ARTIFICIAL INTELLIGENCE IN PHARMACEUTICAL SALES AND MARKETING

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ABSTRACT

Artificial intelligence (AI) is a perception that defines how intelligent people interpret an intelligent machine, a computer-controlled robot, or a piece of software. By learning from previous errors, tying actions and efforts to outcomes, finding and fixing faults, adapting to novel and erratic input values, and performing human-like activities with ease through extensive scenario analysis, AI makes tasks easier. The goal of the sales and marketing teams is to identify the ideal healthcare professional and segment them into the ideal channel at the ideal moment. AI will help marketing teams analyse brand history, conduct brand diagnostics, and determine the brand's future course.In general, this will help businesses run more efficiently and produce greater results with fewer resources. Furthermore, the interactions between salespeople and healthcare professionals (HCPs) may be subject to regulation. An HCP can now access the power at any time and from any location through a number of touch points, plenty of them digital. As a result, in order to maximise their value, sales representatives must have a thorough understanding of the market and its customers. This will allow them to customise their interactions to meet the specific requirements of each customer. When data is carefully gathered, accurately ingested, simply analysed, and effectively deployed, the sales force is more effective and successful.

Keyword: *Artificial intelligence, health care professionals , marketing , pharmaceuticals, sales*

INTRODUCTION:

AI refers to the imitation of human intellectual processes by computers, particularly computer systems. Knowledge, reasoning, and self-correction are some of these processes. Knowledge is the acquisition of information and the rules for employing it. John McCarthy, a member of Stanford University's computer science faculty, was the first to define artificial intelligence. In 1955, when he coined the phrase, he gave it the following definition: "the science and engineering of creating intelligent and quick-witted machines." [1]

The Idea that intelligence, a key aspect of human nature, may be precisely characterised and recreated by a machine is the foundation upon which the field of artificial intelligence was founded. The current state of artificial intelligence in the pharmaceutical industry is discussed in this article, along with its potential applications in the future .Computer science includes a field known as artificial intelligence. [2]

The term "artificial Intelligence" has numerous definitions. According to Wikipedia, AI, also referred to as machine intelligence, is "intelligent behaviour displayed by machines as opposed to the natural intelligence displayed by humans and animals." [3]

According to SAS analytics, "Artificial intelligence [AI] enables machines to draw lessons from past performance, adapt to novel inputs, and carry out jobs that would often be performed by people.[4]

The way many sales and marketing teams in the healthcare sector approach their go-to-market strategies is already being disrupted by AI, which strengthens their experience-based judgments with data-driven insights. The pharmaceutical industry is currently transitioning from an AI fad to an AI implementation phase. Healthcare business strategies are already being disrupted by AI, which is augmenting decision-making based on expertise with data-driven insights.

Pharmacies, HCPs, and patients are the main stakeholders for pharmaceutical sales and marketing. The sales and marketing teams could enhance and have an impact on interactions with each of these groups of people by applying AI.

Making a machine, computer-controlled robot, or piece of software think like an intelligent human is known as artificial intelligence (AI). In order to create intelligent software and systems, it is necessary to first understand how the human brain works, as well as how humans learn, evaluate, and act when trying to solve a problem.

AI for Managers or Decision makers:

AI has proven successful in accelerating business processes and giving decision-makers precise information on a number of business tasks, including marketing and distribution. For instance, digitization of campaign management and market segmentation in marketing has permitted more effective decision-making and quicker action.

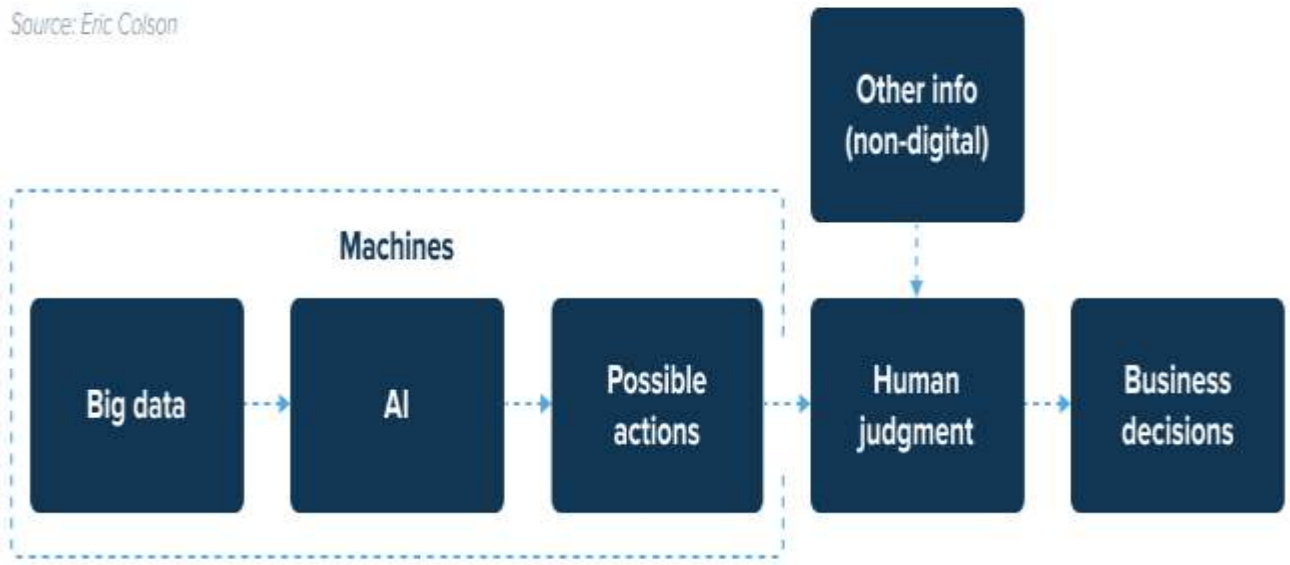

Fig 1 – AI for Managers or Decision makers[5]

What part will AI play in pharmaceutical sales and marketing?

In the healthcare sector, many sales and marketing teams are already utilizing AI to improve their data-driven insights into their experience-based decisions, which is altering the way they approach their go-to-market strategies. The primary protagonists in pharmaceutical sales and marketing are pharmacies, HCPs, and patients, and the pharmaceutical business is currently transitioning from AI infatuation to AI application. To enhance and influence

efficient and result-oriented interactions with each of these stakeholders, the sales and marketing teams need to employ AI strategically.

Fig 2- AI Tools to target customers idea,prepare and execute product catalogs

BRAND & AI:

AI has enormous potential for-

- Increase brand participation and justify actions that boost brand objectives.
- Avoiding significant market perception turbulence
- Help to customize and significantly enhance the brand's experience.

The Tools-

- Signal assessment and entropy combining
- Improves consumer loyalty, experience, profit, and competitive edge.

Implement product catalogs with intelligence-

- Technologically adjusting product catalog offers in accordance with consumer actions and knowledge
- Provide sophisticated deep learning arrangements that maximize the value of the pricing, the content, and the validity.

Enhancing social networks-

Utilize data optimization to design content routing based on user activity, traffic volume, and other factors.

Participation in the market-

Real-time interactions can be contextualized and made more unique based on several factors.

Customer service-

Using information and technology to provide "just-in-time" participation while anticipating demands.

Choice cycle-

Focusing on brand management through customer involvement.

Consumer satisfaction fosters brand loyalty, which improves the brand's profile.

AI improves Customer experiences-

- Developing custom reviews
- Application programming interfaces (APIs) with AI capabilities
- developing a relationship between the business and its clients to raise awareness
- provide voice recognition and emotional intelligence techniques.

Brand Promotion via Digital Media-

- Information spread swiftly.
- The power of social media and word-of-mouth
- Customer feedback affects reputation.
- Brands employ AI to better manage the experience and hype.
- Automation software facilitates labor-intensive processes.

AI & PHARMACIES:

The demographics of each pharmacy's clientele are catered to. In order to achieve optimal sales performance, pharmaceutical businesses must take responsibility for these differences, taking into account the sales drivers, sales capability, and upselling opportunities in all areas. Artificial intelligence (AI) can be used to track pharmaceutical sales activity details, sociodemographic data, location, and more. This makes it easier to analyze pharmacy sales potential and customize efforts based on specific interests (such as price sensitivity or reactivity to promotional activities, etc.). According to Angela M. Welbaum (2020), the AI and ML techniques may also go one step further and gather data that is unrelated to upcoming sales.

AI & HCPs:

Hyper-personalization: By developing an in-depth knowledge of HCP profiles, behaviors, and attitudes, AI may assist marketers in segmenting, aiming, and delivering precise and individualized marketing. As personalization

evolves towards hyper-personalization and hyper-customization, marketers may be able to leverage AI to support this transformation. Using AI, marketers will also be able to target certain doctors more precisely based on their geography, patients, prescribing patterns, and individual behavior (K. Anton, 2020).

Optimizing Multi-Channel Marketing: The majority of pharma businesses engage in nonpersonal marketing, such as email and other digital media, in addition to personal promotional activities including medical rep visits, conferences, seminars, and webinars. However, as the number of advertising outlets grows, so does the level of competition, making it harder to gauge how marketing strategies affect sales and identify the precise channels that will produce the most effective results .According to Ling et al. AI research can be used to examine response rates from prior campaigns as well as the results of multi-channel advertising expenditures. After that, the focus of the marketing and sales departments will be on selecting the appropriate HCPs and grouping them into the appropriate channel at the appropriate moment. To conduct brand diagnostics, better grasp brand history, and chart the brand's future direction, marketing teams will leverage AI .There are many different types of drugs that are available and have numerous uses. Beyond traditional approaches, AI and machine learning analytics will give a more thorough picture of how multi-indication artifacts are used . Marketing teams will monitor product development according to indication, specialization, geography, and revenue source in order to guide their future marketing initiatives. In order to give sales teams a competitive edge and improve their sales outcomes, AI may also support them with CRM systems, pre-call preparation, guided sales, and e-detailing of brands. AI may also help sales teams with CRM systems, call preparation, guided sales, and e-detailing of brands in order to provide them with a competitive edge and improve their sales outcomes.

AI & PATIENTS:

As it develops in the healthcare setting to support patients, AI has the potential to be a true ally in the patient journey.

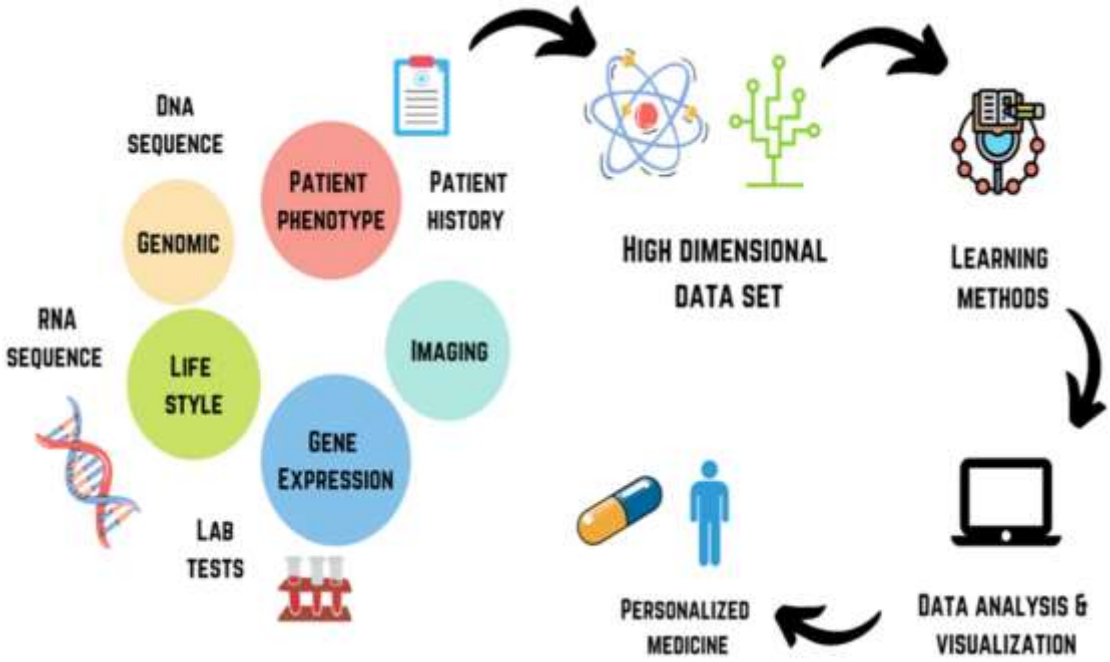

Fig 3-AI in Patients

Awareness & Recognition-

- Advertising in search results can be highly targeted thanks to programmatic media bidding.
- Search Engine Optimization: Based on the patient's recent and anticipated behaviors, messages are automatically adjusted. A unique search experience is produced when voice search is combined with a chat interface.
- It was simple to fit important medical appointments into a busy schedule using Google Duplex appointment booking.
- **Presentation & Diagnosis-**
- improved methods for testing and study (MRI, CT scan, melanoma)
- AI-driven chat interfaces

Compliance and converting-

- Through forum bots, patients are connected to relevant care posts.
- Notifications for buying and taking medications that are dependent on AI.

AI and future representatives meet-

Shorter interactions with HCPs, Sunshine Act time restrictions, and practice consolidation into bigger health systems are some of the challenges sales reps must overcome when access to healthcare professionals (HCPs) declines. It might terrify you.

Prior to pretty much anything else, control was primarily centered on interactions between representatives and HCPs. An HCP can access power transmission at any time and from any location through a variety of contact points, many of which are digital. Sales representatives must have in-depth knowledge of the market and its clients in order to be more valuable. This will allow them to customize their interactions to meet each client's individual needs.

AI IN HEALTHCARE:

Rock Health, a venture capital firm, reports that between 2011 and 2017, 206 deals achieved $2.7 billion for 121 health AI and machine learning firms. By 2026, up to $150 billion in annual health care savings might be produced in the United States thanks to the value of 10 promising AI applications. Image processing, protecting patient information from thieves, and helping with operations can all help cut down on healthcare expenditures. Doctors are able to free up their calendars with the help of AI-enabled workflow assistants, which saves time and money. Artificial intelligence (AI) aids pathologists in the analysis of tissue samples, which leads to a more precise diagnosis. According to Harvard Business Review and Accenture, there are ten potential applications of AI that could transform the health care sector.[6]

Health Application	Reasons for adopting
Robot assisted surgery	Robotic surgery solutions that are more versatile because to technological advancements
Virtual nursing assistants	As a result of the manpower crisis in medicine, pressure is growing
Preliminary diagnosis	Interoperability and data architecture for better precision
Cyber security	More breaches; increased demand to protect health information
Clinical trial participation	Numerous facts, a patent cliff, and a focus on results
Autonomous image diagnosis	Storage capacity and improved faith in AI technologies
Connected machines	the expansion of connected devices/machinesv

Dosage error reduction	The frequency of errors in medical care, which results in real consequences

Table: Ten potential health applications and potentials motivation for adoption.

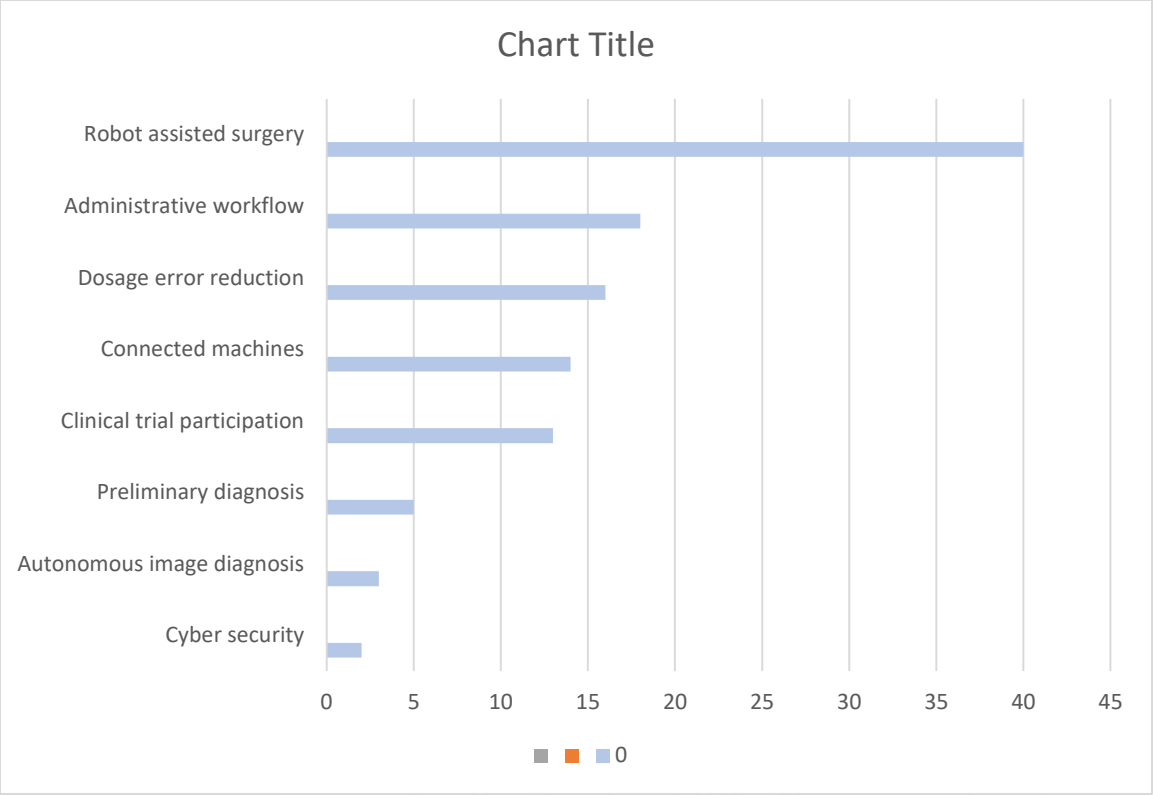

Chart: AI application that could change healthcare

AI IN PHARMA INDUSTRY:

The cost of producing a medicine is significant, estimated at US$ 2.6 billion over more than 10 years. Despite this investment, nine out of ten proposed medicines are unsuccessful between phase I studies and regulatory approval.[7]

Artificial intelligence in pharma refers to the employment of automated algorithms to carry out tasks that normally need human intellect, as stated in the report by Codrin Arsene, CEO of Digital Authority Partners. Artificial intelligence has revolutionised how scientists create new medications, treat diseases, and more during the last five years in the pharmaceutical and biotech industries.[8]

It is anticipated that the search for novel drugs would become easier, quicker, and more cost-effective thanks to machine learning and other technologies. Less than 5% of healthcare organisations are already employing or making investments in AI technologies, according to a HIMSS Analytics 2017 Essentials Brief report.[9]

Leading pharmaceutical firms are moving closer to utilising AI for specific strategic applications. AI will assist pharmaceutical companies in lowering operational expenses while increasing the success rates of new drug research.[10]

According to McKinsey, using big data, AI, and machine learning might result in up to $100 billion in pharmaceutical and medical product production yearly through improved decision-making, streamlined innovation, improved testing performance, clinical trials, and new tool creation.[11]

ADOPTION OF AI IN PHARMA INDUSTRY:

The progression of drugs is getting harder despite the excellent standard of care that exists now. As a result, overall revenues are generally declining, and many companies are seeking cutting-edge management strategies to address this. To improve R&D performance and produce novel medications, more efficient and automatic procedures, data-driven judgments, and superior predictive analytics tools are required. The use of AI is discussed here.

It might be challenging to completely embrace AI, though, given that many healthcare and pharmaceutical professionals lack AI competence. Adoption can be facilitated via a variety of methods, including:

• Working with AI startups and IT corporations or buying them out a lot of pharmaceutical companies contact specialized businesses and startups that focus on AI-powered drug discovery. In order to develop promising therapeutic candidates based on current theories and experience, it is now possible to draw on their expertise and resources. AstraZeneca, Roche, and Sanofi Pasteur, the aforementioned biopharmaceutical giants, are only a few examples of notable cooperation with Bergand enterprises. In addition, Pfizer made news when they recently joined IBM's Watson Center for Drug Discovery, while Novartis and Johnson & Johnson also partnered with IBM Watson Health.

• Working with academics as pharma begins to adopt AI, relationships between industry and academia are anticipated to continue expanding.

• Creating internal expertise and providing employees with the necessary tools

• Research and development problems and open science projects This is a useful strategy for using AI in drug development that has lower financial risk than other strategies.

AI IN PHARMACEUTICAL MARKETING:

Marketing is the process of encouraging the sale of a company's goods and services.[12]

According to an interview with Jon Resnick, President, Real World & Analytics Solutions, IQVIA, "Machine learning and artificial intelligence allows the global life science sales, marketing, and branding team to come up with more successful and practical commercialization tactics from the insights identified from AI." He also stressed how AI and machine learning allow healthcare organizations to go deeper into the finer layers of health care professionals, patient, and payer data to disclose previously untapped insights, provide predictions for what actions can be made, and facilitate better and faster decision-making. [13]

The application of artificial intelligence systems in the pharmaceutical industry has additional benefits, including an improved value proposition, optimal utilization of resources for better market share gain, the capacity to maximize growth, and channel-specific sales and marketing information. pharma marketing efficiency and growth with sophisticated analytics.Companies like Google, IBM, and some others are beginning to focus on using AI for disease diagnosis. Artificial intelligence that is both predictive and descriptive is being used in India. Additionally, in India, businesses that create medical supplies and equipment employ descriptive and prescriptive AI.[14]

Leading US pharmaceutical businesses increased the effectiveness of their promotional plans and their implementation by analyzing physician-level information and optimizing data from multichannel marketing activities. They made an effort to maximize return on investment with the aid of unique targeting, segmentation, and promotional marketing plans. Without needing to raise its marketing spending, there was a modest rise in sales of around $25 million over the course of six months.Another case study involved a pharmaceutical corporation with operations in Europe that used AI and machine learning to determine the HCPs' preferences for online interaction. The organization was able to categorize doctors using the new insights and develop a digital engagement plan using

information gleaned from a doctor. It revealed a rise in the number of emails opened and requests for further product information addressed to HCP.At several locations throughout the healthcare network, AI is being used and accepted. Artificial intelligence can assist in analyzing a person's genome to suggest the most suitable treatment option with the fewest negative effects.[15]

Businesses all over the world are embracing artificial intelligence, especially those in the pharmaceutical and healthcare sectors. The application of AI can aid in the improvement of commercialization tactics, from patient compliance to a sales call, as well as in the search for speedier, more informed decisions along the route from molecule to market. Several pharmaceutical firms, including Pfizer, GSK, Novartis, Lundbeck, Takeda, AstraZeneca, and Teva, are using artificial intelligence to enhance their marketing of both new and old medications. According to a report by Eularis, the usage of sales communications that were tailored with the use of artificial intelligence analytics increased prescribing by 43% for sales professionals who used those insights as opposed to those who did not. Dr. Merton of JLABS predicted that "AI will be better at processing stakeholder-oriented information for the customer, enabling more targeted dissemination of data to the customer. He added that marketing expenses ought to drop quickly.[16]

Physicians want more online involvement, according to Bjarni-Kornbech, VP of Marketing and Communications at Agnitio. This is now a known reality. The remote channel, he added, is the one that is expanding quickly. According to a poll conducted by eyeforpharma, marketers' inability to prove the new technology's value and return on investment is one of the main barriers preventing them from implementing it. The sales crew must receive training on using CRM systems. The effort to teach their sales crew in this way, nevertheless, is being made by a very small number of businesses. According to Bjarni Kornbech's observations, it is necessary to link customer engagement data into the CRM and, ideally, couple the data from the marketing engine in order to truly provide value. The field force must then have access to everything in a single location.[17]

In the past and even now, marketing and sales teams frequently communicated with doctors who were likely to write about their product through a variety of methods. The marketing strategy was unsuccessful and overused, both in terms of money and people. A more complicated and well-inclined brand strategy and sales approach were made possible by the commercial applications of machine learning that used analytics. Now more than ever, healthcare professionals are drawn to digital businesses that assist healthcare. Alpha geeks currently make up about 70% of doctors. Pharma sales must change to meet the evolving demands and preferences of physicians. In addition to decreasing their face-to-face interactions with medical professionals, doctors are increasingly turning to internet resources.

By evaluating each customer's preferred method of contact, such as call, text, email, webinar, face-to-face meeting, etc., as well as what tone they will respond in, brand teams can use machine learning to make the most out of such quick interactions. In order to increase their participation in digital modes, brand teams can use machine learning and analytics to launch more focused multi-channel marketing campaigns.[18]

PHARMA SALES - BUISNESS CHALLENGES:

1.Digital transformation-

With the emergence of new business models and patient interaction techniques, digital technology is upending the pharmaceutical sector. Companies must invest in digital technologies, such as customer relationship management systems, artificial intelligence, and predictive analytics, in order to react to these developments

2.Regulatory Environment-

Digital technology is revolutionizing the pharmaceutical industry by giving rise to new business models and methods of patient involvement. In order for businesses to respond to these advances, they must invest in digital technologies like customer relationship management systems, artificial intelligence, and predictive analytics..

3.High research and development cost-

A time-consuming and expensive procedure goes into creating new pharmaceuticals and bringing them to market. For the purpose of bringing a single drug to market, pharmaceutical companies spend a lot of money on R&D,

clinical testing, and regulatory compliance. This may have a negative impact on the profitability of particular products by raising the cost of goods sold.

4.Intense Competition-

In order to gain market share in important therapeutic areas, several companies compete fiercely in the pharmaceutical industry. Market share can be lost and existing goods' prices put under pressure by new competitors, generics, and biosimilars. To stay relevant in the market, businesses must also maintain a strong product pipeline and provide cutting-edge solutions.

5.Pricing pressure-

Government organizations, payers, and patients are increasingly scrutinizing pharmaceutical corporations' drug pricing decisions. This puts pressure on businesses to provide goods with a distinct value proposition and control expenses to retain profitability.

6.Health care access and affordability-

Many people, especially in emerging markets, struggle with access to cheap healthcare. To guarantee that their drugs are available to patients, pharmaceutical companies must navigate a variety of payment and pricing models.[19]

Growth of AI / ML/ e-Health Market-

According to Grand View Research Inc., by 2022, the global eHealth industry is expected to reach USD 308.0 billion. It is anticipated that the primary driver of the market will be the healthcare sector's shift to a digital healthcare system for patient analysis and management.[20]

The European Commission has introduced an eHealth Action Plan 2012–2020 in other nations, particularly in Europe, which is paving the way for enabling medical staff and patients to connect tools and technologies. It also recommends spending money on research to create customized medicine. Research from Accenture's Technology Vision 2017 claims that by 2035, artificial intelligence will enable yearly economic growth to double.[21]

One of AI's most promising application areas has been identified from the start as medicine. Since the middle of the 20th century, academics have suggested and created a variety of methods to assist clinical decision-making. The execution of the network is constrained by the completeness of prior healthcare information as well as the difficulty of coding higher-order interactions among multiple expert-written knowledge fragments. Additionally, it has been difficult to put into practice a system that combines deterministic and probabilistic thinking in order to decrease the pertinent clinical background, prioritize diagnostic assumptions, and suggest therapy. The COVID-19 epidemic undoubtedly changed the demand for AI technology and showed its potential. These technologies have received widespread acceptance in the medical community for their quick identification and classification of various viral strains, as well as their utilization of individualized information to enhance the operation of the outburst.

The global artificial intelligence in healthcare market is experiencing rapid growth as a result of the expanding use of digital technologies in the healthcare industry to lower healthcare costs and provide patients with higher-quality patient care services. Hospitals are seeing a larger number of patients as a result of the rising prevalence of numerous chronic diseases and the aging population. Daily production of a sizable amount of patient health data necessitates appropriate management and storage of that data. The market for artificial intelligence in healthcare is being majorly driven by the rise in demand for customized medications and the requirement to keep digital health information. Healthcare systems are increasingly incorporating cutting-edge technologies like artificial intelligence and machine learning, which will help doctors identify ailments earlier and provide patients with better care. Additionally, the use of data analytics, deep learning technologies, natural language processing (NLP), predictive analytics, and content analytics is assisting medical professionals in providing early diagnosis and care.[22]

Fig 4-Leading Companies (Advanced AI in healthcare and drug discovery)

FUTURE SCOPE OF ARTIFICIAL INTELLIGENCE IN PHARMA MARKETING:

Whether it's in the manufacturing, medical, research and development, or sales industries, computer science is being used more and more frequently. Healthcare AI projects received more funding in 2016 than any other AI project in any other field.[23]

However, despite the excitement, there is an absence of confidence as a result of certain unmet expectations.[24]

Radiographs, retinal scans, and ultrasound images have all proven that artificial intelligence is capable of evaluating them.AI allows for the cost-effective acquisition of a large number of these images. Building a mutually beneficial interaction between physicians and artificially intelligent systems is made possible by integrating these technologies with clinical practice. When they collaborate, they both perform better. The R&D segment of the global pharmaceutical industry is very expensive. A recent poll by GlobalData found that artificial intelligence is leading the way in boosting R&D productivity and efficiency. The survey also revealed that big data and artificial intelligence (AI) have the potential to change and disrupt the pharmaceutical industry within the next two years.[25]

Artificial intelligence (AI) is enhancing marketing strategies day by day, becoming more useful in the process. A business can map the client journey by implementing AI. Because of this, the business will be able to recognize each customer uniquely and sign them up for its marketing campaign.[26]

Future AI systems are probably going to develop and get more sophisticated, and they'll be able to do a lot of different things without requiring human intervention.[27]

CONCLUSION:

Artificial intelligence (AI) of health industry is a set of multiple technologies that allow machines to feel, understand, act, and learn to perform administrative and clinical health care functions. In conclusion, the future lies in cooperation between humans and machines, and alongside technological advances, human clinical experts will need to adapt, learn and grow. Although potential experts will have to be both medical and technology experts, it is evolution of medicine, not extinction. There are various AI and machine learning applications in pharmaceutical applications, including disease identification/diagnosis, personalized treatment/behavioural modification, drug discovery/manufacturing, radiology and radiotherapy, smart electronic health records, prediction of epidemic outbreaks, sales, marketing, predictive analytics, and so on. In addition, AI and ML-based analytics are superior for advertising, particularly because success often needs many ongoing complex decisions with a high degree of judgment. Revenue on the AI health sector is projected to hit $6.6 billion by 2021, a 40% CAGR, and the medical AI industry is expected to expand more than 10 times in only the next five years.38 AI and machine learning have the potential to enable smarter, faster, and cheaper operations in the near term.Artificial intelligence works as a supportive function in routine tasks and provides better insights. It adds efficiency and provides marketing function with deeper insights and valid data which make the selling easier. AI offers uniformity, cost- efficiency, solve complex problems, and make a judgment and AI control data from getting lost.

REFERENCE:

[1].Rajaraman V, Resonance. 2014; 19:198-207

[2].Barr A, Feigenbaum EA, editors. The Handbook of Artificial intelligence. In: 2nd ed. Stanford: HeurisTechPress ; William Kaufmann, Inc; 1982.

[3]. Wikipedia. Artificial intelligence, Wikipedia.comWebsite.https://en.wikipedia.org/w/index.phptitle=Artificial_intelligence&oldid=955473607. Accessed April 14, 2020.

[4]. SAS. Artificial Intelligence What it is and why it Matters,SAS, Analytics software and solutions Website, https://www.sas.com/en_us/insights/analytics/what-is-artificial-intelligence.html.Accessed April 14,2020.

[5]. https://www.google.com/search?sca_esv=563972803&sxsrf=AB5stBiOVikGZa_PqLX-G8WJDGU3biAl2A:1694255019818&q=%E2%80%A2+AI+for+Managers+or+Decision+makers:&tbm=isch&source=lnms&sa=X&ved=2ahUKEwivw_Xkp52BAxV7UGwGHchzAxsQ0pQJegQIChAB&biw=1024&bih=651&dpr=1#imgrc=-rJk76C2glu9sM&imgdii=Yh1RROydqGZ2oM

[6].Kalis B, Collier M, Fu R. 10 Promising AI Applications in Health Care. (2018 May 10) https://hbr.org/2018/05/10-promising-ai-applications-in-health-care (Accessed on November 23, 2019).

[7].Nic Fleming. How artificial intelligence is changing drug discovery. Nature 557, S55-S57 (2018) doi: 10.1038/d41586-018-05267-x

[8].https://www.digitalauthority.me/resources/artificial-intelligence-pharma/ (Accessed on November 23, 2019).

[9].https://www.himssanalytics.org/sites/himssanalytics/files/2017_Essentials%20Brief_Mobile_SNAPSHOT%20REPORT.pdf (Accessed on November 23, 2019).

[10].Keshavan M. Berg: Using Artificial Intelligence for Drug Discovery. http://www.medcitynews. Com/2015/07/berg-artificialintelligence/ (Accessed on November 23, 2019).

[11].Cattell J, Chilukuri S, Levy M. How big data can revolutionize pharmaceutical R and D. 2013 Apr. https://www.mckinsey.com/industries/pharmaceuticals-and-medical-products/our-insights/how-big-datacan-revolutionize-pharmaceutical-r-and-d (Accessed on November 23, 2019)

[12].Ritter AI. Artificial Intelligence as Enabler in the Marketing Process: A Research Agenda. 2019;1-10

[13].Myshko D, Robinson R. Artificial Intelligence: Molecule to Market. Pharmavoice website. https://www.pharmavoice.com/article/2019-01- pharma-ai/.Accessed April 18, 2020

[14].Ledley RS, Lusted LB, Science, 130(3366):9-21.

[15].How Artificial Intelligence will Revolutionize Healthcare. Bigthink.com website. https://bigthink.com/philip-perry/how-artificialintelligence-will-revolutionize-healthcare. Accessed April 4, 2020.

[16].Myshko D, Robinson R. Artificial Intelligence: Molecule to Market. Pharmavoice website. https://www.pharmavoice.com/article/2019-01- pharma-ai/.Accessed April 18, 2020

[17].Stone A.Towards the sales force of the near future. eyeforpharma website. https://social.eyeforpharma.com/multichannel/tow ards-sales-force-near-future. Accessed April 12, 2020.

[18].Alper J, Sawyer K.Leveraging Artificial Intelligence and Machine Learning to Advance Environmental Health Research and Decisions. http://nap.edu/25520 Accessed April 20, 2020.

[19].https://www.optisolbusiness.com/insight/top-5-benefits-of-using-ai-for-pharmaceutical-sales

[20].eHealth Market Projected To Reach USD 308.0 Billion By 2022, Grandviewresearch.com website. Available from: https://www.grandviewresearch.com/pressrelease/global-e-health-market.Accessed March 25, 2020.

[21]. https://health.economictimes.indiatimes.com/news/health-it/the-role-of-ai-in-pharma-sales-marketing/74668883

[22].https://www.precedenceresearch.com/artificial-intelligence-in-healthcare-market#:~:text=The%20global%20artificial%20intelligence%20in,USD%206.8%20billion%20in%202022.

[23].Healthcare Remains The Hottest AI Category For Deals. cbinsights.com website. https://www.cbinsights.com/research/artificialintelligence-healthcare-startups-investors/.Accessed January 15,2020.

[24].Chen JH, Ph D, Asch SM. N Engl J Med., 2017; 376(26):2507-2509.

[25].Pharma executives have faith in AI to solve the R&D optimization puzzle, says GlobalData. GlobaldData.com website. https://www.globaldata.com/pharma-executiveshave-faith-in-ai-to-solve-the-rd-optimization-puzzlesays-globaldata/.Acce

[26].Tierney S. Artificial intelligence in pharma: utilizing a valuable resource. EuropeanPharmaceuticalReview.com website. https://www.europeanpharmaceuticalreview.com/ article/114914/artificial-intelligence-in-pharmautilising-a-valuable-resource/. Accessed March 25, 2020.

[27].Powles J. Health Technol (Berl), 2017; 7:351-367.