 2% from a year ago, driven by lower prescription volumes and partially offset by growth in the specialty provider business. "I am proud of the dedication and discipline of McKesson's employees as we navigate the complexities and uncertainties of the COVID-19 pandemic while continuing to serve our customers and our communities" said McKesson's CEO, *Brian Tyler*.

♦ **Cardinal Health** reported Q4 2020 revenues of US\$36.7 billion, a decrease of 2% year-over-year. The company also saw its full-year revenue increase to US\$152.9 billion, an increase of 5% from 2019. Operating earnings were US\$270 million, a decrease of 12% year-over-year, and a full year operating loss of US\$4.1 billion was reported. "In fiscal 2020, we delivered on our commitments, grew operating earnings and exceeded our EPS guidance, despite the unprecedented global environment," said Cardinal's CEO, *Mike Kaufmann*.

♦ **Pfizer** is among the COVID-19 vaccine frontrunners racing to deliver a safe and effective shot, and now it is teaming up with **Gilead Sciences** to help manufacture the antiviral drug *remdesivir*, as Gilead and its partners push to meet "real-time global demand" beginning in October. Joining a remdesivir network of more than 40 drug makers in the U.S., Europe and Asia, Pfizer will produce remdesivir at its plant in McPherson, Kansas. The tie-up comes as hard-hit U.S. hospitals report shortages of the medicine, which the U.S. FDA cleared for emergency use against COVID-19 back in May.

♦ Despite media reporting and public perception of rising drug costs in the U.S., a report by the **IQVIA Institute** details that the average out-of-pocket amount paid per prescription remains steady at US\$10.67, unchanged from 2018 and up

(continued on page 2)

## Blockchain (cont.)...

Even now in the current scenario, we do not have accurate estimates of wastage rates. In the absence of national figures, WHO issued indicative vaccine wastage rates and a tool for estimation. However, the tool itself acknowledges a lack of accurate and appropriate data at the country level, thanks in part to overburdened systems reporting data that are late or incomplete, and the difficulties in identifying a vaccine's target demographic.

A report on immunization information systems by WHO under project Optimize (a WHO-PATH project to facilitate an efficient vaccine supply chain) hints that even the Gavi Alliance has seen its attempts to make financial support proportional to performance targets challenged by limitations and questions regarding data variances. For the COVID-19 vaccine, we would need live tracking of every vial with all the storage and handling parameters with absolute integrity and open accessibility by all stakeholders. This can only be done with a decentralized open ledger.

Efforts leveraging blockchain technology have been begun across the globe, in context of supply chain at ports, in retail and logistics. Blockchain has been mostly used in these pilot experiments to enable real-time tracking of shipments and shared access of data between consortium members which helps to build trust. The lessons from these pilot programs can be utilized to enable a truly global tracking system involving checks and balances for the COVID-19 vaccine supply chain.

One UNICEF Innovation Fund and Gavi INFUSE portfolio startup, StaTwig, has been building and testing a vaccine supply chain management platform which ensures all stakeholders have complete visibility of all vaccines at national, state and district levels and at different stages of the supply chain. The platform uses QR codes (bar codes and serial numbers) printed at unit-levels to track the vaccines from the manufacturer to end-consumer on an open source blockchain platform. At each touchpoint in the supply chain, the platform records data such as quantity, temperature record, timestamps, chain of custody and price against the unique QR code. The platform supports aggregation and disaggregation so that the number of QR code scans can be reduced exponentially at pallet and box-levels. This process also simplifies tracking of the products in the extended supply chains which includes last-mile deliveries. StaTwig's teams have been testing the solution with UNICEF program teams in the Middle East, North Africa and India.

Helpful in these efforts is a recently released a *Blockchain Deployment Toolkit*, developed by the World Economic Forum Centre for Fourth Industrial Revolution. The toolkit helps to build a "shared truth" in supply chains dependent on trust, transparency, and integrity.

Still, more needs to be done. Such an effort would require global coordination of digitizing the vaccine supply chains, retraining the involved workforce and aligning all the players including manufacturers, suppliers, buyers, frontline health workers and governments to ensure success of the system. Large scale deployment of Internet of Things (IoT) devices would be required across the whole inventory and logistics to maintain real-time tracking with minimal manual intervention. Since a shared tracking of data may also give rise to concerns around privacy (for both individuals and enterprises alike), privacy preserving

techniques would need to be fundamentally coded into the information system.

Efforts to build an open system to track and trace every vaccine dose accurately will be required to build a global consortium of vaccine researchers, pharmaceutical companies, manufacturers, distributors, healthcare workers and governments. Blockchain technology can accommodate this to scale, while building trust and transparency, reducing vaccine wastage rates, and ensuring a truly equitable distribution of the COVID-19 vaccine to the entire global population.

The technology evolution involving the right tools, resources and optimism is present. Leveraged correctly, it is an unprecedented opportunity to capture the minds of innovators to construct a first-ever solution to save human lives around the globe.

## In Brief (cont.)...

only US\$0.33 since 2014. These changes are attributed to high levels of generic drug use and greater use of manufacturer coupons offsetting changes in insurance programs that can expose patients to higher costs. Only 1% of prescriptions cost patients more than US\$125, while 30% overall and 44% of brands cost \$0. For a full copy of this report available for download, please visit <https://www.iqvia.com/insights/the-iqvia-institute/reports/medicine-spending-and-affordability-in-the-us>.

- ◆ Japan has agreed to buy 120 million doses of **AstraZeneca** and the **University of Oxford's** COVID-19 vaccine hopeful according the country's health minister, *Katsunobu Kato*. Should the shot cross the regulatory finish line, AstraZeneca will begin deployment to Japan next year, with an initial 30 million doses expected by March, Tokyo-based Kyodo News said. The British drugmaker plans to launch additional vaccine trials in Japan before month's end. Financial terms are still under wraps, but Japan is eager to keep the COVID-19 supply pacts coming.

- ◆ **Bayer Yakuhin** President, *Heike Prinz* has been elected to the position of chairman for the European Federation of Pharmaceutical Industries and Associations (EFPIA) Japan effective August 1st. Ms. Prinz will assume the position from Nippon Boehringer Chairman and President *Thorston Poehl*, who will step down from his position at the company at the end of August to take on a new overseas post at Boehringer Ingelheim.

- ◆ **Johnson & Johnson's Janssen Pharmaceuticals** has inked a deal with the U.S. government's **Biomedical Advanced Research Development Authority (BARDA)** for 100 million doses of Janssen's COVID-19 vaccine following approval or an Emergency Use Authorizations from the U.S. Food and Drug Administration. The U.S. government also has the option to purchase an additional 200 million doses under a subsequent agreement.

- ◆ The Japanese units of **Bristol Myers Squibb** and **Celgene** plan to integrate in 2021 and relocate the headquarters in the first half of 2022, according to *Jean-Christophe Barland*, President and CEO of both business units. BMS completed the acquisition of Celgene in November of last year and their headquarters have already been combined in the U.S.

(Sources: Company Press Releases, Drug Store News, FiercePharma, Pharma Japan, and Reuters)