Solution: **IBM Hybrid Cloud** Industry: **Healthcare**

Medtronic

Builds a cognitive mobile personal assistant app to assist with daily diabetes management

Diabetes dramatically impacts people's lives, and managing it successfully requires constant vigilance. Medtronic is harnessing IBM Streams and Watson Platform for Health to help improve the lives of people with diabetes, building a mobile personal assistant app for diabetes management that will provide actionable glucose insights and predictions.

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Business challenge

With worldwide diagnoses of diabetes on the rise, how can Medtronic help people with diabetes easily monitor their condition and avoid severe and costly health complications?

Transformation

Medtronic is working with IBM® Watson Health™ to build Sugar.IQ With Watson, a cognitive mobile personal assistant app that will provide real-time actionable glucose insights and predictions.

Results

Unlocks	Reveals	Enables
the potential for Medtronic to analyze what we anticipate will be millions of data points from medic	potential links between glucose readings, drug administration and lifestyle choices (especially diet	more informed decision-making by patients around oral medication, insulin management, diet and exerc

Business challenge story

Tackling a worldwide health epidemic

By 2040, the International Diabetes Federation anticipates that more than 642 million people will be living with diabetes.

Huzefa Neemuchwala, Head of Data & Informatics Innovation in Diabetes Service and Solutions at Medtronic, explains: “Type I diabetes is an autoimmune disorder where insulin production in the pancreas is inhibited, whereas type II diabetes inhibits the body’s ability to effectively metabolize glucose. Both conditions lead to glycemic variability such as hyperglycemia (high glucose levels) or hypoglycemia (low glucose levels). To avoid serious consequences, people with diabetes must regularly monitor their glucose levels and take action when necessary to maintain glucose control.”

People with diabetes generally want to be able to manage their condition independently, and to live their lives to the fullest without risking a visit to the emergency room. With cases of both type I and type II diabetes rising, Medtronic recognized the need to create a new generation of glucose monitoring solutions that would give people the tools to manage their diabetes more easily, in combination with routine support from healthcare professionals.

“Traditionally, Medtronic has provided systems such as continuous glucose meters and insulin pumps, which are physical devices used predominantly by people on insulin therapy to monitor glucose levels and administer insulin directly to the body,” Neemuchwala continues. “If we can harness these devices and provide continuous feedback on individuals’ glucose levels, the potential

exists to support millions of people in the daily management of their condition.

"The growing popularity of wearable technology also means that all-important biometric data on diet, exercise, sleep and medication is now becoming easier to capture. The challenge is to gain actionable insight from this massive volume of data, and deliver it to users quickly enough for them to make appropriate decisions."

> "Sugar.IQ With Watson aims to give people the insight to manage their diabetes—potentially improving quality of life, and reducing the cost of care."
>
> **— Huzefa Neemuchwala, Head of Data & Informatics Innovation, Diabetes Services and Solutions, Medtronic**

Transformation story

Contextually relevant insights to reduce the cognitive burden of diabetes

To bring its new solution to market rapidly, Medtronic worked with the IBM Analytics and IBM Watson Health teams to develop Sugar.IQ With Watson, a cognitive mobile personal assistant app that aims to provide real-time actionable glucose insights and predictions for individuals with diabetes, helping to make daily diabetes management easier.

Neemuchwala says: "Without the right monitoring tools, people with diabetes

are left in the dark. They struggle to reduce glucose variability because glucose levels depend on so many factors – medication and insulin intake, meal content, size and timing, activity type and intensity, sleep, stress, weather and location among other factors. They can't always predict when they are heading towards a low glucose episode. The aim of Sugar.IQ With Watson, is to shine a light on these factors, helping them see their glucose in a contextually relevant setting.

"But it's not just about enlightening people about their current glucose status – we are also working on using IBM cognitive analytics to personalize these insights, based on each individual's behavior patterns and the history of their glucose levels.

"For example, we're designing the solution so that it should be able to process the factors that affect each individual's personal glucose levels – food, sleep, stress, and so on. The aim is that the app could coach them by helping make smarter glucose-related decisions, for example by avoiding foods or habits that tend to cause problems for them, so that they can live their lives to the fullest."

Amit Singh, IT Director of Digital Platforms at Medtronic, continues: "Before we started the development of Sugar.IQ With Watson, we correlated anonymized data from users' insulin pumps and glucose monitors with their history of hypoglycemic episodes. Based on this research dataset, the team has been able to build predictive models that are capable of predicting hypoglycemia within a two to three-hour window, with 85 to 89 percent accuracy within the model [with accuracy as measured by Area Under the Curve (AUC)].

"To provide insights that can really help people with diabetes, we needed a way to generalize and personalize the model further, and process data at near-real-

time speed and scale. Our insulin pumps send us data every 24 hours, and wearable continuous glucose monitors send data every five minutes, so we're expecting to have millions of data-points to analyze."

Working with the IBM Watson Health team, Medtronic has designed an architecture that stores incoming medical device data in a staging area based on IBM Db2®, and then passes it into the IBM Watson® Platform for Health. The Watson Platform for Health provides a secure environment for analyzing health data and extracting cognitive insights, which are then relayed back to the Sugar.IQ app for the user.

Singh adds: "The aim is for IBM Streams to analyze the data as it flows in from the devices, using predictive models to assess each person's current situation and the risk of their glucose levels falling outside safe thresholds. So, we will be able to provide meaningful and personalized tools and insights and create awareness if the models detect significant patterns."

He adds: "We wouldn't have been able to make this project a reality without the technology and expertise of IBM. The IBM team has delivered a truly end-to-end solution, including experts in design, cognitive computing, mobile app development and quality control."

Results story

Helping make daily diabetes management easier

With IBM Streams at the heart of the Sugar.IQ With Watson solution and built on a secure, purpose-built cloud from Watson Platform for Health, Medtronic and the IBM Watson Health team are well on their way towards achieving their goal of building a cognitive mobile app that can provide real-time actionable glucose insights and predictions to help individuals with diabetes make daily diabetes management easier.

Neemuchwala says: “In an astoundingly short period of time, we have built a solution that we hope will enhance the lives of people with diabetes everywhere. For example, in the future, if a user logs that they are planning to eat a dish of pasta for lunch, our app should be able to combine data from similar meals in the past with current glucose levels, and inform the user whether that meal is likely to be a safe choice—helping them make an informed decision.

“Many of our customers have told us that the pressure of continually self-testing and anticipating the consequences of eating, exercising or sleeping can be a major source of stress. Our hope is that with Sugar.IQ With Watson, they will be able to have much more confidence that they are in a stable condition, and that their lifestyle is keeping them on the right track.”

Based on Medtronic’s research dataset, which includes data on 10,000 people with diabetes, Sugar.IQ With Watson’s predictive models have shown an AUC accuracy level of around 85-89 percent when predicting the risk of hypoglycemic episodes two to three hours ahead. By harnessing the power of machine learning, the company is hoping to enhance the predictive capabilities of these models even further—by predicting hyperglycemia, continuously predicting glucose levels, and harnessing the ability of natural language conversations with Watson to help people plan their days more effectively, with the aim of keeping

themselves healthier and safer.

Neemuchwala concludes: “Thanks to our IBM solution, we should be able to provide timely advice to help people better manage their diabetes—potentially avoiding hospital visits, improving quality of life, and reducing the cost of care for health providers, insurers and governments around the world.”

Medtronic

About Medtronic

Medtronic is a global healthcare solutions company committed to improving people’s lives with medical technologies, services, and solutions. With four divisions focusing on the most pertinent health issues faced by the globe, Medtronic builds technologies and conducts research that will keep the future healthy. Its guiding principle is to contribute to human welfare by applying biomedical engineering to the research, design, manufacture, and sale of instruments and devices that alleviate pain, restore health, and extend life.

Solution components

- HC: Provider Solutions
- InfoSphere Streams
- Streams

- Watson Platform for Health (LSC) - SaaS

Take the next step

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