IoT Transformation at Carestream: Market Disruption and Improved Customer Relationships

Overview

Carestream is a worldwide provider of dental and medical imaging systems and IT solutions; X-ray imaging systems for non-destructive testing; and advanced materials for the precision films and electronics markets—all backed by a global service and support network. By applying insights and voice-of-the-customer feedback, the company creates inventive, elegant solutions that offer a smarter way forward.

Imaging is a critical part of the diagnostic chain of events that is essential to positive patient outcomes. Carestream sees the IoT as a major enabling technology that can help ensure that this critical imaging link is performing at peak efficiency so its healthcare customers can focus on what matters most: helping people. Medical providers large and small, from clinics and single hospitals to large networks and even entire countries, are upgrading their radiology and IT systems using Carestream's latest solutions.

Problems and Opportunities

In the healthcare imaging services segment, Carestream sought to differentiate itself and increase share in a mature market. In the healthcare information systems segment, it saw an opportunity to improve critical maintenance and performance issues, and thus its relationships with customers.

Medical Imaging

Healthcare imaging centers provide diagnostic imaging from computed tomography (CT), magnetic resonance imaging (MRI), digital mammography and other advanced imaging systems to physicians in digital format as well as printed on radiographic film, tailored to the referring physician's requirements.

The global market for diagnostic print services is mature and increasingly commoditized due to consolidation into a few large vendors that have heightened customer's sensitivity to total cost of ownership. Carestream sought a new and innovative way to improve the customers total cost of ownership through consumption based services that has resulted in the creation of a new business model that has disrupted this commoditized market and changed its dynamics in Carestream's favor.

It turned to the application of the Internet of Things (IoT) and created Carestream Managed Print Solutions (MPS), which uses IoT to monitor usage, enable the ordering of radiographic film, improve product uptime, and build stronger relationships with customers.

Healthcare Information Systems

Carestream also had an opportunity to optimize critical maintenance and performance of its Healthcare Information Solutions (HCIS) portfolio, which simplifies clinical data management throughout different imaging departments. As the IT ecosystem expands from just back-end infrastructure to more bed-side diagnostics or patient facing, maintenance and system uptime becomes even critical to healthcare providers.

Carestream incorporated IoT into its HCIS offerings to shift service from a reactive model to one of proactive response and maintenance. The new service deployed onsite or via the Cloud helps to monitor key metrics and thresholds so that issues can be addressed before it impacts the system uptime.

Strategic Choices

Michael Porter and James Heppelmann, writing in the **Harvard Business Review**, identified 10 specific strategic choices faced by companies seeking to gain competitive advantage in a smart, connected world. Each involves trade-offs, and none can be dealt with in isolation. Together they must define a distinct and

interdependent strategic positioning. Carestream had to think carefully about opportunities and available resources before making the appropriate choices and committing to their IoT strategy.

Three initial choices governed their initial IoT implementation.

What Smart Connected Product Features and Capabilities Will Be Pursued?

Carestream's MPS products initially focus on monitoring the performance and usage of their products, not unusual with first-generation IoT implementations: being able to clearly demonstrate operating efficiencies is a quick win with customers.

IoT enabled Carestream's printing business to continuously and accurately monitor how much film is being used in a given location, to a great level of detail including film size, type, and material. It could also monitor the DRYVIEW laser imaging system performance ensuring uptime.

> As the ability to unlock the full value of data becomes a key source of competitive advantage, the management, governance, analysis, and security of that data is developing into a major new business function." How Smart, Connected Products are Transforming Companies, HBR October 2015."

The HCIS team has also enabled monitoring, in this case, various aspects of equipment status, including software services and various IT related properties like hard disk free space in order to improve uptime and reduce customer efforts to maintain installations.

How Much Product Functionality Should Be Embedded, and How Much of It Should Be Cloud-Based?

Carestream's IoT enabled products produce a significant amount of machine data. Using cloud connectivity, that data is reliably captured and subsequently downloaded to Carestream's own databases, where it is analyzed. The processed information is then transferred to a variety of company back-office systems and various portals to enable monitoring of products and improved interactions with customers.

Keeping transactional functionality in the cloud, and using it as input to back-office systems and portals, minimizes any changes that need to be made to the actual imaging systems in the customer environment. This enables Carestream to minimize cost increases while still providing greater service value. Due to the standard and well-defined nature of imaging functions, there is no need for printers to respond immediately to their environment. Thus, there is no drawback to embedding minimal functionality on the product, and a number of advantages to hosting data capture in the cloud.

To enhance the customer experience, Carestream provides a sophisticated user interface for each customer with their personalized account, so that the customer can log in, view usage, billing, and shipping information, along with some service history. This portal allows for a multi-site view for larger enterprises. Finally, it also allows customers to check that they are being invoiced accurately for the film that has been provided.

A portal is best handled through a common platform so that it can be scaled across several product platforms and a global customer base as offerings increase over time.

What Product Data Must Be Captured, Secured and Analyzed to Maximize Product Value?

Medical imaging equipment is a critical part of the diagnosis chain. As an example physicians request a variety of imaging formats, depending on their needs and practice patterns. Usage of various film forms, sizes, and materials can be difficult for imaging centers to track and anticipate. Constant monitoring of usage data provides Carestream's logistics team with the information that enables prompt and accurate replenishment of the necessary film and eliminates that burden from the customer.

In addition usage data was also combined with monitoring of printer performance and wear. This enabled Carestream's service teams to adjust printers remotely to optimize product performance, and schedule preventive maintenance as needed, long before there is any discernible degradation in function.

The HCIS organization monitors the operational status of the many IT services necessary for managing complex and specialized healthcare imaging data. The data generated by these new monitoring functions and associated portals allow the HCIS service team to proactively monitor over 100 metrics across a large installed base and effectively anticipate system problems, thus preventing any potential problems before it becomes a downtime. The service team can also monitor system usage such as storage or software licenses so that customers are fully optimizing their investment.

Business and Organizational Transformation

IoT's demand for constant connectivity can be hard to meet, particularly with systems that previously had minimal network capability. With the increased need for connectivity, Carestream's customers sometimes struggled with network connections, and often required an additional vendor for setup. In many areas of the world, connectivity is limited, and requires a 4G or even 3G mobile connection, with the difficulties that implies. Carestream had to be careful to monitor and assist with such difficulties, providing a new level of customer communications and support.

In terms of Carestream's own internal operations, the big challenge has been managing the changes to its sales model. As with many IoT implementations, Carestream's sales team had to make the transition from selling a product to selling a service, a change with significant implications. The sales team went from dealing with single large, annual transactions, to interacting much more often with their customers. They had to develop new methods for managing their own operations.

Customer Transformation

The customer's acceptance of this new approach couldn't be taken for granted either. This really is a new way of providing sales and service to customers. They have their specific expectations, workflows, and habits, which will also be disrupted by the new approaches. Such offices are constantly busy, and rely on a steady, recognized workflow to function. Reconfiguring processes would be resource-intensive and take a significant amount of time. Carestream was careful to take this into account, manage customer expectations, and effectively communicate the benefits of the changes. The fact that customers could see every transaction, monitor key machine information, and outsource some internal responsibilities was also an advantage for their operations.

Internal Process Changes

In order to achieve its goals, Carestream had to bring together a number of internal departments that were not used to working together. R&D, IT, Logistics, Service, and Sales were all involved. Some of these groups were used to working together for commercialization purposes, but other groups, such as IT, were not normally involved directly with commercialization. Key to moving forward was recognizing that this was not primarily a technology project, though it was initially thought to be one. The process re-engineering component was the most important part of the change, and the biggest challenge to communicate across the various groups in order to get alignment across the company on the approach. The entire process used to be handed off from one group to another sequentially. Now continuous collaboration is essential for success.

In addition, the implementation had to be understood and managed across different regions and countries, all with their specific procedural requirements.

Business Model Changes

One of the risks of being a disruptive force and an early adopter is a necessary lack of certainty about the value proposition, an understanding of where the highest value to the customer lies. Carestream is looking to understand and transform this market first, and will be continuously evaluating the real value provided to customers.

> Having full transparency about how customers use products helps companies develop entirely new business models." How Smart, Connected Products are Transforming Companies, HBR October 2015."

The new business model is still emerging. Carestream is expanding it, investing further, and working on continuous improvement of the sales and service models. The problem is no longer the availability of the technology, but the way it should be implemented. Data can no longer be treated separately in functional silos such as product development, service, marketing, sales, or manufacturing. Product Lifecycle\Management will have to merge with Application Lifecycle Management and Service Relationship Management to form an integrated whole. The key to success will no longer be a better technology product, but one whose value-added services allow for customer partnership. In disrupting the market, Carestream is aware of the organizational disruption that is a necessary corollary.

Outcomes

HCIS has shown an interesting outcome, which holds an important lesson for all IoT implementations: a well-designed system increases interpersonal contact, building a tighter and stronger relationship with the customer. This proactive approach enabled by the IoT, detects system problems before they become serious, has reduced customer downtime, made maintenance a less-intrusive focus, and ensured that resources are renewed at the proper time. As a result, service interactions are centered on more complex and important functions, and increased the time customer service reps can spend on instruction, training, and advice.

From the point of view of imaging offices and departments, the result has been an ability to focus on serving their own physician customers, rather than internally monitoring equipment function and film volumes. Since everything is accurately tracked and recorded, office managers can always look back to understand usage patterns, see a useful record of what has been done to proactively anticipate and head off equipment failures, something that has significantly improved Carestream's relationships with its customers.

At a Glance

IoT Business Opportunities

Carestream wanted to differentiate itself in its markets by providing more responsive and innovative customer service through the development of IoT functionality.

It sought to do this in two of its main business areas: Managed Print Services and Healthcare Information Solutions.

Through the use of IoT, Carestream has been able to provide an increased level of service to its customers and has been able to gain market share and increase profits by distinguishing itself from its competition through that increased service.

IoT Benefits and Results

- For its Managed Print Services (MPS) Carestream has been able to monitor and proactively respond to customer use of radiology film, preventing inventory problems and offering new consumption based models to customers.
- MPS has also been able to provide proactive servicing for Carestream's DRYVIEW line of laser imaging systems.
- For its Healthcare Information Solutions (HCIS) service, Carestream has been able to anticipate outages, eliminate downtime and provide its customer with useful information on the use of Carestream services.
- Carestream's customers were able to focus on providing a higher level of service to their own customer base.

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With over 25 years of experience spanning product design, business process re-engineering, project management and IT system development David brings a unique perspective to conversations involving the Internet of Things (IoT) and its impact on enterprise businesses. As a frequently requested contributor to industry publications and conferences, David regularly contributes leading edge ideas relative to the IoT, Product Commercialization, and Engineering IT. As a Senior IT Director for Carestream Health Inc. David is currently immersed in comprehensive IT system implementations in the areas of IoT, Quality Management, Engineering Applications and Project/ Portfolio Management.

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