

Technological Transformations

Artificial intelligence and machine-learning promise to change the role and business models of life sciences in future, as part of a broader transformation of the health value chain. Firms should prepare for the technology's long-term potential

By Siniša Belina
at AMPLEXOR
Life Sciences



Far from being a science fiction fantasy or something hovering in the near distance, artificial intelligence (AI) is already tangible, within reach, and something companies in all industry sectors ought to start planning for, including life sciences.

Automated personal assistants

like Alexa and Siri, smart web, or content searches that adapt to user preferences and customer care channels such

as web chat are already exploiting AI in everyday situations. Through machine-learning – a subset of AI – algorithms do not just make clever connections and spot trends in masses of data, they also become increasingly refined and efficient at this over time in response to the conditions they are exposed to and the results they find. All of this leads to the speed of discovery, and the following actions make this possible.

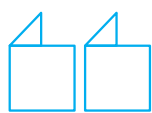
Automation is a big attraction of the AI proposition. If machines can get to grips with routine knowledge work and do it more rapidly without

needing breaks to sleep, rest, and refuel, then applying technology to sift, fill, find, and organise makes sense. As long as humans are overseeing and sense-checking the results, why not let IT systems take the load and allow experts to do the more interesting and mentally demanding tasks?

Talk of new waves of automation may bring initial fear as people wonder about their jobs and the risk of removing common sense and intuition from important or sensitive work. However, where machines can get through more of the work, plough through more of the data,

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and spot more subtle patterns that the human eye might miss, denying automation's potential would limit progress.

Early Glimpses of Health Transformation

In primary care, AI-based systems will not take long to play a more direct and prominent role in patient diagnostics. This makes sense given that high-capacity computing resources – which are now more readily available for everyday use thanks to cloud-based delivery models – can consolidate and crunch data in high volumes and at such a rapid rate that their potential for an accurate diagnosis of even the rarest condition is far greater than that of even the most experienced and highly qualified clinician. Recently, UK researchers at a hospital in Oxford announced the availability of AI technology that can diagnose heart disease and lung cancer at a much earlier stage from analysis of patient scans (1). The heart disease technology will be made available to NHS hospitals for free within a matter of months.

Smart robots are likely to be seen helping with the heavy lifting of patients, as they are moved in and out of hospital beds, saving the backs of nurses and support staff. Connected devices will be used increasingly to feed patient data to the health practitioners managing their care, not only to monitor the progression of or any improvement in their condition, but to allow much earlier interventions if the continuous trackers begin to pick

up signals that indicate certain types of subtle changes.

Ongoing patient monitoring is part of a strategy for more pre-emptive, preventative care – a shift towards maintaining well-being rather than reacting to illness – all of which is expected to lead to better outcomes for patients and a reduced strain on healthcare resources, hospital beds, and so on.

The Scope for Transformation

Where does this leave Big Pharma and the wider life sciences industry (which has done well for so long) for providing treatments that alleviate, heal, and manage existing patient conditions? How far might AI take them in transforming the way they operate and, indeed, the role they play in the health cycle?

The surge in technology-related events for the healthcare and life sciences industries is no coincidence. In 2018, conferences and exhibitions are seeking to bring new awareness of the opportunities to the combined sector. In April, Next Generation Healthcare formed the central theme at BioTrinity 2018, whose sessions include AI and drug discovery (2). In the summer, AI summits will be hosted everywhere from London to Philadelphia (3-4). Alan Boehme, CIO/CTO of Procter & Gamble, and Juliet Bower, Chief Digital Officer at NHS England, featured among the speakers at the London event. Even if it is just to have a response ready for funders, partners, and patients, industry leaders recognise they need to have a position on AI.

June's US healthcare and life sciences AI event highlighted the technology's substantial potential for enhancing R&D operations through the ability to analyse large volumes of data leading to richer insights. To this end, applications, systems, and platforms have already been developed to transform clinical trial innovation. This is not just about teasing out finer details and subtler patterns from once-untameable volumes of disparate data. This is also about modelling and extrapolating from such findings to arrive at bolder hypotheses and deeper, more targeted work, thereby accelerating progress.

Beyond traditional drug development, AI and machine-learning in particular offer scope for new advances in medical imaging interpretation, genomic profiling, personalised medicine, and treatments.

Bridging the Patient Gap

AI technology also offers a way to track global patient trends, concerns, experiences, behaviour, and needs, enabling the life sciences industry to understand what is happening in the real world to a level of granularity and completeness that has not been possible before. This offers potential not only for more proactive and thorough monitoring of adverse events and other safety signals as drugs move into markets, but also for spotting untapped requirements, triggering new innovation.

Where the life sciences industry has traditionally been one step removed from patients, public internet forums and social networks offer an opportunity to understand evolving demands and engage with patients in new ways. Although companies have to be careful about disguising promotions as neutral information and advice, a greater dialogue with patient communities could be their best shot at capturing a share of the growing wellness/preventative medicine opportunity. The global nutraceutical market, valued at around US \$383.06 billion in 2016, is expected to be worth US \$561.38 billion by 2022 due to the growing consumer appetite for products that keep them healthy (5). Other research has shown that millennials are prime targets for proactive treatments in this category – a demographic that is especially vocal on social media (6).

Getting Started

The scope for AI in transforming life sciences as we know it today is great. However, this is not a fast-moving industry, and a number of things need to happen first if companies are to adapt to and exploit the potential ahead of them in a sufficiently timely fashion. The first is a recognition and acceptance of the fact that

change is coming and no industry is immune to disruption from emerging market entrants – new potential competitors with bold ideas and the advantage of not being tethered to legacy thinking and ways of working. The second is preparing an IT and data environment that allows for new experimentation and insights within the restrictions of regulatory control and privacy protection.

Already, the world is building knowledge at an unprecedented rate: IBM estimates that, by 2020, knowledge will double every 11-12 hours (compared with a rate of every 25 years, as was the case in 1945) (7). This is indicative of a growing urgency for companies to bring this situation under control in their own context and harness it to maximum potential.

However, this is not just about developing Big Data strategies, but organising and preparing that data so it can be analysed efficiently, accurately, and holistically using AI platforms to spot emerging trends, anomalies, concerns, and opportunities, at a speed and degree of precision that could become a market differentiator in time.

Build out from Existing Data

For now, regulatory pressures are behind many data-related initiatives in life sciences. More data are being captured, consolidated, and cleaned up now, but primarily this is for a specific purpose and not one that will add significant value for the business. Innovation is not a part of

the plan when it really should be. If the work has to be done, then doing it once and doing it well is far better – thereby laying the foundations for all future-use cases, however futuristic these might seem now.

As mundane and mandatory as regulatory data initiatives might seem, they do, in themselves, offer a potential platform for experimenting with AI. For instance, using machine-learning, systems could ‘learn’ how to produce better output or the conditions most likely to result in a new marketing submission being accepted first time.

The critical enabler for all of this is the creation of a comprehensive master data model – one that also includes interdependencies between the data, so sources can be exploited to the maximum potential. Beyond that, companies need a strong sense of new purpose and direction to bring all of the potential to fruition.

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Siniša Belina is Senior Life Sciences Consultant at AMPLEXOR Life Sciences. He started his professional career at Pliva (now a member of the TEVA Group), where, in addition to his responsibilities in manufacturing, he also engaged in successful electronic data management systems (EDMS) implementation projects. Siniša later joined KRKA's Regulatory Affairs Department before moving to AMPLEXOR where he applies his detailed knowledge of pharmaceutical documentation and processes to areas of business process analysis and EDMS optimisation.
Email: sinisa.belina@amplexor.com

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