



How Internet of Things (IoT) is impacting Life Sciences and Healthcare Industry

42Gears Team

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INTRODUCTION

In recent years, life sciences industry has seen remarkable advancements such as the application of **IoT-based devices** which are benefitting patients, manufacturers, doctors, nurses and the entire industry as well. Though life sciences industry has conservative rate of adoption of new technologies, however, it has been among the early adopters of IoT.

In life sciences, the real **diagnosis, monitoring, preventive measures** and **treatment** in chronic conditions require proactive action and it is feasible today with IoT by embedding sensors and smart devices in our surroundings. As per a report by **Mind Commerce Publishing**, the value of IoT in healthcare will reach **\$117 billion** by **2020**. Also, healthcare a part of Life science industry is predicted to be the fastest-growing segment in entire IoT market with **CAGR** of **15.1%** stated in the report.

IoT is a network of physical objects such as smart devices, sensors and actuators through which data is collected for analysis and action. IoT devices can be used in entire pharma value chain for various purposes such as drug invention and development, manufacturing and supply chain, sales and marketing of drugs, and patient engagements. IoT helps in assessing the overall equipment effectiveness(OEE), improving drug efficacy, detecting errors, improving regulatory compliance, improving Research and Development productivity, cutting cost and more.

IoT-BASED SMART DEVICES USED IN PHARMA AND HEALTHCARE:

A Glimpse of few smart devices and their implications in life sciences industry are given as under:

Organ on a chip

Organ on a chip is a ground-breaking invention in the field of life science. It is a clear polymer which contains microfluidic channels lined by living cells. These microchips help to understand the functions of living human organs including lung, brain, kidney, skin and intestine. It helps to improve Research and Development productivity, reduce data reporting time and cost and increase drug efficacy. Organ on a chip plays a key role to accelerate development of new drugs and advance personalized medicine.

Chip in a pill

Another application of IoT in life science is a chip in a pill. It is an ingestible pill very similar to micro cameras in looks. These pills are used to capture the organs images from inside to understand the inner functions and drug effects on it. These pills transmit the data to a wearable device then it goes to healthcare professionals for diagnosis via Cloud. The procedure altogether helps to improve drug efficacy and with prompt understanding of problem treatment time also can be reduced.

Google Glass

In recent years, **Google Glass** or smart glasses have been playing an incredible role across all verticals including healthcare. As patient records and history always play a vital role in treatment. These glasses enable doctors to record visual information during a conversation with patients by just maintaining eye contact. In addition, these glasses can change the game during surgical procedures where doctors can share perspectives with specialists present anywhere in the world, and the recorded data also provide assistance in future. Also, in procedural analysis and clinical training, these glasses are providing a better assistance. Moreover, by adopting glasses hospitals can save a lot yearly due to significant differences between costs of video conferencing which is around \$40000 as compared to \$1500 only for google glasses.¹

iBeacons

In healthcare, **iBeacon** is the most adopting technology among location-based technologies. iBeacons streamlining hospital's operations by notifying duties and assigned works to hospital staff such as patients' medication requirements and emergency cases. iBeacons directly sends patients' health history and records to doctor's mobile immediately when patients are about to reach doctors' room. Hence, it enables easy access to information and reduce uncertainty over treatment history.²

Sensors in drug delivery devices

This is another application of IoT in healthcare to attach sensors in drug delivery devices. It empowers healthcare providers and patients with a tool to acquire, analyze and monitor medication usage data. Few devices such as **Amiko** are already available in the market to monitor drug dosage and to keep track medications by the patients itself. Today many pharmacies are using **Amiko** to dispense pills to minimize chances of errors and to ensure better medication management.³

Smart wheelchairs

Automatic wheelchair is also a good application of IoT Technology. Smart wheelchairs are designed by integrating wireless body area network with various sensors whose functions managed via IoT. Vitals of individual sitting in the chair can be monitored and also it can keep an eye on the location of users. This tool empowering disabled people to get the feeling of independence and if used in hospitals can provide better assistance in patient management.

Wrist bands

Wrist bands are designed to measure the user's pulse, activity, body temperature, oxygen level, and blood pressure. All vital information sends on user's smartphone to monitor health and keeps track on daily activities. A Korean company has recently introduced **Angel** which is compact and wearable BP sensor through which users can monitor BP.

ROLE OF IOT ACROSS VARIOUS STAGES IN HEALTHCARE VALUE CHAIN:

Stage 1: Research and Development

IoT is playing a crucial role in invention and development of new drugs. Various IoT applications such as organ on a chip, wearable devices and sensors are providing real-time reporting and diagnostics which facilitates better treatment and improves productivity. In addition, cost savings can also be attained through faster screening and analysis through sensors.

Stage 2: Supply chain

In recent years, latest technological trends such as RFID and sensors have been providing valuable inputs in supply chain among all verticals including pharma. Reporting on key parameters like temperature is vital in pharma industries, with continuous logistics monitoring and reporting through RFID and sensors all parameters can be ensured. Warehousing and routing of drugs through smart sensors enable admins better supply chain management. Hence, an improved supply chain management helps to reduce cost occurring due to wastages which in turn minimizes the overall drug cost.

Stage 3: Marketing and sales

Sensors are very effective in early detection of adverse effects of drugs. Data collected through sensors sends to wearable devices further goes to healthcare professionals. The HCPs by analyzing and monitoring drugs effects get the better capability to market their products in a better way. Also, the interactive ecosystem encourages fewer chances of errors during research and manufacturing of drugs which helps to improve drug efficacy as well. In addition, the outcome of entire procedure ensures quality products in less cost which increases sales of products.

Stage 4: End users'

All technological advancements in the life science industry are ultimately made for the benefit of end users' i.e. patients. Whether it is organ on a chip, wearables, smart pills and other IoT-based tools all have similar goal i.e. to advance the life science industry with vital techniques and equipment to ensure better diagnosis and treatment procedures which enhance drug efficacy and minimize errors as well. Though most of the applications are made to provide assistance in hospitals and R andD but quite a few tools are also in the array which provides independence to patients such as wearable devices, drug delivery devices, smart wheelchairs, iBeacons and smart wrist-bands. By using these IoT based devices patients can keep track of health and monitor drug dosage and its effect on the body without any professional interventions.

KEY BENEFITS OF IOT TO LIFE SCIENCES INDUSTRY

Some key benefits of IoT are listed below:

First, IoT is providing better equipment to **diagnose** the disease in early stages. Through continuous health monitoring by the patient itself or by hospitals many deadly diseases such as cancer, pulmonary diseases can be prevented and cured. Not only diseases but the sources of illness also can be found out through the pill shaped micro cameras.

Second, IoT technology is better equipped to understand drug's effect on human body. After dispensed drugs, **continuous monitoring** would be required to know medication effect and how the patient is responding with that. With sensors embedded devices it is possible to understand how the medication works with the progress in disease.

Third, few IoT devices are very **user-friendly**, patients can itself use it without any professional aid. For example, patients can monitor their health by placing or wearing a wearable sensor on wrist or elbow. These wrist bands are capable of measuring body temperature, pulse, activity and oxygen level in blood. Various BP and sugar monitoring devices are also available in the market which prompts immediately as the BP or sugar level increases/decreases.

Fourth, IoT-based devices are playing a crucial role in **Research and Development**. For years, many animals' lives have been lost due to drug invention and testing but now with the help of organ on chip drug's effect can be monitored without sacrificing lives.

Fifth, clinical research and testing take several years to invent and find the effectiveness of drugs. Drugs have to go through several trials which are very expensive, and if the researcher finds the drug to be ineffective, all money invested in a project will go waste. In that case, IoT can be very **cost effective**, irrespective of the result. With multi-stage trials and monitoring the result comes in less time and saves time and money both.

CONCLUSION

IoT devices and sensors are taking life sciences industry to the next level. These devices enable admins to remotely manage, control and track the production processes to enhance productivity and minimize errors. Also, by providing real-time information quality of products can be improved and helps to reduce the cost of production as well. IoT facilitates data and messages transferring from patients to home, home to HCPs, and from home to hospitals as well to serve various purposes across the value chain. The outcome of entire procedure leads accumulation of data in hospitals and Research and Development centres. These accumulated data include various sensitive information hence, concern over data security, privacy, transfer and regulatory compliance also rise. To overcome these security problem, companies are required to rely on third-party cloud computing solutions to some extent.

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IoT devices management require an **Enterprise Mobility Management (EMM)/Unified Endpoint Management (UEM)** solutions to ensure secure data collection, management and control. Companies like [42Gears](#) are providing reliable solutions for managing IoT devices. Moreover, companies can adopt a unified solution if they have a variety of mobile and IoT devices to manage. With 42Gears' solutions organizations can make itself less vulnerable to data security threats while managing these devices.

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