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TRENDS IN CURRENT PHARMACEUTICAL MARKET

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ABSTRACT-

The pharmaceutical market growth is critical for any country. A strong pharmaceutical status requires health professionals, health infrastructure, invention and innovation in the health sector, and the nature of government program and policies. The Government of India unveiled the 'Pharma Vision 2020,' which aims to make India a global leader in end-to-end drug production. The Indian pharma industry has seen a rapid rise in the past three years with rapid digitization and the advanced research in the field has opened gates for newer avenues of treatment for mankind. The pharmaceutical industry in India appears to be on track for long-term growth. With nearly US\$19 billion in sales in March 2009, it already ranks fourteenth in the global league table. However, it is expected to rise to around US\$1.5 trillion by 2023, representing a 689 percent increase in just eleven years. By showing strength and commitment amid the disruption caused by the pandemic, the industry not only exhibited its ability to provide adequate medicines but contributed significantly to other areas like medicine distribution, Drug record, Drug design, Data collection and patient outcomes, Patient security, Patient problems with respect to drug therapeutic effect, Laboratory work information, clinical trials data records, online training courses with the help of Current advancement in pharmaceutical industry like E pharmacy, Artificial intelligence, Digital training, blockchains, and digital therapeutics.

1. INTRODUCTION-

Pharmaceutical products, along with well-trained and motivated health professionals, play an important role in healthcare. The pharmaceutical industry contributes significantly to public health by developing, manufacturing, distributing, and marketing necessary drugs or pharmaceutical products.^[1] The twentieth century will be remembered for many technological achievements, including a better understanding of the structure of the atom, the information explosion caused by advances in computer technology, and the information obtained from space explorations. However, in terms of its impact on people's lives, the twentieth century "might just as well be called the drug age."^[2] The pharmaceutical market in India can be said to be competitive, with several players marketing a large number of brands. However, the pharmaceutical market should not be studied as a whole, but rather as a collection of many individual submarkets.^[3] Several characteristics of the pharmaceutical industry and the overall healthcare sector have implications for the level of competition in these markets. Some issues, such as a conspiracy between players at various levels of the pharmaceutical supply chain, exclusive supply and coercive distribution agreements, patent-related issues, anticompetitive mergers, and so on, have a negative impact on market competition. Due to the monopoly conferred by patents, originator drug companies enjoy significant market power and may abuse it in a variety

of ways to extend the continuation of its patented products for as long as possible. India is one of the most important beginning markets for pharmaceuticals, and competition in these markets is critical for producing high-quality drugs at reasonable prices for consumers.^[1] The pharmaceutical industry in India appears to be on track for long-term growth. With nearly US\$19 billion in sales in March 2009, it already ranks fourteenth in the global league table. However, it is expected to rise to around US\$1.5 trillion by 2020, representing a 689 percent increase in just eleven years.^[4] India accounts for 16% of the global population, with a population of nearly 100 crores. According to the WHO, 65 percent of the population still does not have regular access to essential medicines. Because of the rise in health-care costs, more than 23% of the sick do not seek treatment because they do not have enough money to spend. Healthcare costs are already high and are expected to rise further. Expenditure on drugs accounts for approximately 50% of total health-care costs, which rises to up to 80% in rural areas, and healthcare expenditure is the second most common cause of rural indebtedness in India. Our national goal is to make medicines affordable and accessible to Indian citizens.^[5]

CURRENT ADVANCEMENT IN PHARMA MARKET-

2. E-PHARMACY-

A pharmaceutical company in India is the third-largest and fastest-growing company in the country. Currently, purchasing a drug online is the most common procedure all over the world, owing to the fact that consumers are accustomed to ordering drugs with the click of a button rather than driving to a pharmacy store. This type of online store sells everything from health-related items to prescription medications. Changing customer behaviors, advancements in computer technologies, and access networks are all major factors influencing the arrival of essential medical services such as e-pharmacies.^[6] Online pharmacies are becoming increasingly popular because they offer home delivery, convenient shopping, accessibility, a wider selection, and a reduction in shopping time and effort. Refill reminder is a useful service provided by online pharmacies in which the pharmacies send alerts when the prescription needs to be refilled. They are especially useful for geriatric patients or patients with chronic conditions who need to buy or refill medications on a regular basis. Online pharmacies sell a wide variety of products, including over-the-counter (OTC) medications, prescription-only medications, medical devices, pet medications, herbal products, and cosmetics.^[7]

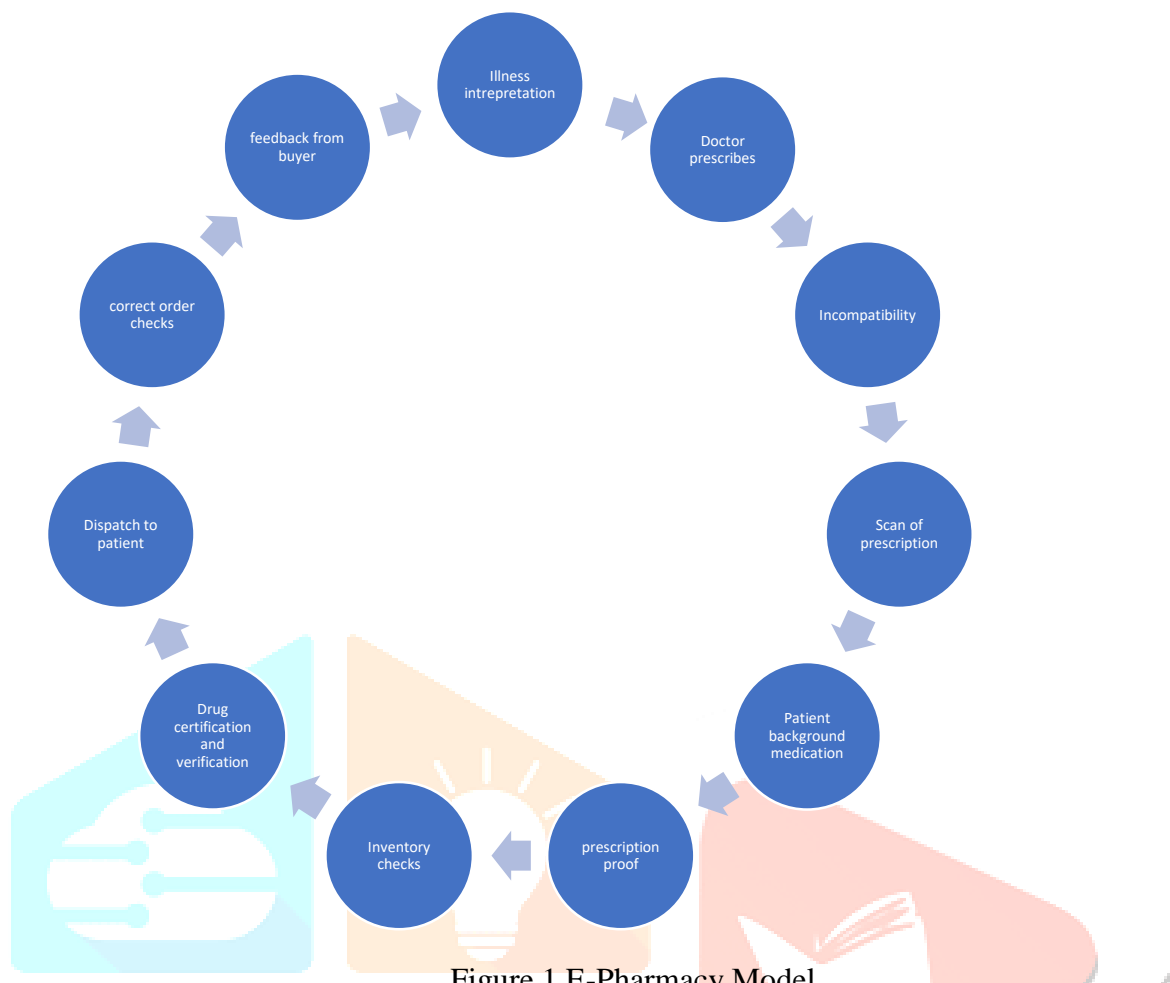


Figure 1 E-Pharmacy Model

Advantages E-pharmacy Model:

- Easy access to medicines for homebound or immobilized patients.
- A virtually limitless number of drug products are available.
- Confidentiality, which may encourage patients to inquire about heinous issues, and highcost
- Product information is easily accessible, as is a cost comparison for purchasing medicines.
- Drugs of the same quality but at a lower price.
- At least 40 percent less expensive.
- Purchases that are more comfortable.
- Available 24 hours a day, seven days a week.
- Reduced time
- Cost-effective
- The option of a refund
- Medical supplies are distributed quickly

Disadvantages of E-pharmacy Model:

- Inadequacy of significant interaction with medical practitioners and pharmacists.
- In most cases, consumers are unaware that the drug provided by e-pharmacies may not require the same quality that a retail pharmacy store may offer.
- It is critical to determine whether an internet site is legitimate or not, as it is difficult to determine whether drugs purchased online are counterfeit, fraudulent, or unapproved.
- Misdiagnosis and inappropriate use of pharmaceutical products.

3.RAPID DIGITALIZATION:

Artificial intelligence (AI) is a branch of computer science concerned with problem solving using symbolic programming. It has evolved into a problem-solving science with widespread application in business, medicine, and engineering.[8]. This artificial intelligence's main goal is to identify useful information processing problems and provide an abstract account of how to solve them. This type of account is known as a method, and it corresponds to a theorem in mathematics. Artificial intelligence is a field that deals with the design and implementation of algorithms for data analysis, learning, and interpretation. Artificial intelligence includes many branches of statistical and machine learning, pattern recognition and clustering, and similarity-based methods.[9] AI is a thriving technology that has applications in a wide variety of areas of life and industry. Recently, the pharmaceutical industry has discovered novel and innovative ways to use this powerful technology to help solve some of the industry's most problems. In the pharmaceutical industry, artificial intelligence refers to the use of automated algorithms to perform tasks that previously required human intelligence. Over the last five years, the use of artificial intelligence in the pharmaceutical and biotech industries has reshaped how scientists develop new drugs, combat disease, and much more.[10] It is common for drug discovery to take a long time because compounds must be tested against samples of diseased cells. Finding compounds that are biologically active and worthy of further investigation necessitates even more research. To expedite this screening process, Novartis research teams use images from machine learning algorithms to predict which untested compounds should be investigated further. Because computers uncover new data sets much faster than traditional human analysis and laboratory experiments, new and effective drugs can be made available sooner, while also lowering the operational costs associated with the manual investigation of each compound. The top biopharmaceutical companies' current AI initiative includes:

- Health-improvement mobile platform the ability to recommend patients based on real-time data collection, thereby improving patient outcomes
- Drug discovery- pharmaceutical companies are collaborating with software companies to implement cutting-edge technologies in the costly and time-consuming process of drug discovery.[11]

List of tools used in Pharma Artificial intelligence:

- Robot Pharmacy-UCSF Medical Center uses robotic technology for medication preparation and tracking in order to improve patient safety. They claim that the technology has prepared 3,500,000 medication doses without error. The robot has proven to be far superior to humans in terms of both size and ability to deliver.[12]

- MEDi Robot-MEDI is an abbreviation for medicine and engineering design intelligence. Tanya Beran, professor of Community Health Sciences at the University of Calgary in Alberta, led the project that resulted in the creation of the pain management robot. She came up with the idea while working in hospitals where children scream during medical procedures. The robot first establishes a rapport with the children before informing them of what to expect during a medical procedure. Although the robot cannot think, plan, or reason, it can be programmed to exhibit artificial intelligence.[13]

4.DIGITAL MEDICAL RECORDS-

Data management has never been easy, and this is especially true in the pharmaceutical industry. Along with documentation management, data security is critical. Think again if you believe that pharmaceutical companies are not at risk. When it comes to data security and integrity, assume the worst. Data integrity is critical to regulatory compliance and is the driving force behind 21 CFR Part 11. The FDA defines its expectations for electronic data using the acronym ALCOA.[14] Laboratory Information Management System (LIMS) is a software- based laboratory and information management system that provides a number of keyfeatures that aid in the operation of modern laboratories. Workflow, data tracking, data exchange interface, assay data management, data mining, data analysis, electronic laboratory notebook (ELN) integration, and other key LIMS features include the following: Despite the fact that LIMS has been commercially available for over 20 years, many changes have occurred in response to today's needs.[15]

Advantage of LIMS-

- Improves ergonomics for laboratory workers.
- Reducing ambiguity and improving consistency of laboratory practices through effective implementation and documentation.
- Productivity increases when the system is properly integrated into the dailyroutine of laboratory operations.
- All information can be stored and retrieved from a central database.
- Data control in real time with built-in quality control specifications.

Disadvantages of LIMS-

- Adequate validation is required to ensure data integrity.
- There is a limited interface between lab and field computers.
- LIMs are expensive.[15]

Electronic data capture (EDC) is a computer-based system that collects clinical data in an electronic format. EDC has replaced the traditional paper-based data collection methodology, allowing for more efficient data collection and a shorter time to market for drugs and medical devices. Many pharmaceutical companies and clinical research organizations are now implementing EDC systems for clinical trial data management. Users of EDC include Sites (locations where clinical trials are held), Sponsors (companies or individuals who fund the clinical trials), CROs (contract research organizations that help with clinical trial planning and execution), and others. It is used to collect and manage data during all phases of clinical trials.[16]

Goals for implementing an EDC system in a clinical trial-

- Data access in real time
- Efficient data transfer and a quicker impact on drug marketing
- Overcoming the difficulty of shipping paper CRFs (case report forms) from remote locations
- Collaboration between serious adverse effect reporting and the data base [16]

Advantages of EDC

- Faster data transfer
 - Employees have instant access to data.
 - Queries are reduced.
 - Data can be categorized and indexed.
 - Decision points can be reached more quickly, saving both time and money.
- ## Disadvantages of EDC
- Installation of software on each PC, which is more expensive
 - Availability of Internet connections in remote areas where the trial is being conducted
 - Data security is a major issue if public internet is used
 - Regular validation of electronic devices
 - Regulatory Compliance.[17]

5.DIGITAL TRAINING-

Online training courses for new technologies in the pharmaceutical sector will be expanded in 2022 to improve operations and compliance. Ensuring that teams have a solid understanding of the proper use of technologies such as digital signatures, patient planning portals, and electronic document software, which will reduce the likelihood of errors and assist pharma organizations in meeting regulatory standards for using that information. Online training courses can be delivered at any time, from any location, and can be tailored to each individual user, making them extremely cost-effective. Many processes of economic agent interaction can be altered by digital technologies. They make this interaction less expensive, faster, and more reliable. Their advancement will aid in the resolution of many economic and social issues. As a result, economic and social efficiency improves. The article analyzes these positive effects in the context of the pharmaceutical industry.[18]

- In 2022, digital therapeutics will further revolutionize the pharmaceutical industry by assisting them in securing data and increasing visibility, compliance, improved drug traceability, and simplified transactions. The upcoming pharmaceutical trends will add to the pharmaceutical industry's ever-changing space for transformation.[19]
- Globally, blockchain provides a solution for recording a specific transaction or any other type of digital transaction that is secure, highly transparent, and resistant to various outages that are found to be more efficient. In terms of technology, it creates a digital long distributed transaction ledger that can be stored on multiple systems sharing information and stored on multiple entities. This creates a broadcasting web in which the responsibility of sharing, storing multiple information, and, most importantly, validating the information in the Blockchain is involved.[20]
- In the blockchain process, any person who is authorized to have viable access to information can review the information stored and validate the information that is accessible in the Blockchain. As a result, Blockchain technology can be divided into four major characteristics that have a global

reputation. They are regarded as fast settlement of transactions in which ledgers are automatically updated and both sides with dual information are executed at a faster rate. Furthermore, because it is an open-source technology, it is thought to be more transparent and low-cost. It has been encapsulated as the most dependable technology, with no failures at any single point of information sharing. [21,22]

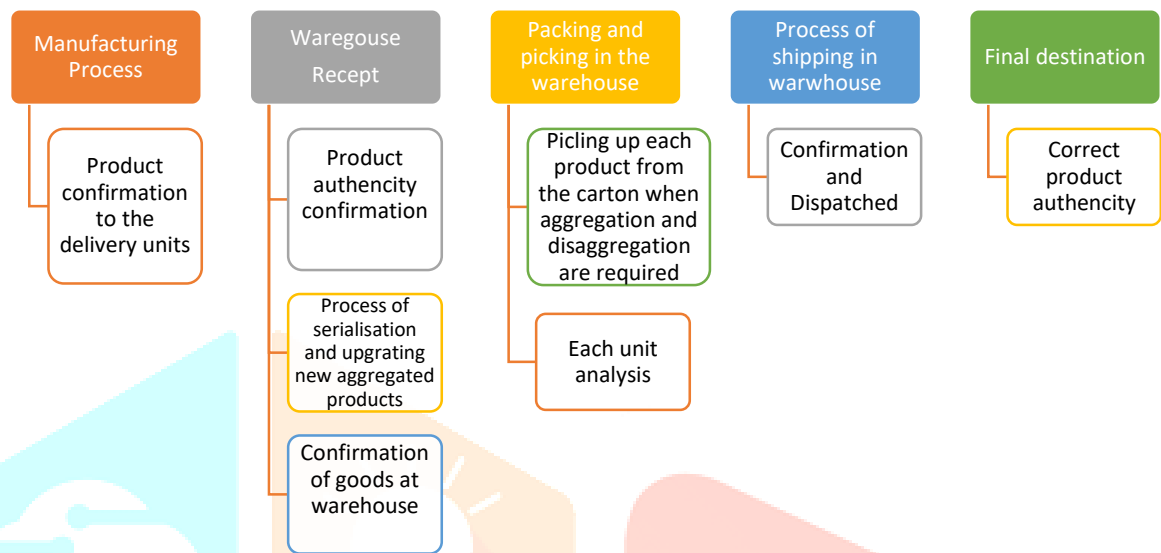


Figure 2. Example of simple blockchain analysis to track and trace system to monitor pharmaceutical goods

- The blockchain analysis begins with the manufacturing process and ends with the products being shipped from the warehouse. This supply chain analysis with IoT sensor detection and data collection can be done on a larger scale for the track and trace system with many pharmaceutical chains. Developing an end-to-end solution with a supply chain process will require all stakeholders to commit to the process of incorporating new technologies.[23]

6. DIGITAL THERAPEUTIC –

Digital Therapeutics are therapeutic interventions that are indicated for a specific disease and are intended to change a patient’s behavior in order to improve the outcomes of his disease. There are some definitions proposed by bodies or associations, the most common of which is the one proposed by the Digital Therapeutic Alliance, a global non-profit association of companies in the sector and stakeholders involved in the development of Digital Therapeutics.[23]

Composition of digital therapeutics-

A Digital Therapeutic, like a drug, is made up of digital active ingredients and excipients that are used by the patient (patient – facing). This distinction may be important in clinical development, particularly in confirmatory clinical trials, where it is not possible to change the digital active ingredient during development but is possible to change the excipients within certain limits. In addition to the patient-facing components, Digital Therapeutics includes a dashboard for the physician and a delivery platform from which to download the application.[24]

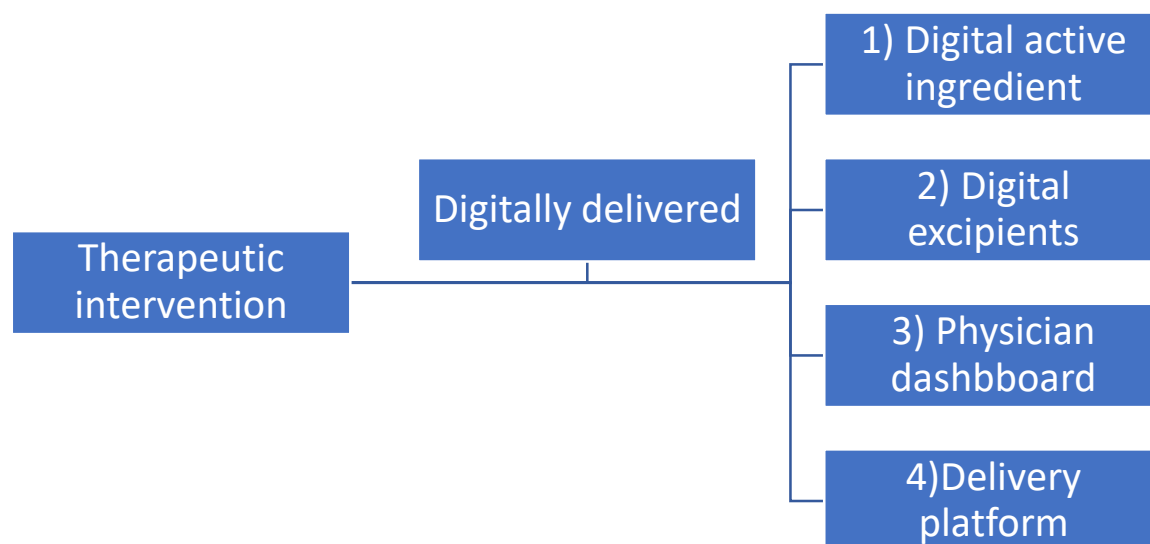


Figure 3 Composition of Digital Therapeutics

- In 2022, digital therapeutics will further revolutionize the pharmaceutical industry by assisting them in securing data and increasing visibility, compliance, improved drug traceability, and simplified transactions. The upcoming pharmaceutical trends will add to the pharmaceutical industry's ever-changing space for transformation.[19]
- It is the therapeutic component responsible for the clinical effect (both favorable and undesirable, as in the case of adverse reactions). It represents the entire flow of activities carried out from the first meeting with the patient to improve health outcomes: preliminary request for information on the patient's state of health, analysis of patient responses, provision of information to the patient on the disease and therapy, daily collection of information from the patient on his state of health, presentation to the patient of the therapy's progress, and so on.[25]

7.RESULTS AND DISCUSSION-

In these review article we had discussed about the current situation of the pharmaceutical market worldwide. We had discussed about E-Pharmacy, Digital Digitalization, Digital Medical Records, Digital Training and Digital Therapeutics. These Article explaining the new ways to secure transparency, easy medicine supply systems, responsiveness, visibility in clinical trials, drug design, patient security so it helps the Pharma industry stay competitive. The pharmaceutical sector is undergoing a major transformation, the pharmaceutical industry, which had been slow to accept technology in the past, is currently undergoing rapid change. Pharmaceutical companies in India are betting big on new-age technologies. More investments, the growth of technological startups, increasing collaborations, and a favorable regulatory environment, are all encouraging pharmaceutical innovation.

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