Push Technology
Value Proposition: Healthcare_Pharmaceutical

Diffusion® & Diffusion™ CLOUD

The Diffusion® Real-Time API Management Platform™ powers business for leading brands worldwide – trusted to manage, secure, and deliver application & system data to Web, Mobile, and IoT applications.

Diffusion helps pharmaceutical companies streamline research & development, manufacturing, and distributiion to increase profits, reduce costs, and deliver improved healthcare.

Pharmaceutical Highlights

The Internet of Things (IoT) combined with the increasing digitization of data in the pharmaceutical sector opens myriad opportunities for massive disruption and industry overhauls.

- Leverage data and digital technologies to optimize manufacturing, improve inventory management, & streamline distribution & patient delivery.
- Enhance security with a single point-of-access for data across back-end and front-end systems, applications and devices.
- Decouple back-end applications & systems to reduce costs and innovate for top-line revenue growth.
- Enhance safety, reduced delays and deliver better patient outcomes.

The huge volume of real-tiime data now available through the Internet of Things (IoT) is disrupting the old pharmaceutical industry business models and driving innovation that will benefit both manufacturers and patients.

From drug discovery research, to detecting problems on the production line, to monitoring issues in the supply chain, and automating remote patient monitoring that improves health outcomes, data intensive technology is transforming the way drugs are developed, manufactured, delivered, and consumed.

Concurrently, there is a huge demand for faster and simpler access to healthcare services. This means that the pharmaceutical companies must expedite production, safe and secure movement of drugs, and better regulated storage and delivery too improve patient outcomes. Faster operations requires harvesting data in a well-organized and effective manner, and delivering the data in real-time to analytics and AI (Artifiicial intelligence) systems.

Data from IoT devices and connected technology is being deployed across pharmaceutical manufacturing, monitoring, distribution, and control in-transit. With the availability and use of real-time data, pharmaceutical companies can better ensure production quality and minimize or avoid pilferage and waste.

The Diffusion Real-Time API Management Platform enables pharmaceutical companies to easily develop applications using a microservices architecture with event-driven data, decouple front-end and back-end systems, extend middleware, ensure real-time data delivery, integrate legacy system data with web, mobile, and IoT data, and deliver data fast for critical event processing, analytics, and action.

*"**Capturing data** throughout the pharma journey and putting it to good use **could save** the industry **$5.8 billion to $6.6 billion** a year."*
Gartner

PUSH TECHNOLOGY™
The Smart Choice in a Demanding World™

Pharmaceutical Use Cases

Manufacturing

Pharmaceutical companies are using IoT technologies in their manufacturing facilities to improve and optimize the efficiency of their machines and processes. IoT technologies within a facility connect equipment, networks, and systems to share information in real-time across the plant floor.

For example, Johnson & Johnson adopted IoT technologies to secure FDA approval for shifting Prezista, an HIV medication, from batch to continuous manufacturing. The sensor technology used by J&J allowed them to eliminate separate testing and sampling steps in the manufacturing process. Pfizer uses IoT data, plus other data management technologies, for their integrated manufacturing process across 25 manufacturing plants. Merck used IoT techniques to analyze biologic process data, which allowed them to find a problem in their manufacturing plant that was causing very high discard rates of a specific vaccine.
The FDA regulates every process in pharmaceutical manufacturing plants because any change in the manufacturing process can alter the characteristics of the drug. Therefore, fast, continuous data collection from all the processes in a plant is required for the FDA's continued process verification.

The Diffusion platform manages and synchronizes real-time IoT data with data from back-end systems and front-end applications - all relevant manufacturing data sources - to deliver the data handling performance, scalability, and flexibility required to facilitate a continuous manufacturing process for pharmaceutical companies. Diffusion easily integrates data from legacy systems with IoT data and delivers real-time information via the Internet to web and mobile devices on or off the manufacturing floor.

Continuous manufacturing allows pharmaceutical companies to significantly cut cost and manufacturing time, and most importantly, enhance product quality.

Logistics - The Supply Chain & Distribution

Upon leaving the manufacturing plant, drugs often travel long distances to reach pharmacies, doctors, and patients. Traveling via ship, plane, and truck, pharmaceuticals can pass through a vast array of weather conditions and altitudes, while the drugs must remain within a narrow band of temperature, pressure, and humidity conditions. Further, upon arrival at their destinations, storage conditions must be monitored and maintained. Otherwise, the drugs can be tainted and the consequences frightening and potentially disastrous. For example, in 2014 and 2015, a pediatrician's refrigerator cooled a vaccine below the acceptable storage temperature and 4,000 children required re-vaccination - a costly and dangerous exercise.

The use of IoT devices plus data management and analytics systems, to monitor drugs during both transit and storage, can eliminate these issues by providing real-time data to manufacturers, doctors, hospitals, and patients. If issues are found in real-time, they can be remedied immediately, often preserving the efficacy of the drug, rather than having to discard it.

Patient Support

Producing and maintaining drugs quality is only half the story. The value is lost if patients do not take drugs when they should. IoT devices are emerging that ensure compliance - the last mile of the pharmaceutical journey. Sensors and mobile applications not only alert patients when to take their drugs, but they also collect data to help physicians and pharmaceutical companies determine how well drugs are performing. This real-time data gathered across thousands of patients improves drug formulation and patient healthcare.

The Diffusion Real-Time API Management Platform is purpose built to handle thousands to millions of data sources from systems, sensors, devices, and applications - in a secure and optimized manner to protect data, streamline operations, and assist in maintaining adherence to regulatory compliance.

*"**Thirty percent** of the **top 20 pharmaceutical companies** have **adopted IoT technologies** in their **manufacturing process** at some level. "*

Market Intelligence

PUSH TECHNOLOGY™
Rethink Real-Time ™

Pharmaceutical Use Cases - Continued

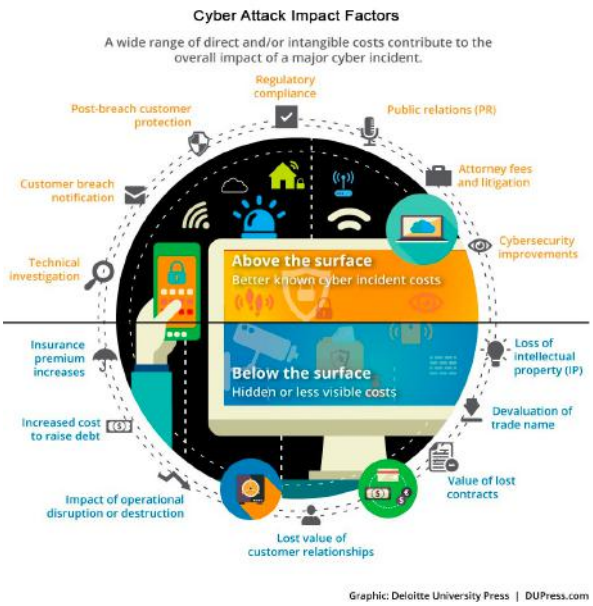
Cybersecurity

Cybersecurity is a critical issue for pharmaceutical companies in today's Internet connected world and the growth and use of big data and IoT introduce a new set of cybersecurity challenges.

Systems have become far more complex as they are connected to an array of third parties including vendors, business partners, and even patients. There are a host of vulnerabilities for hackers to to exploit, and attempt to steal data or manipulate industrial processes. Pharmaceutical companies must make their IT and Industrial Control Systems secure in order to protect assets, industrial processes, and most importantly, their reputation.

Pharmaceutical firms own and must manage a large amount of extremely valuable intellectual property data for drugs in development or already patented. Pharmaceutical companies spend and average of $2.6 billion USD developing each new drug that is brought to market and the process often takes 10-12 years to complete. These costs makes intellectual property (IP) protection crucial because the welfare of the business depends upon protecting this information.

Diffusion assists companies with their data access and user identity management to ensure data privacy to avoid misuse or theft of critical business information.



> *" The UK Government identified the **pharma sector** as the **primary target of cybercriminals** looking to **steal IP** and estimated the costs of such theft at **1.8 billion** pounds.*
>
> Deloitte "Cyber & Insider Risk at a Glance: The Pharmaceutical Industry

Integrating Legacy IT Systems

Many pharmaceutical companies are constrained by legacy back-end systems, not designed for today's digital economy. Often reliant on Enterprise messaging solutions that served the internal integration needs for two decades, IT leaders are now challenged to effectively deliver the web and mobile application experience that users and employees expect today. This slows the innovation. Diffusion can help airlines introduce a reactive data layer to their existing integration architecture that delivers a platform for present and future innovation, and extends the life and utility of their previous investments.

Conclusion

Pharmaceutical companies face challenges in harnessing big data and IoT for digital transformation including:

- Integrating data from new technologies with systems and hardware that may have been in-place for decades.
- Assuring security of valuable, business-critical Intellectual Property (IP).
- Determining how to adapt business practices to technology changes.

Despite these challenges, pharmaceutical companies worldwide are embracing the benefits of big data analysis and IoT to streamline manufacturing and logisitics, simplify regulatory reporting, reduce costs, and improve patient care.

The Diffusion Real-Tiem API Management Platform simplifies and speeds application development by managing, optimizing, and integrating the wealth of data exchanged among applications, devices, sensors, and systems. Diffusion provides the scalability, real-time communications, and easy integration with legacy systems, required for successful digital transformation.

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