ORACLE

# Oracle Health Sciences Connect 2023

Asia | Mumbai

April 4, 2023

ORACLE

# Oracle Health Sciences Connect 2023

Asia | Mumbai

**Manish Kishore**

Global Head IT
Wockhardt Ltd

April 4th, 2023

# Safe harbor statement

This presentation contains forward-looking statements that are subject to risks and uncertainties.
All statements other than statements of historical fact included in this presentation are forward-looking statements. Forward-looking statements give our current expectations and projections relating to our financial condition, results of operations, plans, objectives, future performance and business. All forward-looking statements are subject to risks and uncertainties that may cause actual results to differ materially from those that we expected. Any forward-looking statement you see or hear during this presentation reflects our current views with respect to future events and is subject to these and other risks, uncertainties, and assumptions, and therefore are not guarantees of future performance. You are cautioned to not place undue reliance on such forward-looking statements because actual results may vary materially from those expressed or implied. All forward-looking statements are based on information available and collected from various websites & research on this date and Manish assumes no obligation to, and expressly disclaims any obligation to, update or revise any forward-looking statements, whether as a result of new information, future events or otherwise.

# Smart Pharma :
# How Technology is Disrupting the Pharmaceutical Industry 



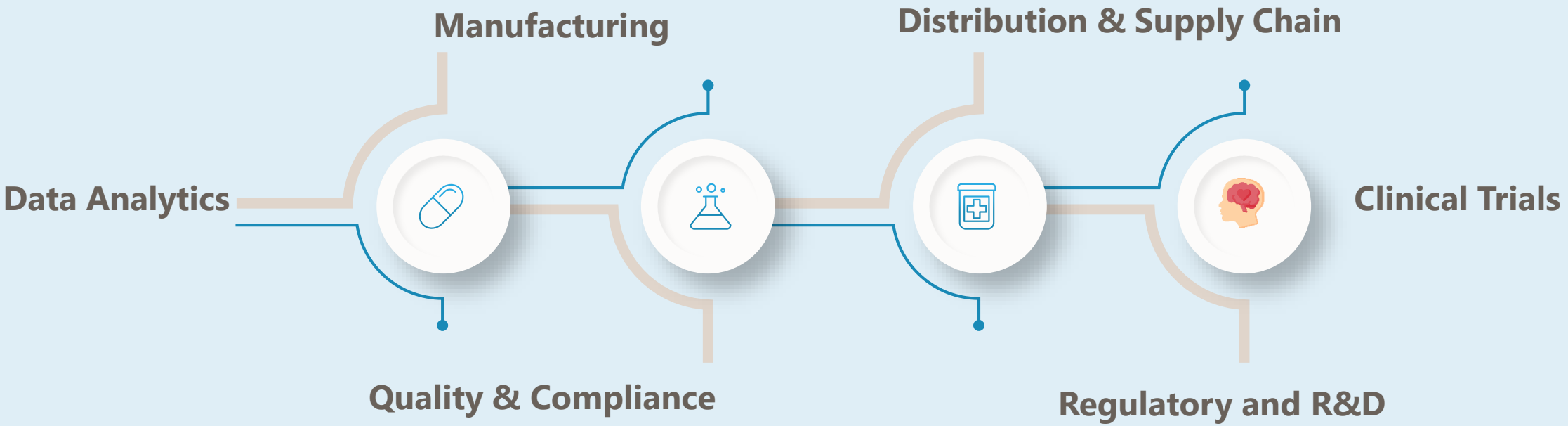
Manish Kishore

We must ensure that Technology is Accessible, Affordable and Adds Value

- Narendra Modi

# Components of Pharmaceutical Industry where technology disruption can happen

**The pharmaceutical industry is an ever-evolving sector that is constantly seeking innovative solutions to improve patient outcomes and provide better healthcare.**




## Reshaping Organization

# Technologies disrupting the pharmaceutical industry

AI / ML

IoT

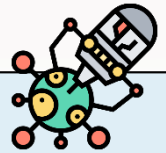
Blockchain

3D printing

Big data analytics

AR / VR

Nanotechnology



Gene editing

Digital therapeutics

Quantum computing

**And many more like Digital Twins, Chat GPT, Cloud …**

# Technologies disrupting the pharmaceutical industry - Use cases


- **Identify Potential Drugs**
- **Predict Yield**
- **Visual Inspection System**
- **Predictive Analytics**
- **AI Powered Analytics**
- **Analyse Genome Data**
- **Speed up Drug Discovery**
- **Personalized Treatment**

**R&D:**

- AI usage to analyze large amounts of **data to identify potential drugs** for diseases like Parkinson's which resulted in the identification of four promising drug candidates in a large pharma.
- Another company used **AI to identify two existing drugs** that could be repurposed to treat Ebola virus, and one of these drugs is currently being tested in clinical trials.

**Manufacturing:**

- To **predict the yield** of a chemical process with 99% accuracy, **enabling more efficient production of pharmaceuticals**.
- **AI-powered visual inspection system** that can detect defects in vials of pharmaceuticals with high accuracy**, reducing the need for manual inspections and improving product quality.**

**Supply Chain:**

- Blockchain technology and AI to **create a secure and transparent supply chain network** for its pharmaceutical products, **improving traceability and reducing the risk of counterfeit drugs.**
- Predictive analytics and machine learning to **optimize inventory management**, **reducing the number of out-of-stock situations**

**Distribution:**

- A large company uses **drones and AI to deliver medical supplies**, including pharmaceuticals, to remote areas in Rwanda and Ghana, improving access to healthcare in these regions.

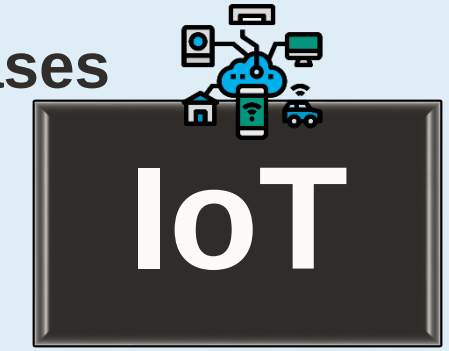
**Analytics:**

- Some companies have implemented **AI-powered analytics platform** that can analyze large amounts of patient data to identify patterns and **insights that can inform drug development and treatment decisions**.
- Another company used machine learning to **analyze genomic data from cancer patients** to identify potential drug targets, resulting in the identification of a new drug target for ovarian cancer.

**Clinical Trials**

- **Speed up the drug discovery process** by identifying potential drug targets and predicting the success of drug candidates
- Analyze large amounts of data generated during clinical trials **to identify patterns and insights that can inform treatment decisions**
- Create **personalized treatment plans** based on patient data, such as genetics and medical history

# Technologies disrupting the pharmaceutical industry – Use cases




- **Monitor temp & humidity.**
- **Create connected Lab for remote monitoring**
- **APM**
- **Storage and transport monitoring**
- **Reduction of theft or loss, tracking**
- **Personalized healthcare**

**R&D**:

- IoT sensors are implemented to **monitor the temperature and humidity** of its research labs, ensuring that experimental samples were stored under optimal conditions.
- **Create a connected lab** that enabled scientists to **monitor experiments remotely and collaborate in real-time**.

**Manufacturing**:

- Monitors the performance of its manufacturing equipment in real-time, **detecting potential issues before they cause downtime or quality issues.**
- A predictive maintenance solution that uses IoT sensors to monitor the condition of its manufacturing equipment and **predict when maintenance is needed, reducing downtime and maintenance costs.**

**Supply Chain**:

- Track the location and condition of its pharmaceutical products as they move through the supply chain, **ensuring that products are stored and transported under optimal conditions**.
- A smart packaging solution that uses IoT sensors to monitor the temperature and humidity of its pharmaceutical products during transportation, **ensuring that products are stored under optimal conditions**.

**Distribution**:

- IoT sensors to monitor the location and condition of its pharmaceutical products during transportation, **reducing the risk of theft or loss.**.

**Analytics**:

- To collect patient data from **wearables and other connected devices**, **enabling more personalized healthcare and drug development**.

# Technologies disrupting the pharmaceutical industry- Use cases


- **Securely store and share genomic data**
- **Improving transparency and accountability in manufacturing.**
- **Reducing risk of counterfeit drugs**
- **Improving traceability**
- **Track & Trace + Authentication.**
- **Secure Personalized healthcare**

**R&D:**

- Blockchain is used to **securely store and share genomic data**, enabling more efficient drug discovery and personalized medicine.
- Blockchain-based platform that enables **patients to securely store and share their genomic data with researchers, accelerating drug discovery and research.**

**Manufacturing:**

- To track the origin and movement of pharmaceutical ingredients and products**, improving transparency and accountability in the manufacturing process.**
- To track the authenticity and provenance of pharmaceutical products, **reducing the risk of counterfeit drugs**.

**Supply Chain:**

- To track the movement and temperature of food and pharmaceutical products, **improving transparency and traceability in the supply chain.**.

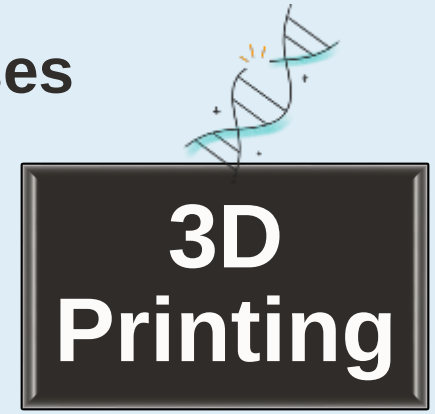
**Distribution:**

- A blockchain-based solution that enables pharmaceutical **products to be tracked and authenticated throughout the distribution chain**, reducing the risk of counterfeit drugs and improving patient safety.
- To track the origin and movement of pharmaceutical products, ensuring that products are stored and transported under optimal conditions.

**Analytics:**

- A blockchain-based platform that enables patients **to securely store and share their medical records and data, improving patient outcomes and research.**

# Technologies disrupting the pharmaceutical industry – Use cases




3D printing is revolutionizing the pharmaceutical industry by enabling more precise and efficient drug delivery, as well as enabling the development of new types of medical devices and treatments.

- **3D Printed Drug products.**
- **Develop Prototype**
- **3D Printed Scaffold for bone tissue**
- **Prototype of pill**
- **3D printed Device for inhalation drug delivery**

- One Pharma company developed the first **3D-printed drug product**, which is used to treat epilepsy. The drug is manufactured using a patented 3D-printing process, which allows for high-dose medications to be delivered in a single, rapidly disintegrating tablet.
- Another Pharma company used 3D printing to **develop a prototype of a polypill**, which is a combination of several medications in a single pill. The 3D-printed prototype enabled the company to test different combinations of medications and dosages more quickly and efficiently.
- A team of researchers at the University in US developed a **3D-printed scaffold for bone tissue engineering**. The scaffold was created using a 3D printer and a biomaterial made from hydroxyapatite, which is a mineral found in bone. The scaffold was then coated with a layer of a protein that encourages bone growth, and the resulting structure was implanted into a mouse, where it successfully induced bone growth.
- Another Pharmaceuticals used 3D printing to develop a **prototype of a pill** that would release medication at a specific time of day. The pill was printed using a specialized printer that could create multiple layers of medication with different release rates, allowing for precise control over when and how much medication is released.
- A team of researchers at the University in Western World developed a **3D-printed device for inhalation drug delivery**. The device was designed to be more efficient than traditional inhalers, and it was printed using a biocompatible material that is safe for use in the body. The researchers conducted trials on the device with a range of different medications, and they found that it was effective at delivering drugs to the lungs.

# Technologies disrupting the pharmaceutical industry – Use cases


- **Drug Development Insights**
- **Analyse large amount of data from clinical trials**
- **Predictive Analytics – forecast demand and optimize inventory levels**
- **Analyse large citizen data (Anonymized) for personalized treatment plans**
- **Analyse large genomic data / proteomic data for new drug targets**

- Big Tech company Health division uses big data analytics to provide **insights into drug development, clinical trials, and real-world data analysis**. It can analyze large amounts of data from electronic health records, claims data, and other sources to identify new drug targets, design more efficient clinical trials, and gain insights into drug effectiveness and safety in real-world settings.
- Another global pharma company uses big data analytics to improve its drug development process. It uses **machine learning algorithms to analyze large amounts of data from clinical trials and preclinical studies** to identify the most promising drug candidates and predict their likelihood of success.
- A global pharma uses big data analytics to optimize its supply chain management. It uses predictive analytics to **forecast demand and optimize inventory levels, reducing waste and improving efficiency**.
- A big pharma uses big data analytics to develop **personalized treatment plans for patients with diabetes**. It uses machine learning algorithms to analyze patient data, such as blood glucose levels and medical history, to develop personalized treatment plans that improve patient outcomes.
- Another pharma company uses big data analytics to improve its drug discovery process. It uses machine learning algorithms to **analyze large amounts of genomic and proteomic data** to identify new drug targets and develop new drugs.

# Technologies disrupting the pharmaceutical industry - use cases


- **Realistic and immersive experience for trainees to learn & practice skills in safe environment**
- **Visual representation of the human body to demonstrate effects of certain medical conditions.**
- **Simulate Clinical Trail**
- **Simulate drug interactions .**

- **Training:**
  to train healthcare professionals in various areas such as surgical procedures, emergency situations, and drug administration. This technology can provide a **realistic and immersive experience for trainees to learn and practice their skills in a safe environment.**
- **Patient education:**
  to educate patients about their medical conditions and treatments. This technology can provide a **visual representation of the human body and demonstrate the effects of certain medical conditions**, making it easier for patients to understand their diagnosis and treatment options.
- **Clinical trials:**
  to enhance clinical trial processes. For example, VR can be used to **simulate clinical trial settings**, making it easier for patients to understand and participate in the trial. AR can also be used **to provide real-time monitoring of patients during clinical trials, improving the accuracy and reliability of data.**
- **Marketing:**
  in pharmaceutical marketing campaigns to provide an **immersive and interactive experience for customers**. For example, a pharmaceutical company can use AR to show how their product works in the body or VR to simulate the effects of a medical condition.
- **Research and development:**
  to accelerate research and development processes. For example, VR can be used to **simulate drug interactions and their effects on the human body, allowing researchers to better understand how drugs work and identify potential side effects**

# Technologies disrupting the pharmaceutical industry - use cases


Potential of nanotechnology to improve drug delivery, diagnostics, imaging, regenerative medicine, and personalized medicine in the pharmaceutical industry.

- **Carry drugs to specific target cells or tissues**
- **Sensitive and specific diagnostic tools for cancer detection**
- **Improve drug imaging techniques**
- **Deliver growth factors or genes to promote tissue regeneration**
- **Personalized medicine delivery**

- **Drug delivery:**
  Nanoparticles can be engineered **to carry drugs to specific target cells or tissues**, improving drug efficacy and reducing side effects. For example, liposomes and polymeric nanoparticles are commonly used to deliver **anticancer drugs to tumors**.
- **Diagnostics:**
  Nanoparticles can be used to develop new diagnostic tools for detecting diseases. For example, **quantum dots are being developed as a sensitive and specific diagnostic tool for cancer detection.**
- **Imaging:**
  Nanoparticles can be used to improve imaging techniques such as magnetic resonance imaging (MRI) and computed tomography (CT) scans. For example, **iron oxide nanoparticles can be used as a contrast agent in MRI scans to improve image resolution.**
- **Regenerative medicine:**
  Nanoparticles can be used in regenerative medicine **to deliver growth factors or genes to promote tissue regeneration.** For example, nanoparticles can be used to deliver genes to damaged heart tissue to promote tissue repair and regeneration.
- **Personalized medicine:**
  Nanoparticles can be used to develop personalized medicine approaches, such as **targeted drug delivery to specific patient populations**. For example, nanoparticles can be engineered to target specific cell types or tissues in patients with certain genetic mutations.

# Technologies disrupting the pharmaceutical industry – Use cases


These examples demonstrate the potential of gene editing technologies to accelerate drug development, develop new genetic therapies, improve cancer immunotherapy, address organ transplantation shortages, and improve agricultural practices.
**Gene editing technologies, such as CRISPR/Cas9,** have the potential to revolutionize the pharmaceutical industry by allowing scientists to modify genetic material in a precise and targeted way.

- **Enable researchers to study effects of drugs on specific genetic mutations.**
- **Develop gene therapies for genetic disorders**
- **Modify immune cells to better target and destroy cancer cells.**
- **Remove genes that cause organ rejection**

- **Drug development:**
  used to create animal models of human diseases with specific genetic mutations, which can be used to test potential drugs and treatments. This approach **allows researchers to study the effects of drugs on specific genetic mutations**, which can accelerate drug development and improve the success rate of clinical trials.
- **Genetic therapy:**
  **to develop gene therapies for genetic disorders** such as sickle cell disease and cystic fibrosis. By targeting the underlying genetic mutations responsible for these diseases, gene editing can potentially cure these disorders rather than just treating their symptoms.
- **Cancer immunotherapy:**
  **to modify immune cells to better target and destroy cancer cells.** For example, CAR T-cell therapy involves genetically modifying a patient's own T-cells to express chimeric antigen receptors (CARs) that can recognize and target cancer cells.
- **Organ transplantation:**
  to modify animal organs for transplantation into humans, potentially addressing the shortage of organs for transplantation. By using gene editing **to remove genes that cause organ rejection**, it may be possible to create organs that are compatible with human recipients.
- **Agriculture:**
  used to **develop crops with improved resistance to pests and diseases**, which can improve food security and reduce the need for pesticides and other chemicals.


Manish Kishore

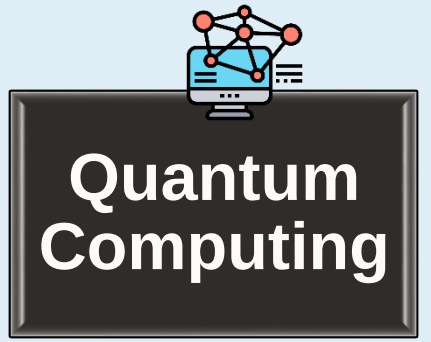
# Technologies disrupting the pharmaceutical industry


These examples demonstrate the potential of DTx solutions to improve patient outcomes, **enhance disease management, and provide personalized coaching and support for patients**. As the field of DTx continues to evolve, it is likely that we will see even more innovative solutions emerge to address a variety of medical conditions.

- **Enhance disease management**
- **Personalized coaching and support for patients**
- **Mobile apps to support personalized treatment**
- **Improve adherence to medication regimes**

- **Diabetes management:**
  to help patients with diabetes monitor their blood sugar levels, track their diet and exercise, and receive personalized coaching to improve their health outcomes.
- **Mental health:**
  to treat mental health conditions such as depression and anxiety. For example, app is created to uses **cognitive behavioral therapy (CBT) techniques to provide personalized mental health coaching to users**.
- **Substance abuse:**
  **to treat substance abuse disorders by providing addiction counseling and support**. For example, app that offers a digital cognitive behavioral therapy program **to help users quit smoking**.
- **Respiratory diseases:**
  to manage respiratory diseases such as asthma and COPD. For example, a company tracks inhaler usage and provides personalized coaching **to improve adherence to medication regimens**.
- **Chronic pain:**
  to **manage chronic pain by providing pain management coaching and support**. For example, an app offers pain management tools and personalized coaching to help patients manage their pain.

# Technologies disrupting the pharmaceutical industry




the potential of quantum computing **to accelerate** drug discovery, improve drug efficacy, optimize complex processes, develop personalized medicine approaches, and enhance cybersecurity measures in the pharmaceutical industry. As the technology continues to advance, it is likely that we will see even more innovative applications of quantum computing in pharma

- **Accelerate drug discovery.**
- **Quantum level computing for modelling the behaviour of molecules**
- **Optimize complex processes in drug manufacturing.**
- **Quantum cryptography.**

- **Drug discovery:**
  to accelerate the process of drug discovery by **modeling the behavior of molecules at the quantum level**. This can help researchers identify potential drug candidates and predict their efficacy more quickly and accurately than traditional methods.
- **Molecular simulation:**
  **to simulate the behavior of molecules and proteins**, which can provide insights into their structure and function. This information can be used to design drugs that target specific molecular pathways and improve drug efficacy.
- **Optimization:**
  **to optimize complex processes,** such as drug manufacturing and supply chain management. For example, quantum algorithms can be used to optimize the synthesis of chemical compounds, which can reduce costs and improve efficiency.
- **Personalized medicine**:
  **to analyze large datasets, such as genomic data,** to develop personalized medicine approaches. This can help identify genetic factors that influence drug response and design personalized treatment plans for patients.
- **Cybersecurity:**
  **to enhance cybersecurity** measures in the pharmaceutical industry. For example, **quantum cryptography** can be used to secure communication channels and protect sensitive data from cyber threats.

## Manufacturing

By leveraging technology, companies can improve the efficiency, speed, and accuracy of the manufacturing process, reducing costs and improving patient outcomes.

**Yield Improvement, Minimize Batch Loss**

## Quality & Compliance

The pharmaceutical industry is heavily regulated, and ensuring quality and compliance is essential for patient safety and regulatory compliance.

**Enhance Patient Safety**

## Distribution & Supply Chain

Supply chain and distribution are critical components of the pharmaceutical industry, as they involve the transportation and delivery of drugs and healthcare products.

**Seamless Resilient Supply Chain**

# Challenges Faced in achieving Smart Pharma

| | |
|---|---|
| Cost | • Implementation Expensive<br>• Capex in Hardware, Software<br>• Train Employees. |
| Integration | • Integrate with existing Systems<br>• Complex Process Testing<br>• Validation and approvals as per compliance |
| Data Security | • Sensitive information<br>• Intellectual Property<br>• Ensuring application and infra security |
| Regulatory Compliance | • New Technology compliant with relevant regulations and guidelines |
| Change Management | • Require Significant Changes to existing processes and workflows.<br>• Challenging to adapt by employees |
| Data Integrity | • Validating new technologies and data generated within the system. |
| Traceability | • Clear Audit Trail<br>• Documentation. |
| Managing Risk | • Associated Risks |

**Value Chain, Return on Investments ??**

ORACLE

# Thank You

Manish Kishore
Email: healthcare.med11@gmail.com

## Oracle Health Sciences Connect 2023