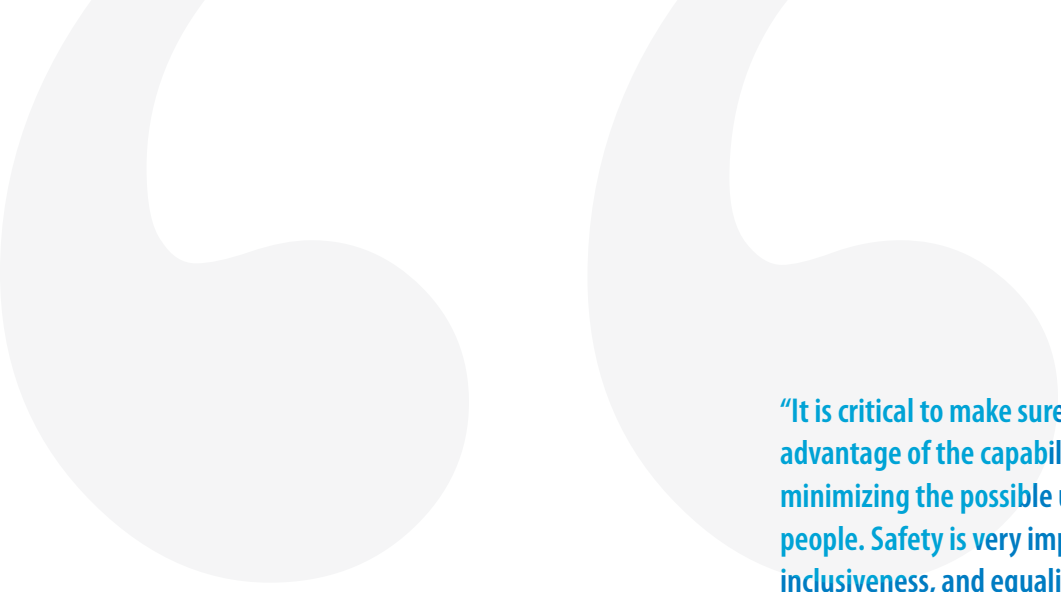# PHARMACEUTICALS: WHEN AI ADOPTION HAS GATHERED MOST MOMENTUM

"It is critical to make sure that society can take full advantage of the capabilities of AI systems while minimizing the possible undesired consequences on people. Safety is very important, alongside fairness, inclusiveness, and equality. AI tools will prove to be complementary assistants to human knowledge workers – made by people for the use of people. Machines will work alongside humans so the latter may be amplified. Recently, working to create a digital lab for a large pharmaceutical company, we shared the immense pleasure of lab chemists leveraging modern technology to automate processes, avoid errors and achieve near-zero rework. So many lab hours otherwise spent fixing issues were now saved! Digital technologies like AI are most valuable to companies that harness it to emancipate and enhance their human workforce."

– An Infosys viewpoint

INTRODUCTION

The pharmaceuticals and life sciences sector is in the throes of change. The rise of specialty drugs catering to smaller patient populations has complicated both clinical trials and regulatory approvals. As already-long research and development timelines extend further, it will stretch the capacity of pharmaceuticals companies to launch new drugs. Amidst tough conditions, the search for efficiency, agility and efficacy in bringing products to market is assuming greater urgency.

That quest is driving adoption of Artificial Intelligence (AI) and automation in the industry. These technologies are extremely well suited to tasks which are routine and repetitive, but also involve some amount of cognition – tasks such as the collection, entry and quality monitoring of vast quantities of clinical data. For some years now, pharmaceuticals and life sciences companies have turned to robotic process automation, machine learning and analytics to improve outcomes in drug discovery, clinical trial, and research and development.

As part of its study *Amplifying Human Potential: Towards Purposeful Artificial Intelligence*, Infosys commissioned independent research to investigate the approach and attitudes that senior decision-makers in large organizations have towards AI technology and how they see the future application and development of AI in their industries. As part of the research, 10 industries were surveyed – Retail, Fast Moving Consumer Goods (FMCG), Utilities, Financial Services, Healthcare, Pharmaceuticals and Life Sciences, Manufacturing, Telecoms, Automotive and Aerospace, and the Public Sector.

What follows is a glimpse into the findings specific to the pharmaceuticals and life sciences sector.

AI, FOR EFFICIENCY AND OTHER ADVANTAGES

The combined pharmaceuticals and life sciences industry is the most mature in AI adoption. 90 percent of the respondents agree that AI is fundamental to the success of their company's strategy. Some 40 percent of the respondents, the highest among all industries, say their organizations had deployed AI and that it was working as expected; this figure was 25 percent overall for all industries. The decision to deploy AI is driven equally by a need to acquire competitive advantage and a push from the executive leadership.

AI deployment is clearly focused on data initiatives. 76 percent of the respondents have deployed, or plan to deploy, big data automation for collecting, processing and storing data; 64 percent have deployed machine learning and 60 percent are using predictive analytics.

Which AI technologies has your organization deployed or is planning to deploy?

Big data automation (collecting, processing, storing)	**76%**	**Neural networks** (deep learning)	**50%**
Predictive/prescriptive analytics	**60%**	**Avatar technologies** (chatbots)	**34%**
Machine learning (smart technology)	**64%**	**Interactive voice response technologies**	**25%**
Expert systems (databases of expert knowledge)	**53%**	**We have not deployed any AI technology and do not plan to**	**3%**

Pharmaceuticals firms recognize that these technologies can add significant value to research and development, making it more efficient and substantially improving success at the early stages of drug development by augmenting the work of researchers as well as enabling an informed first analysis of scientific data to form essential new knowledge.

Applying big data strategies to better inform decision-making can help optimize innovation, improve the efficiency of research and clinical trials, and build new tools for physicians, consumers, insurers, and regulators to meet the promise of more individualized approaches. For example, the MIT Clinical Machine Learning Group is working on developing algorithms for understanding the workings of diabetes, and designing more precise and effective treatments for Type 2 diabetes.

Effectively utilizing big data will help pharmaceuticals companies better identify new potential drug candidates and develop them into effective, approved and reimbursed medicines more quickly. Predictive analytics can work with much bigger and more varied data, including that sourced from social media and hospital visits, and combine it with genetic information to identify the most suitable candidates for clinical trials. This would make the trials more focused, besides reducing their cost and lead-time. A little over 40 percent of the respondents say they have experienced cost savings and productivity improvements by using AI.

What are the key drivers for your organization in implementing (or planning to implement) AI technologies?

Automate IT processes	66%	Increase revenues	52%
Increase innovation	56%	Improve decision-making	49%
Automate business processes	55%	Augment employee knowledge and skills	42%
Boost employee productivity	54%	Improve go-to-market time	42%
Cost savings	54%	Improve customer experience	28%

AI, FOR BETTER TREATMENT OUTCOMES

Improving the experience of customers (or patients), say 48 percent of the respondents, and identifying their new needs (35 percent) are two of the top three strategic priorities of pharmaceuticals and life sciences organizations over the next three years. Complete cures and saved lives are important determinants of experience, and AI is contributing to both.

For instance, melanoma survival rates are improving, thanks to fatal blotches being identified much earlier and more accurately by using technology to augment and amplify human efforts. Detecting this deadly cancer early before it progresses to the lymph nodes makes all the difference, taking survival rates to 98 percent from an abysmal 16 percent. Today, the Translational Genomics Research Institute's Centre for Rare Childhood Disorders in the U.S. is running extremely complex algorithms to analyze massive quantities of genetic and molecular data to diagnose medical conditions and develop personalized treatments. And Google Brain is working on detecting diabetic retinopathy early so that blindness may be prevented.

AI-led systems are not just curating more medical insights than human professionals, but unlike humans, are also making decisions free of cognitive biases, allowing for more objective diagnoses and treatments. While some human intervention may be necessary at times, basing decisions on the merit of strong data analysis makes a significant impact on the health outcomes.

How is your organization preparing for AI deployment and use?

Investing in supporting IT infrastructure	66%	Using external support for knowledge gathering	50%
Developing knowledge/skills	65%	Gathering feedback from customers	35%
Building AI into company ethos	52%	Assessing competitor/industry approach	27%
Using external support to assist with planning	50%	We are not preparing for AI	3%

AI, FOR NEW PRODUCTS AND SERVICES

43 percent the respondents say developing new products and services is a top strategic priority in the next three years. But the drug development process, which takes as long as 10 to 15 years and a billion dollar plus investment, casts a long shadow on the industry's ability to innovate. Here, AI, and Robotic Process Automation in particular, are providing a measure of relief by accelerating and improving drug development to enable pharmaceuticals companies to launch products faster and earn a better return on investment.

Identifying potential winners from the huge repositories of synthetic and theoretical drug banks is a big part of the problem, as scientists don't even know what to look for and may take decades to stumble upon something worthwhile. But now, bioinformatics firm Insilico Medicine is using AI to predict the impact of a new drug even before it is tested. It has now evolved to the point where out of 12 therapeutic applications AI can identify one for a drug with 55 percent accuracy. This number might sound unimpressive but its impact on researchers who would need to experiment extensively to arrive at a similar judgment is enormous

How much has your organization invested in AI technologies in the last year?

Less than $1 million	**9%**
$1 to $4 million	**33%**
$4 to $6 million	**30%**
$7 to $10 million	**25%**

More than $10 million	**3%**
Don't know	**1%**
Average amount the respondents' organizations have invested in AI technologies in the last year	**$4,693,291**

ETHICS AND AI

Like other industries, pharmaceuticals and life sciences industry faces ethical issues in adopting AI technologies and solutions, and there has been no shortage of ethical conundrums arising from the use of machine learning and other technologies. For instance, what if a machine's ability to see patterns in data that are invisible to human beings backfires to throw up patterns that don't exist? Or what will the inevitable march of robots to the workplace do to job security? Then there is the question of transparency (or the lack of it); to understand how important this is, consider the fact that a healthcare algorithm could prioritize hospital patients and determine which drugs the government should offer for free. To eliminate any bias from creeping in, the industry needs to know how these decisions are arrived at.

Given these questions, it is not surprising that a significant proportion of respondents in the Infosys study feel that ethical and related concerns are a key barrier to AI adoption. Specifically, 49 percent agree that fear of change among employees is a barrier, while 36 percent say the same thing about ethical concerns. Cultural acceptance is also named a barrier to AI deployment by 44 percent of the respondents. Against these findings is the fact, a rather worrying one, that only 53 percent of the respondents believe their organizations have fully considered the ethical issues related to AI; clearly there is a need for more introspection and debate.

The impact of AI on data privacy is also a major cause of concern. With EU General Data Protection Regulation coming into force next year, the industry is still looking for validation methods to make AI solutions acceptable to regulatory agencies across Europe and the world. Care must be taken not to indulge in excessive regulation, which will only prevent the industry from leveraging AI to the fullest in saving lives, curing disease, and promoting global wellness.

SOURCE: AMPLIFYING HUMAN POTENTIAL - TOWARDS PURPOSEFUL
ARTIFICIAL INTELLIGENCE

The biggest ethical concern, however, is the extent of AI-led job loss, a concern sparked by every technology revolution of the past, without exception. But history bears witness to the fact that every revolution created new roles and opportunities for human beings even as it swept old ones away in a wave of mechanization. Yes, AI will take over routine, repeatable work, and do it better than human beings, but it will also create a demand for new skills related to developing, improving, managing and maintaining its technologies. And even as it throws open new employment in data science, robotics, and biotech, it will allow the industry to redeploy workers whose jobs have been taken over, to more challenging and purposeful pursuits that call for creativity in place of tolerance for monotony and free thinking in place of mechanical precision.

It is heartening to note that the industry is seeing this big picture. When asked what they plan to do with employees whose jobs are automated, 48 percent say they would redeploy them within the same functional area, while 30 percent say they would retrain the workers to slip into a new role or function.

CONCLUSION

AI will standardize the way medicines are made, prescribed and consumed today. It will also revolutionize many aspects of the pharmaceuticals and life sciences business, but will neither cure disease nor replace doctors. A machine, however clever, cannot find and articulate a new problem or innovate a breakthrough solution the way humans can. It can, however, help human beings to understand a disease condition much faster, allow physicians to make better decisions, and empower scientists by enabling them to fail fast, fix errors faster, and grow in confidence in their pursuits. Understanding the true purpose of AI – which is to amplify human ability and achievement rather than threatening it – will dispel most of the fears surrounding the technology and bring forth its outstanding potential to serve mankind.

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