

Digital Transformation of Pharmaceuticals and Healthcare

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As with other sectors of the economy, pharmaceuticals and healthcare is undergoing digital transformation and with some companies this is continuing at a rapid pace as companies attempt to mine the sources of data available.

For those involved with the industry, this means an array of new abbreviations, initialism and acronyms to learn. Terms such as: artificial Intelligence, machine learning, internet-of-things (or the 'industrial' internet-of-things -IIOT), blockchain, augmented reality, predictive analytics, big data analytics, Industry 4.0 (or Industry X.0), digital twins, and telehealth are becoming part of the modern manufacturing lexicon.

Industry 4.0 is the subset of the fourth industrial revolution and it concerns the digital age and the interconnected manufacturing process, plus design of new products and controlling distribution. The route to get there is through digital transformation; and this process has many journeys, ways of thinking and different technologies, which include those centered on smart manufacturing, such as cyber-physical systems, the internet of things, cloud computing, and artificial intelligence. Central to all of this is data and the value that can be drawn from data, either for gaining real-time metrics about operations, production, inventory control, and quality data; to controlling the supply chain (such as through blockchain, which is a digital ledger); and using data for the purposes of predictive analytics.

DIGITAL TRANSFORMATION

Digital Transformation in the pharmaceutical industry offers a mechanism to revise its business model, to improve production processes, and to increase its responsiveness to customers. Furthermore, the volume of data processed by pharmaceutical firms shows no sign of slowing down. This means pharmaceutical companies must act quickly in terms of building core internal digital capabilities and moving beyond their traditional IT functions to all areas of the business.

According to the business analyst firm Frost & Sullivan the pharmaceutical industry should be regarded as being in a state of flux, with competitive pressures at their highest. Companies are

attempting seek a balance between developing new products that will appease shareholders (the so-called 'blockbuster drugs') and in seeking operational efficiencies.

To achieve both of these aims, digital transformation is key and considerable investment is going into creating new technologies and fostering different ways of working.

New technologies are being used across multi-departments within the typical pharmaceutical firm. This includes research and development (where new products are created), manufacturing (which is seeking a flexible approach), and through to the end-user. At the end of the process, both the digital pharmacy (embracing news ways of ordering stock) and the patient (where data can be collected by connecting the patient back to the firm, as with connected technology), have seen advances in terms of digital transformation.

There are two reasons why those working in the pharmaceutical sector need to understand and embrace what is happening. First, big players in the industry are adopting digital technologies that will speed up drug development and which may afford a competitive advantage. Second, the established players are being disrupted through an array of competitive startups. Looking at examples of both of these illustrates why getting to grips with the digital transformation paradigm is important, as well as illustrating some of the new concepts. This introduction paves the way for a new IVT blog issues on emerging and disruptive technologies affecting pharma.

HOW MAJOR PHARMA IS TACKLING THE DIGITAL REVOLUTION

Data analytics for process improvement

GE Healthcare has built a digital data exchange collaboration program with another manufacturer, Amgen. The aim is to use data analytics to better understand the relationship between raw material variability and process performance during manufacturing.

What can be leveraged from such analysis are better ways to ensure consistent and predictable biomanufacturing performance. Predictive analytics deploys different statistical techniques, ranging from data mining, predictive modelling, and machine learning, to analyze current and historical data to make predictions about future events. The collaboration rests on the efficiency of the data exchange capabilities between the two companies, as well as their willingness to share data.

Creating the digital company

The "digital plant" and technologies that go along with digital transformation, such as robotics, data analytics, artificial intelligence, and the industrial Internet of things (IIoT) can deliver greater efficiency. For these reasons, Eli Lilly and Company is advancing the implementation of these technologies to its pharmaceutical manufacturing organization. Central to this are processes like augmented reality and digital twins which allow modifications and improvements to be tested out on digital representations of physical systems or processes.

Pharmaceutical Technology magazine has discussed the process with Jim Weber, advisor for of Lilly. Weber notes: "The digital plant can accelerate improvements. For example, we can reduce ergonomic risks through robotics lifting boxes and ensure quality through real-time analytics rather than after-the-fact testing. These technologies also drive cost efficiencies."

Of the different digital transformation tools, Weber singles out robotics and advanced analytics as being the most mature and thus the ones that will be easier to implement in the shorter-term. This represents just the tip of a digital iceberg.

Predictive manufacturing



In further news Teva Pharmaceuticals Industries is to work with Insilico Biotechnology where Insilico's technology for predictive biomanufacturing will be applied to Teva's manufacturing processes. This will allow for more efficient production processes.

The technology will assist with assessing the vast quantities of data generated from bioprocessing. By being able to satisfactorily review this data presents new opportunities for solutions to improve manufacturing operations based on predictive biomanufacturing. The focus is with optimizing biologics production processes through the use of computational simulations. Such technologies also assist with drug development and drug design (a high-cost business area that is being accelerated through the use of artificial intelligence to screen candidate compounds with the view of bringing new medicines to market faster).

Personalized (precision) medicine

Creating a one-size fits all generic drug is no longer the best option for many patients, Tailoring drugs along the genetic make-up of the individual is part of the precision (or personalized) medicine initiative, and much of this has been fueled by advances with our understanding of the human microbiome, especially the way the human gut flora interact with pharmaceutical products. In the future, it will not be important to be able to produce a pill; it will be important to provide patients and people with comprehensive yet personalized product and healthcare service solutions."

To support this, there is pressing need for technically well-educated data scientists in the pharmaceutical industry. Furthermore, there is also a need for associations to advocate for policy that will help fill the gap in the availability of trained data scientists.

Drug filing

Regulations and drug filing are gradually being digitalized. Here the electronic exchange of information enables drug product dossiers to be easily updated across a number of platforms. In addition, several pharmaceutical organizations are adopting a 'cloud first' strategy. This is so that companies can streamline services across multiple sites and to facilitate greater collaborative working across business units.

An example of the digital road is shown with the German multinational drugs company Merck. The core change is through linking up different software solutions into a cohesive package

Startup disruptors



The medical and pharmaceutical sectors are facing disruption from companies that occupy space traditionally outside of healthcare. These are companies like Apple and Google, plus an array of startups. What does this mean for the healthcare landscape?

In terms of big players in the technology space, firms such as Benevolent AI and Exscientia are developing artificial intelligence applications to assist with the process of structured and unstructured data in order to gain insights for the drug discovery process.

Other leading players include Science 37 and Transparency Life Science, who are assisting with the virtualization of clinical trials by offering cloud and mobile models. These approaches make method transfer faster and by digitizing data, error rates can be reduced.

Blockchain can assist with the pharmaceutical supply chain and help to prevent fraudulent medicines from reaching consumers, including technologies from firms like Elemental Machines and iSolve. Digital pharmacy solutions come from companies like PillPack.

In response to such challenges, some big pharma companies are seeking to combine their knowledge and know-how with smaller, creative companies. This is in order to create sustainable pharmaceutical products and service solutions.