



How Advances in the Internet of Things (Iot) Devices and Wearable Technology Will Impact the Pharmaceutical Industry

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Abstract: Today, patients can use their wearable or IoT devices to report data of physiological parameters and track their own health records. IoT wearable technology has been embedded with software and sensors to create a connected network that collect and exchange data. Advances in digital health have fundamentally changed the business model of the pharmaceutical industry, and has impacted all aspects of a pharma company's structure—from sales and marketing, to R&D and business-to-business activities. As healthcare becomes more digitized, pharma companies are transforming to remain competitive by rethinking their business and operating models, their cultures and capabilities, and adopting policies that nurture innovation and courageous strategic moves.

Keywords: IoT, wearable technology, pharma

The Internet of Things (IoT) is a network of tangible devices, such as wearable technology, that have been embedded with software and sensors to create a connected network that collect and exchange data^[1]. Digital health is the integration of digital and genomic technologies with health, healthcare, lifestyle, and social networks that enhance the efficiency of healthcare delivery and personal medicine ^[1]. Innovation in this field has improved clinical outcomes and reduced cost of treatment. Advances in digital health have fundamentally changed the business model of the pharmaceutical industry, and has impacted all aspects of a pharma company's structure—from sales and marketing, to R&D and business-to-business activities. As healthcare becomes more digitized, pharma companies are transforming to remain competitive by rethinking their business and operating models, their cultures and capabilities, and adopting policies that nurture innovation and courageous strategic moves ^[2]. Patients have become less passive recipients of

therapies, and are starting to control their own health treatments by providing their doctors with more information, home-measured parameters, which allows for an informed opinion about how they should be treated ^[3]. With individuals assuming more control over their own health, pharma companies must adapt to this new decision-making power and create more effective methods to engage them. This is difficult since it is challenging to determine exactly what engagement model appeals to their patients ^[2].

To drive better patient engagement, physicians can observe patient behaviour from a continuous daily stream of patient data from online communication, in-home visits, and quantitative methods to analyse trends and adjust treatments as needed. ^[2]. Data from wearable devices and other quantified self-technologies are evolving into research and clinical grade medical tools. Health devices can increase patient cost consciousness, allowing for comparisons of price points for various treatments ^[2]. Payers and



providers will have more health information to link drugs to outcomes and update value-based pricing [2]. Pharma companies will need to provide third parties with access to their product data and become transparent about clinical trials [2].

Today, patients can use their wearable devices to report data of physiological parameters and track their own health records. Researchers have observed that actively participating individuals experience results in less treatment cost and better adherence to prescribed medicines as compared to those who do not [3].

Patient education is essential for providing effective communication between patient and physician. With the use of digital techniques, patients are becoming more engaged and outcome based care is becoming a strategic healthcare goal by improving the patient-physician relationship at the lowest cost. Identification of the right initiatives allows pharmaceutical industries to bring about a digital revolution in health care. The pharmaceutical industry is utilizing such technologies for success and innovation. More information about product performance is available and process efficiency is improving. Digital development can bring innovation in personalised patient care. It has improved patient physician relationship and helps in decision-making. Marketing strategies can be well managed and planned by using latest techniques. Companies need to transform their commercial and innovative models in benefit of health care. In the pharmaceutical industries, these techniques are used in the form of sensors and digital apparatus to provide efficient performance [4]

Wearable technology is an important component of digital technologies. Wearables are wireless sensors worn on the body, which can accurately measure body physiological functions and alert

users whenever abnormal parameter readings or fluctuations occur. Wearable technology can greatly benefit pharmaceutical companies in many aspects such as speeding drug research and development, streamlining clinical trials, improving efficiency of drug delivery, and enhancing patient engagement and adherence.

The global market for IoT devices and wearable technology is projected to be \$41 billion by 2020 and the market will grow to with an astonishing compounded annual growth rate of 65%. However, the majority of this wearable technology is currently dominated by wellness, fitness and sports wearables. Devices specifically designed for medical wearables are relatively fewer and most of them are in either early stages of development including clinic trials. For example, the Free OStyle Libre, manufactured by Abbott is a two component system that measures the blood glucose levels of diabetic patients. The sensor, a small disc, attaches to the patient's body, measures the blood glucose level and sends information to a receiver or Android phone. The new system allows for patients to see trends in their blood sugar and quickly make changes in diet when the trend is to high blood sugar levels [5]

The immediate and obvious application of wearable device for pharmaceuticals is in the clinical trial, in which recruiting patients and getting them to adhere their treatment regime are a constant challenges. Wearables can collect real-word data remotely (and, therefore, freeing participants from having to report on site) and then provide reminders so patients don't forget to take their medication. These capabilities can save companies huge amounts of money by increasing the efficiency of costly and lengthy clinical trials. The ability to easily and quickly collect all of this patient data is particularly impressive and creates great opportunities to monitor the efficacy and



safety of drugs in real-time in patients and provide fast feedbacks to R & D. As of April 2017, over 250 trials in the UK and US incorporate wearables, with promising results for boosting participation and compliance[6].

In the long run, utilization of wearable technology techniques can generate an ecosystem that starts from drug production, drug use to monitor patient condition and reaches up to providing feedback to the patient after consultation. With such systems, everyday information of the patient can be monitored by the physician anywhere anytime. For example a patient suffering from Parkinson disease can provide information to the care provider on the basis of chip on pill technique. With this technique, a smart watch is provided to the patient which monitors drug taking schedule, send reminder to the patient for medication taking and send health status report to health provider. Specialist virtual care application is already in use by health providers for betterment of patients [7].

In research and development department of pharmaceutical industries, the wealth of data collected by wearable device offers more opportunity to better understand the action of medicine in individual patients and to translate back to more effective drug discovery and development tailored to personal medicine[8].

The *Dyno* developed by DynoSense Corp., is a fully integrated multi-function health scanner technology that can capture more than 33 health metrics in less than 60 seconds with a single user action. The captured health data is securely and wirelessly uploaded to the company's cloud computing platform for further analytics and processing, and is then communicated with healthcare professionals [9]. This device can be readily applied for monitoring patients with cardiovascular disease in clinical trials, and the

quality of the data collected will be more accurate than the data provided by patient logs or diaries during clinical trials.

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