Storstrøms ErhvervsCenter lays the foundation for a new model of elderly at-home healthcare.

Overview

- ***Business Challenge***
  A regional business development group, Storstrøms ErhvervsCenter sought a way to mitigate the looming strain on healthcare resources that the region's growing elderly population represented – and do so in a way that created new revolutionary service opportunities.
- ***Solution***
  Storstrøms ErhvervsCenter worked with IBM and local healthcare providers to create a predictive health monitoring system. By combining advanced telemetry technology with leading-edge practices in other industries, SEC laid the groundwork for a whole new way of managing chronic illnesses among the elderly.
- ***Key Benefits***
  - *Estimated reduction of €100 million in healthcare costs associated with debilitating falls over a ten-year period (for a region of 800,000 citizens)*
  - *Estimated reduction of €25 million in healthcare cost savings related to improved means of monitoring hypertension*
  - *Improved quality of life for elderly citizens*
  - *More efficient allocation of scarce healthcare resources*

Storstrøms ErhvervsCenter (SEC) is a publicly funded independent business development center whose mission is to assist small and medium-sized enterprises, with the aim of strengthening the economy of the Storstrøm region in Denmark. One of SEC's top goals is to inspire companies in fields such as healthcare services to leverage new technologies and services to support growth.

While there may be a number of ways to define it, business innovation is at the core about finding new ways to solve problems or improve practices. In many cases, innovation tends to happen within an industry or a market, since many business practices, issues and requirements are specific to particular industries and markets. But it's also true that some of the most notable improvements come about when innovations cross industry boundaries. Making cross-industry innovation work depends not only on the strength of the initial idea, but on the creative vision to connect it to broader problems.

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> – Ann Roldan, project manager, Storstrøms ErhvervsCenter

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Lessons from the farm

One particularly compelling example of this exchange originated in Denmark's livestock industry, where time-tested processes came into conflict with regulatory changes. As long as there have been livestock farms, success has depended on getting the most from animals, and that includes maximizing their reproductive efficiency. For pig farmers, one of the biggest challenges in this area has been in knowing when a sow was ready to mate, a determination usually made by visually observing their behavior while immobilized in a pen. When the European Union established new rules that restricted their ability to restrain their pigs, farmers – especially on large farms – needed to find a more practical and efficient method of sensing a sow's reproductive readiness and reacting accordingly. Working with a group of farmers, researchers from the University of Copenhagen used 3D accelerator sensing technology to develop a wireless telemetry solution that detected the telltale changes in a sow's gait that indicated estrus, and automatically notified the farmer. This enabled pig farmers to circumvent the disruptive effects of the new regulations.

The second half of this innovation story shifts the focus to Storstrøm County, a 2,000-square-mile region in southeast Denmark with a population of just over 260,000 – and into the realm of human healthcare. Like most of Scandinavia, Storstrøm County operates a world-class healthcare services infrastructure. While funding comes from the Danish government, it is the responsibility of counties such as Storstrøm to administer healthcare services. Beyond this, Storstrøm also plays a more general role in supporting regional business development through Storstrøm ErhvervsCenter (SEC), a publicly funded organization whose mission is to assist small and medium-sized enterprises and to inspire them to leverage new technologies and services to encourage their growth. It was in the latter role that SEC (www.sec.dk) provided a catalyst for healthcare innovation.

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Heading off trouble

Like much of the developed world, SEC recognized the increasing strain that an aging population was likely to place on the county's healthcare infrastructure. Of particular concern was the growing population of elderly patients with high blood pressure or mobility issues that make them prone to falling. To manage their conditions and prevent adverse events, caregivers need to make frequent and costly visits to patients' homes to monitor them. With this population expected to surge – along with that of chronically ill elderly citizens in general – Storstrøm foresaw even greater strains on its healthcare resources in the future. The real motivator, however, is the much higher personal, clinical and financial costs society incurs when prevention fails and at-risk patients become victims of debilitating falls, broken hips and strokes.

SEC sought not only to head off this problem, but to do so in a way that would catalyze Storstrøm's healthcare community. Cross-industry innovation proved to be a critical ingredient in realizing this vision.

In collaboration with local municipalities and healthcare providers, SEC engaged IBM to help it develop a pilot system to demonstrate the viability of the concept. At its most basic, the system needed the ability to detect and then transmit the relevant health data, which were defined as blood pressure readings and – more challenging – a measure of the "normalness" of a patient's physical movement. It was at this point that IBM introduced the idea of adapting the livestock motion detection approach to the human motion requirements of SEC's solution. It was a perfect fit, opening the door for a first-of-a-kind healthcare telemetry solution.

Sensing trouble and sending help

Led by IBM Global Business Services, IBM designed and successfully built a wireless predictive monitoring solution that measures blood pressure and muscle movement at the patient's home and feeds it – securely and automatically – to a centralized facility where it can be analyzed and acted on by healthcare providers. In designing the solution, IBM's overarching goal was to maximize its ease of use and minimize its intrusiveness on patients' day-to-day activities. It achieved this by simplifying the sensing method on the front end of the solution. To read blood pressure, elderly patients step on a scale in their homes and affix a measuring device enabled with a Bluetooth wireless sender. In stepping on the scale, the patient automatically transmits the data from the device to an asset monitoring hub, a specially configured Sony Ericsson P910i Smartphone that performs the solution's most critical functions. The "brains" of the hub are an embedded software solution called IBM Personal Care Connect (PCC) that was developed by IBM using the IBM WebSphere Everyplace suite of products. The key sensing function is performed by IBM WebSphere Event Broker, which – upon detecting the signal – triggers IBM WebSphere MQ Everyplace to deliver the information to a remote IBM System p server, which stores it in an IBM DB2 database. If the central system detects a blood pressure reading outside of a normal range, it can be configured to send an alert that would trigger the appropriate medical intervention.

The motion sensing part of the solution was rooted in the observation that among the elderly, abnormal movements tend to signal a higher likelihood of falling. This is where the existing motion sensing technology used in the livestock solution comes in. As the patient walks, a small, belt-mounted sensing device uses Bluetooth to send motion data to the PCC hub, which uses the

Key Components

Software

- IBM WebSphere® Event Broker
- IBM WebSphere MQ Everyplace®
- IBM Mobile Connect
- IBM WebSphere Everyplace Suite Embedded Edition
- IBM WebSphere Everyplace Connection Manager
- IBM DB2®

Servers

- IBM System p™

Services

- IBM Global Business Services
- IBM Software Services for WebSphere

Time frame

- Solution design: 12 months
- Implementation: 6 months

Why it matters

In its role as a regional business catalyst, Denmark's Storstrøm ErhvervsCenter (SEC) applied a fresh approach to an old but growing problem – keeping the at-risk elderly population healthy. Leveraging advanced sensing technology, SEC laid the foundation for the automated monitoring of elderly patients in their homes, and a fundamental change in the way healthcare services are delivered.

same combination of WebSphere tools to upload the data to the centralized server. Once there, an algorithm compares the patient's motion to a baseline that the system calculates from empirical observations. As with blood pressure sensing, a motion pattern that deviated from an established norm would signal the need for caregivers to check on the patient and head off a potentially catastrophic fall. By leveraging the fundamental approach of the livestock application, IBM and SEC have established a means by which the Storstrøm healthcare system can improve patients' lives by being more proactive in the way they deliver care.

Changing the formula

As with any healthcare initiative, the most important measure of success for the predictive monitoring system is what it does for patients. To underscore this benefit, one need only look at the human and financial cost when the warning signals of hypertension and fall proneness are missed and patients suffer strokes, falls and broken hips. That's just what SEC did in a business case it compiled in the wake of the pilot. The biggest beneficiaries were the at-risk elderly, who would be far more likely to sustain high-quality lives. But so too were the broader base of citizens, for whom the efficient use of scarce healthcare resources will become an increasingly important priority. By SEC's estimates, a region of 800,000 citizens would be expected to reduce the healthcare costs associated with debilitating falls by as much as €100 million over a ten-year period, with another €25 million in savings related to improved monitoring of hypertension.

But that's just the start. True to its mission of nurturing opportunity, SEC has applied for grant funding from the European Union to further its studies and work with IBM, which will expand the system's capabilities and develop a market-ready offering. Ann Roldan, a project manager at SEC, sees the solution providing similar preventative benefits for other chronic conditions – such as diabetes – as well as in monitoring patients at home after surgery. "The work we achieved with IBM provides clear evidence that remote predictive monitoring of chronic medical conditions can help healthcare organizations deliver better outcomes while achieving a whole new level of resource efficiency," says Roldan. "It shows how the right combination of fresh, creative thinking and enabling technology can fundamentally change the equation in healthcare service delivery."

For more information

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