The Digital Metamorphosis of Three Industries

The Digital Revolution of Life Sciences Companies

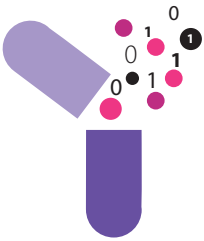
Authors

Debashis Ghosh

President, Life Sciences, Healthcare, Energy and Resources, and Public Services, Tata Consultancy Services

Sanjeev Sachdeva

Global Head Advisory and Chief Technology Officer, Life Sciences, Tata Consultancy Services



Digital technology is altering the DNA of the global life sciences sector. Artificial intelligence, digital sensors, cloud computing, advanced analytics, and other advanced technologies have ushered in a flock of digitally savvy companies. At the same time, leading life sciences companies have been capitalizing on the rapid maturation of these technologies and scientific advancements in personal genomics, cell and gene therapy, as well as other areas. They are changing the rules about how drugs are discovered, developed, and manufactured, supply chains are tracked, clinical trials are conducted, and patients are recruited and monitored.

Yet this digital transformation is just beginning. Pharmaceutical and medical device companies have abundant opportunities in the still-emerging digital ecosystem of health care. From TCS' experience with dozens of life sciences companies, and our recent research on digital strategies in this and 10 other industries, we believe the most successful life sciences firms will be those that work effectively with their ecosystem partners to launch breakthrough therapies and devices, and digitally monitor and improve the health of patients who are using them.

The Digital Invasion of Health Care

Digital companies have long viewed the $8 trillion[99] global healthcare market as ripe with opportunity. Smart watches with fitness trackers and wellness apps, as well as wearables with health monitors, are among the kinds of devices that these digital companies are developing for health-conscious consumers. Personalized medicine is a whole other arena with large opportunities with rapid advancements in genomics and artificial intelligence, and an explosion of personal health data on which to study the progress of diseases, therapies, and their impact.

As well, the pharma and med tech enterprise's supply chain is becoming a center of digital innovation, with additive manufacturing and digital tracking of drugs through distribution, from the factory to the pharmacy.

Many leading life sciences companies have recognized the arrival of big digital companies as an opportunity, not just a threat. For example, Novartis, Sanofi, and Pfizer are among those that are collaborating with Verily, a Google

[99] PwC report, based in part on data from TeleGeography, published 2018. Accessed Aug. 20, 2019. https://www.strategyand.pwc.com/media/file/Grasping-at-differentiated-straws-v2.pdf

sister company, to speed up and improve clinical trials, a segment which is predicted to be worth $70 billion in 2026[100]. And investors such as Novartis have gotten behind 'smart pills' made by digital start-ups like Proteus—medicines with sensors that let doctors know whether patients are taking their therapies and in the right doses[101].

More broadly, several pharmaceutical companies—led by Novartis, Johnson & Johnson, Novo Nordisk, Eli Lilly, and Merck—have been investing in a variety of joint ventures with companies that specialize in e-commerce, drug delivery, computer chips, and hospital data. These companies have made 413 investments in 28 industries since 2015[102].

Many leading life sciences companies have recognized the arrival of big digital companies as an opportunity, not just a threat.

The promise of these and other ecosystem partnerships is to bring transformative digital innovations. This ecosystem also gives life sciences companies access to abundant clinical, molecular, and other data to improve drug repurposing, regulatory intelligence, drug efficacy and effectiveness, and other key capabilities.

One big opportunity is in the business of collecting and processing big pools of patient data to gain insights about potential drugs and treatments that make them safer, more effective, and more efficient. Another is the development of operational 'digital twins'—as an example, digital replicas of a pharma manufacturing operations for optimizing manufacturing process outcomes.

A third, and perhaps most exotic, breakthrough is sought with 3-D printing, which is no longer from the realm of science fiction. Already,

[100] Grand View Research, as cited by an article in CNBC, accessed Aug. 16, 2019. https://www.cnbc.com/2019/05/20/alphabet-verily-doing-clinical-trials-with-novartis-sanofi-pfizer.html

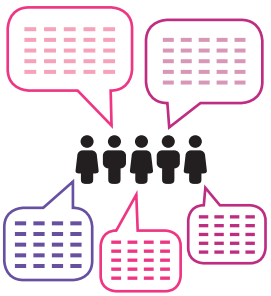
[101] Business Insider article, Jan. 19, 2019. Accessed Aug. 22, 2019. https://www.businessinsider.com/digital-smart-pill-drug-sensor-company-expands-cancer-proteus-2019-1

[102] CB Insights, accessed Aug. 17, 2019. https://www.cbinsights.com/research/report/what-are-neoantigen-vaccines-personalized-cancer-treatment/

physicians have replaced a child's vertebrae with a 3D-printed bone[103] and given the victim of a head trauma a 3D-printed titanium skull[104]. Scientists are now exploring the possibility of fabricating organs such as the heart[105].

The collaborations are forming the basis for an emerging series of digital ecosystems which facilitate the convergence of life sciences companies and healthcare providers such as hospitals. The impact is already being seen in personalized medicines. In 2018, 42% of drugs approved in the U.S. were personalized medicines, up from 34% in 2017[106].

But our research suggests some life sciences companies have yet to broadly seize the opportunities presented by the new wave of digital innovation.



Lessons from Digital Leaders in Life Sciences

This summer, TCS surveyed more than 1,000 CIOs in 11 industries including life sciences, in North America and Europe. While only 3% of the life sciences companies (pharma, biotech, medical device, and medical products) said their companies had new digital businesses, digital products and services, or new digital operating models to date, three quarters believe there are vast new digital opportunities to pursue over the next decade[107]. The question is how?

Some insights to this question can be gained by comparing the more digitally successful life sciences companies with the rest. From our survey, we found these companies differed in several important ways.

[103] CBS News site, accessed Aug. 18, 2019. https://www.cbsnews.com/news/3d-printed-vertebra-used-in-spine-surgery/

[104] Business Insider, accessed Aug. 17 2018. https://www.businessinsider.com/3d-printed-titanium-skull-in-chinese-man-2014-9?r=US&IR=T

[105] Financial Times, accessed Aug. 16, 2019. https://www.ft.com/content/67fbca0c-6c05-11e9-80c7-60ee53e6681d

[106] Personalized Medicine Coalition, accessed Aug. 18, 2019. http://www.personalizedmedicinecoalition.org/Userfiles/PMC-Corporate/file/PM_at_FDA_A_Progress_and_Outlook_Report.pdf

[107] TCS 2020 CIO study, accessed Aug. 17, 2019. https://sites.tcs.com/bts/tcs-cio-study/

One of the most striking differences was that digitally leading life sciences companies had a much greater percentage of top executives and board members with deep digital experience. We found that 69% of board members and 58% of top executives at the digital leaders possessed deep digital experience, compared with an average 23% of board members and 39% of the top management teams at the least digitally advanced life sciences companies[108].

Digitally leading life sciences companies had a much greater percentage of top executives and board members with deep digital experience.

Sometimes adding digital experience requires reaching outside the industry. Some life sciences companies have hired digital leaders from retail, high tech, and other more digitally advanced sectors.

Another difference between the leader and follower companies is how they viewed opportunities to mine the large and growing amount of health data: patient information, hospital records, real-time numbers on the performance of different drugs and treatments, as well as vital physiological and genomic information. Such real-

[108] Ibid

world data is abundant, and growing more so by the day. Life sciences companies that are best at harvesting this data have significant growth opportunities.

By accessing vast quantities of data with the help of AI and other technologies, pharmaceutical companies not only expect to shorten the cycle of clinical trials, they also want to quicken the pace of drug discovery. According to research published in the *Journal of Health Economics*, it costs an average of €1.9bn and 13 years to bring a drug to market[109]. But a consortium of 10 companies (including Johnson & Johnson, AstraZeneca, and GSK) have come together to share priceless data through a secure, blockchain-based system that allows

Their hope is that by predicting how molecules will work, the AI-driven collaboration will accelerate the slow and costly process of discovering new drugs.

their drug discovery machine-learning algorithms to search each other's data without uncovering commercial secrets. Their hope is that by predicting how molecules will work, the AI-driven collaboration will accelerate the slow and costly process of discovering new drugs[110].

[109] Financial Times article, June 4, 2019. Accessed Aug. 18, 2019. https://www.ft.com/content/ef7be832-86d0-11e9-a028-86cea8523dc2

[110] Financial Times, June 4, 2019. Accessed Aug. 18, 2019. https://www.ft.com/content/ef7be832-86d0-11e9-a028-86cea8523dc2

The Digital Revolution of Health Care Has Just Begun

Leading life sciences companies have recognized that the digital revolution presents vast opportunities to shift from being pure product manufacturers to also being service companies to health care providers. They are busily on-boarding top executives from leading digital companies, or from industries with high levels of digital adoption. And they are collaborating with established and start-up digital companies, as well as seeing the benefits of participating in broader health ecosystems.

At the start of the digital revolution, life sciences companies were in an enviable position, buoyed by healthy profit margins that seemed to be protected from the winds of change. Now, things have changed. The time has come for them to develop digital capabilities, make investments that are necessary to harness the abundance of data, and connect into the fast-evolving health care digital ecosystems that promise to dramatically raise the quality of care.