

Internet of Things & Healthcare



White Paper

How Internet of Things Is Transforming Healthcare Industry

Internet of Things (IoT) has enormous power to revolutionize the way businesses operate. The 'connected network' includes cars, heart monitors, heating/cooling options, and kitchen appliances; all these items are connected through the Internet with the help of smart computers and mobile devices.

Gartner predicts that 8.4 billion devices to be connected through Internet around the world in this year (2017), which is up by 31% since 2016. Connected devices, by 2020, are expected to cross the 20 billion mark. Global enterprises will spend roughly up to \$2 trillion annually to adopt this technology that is revolutionizing businesses in every vertical.

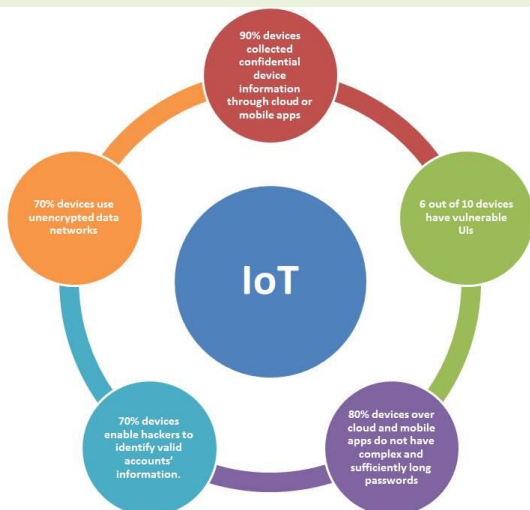
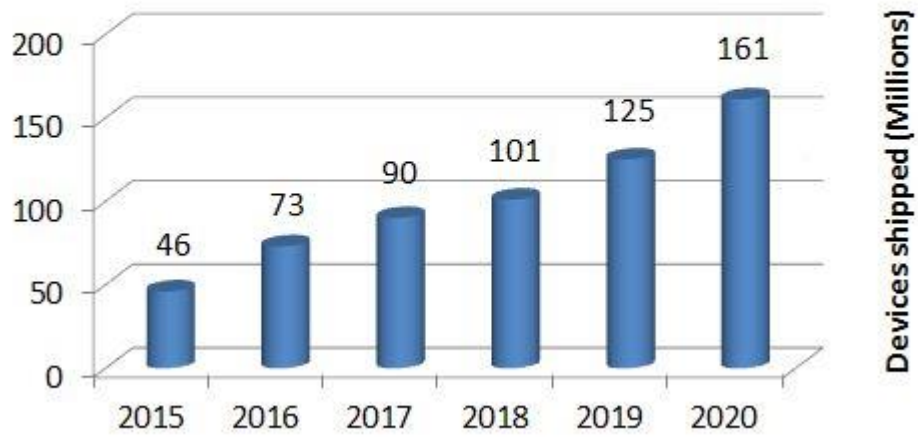
Scope in Healthcare Industry

Most of the businesses have started adopting this emerging technology called the Internet of Things. So, why should the healthcare industry be left behind? The wave of IoT is impacting healthcare services on the part of the healthcare providers, doctors, and the patients as well.

It involves heterogeneous computing through wireless communication channels (apps/devices); IoT applications connect patients to health providers in order to diagnose, monitor, record and store important information related to patient's data.

Industry experts predict growth of IoT – healthcare market up to \$72.02 billion in 2021. Major market players, startups, and technology giants are gradually adopting IoT for successful digital transformation of their healthcare services.

Predicted Healthcare IoT Device Installations



Examples of IoT in Healthcare



Benefits of Implementing IoT in Healthcare

1. **Reduced costs:** Leveraging the benefits of IoT, health care providers can monitor patients in real-time, resulting in reduced costs incurred on doctor visits. Regular home visits and care facilities reduce the costs incurred on patient admission and hospital charges.
2. **Enhanced treatment options:** Virtual infrastructure provides real-time access to information which enables health care providers to arrive at well-informed decisions. It ensures timely provision of medical services and enhanced treatment outcomes.
3. **Disease Management:** Continuous monitoring of patients helps in improved disease management.
4. **Proactive Patient Experience:** Healthcare providers are able to understand patient needs accurately with the help of connected devices. Accurate diagnosis, timely doctor intervention, and improved treatments result in an increase in patient's satisfaction levels and build patient loyalty.
5. **Few Errors:** Accuracy in data collection, automated processes and data-driven business decisions reduces operational costs and minimizes the risk of human errors.
6. **Improved Drug Management:** Healthcare providers allocate a huge amount to creation and management of specialized drugs. With implementation of IoT applications, they re-allocate their drug management budgets efficiently.

Health Applications Leveraging IoT

In this section, we will learn about few examples of practical applications of Internet of Things in the healthcare division.

UroSense – An innovative fluid management solution by Future Path Medical. Key features include:

- Measures CBT automatically
- Measures urine quality for patients having catheters.
- Smart monitoring of symptoms avoid infections
- Early detection of critical diseases such as heart failure, cancer, diabetes etc.
- Automatic transfer of patients' critical data to nursing stations.

Medication Dispensing Service: An IoT-based application developed by Philips. The target audience is elderly patients facing difficulties with timely medication dosages. This smart device dispenses pre-filled cups at the specific dosage time. The device notifies the patient for consumption or refill of medications. Notifications are sent to the user when the device fails to function or when a patient misses the dosage.

Natural language processing capabilities of IBM Watson has revolutionized the healthcare industry. Key features of evidence-based learning and hypothesis generation enable efficient clinical decision support systems. A physician posts a query describing symptoms of

the patient in detail. Watson analyses the data inputs and identifies accurate medical condition of the patient. Data mining activities helps doctors discover relevant patient insights as well as the medical history of the patient. This data helps doctors arrive at a wise decision with the help of individual patient scores.

Data sources for Watson analysis include electronic medical records, treatment regulation standards, physician's observations and notes, nurses' notes, clinical reports, research study material, medical journals, and historical patient data. Watson assists healthcare providers to identify best treatment options available for the diagnosed patients.

IoT Transforming India's rural healthcare:

A recent KPMG report concludes, "74% of the doctors address only 1/3rd of the urban population. It means around 2.63 lakh doctors treat Indians who are residing in urban settlements and in rural areas. Cutting-edge technology and innovations in medical science is restricted only to the corporate hospitals in urban cities. Lack of healthcare infrastructure, poor accessibility, and lack of skilled medical professionals remains a huge challenge for rural healthcare services in India.

Preventive health care is the need of the hour. Identifying symptoms and diagnosing health problems at the early stages is a major benefit of implementing IoT and cloud-based applications. Another benefit is generation of EHRs i.e. real-time, patient-centric records to make information available instantly and securely to authorized users.

Patients suffering from poor health can utilize smart devices to monitor blood pressure, hydration, oxygenation levels, blood sugar, lung capacity, BMI, capillary blood flow, and mood swings.

Now, smart pill bottles will be available to dispense, regulate, and monitor medication dosages. Last, but not the least, doctors and physicians can use their smartphones or mobile devices for delivering instant healthcare services. Visit summaries can be dictated, which the IoT-enabled device converts into text in order to update the patient's medical records timely.

Adoption of trending technologies enables people to maintain a daily routine to stay healthy. People can regulate their daily habits due to real-time health status updates. Additionally, a person does not have to visit a hospital in case of a minor health problem. You can consult the doctor on his mobile device regarding your health problem. IoT devices enhance the overall quality of life.

Even, healthcare providers are realizing the enormous benefits of IoT and other smart devices. It has enhanced the quality of healthcare provisional services. Monitor patients, modify dosages, treat patents at a remote location etc. are factors contributing to advancement of the healthcare industry. High-quality of services also increases patient

loyalty. Doctor visits and discharge summaries are generated automatically with real time updates in the patient's EMR.

Challenges

Every technology comes with its specific challenges that reduce the pace of technology adoption. Even in the case of Internet of Things, healthcare professionals have to keep the following challenges in mind.

1. **Information Security:** storing highly confidential data over a cloud server is risky. You need to store patient's medical records in a secure way. Data encryption is the most popular technique of securing organizational data. Two-way authentication is another security measure.

2. **Training & Development:** Doctors and nurses need to undergo trainings to upgrade their skills in order to use the IoT devices efficiently. Automation of healthcare will reduce the risk of human errors.

The way forward is to improve your IT infrastructure, comply with legal standards, and bolster security levels. Transformation of healthcare industry with IoT applications offers healthcare providers an opportunity to improve their quality of services and enhance patient's end-experience. With proper precautions in place and accurate positioning of IoT-based healthcare services, the industry promises considerable amount of business growth and scalability in future.

