AI Here and Now

▶ Companies have increasingly turned to machine learning and AI to improve R&D, manage costs, and address stakeholder expectations.

A rtificial intelligence and machine learning are no longer futuristic innovations. Today, AI is widely used within the pharmaceutical industry, with the market expected to grow to $1.27 billion in 2021 at a compound annual growth rate (CAGR) of 39%.

Companies are using AI in drug discovery as companies seek to reduce drug development costs. They are looking to AI to improve clinical trial recruitment by identifying the right patients for a trial based on their medical history and their conditions as well as making use of wearable sensors to improve monitoring. Companies are also turning to AI for manufacturing as they seek to improve quality control, reduce waste, and address supply chain issues. Diagnostics is another area where AI is seen as a game-changer, enabling earlier detection and helping radiologists to speed up their processes and prioritize urgent cases.

AI also will become increasingly valuable in the move toward personalized medicine, which while highly effective are often more expensive to develop. AI-driven approaches have been shown to reduce development timelines and, as a result, lower costs.

Barriers to AI

AI does, however, have several challenges. One is a skills shortage. In 2019, Indeed.com disclosed that AI job postings increased 29.1% over the last year, while searches for AI-related roles decreased by 14.5% over the same period. This is a particular challenge in the pharma industry, where AI experts not only need to have the necessary technology and math/statistics skills for machine learning, but also a deep understanding of the industry and the therapeutic field companies are pursuing.

AI-enabled healthcare solutions are also not without their issues. Some have resulted in inaccurate and even potentially harmful treatment recommendations. Stanford University of Medicine researchers, for example, have warned that bias can creep into health data either as a result of human bias, bias introduced by design, or bias in the ways healthcare systems use the data. "What if the algorithm is designed around the goal of saving money? What if different treatment decisions about patients are made depending on insurance status or their ability to pay?" notes David Magnus, director of the Stanford Center for Biomedical Ethics.

These concerns lead to mistrust of AI, which presents a barrier to adoption. Added to this is a resistance to change within biopharma companies, with R&D teams often wary of new approaches given the risks involved. Another challenge can be getting access to meaningful data, whether due to commercial restrictions or protection of patient data.

McKinsey AI Survey Findings

A 2020 McKinsey Global Survey on artificial intelligence (AI) suggests that organizations are using AI as a tool for generating value. Increasingly, that value is coming in the form of revenue.

A small contingent of respondents coming from a variety of industries attribute 20% or more of their organizations' earnings before interest and taxes (EBIT) to AI. These companies plan to invest even more in AI in response to the COVID-19 pandemic and its acceleration of all things digital.

AI adoption is highest within the product- or service-development and service-operations functions.

(AI use cases most commonly adopted within each business function, %)

Product and/or service development:
▶ New AI-based enhancements of products — 24%
▶ Product-feature optimization — 21%

Service operations
▶ Customer-service analytics — 24%
▶ Predictive service and interventions — 19%

Marketing and sales
▶ Customer-service analytics — 17%
▶ Customer segmentation — 14%

Manufacturing
▶ Yield, energy, and/or throughput optimization — 15%
▶ Predictive maintenance — 12%

Supply-chain management
▶ Logistics-network optimization — 9%
▶ Inventory and parts optimization — 9%

Source: The State of AI in 2020, McKinsey.com

EXECUTIVE VIEWPOINTS

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PARTNERING FOR SUCCESS
It's important to have the right data that can be consumed by algorithms or systems to derive meaningful value. The first step is to get the foundational data ready to be consumed to solve problems. The nature of partnerships could range from bringing the business and technology teams to collaborate to define the right use cases to looking at technology companies that can bring in relevant AI/ML/NLP solutions that can coexist in the pharma's ecosystem.

ADDRESSING DATA BIAS
The single biggest challenge that has not been solved yet is the bias in data that exists and how it's used today. While technologies have continued to evolve over the last few years and computing

COVID-19 and AI

These concerns aside, AI is coming into sharper focus in the wake of the COVID-19 pandemic as leaders look to such tools to assist with better R&D, collaborations, patient experiences, and outcomes in order to manage costs and stakeholder expectations.

The pandemic highlighted the urgent need for treatments and how traditional discovery methods were not equipped to deal with the speed required.

The pandemic led many to turn to AI to identify targeted treatments for COVID-19. For example, DeepMind used the latest version of its AlphaFold system that uses a protein's DNA sequence to predict its folded shape. Researchers used the DNA sequence of SARS-CoV-2, the virus that causes COVID-19, to inspect proteins associated with the virus as possible targets for vaccines and treatments.

Additionally, BenevolentAI applied its AI technology to identify Eli Lilly's rheumatoid arthritis treatment baricitinib as a potentially effective COVID-19 drug — and it achieved this in just a few days.

With data from multiple sources — both internal and external — AI offers the ability to improve product launches and to support decision-making, according to a Deloitte report. For example, RWE provides insight into how a product affects patient populations, but that can only be realized through the use of advanced technologies to collect, aggregate and analyze data. Another example is the use of AI to support pricing strategies or to identify patient or healthcare segments and improve commercial performance.

In this environment, some companies are placing even greater emphasis on the potential of AI to drive drug discovery beyond COVID-19. One example is Exscientia, which uses AI systems to assess targets and design molecules. The company has built dedicated AI systems that learn from a wide range of data and apply the knowledge gained to the design of therapeutics.

In May 2021, Exscientia announced a collaboration with Bristol Myers Squibb that will take advantage of AI to accelerate the discovery of small molecule therapeutic drug candidates in multiple therapeutic areas, including oncology and immunology.

Exscientia also partnered with Sumitomo Dainippon Pharma to help find a drug candidate for obsessive-compulsive disorder, and the company is also conducting clinical trials on an Alzheimer's disease psychosis drug candidate designed using Exscientia's AI platform.

Healx, which has created an AI platform for rare diseases, has formed partnerships with other pharmaceutical companies, including Ono Pharmaceutical, to help find new therapeutic indications for its proprietary assets.

DeepMind has also used its AI technology to map 98.5% of the proteins used within the human body and made that data freely available to help with future drug development. **PV**

power is on the rise, there is a human element that determines the nature of data and dictates how it needs to be consumed.

Teresa Arroyo
Chief Data Scientist
nQ Medical

AI DISRUPTION
AI will disrupt pharma in two ways: drug discovery, where AI techniques support drug design from molecule generation to prediction of clinical outcomes, and clinical trials — specifically decentralized trials, where AI is applied to study execution and to optimize protocol design with real-world evidence enabled by digital biomarkers providing 24/7 information about patient status allowing for a realistic look at compounds clinically and commercially. Key advantages of digital biomarkers: early detection; longitudinal, remote, real-world quantification of disease progression; and early indication of therapeutic efficacy.

KEEPING PACE WITH INNOVATION
AI technologies evolve rapidly. It is difficult for pharma to keep pace with innovation. With partners, they can adopt an agile approach to continuous changes in AI technology. Specialized companies can help pharma to leverage the potential of AI without forcing a complete mindset shift in the organization. Exploiting the full potential of AI requires the right expertise, resources, and technological infrastructure. At nQ, we support pharma with our Digital Biomarker Discovery Platform aligning our machine learning algorithms with data collected from personal devices, EMRs, wearables, genetic testing, physiological testing, et al.

Jonathan Burr
Senior VP, Clinical Platform Strategy
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DEMOCRATIZING CLINICAL TRIALS
Partnerships between qualified AI solution providers and the R&D and business arms of biopharma are critical to effectively rewriting the AI clinical trials handbook. Optimal outcomes will come from these partners working hand in hand to identify and integrate ClinTech, the exciting new category of purpose-built, AI-based clinical insights and automation platforms. As DCTs expand, biopharma, physicians, AI data solution providers, and regulatory agencies must partner to democratize and streamline clinical trials.

THE EMERGENCE OF CLINTECH
The development of COVID-19 vaccines in months versus years changed the clinical development playing field. The traditional clinical trial process is becoming a relic. A qualified provider of AI data analytics solutions can help facilitate the 180-degree pivot necessary to ensure effective adoption and integration of ClinTech — AI-based clinical insights and automation platforms that will empower life-sciences