The Impact of Data Science

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Evaluate

Introduction

Digital technologies have plenty to offer a pharma industry seeking to up its productivity game. Attention often focuses on the shiniest prizes: artificial intelligence (AI) powered drug discovery, say, or virtual trials that recruit and monitor patients using digital apps.

Both are compelling innovations, yet neither will transform R&D economics anytime soon. The most impactful application of digital today is in improved decision-making. It is through accessing and analysing the right data to inform business development decisions, portfolio reviews, capital allocation, market analyses and more.

The drug R&D landscape is increasingly complex and competitive. So are commercial market dynamics, as payers push back on all but the most effective – and cost-effective - solutions. Regulatory pathways and designations are also evolving. All this is generating an unprecedented volume and variety of data. Teams that can rapidly identify and mine the most appropriate information will gain an edge. A more informed assessment of an asset's likelihood of approval and peak sales could differentiate a successful deal from an expensive flop.

The biopharma industry's challenge today is accessing and exploiting the growing range of data sources to make better decisions, without getting bogged down in endless cycles of technology installation and upgrades. Companies need to infuse data science into their business decisions as easily and systematically as they do medical science in R&D.

Evaluate's data science team offers off-the-shelf and tailormade predictive models to help decision-makers across R&D, business development and commercial functions. Their AI-powered tools mine multiple structured and unstructured data sources from clinical and commercial activities, helping companies:

- identify the risk and return profile of R&D assets, including earlier stage programs not typically covered by equity analysts, to support prioritization decisions
- pinpoint the most promising drug candidates for in-licensing or acquisition
- predict market response to a new drug, given expected competitive and access dynamics
- identify factors to optimise for pricing and market access

The models use machine learning algorithms to scour hundreds of millions of data points from disparate R&D or commercial data sets, identifying links that may be invisible to human brains.

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> **Cem Baydar, Evaluate's Chief Consulting Officer**

For example, the models may pinpoint attributes of R&D candidates that are more tightly correlated to commercial success in each therapy area, market, or modality, helping sponsors optimise their programs. They may help pharmaceutical companies evaluate the future impact of a particular emerging technology, such as mRNA, so they can adjust research expertise and business development activities accordingly. The models may support strategic and financial investors in assessing the most promising biotech companies, based on both technological and management expertise. "We rate [a biotech's pipeline] compounds, but also other factors" that might influence an investment decision, such as the team's track record, says Evaluate Chief Consulting Officer Cem Baydar.

An added expert opinion – which improves with more data

Almost every aspect of business activity can be captured as data. Yet data science doesn't deliver a yes-no answer to a given question. Instead, it adds "another expert opinion" of an asset's value or position, explains Baydar. That expert opinion typically takes the form of a numerical probability – a mid-stage compound's likelihood of technical success, say—or a forecast sales range.

Importantly, this data-powered opinion is free of some the bias that can infect decision-making inside organisations. Evaluate's data scientists are trained to work with various kinds of datasets, and "have no preconceived ideas of what particular datasets may or may not indicate," says Baydar. All of us tend to elevate or over-weight data that fits in with our existing beliefs and downplay that which doesn't. Including third-party data analysis can help counter these emotional or experiential biases.

Furthermore, data-powered decision-support gets better over time. The accuracy of AI-powered predictive models improves as more data is available to feed it, test its predictions and refine its assumptions. It also captures shifts in the regulatory and commercial landscape. "This is the beauty of machine learning," says Karthik Subramanian, VP Product Strategy at Evaluate. "The model learns, and we run regular tests to ensure that its accuracy keeps improving."

Rapid, flexible solutions to evolving demands

Evaluate's data science approach is designed to fit easily and quickly into companies' existing workflows. The pace of change in the industry — and in companies' needs — makes it impractical (and expensive) to spend months installing new systems and teams, which may quickly become redundant. "It's always a game of catch-up," says Baydar, referring to changing dynamics, data sources, and demand.

Evaluate's predictive models can be combined with emerging or existing datasets and tailored to customers' specific needs. Delivery is either through conventional APIs (application programming interfaces) embedded into workflows, or as "AI as a service (AIaaS)". The latter allows teams to rapidly tap into data science expertise and to build issue-specific predictive models (e.g. therapy area or technology specific) and generate predictive measures on demand.

API DELIVERY

Supporting a US biotech in assessing hundreds of Phase I and early Phase II assets, spanning a range of modalities and mechanisms of action. Evaluate leveraged core-Omnium models to interrogate specific therapy-area or modality-focused datasets available to the biotech. Each model was built seamlessly into the relevant team's workflow.

AI AS A SERVICE DELIVERY

Calculating predictive success rate metrics for a US biopharma. The company sought robust, defensible probability-of-success figures for multiple target product profiles to direct portfolio/financial planning and decision-making. Evaluate used AI/ML techniques and its extensive data archive to generate credible predictive analytics specific to the client's priority product profiles. The output data were directly integrated into client planning, and materially impacted projections.

The aim of Evaluate's Consulting & Analytics and Data Science teams is to equip biopharma teams with the means to improve their decision-making — whether through delivering predictive analytics or providing models that allow more effective in-house data investigation.

Evaluate Omnium – capturing the best data in real-time

The Omnium platform underpins Evaluate's data science and predictive analytics activities. Omnium uses machine learning and proprietary methodologies to deliver robust, defensible predictions for multiple R&D compounds, including early-stage and privately held assets.

The platform, whose baseline data covers 35,000 R&D programmes and six million data points, predicts both risk- and return-related metrics – from the probability of progression to the next development stage, to peak sales forecasts, timelines and projected R&D costs.

Omnium includes all development assets from Phase I onwards; unlike most equity analyst forecasts, it is not restricted to later-stage compounds. It can also be interrogated to provide predictions by indication, technology, mechanism-of-action or even by company.

How does it work? Carefully honed algorithms run through tens or hundreds of product attributes – from modality to mechanism, therapy area, orphan designation, sponsor, provenance and more – to predict that asset's outlook. The model is trained using historical datasets, and its predictions tested using separate historical datasets. Through an iterative test-and-adjust process, the model is refined to be as accurate as possible.

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It also keeps learning as new data is inputted. For example, accelerated approval may be found to increase the probability of approval by a certain amount. If several accelerated products in one therapy area fail to win approval, the weighting of this designation may be adjusted downwards in that category. Similarly, if a dozen IPF candidates falter in Phase II, the probability of progression for Phase II fibrosis assets will be reduced – all other attributes being equal.

Decision-making is a dynamic process: science progresses, markets move, landscapes change and companies evolve. Whether it's judging the viability of an in-licensing candidate, determining whether to pursue a mid-stage asset, or deciding where to invest limited resources, being able to rapidly sift through the most relevant information at the time it is required – and to adapt models and assumptions to fit a changing context – is increasingly important to reaching the right outcome. In this competitive setting, using adaptive and flexible machine learning-based predictive models in this setting becomes a necessity, rather than a luxury.

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Evaluate provides trusted commercial intelligence for the pharmaceutical industry. We help our clients to refine and transform their understanding of the past, present and future of the global pharmaceutical market to drive better decisions. When you partner with Evaluate, our constantly expanding solutions and our transparent methodologies and datasets are instantly at your disposal, along with personalised, expert support.

Evaluate gives you the time and confidence to turn understanding into insight, and insight into action.

Evaluate Pharma offers a global view of the pharmaceutical market's past, present and future performance with best-in-class consensus forecasts to 2028, unique broker forecasts, and the application of proprietary methodologies to support highly robust, detailed and accurate analysis.

Evaluate Omnium provides a complete, dynamic view of development risk and commercial return across all phases of the clinical lifecycle – including early-phase and privately-developed drugs not covered by analysts' forecasts. With product-specific data including Predicted Peak Sales, Probability of Technical and Regulatory Success (PTRS), R&D Costs, Net Present Value, Time-to-Peak and more, Evaluate Omnium makes it easier than ever to quantify and compare risk and return across the full pipeline landscape.

Evaluate Epi is curated by epidemiology experts and delivers comprehensive, global epidemiological data in granular detail, on a highly interrogatable platform. Customers have access to impartial data for 15 therapeutic areas, and over 230 indications and 9,500 sub-populations across 27 core markets (up to 49 for some countries).

Evaluate Medtech provides a transparent and trusted source of market intelligence and consensus forecasting for the global medical device and diagnostic landscape, using the same proprietary methodologies as Evaluate Pharma. Customers can quickly understand how the market views products and portfolios – and where their opportunities, risks and priorities lie.

Evaluate Consulting & Analytics are specialists in solving unique and complex biopharma pipeline, portfolio and commercialisation challenges with best-in-class datasets, powerful analytical capabilities, and deep therapy and commercialisation expertise.

Evaluate Vantage provides award-winning, thought-provoking news and insights on current and future developments in the pharma, biotech and medtech industries, and is the only news service underpinned by Evaluate's commercial intelligence and data.

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