EXECUTIVE | SCHOLAR

EXCHANGE

A TCS Perspective by (above) SREENIVASA CHAKRAVARTI, Global Head of Manufacturing Innovation & Transformation and (below) SENTHILKUMAR K, Lead Consultant, Big Data Analytics

Manufacturing, Disrupted: Changing the Game with Analytics

DATA ANALYTICS IS NOT ONLY ENHANCING the way manufacturers design and build products, bring goods to market and serve customers, but it is also profoundly transforming the industry itself. Using advanced analytics and data gathered from what is known as the Internet of Things (IoT)—including connected machines and equipment, connected customers and connected processes—manufacturers are boosting product quality, cutting costs, finding efficiencies, forging new customer relationships and generating entirely new ways of doing business.

Consider the automobile sector. Whereas automakers have traditionally relied on after-the-fact information about vehicle performance in the field, they can now apply predictive analytics to real-time feedback from customers and vehicles. This enables them to render proactive services to avoid penalties and lower the cost of warranties and recalls, while upholding brand reputation.

SPECIAL SPONSORED SECTION

One OEM, for example, applies machine learning algorithms to voice-of-the-customer data regarding automobiles under warranty. This enables the company to reduce the time required to detect quality issues by 35%. With the added buffer of time, the OEM's quality engineers have introduced countermeasures, helping the company avoid product recalls. Previously, when the OEM relied on historical warranty claims data, it could take three to six months to detect a quality issue.

Through analytics, manufacturers are also increasing Overall Equipment Effectiveness (OEE) and throughput by using sensor-equipped machines to remotely monitor plants for corrective or preventive actions. In one case, a chemicals manufacturer began analyzing equipment sensor data—pulled into its big data ecosystem in real time—to remotely monitor pumps and other process equipment. The company reduced operational expenditures and improved asset utilization for better returns on capital expenditures.

In another example, an OEM seeking to double its production output discovered a bottleneck in one of its plants by using sensor data. The insight enabled the company to eliminate weekend maintenance and breakdowns, as well as boost capacity without adding equipment.

Sensor technologies are also being embedded in products sold to customers, leading to unprecedented insights. Engine manufacturers, for example, can identify usage and performance patterns to optimize product design or quality. They can accomplish this by assessing the gap between product design and actual performance, and then run a what-if analysis to determine the impact of changes on product parameters in actual customer conditions.

Perhaps more important, "intelligent" manufacturers can use these insights to add a new dimension to customer relationships through proactive services to end users. For example, using the conditions observed and the patterns analyzed, they can advise customers in real time about potential failures.

Even more revolutionary changes are on the horizon, as forward-thinking manufacturers are beginning to use the real-time intelligence gleaned through analytics to find new revenue-generating opportunities. An example is an aircraft engine maker that uses field data from its aircraft engines to monetize service levels and sell engines based on actual flying hours.

Adopting these types of product-as-a-service revenue models will be one of the most important factors shaping the manufacturing industry over the next few years, according to research firm International Data Corp. (IDC). Manufacturers will need to transition from a "product-as-an-asset" mindset to a "products-as-a-service revenue-generating platform" one, according to IDC.

Indeed, any manufacturer that does not yet leverage analytics capabilities—which are increasingly fueled by data from the IoT—runs the risk of being overtaken by competitors that do. IDC predicts that by 2017, 70% of global discrete manufacturers will offer smart, connected products.

Entering the New Age of Manufacturing

As we enter the new age of manufacturing, data analytics can provide "traditional" manufacturers with a powerful competitive edge with which they can fend off competitors disrupting the industry with redefined business models. These models unlock new sources of revenue via direct monitoring of performance, quality and consumption, supported by analytics and connected products enabled by the IoT.

To begin their journey toward the optimal use of analytics and the IoT, manufacturers need to be mindful of the critical success factors that will propel the transformation. Decision-makers must first prioritize the most advantageous scenarios for applying analytics. At the most basic level, this means deciding between improving internal business operations or enabling market-making capabilities, such as monetizing services.

Manufacturers must also clearly identify the business problems they are trying to solve. Although the opportunity to examine multiple data sets is immensely attractive, it could potentially impede the flow of business if stakeholders are working at cross-purposes from other stakeholders. Without defining stakeholder requirements, as well as which processes and procedures need to be refined in the quest for competitive advantage, organizations cannot make the best technology decisions and optimize their use of analytics. A close alignment between business goals and the analytics solution will help ensure success.

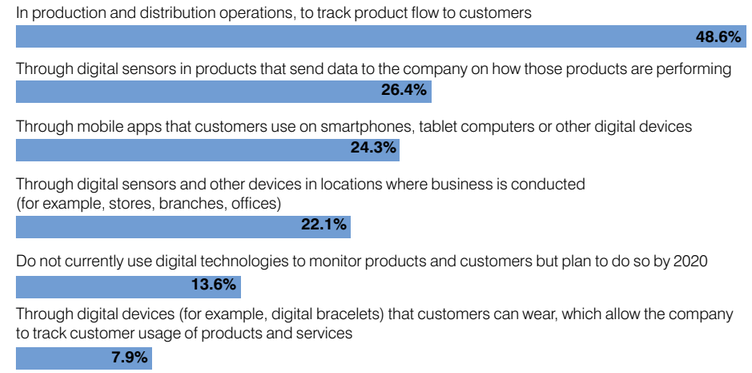
Another critical element is identifying the right data to analyze. Manufacturers need to know how data was generated for a particular process—such as how each subsystem or payload system operates—to effectively set up the data analysis. Equally important is sharing data across the value chain, as visibility into insights must be available to all relevant constituents across the ecosystem to make their context-specific interpretations.

Choosing the right machine learning algorithm, including open-source algorithms, is another critical success factor. Visualization tools are also rapidly taking center stage to enable end users of data to analyze patterns, particularly in the area of predictive analytics. Visualization tools or features must be dynamic and intuitive, enabling users to simulate multiple scenarios in seconds.

No matter what the actual decisions are, it's clear the time is now to begin strategizing around the usage of analytics to deliver the biggest bang from the IoT buck. Applying game-changing analytics to the surge of data flowing from connected products, connected processes and connected people—especially customers—is a priority. Manufacturers can ill afford to wait before taking steps to discover its potential. •

TOP STRATEGIES FOR IoT ANALYTICS

Manufacturing firms experienced the highest increase in overall revenue compared with firms in any other industry, according to the recent Global Trends Study conducted by TCS. Here's how they're putting IoT insights to work.



Source: TCS

ROLE OF THE IoT IN MANUFACTURING INNOVATION

A Scholar Perspective by DR. SHOUMEN PALIT AUSTIN DATTA, Research Affiliate, School of Engineering, MIT, and Senior Vice President, Industrial Internet Consortium

THE MANUFACTURING INDUSTRY will experience sweeping changes attributable to advances in technology and connectivity due to the Internet of Things. A tsunami of data about connected objects, intelligent analytics and the consequent actions, combined, will influence the future of manufacturing, business and customer lifestyles.

Data acquired from products, assets, machinery and people may enable manufacturers to design or re-design products to improve customer satisfaction, loyalty and retention. Increased visibility may augment supply chain transparency. For instance, connectivity may allow near real-time information about location and delivery status, in addition to product identification, performance tracking and efficiency optimization.

Precision monitoring of shop floor equipment will enhance the granularity of metrics (mean time between failure), enable preventive maintenance, decrease downtime and reduce energy use. By creating "digital twins" (3-D models that act as digital companions for physical systems), companies can detect variations in performance and modify production runs if product excellence is compromised.

The IoT ecosystem, in combination with digital 3-D concurrent engineering, may lead to cyber-manufacturing (cyMAC). In this view, design, manufacturing, metrology, re-design and re-manufacturing will be coupled and compressed due to advances in 3-D printing, especially in the case of high-value metal additives.

In a cyMAC environment, most elements of the manufacturing process will be connected. Sensors and actuators will provide data, as well as execute feedback through automation and enhancements due to the integration of robotics. cyMAC will require the use of digital twins, not only to monitor and execute but also to simulate tasks and activities. The latter is essential to autonomy and to modeling the value of automation with respect to scalability and reproducibility.

Industrial IoT may reduce the cost of precision variant configurations of high-value products that use alloys with exotic properties necessary in the aviation and automobile industry. Turbine blades are an example.

Remote manufacturing with appropriate cybersecurity measures will make it routine for operations to print drones and medical equipment at distant locations using instructions from the source and 3-D printers at the remote site. For example, the U.S. Navy has installed a 3-D printer on board the USS Essex that is capable of printing drones configured for specific functionalities on demand. Using MRI, CAT and PET scan data, printed hip joints and knee replacements will be designed to fit perfectly. Advances in material science will enable super-alloy titanium joints to be printed with embedded sensors and installed with *in situ* wireless communication to receive and transmit signals (i.e., sensor "skins" with transducers).

Surface components may include printed electronics, nanomaterial RFID and nanoradios for transmitting and receiving signals. 4-D printing may add an extra dimension by enabling the use of materials that respond autonomously to stress and strain by changing shape, either through hydration or voltage pulses or through the detection of environmental change (chemicals, pH, decibels, lumens, radiation or vibration).

cyMAC 5.0 may usher in the age of robotics 5.0, where clusters of atoms may be linked to bits and bytes in a manner that can sense, think and respond. The latter will redefine the principles and practice of ubiquitous computing in the context of connectivity. •

SPONSORED BY

TATA

TATA CONSULTANCY SERVICES

From aligning your IT with your business needs to an end-to-end strategy for transforming your enterprise, TCS has the world-class experience and expertise that you need. Learn more at **www.tcs.com/industries/manufacturing**.