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**White paper**

# Analytics in Manufacturing

An opportunity for business growth

While manufacturers possess vast amounts of valuable data, hardly any of it is being analyzed. With a well-developed analytics strategy, manufacturers can tap into this value, converting data into actionable insight to improve decision-making. This white paper examines how analytics can increase operational productivity, create competitive advantage and develop new business opportunities.

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**Key benefits of big data analytics in Manufacturing:**

- Increase actionable insight and data-driven decision-making
- Improve performance and productivity of operational assets
- Introduce predictive maintenance
- Improve product quality
- Initiate demand-driven production
- Enhance customer experience and satisfaction
- Launch new data-driven products and revenue streams
- Boost after-sales and services business

## Introduction

Data centricity is defining a C-Level agenda that puts business intelligence, artificial intelligence and big data as the top three digital transformation initiatives.[1] It also marks a watershed moment for manufacturers, as their traditional operating boundaries fall away, revealing a new world characterized by digital services, processes and customer interactions. Manufacturers are starting to see the industrial Internet of Things and the establishment of Industry 4.0 as the new status-quo.

While the associated explosion of data and data sources presents a challenge, it also provides an opportunity. If managed properly, data has the potential to become an organization's most valuable business asset.

While there has never been a shortage of data within manufacturing organizations, the amount of data created today is far greater than ever before. In fact, one high tech manufacturer reports processing five terabytes of machine data every single hour.[2] As Industry 4.0 develops and more intelligence is added to smart manufacturing processes, the volume and variety of data will only increase and at an incredible rate. For manufacturing companies to extract value from the data they are creating and collecting, they must:

1. Gain control of the vast amounts of data.

2. Ensure access to the right information, from multiple structured and unstructured data sources, and apply analytics for improved decision-making and productivity.

These goals can be achieved by leveraging new technologies and using big data solutions to extract value from them. The manufacturing sector has traditionally been slow to adopt new technologies and many organizations find it difficult to fully benefit from investments in digital technologies. An Industry Week survey found only one quarter of manufacturing leaders felt they had gained an advantage from their digital investments, while one-third felt they had achieved little or no performance advantage.[3]

Despite this, manufacturing executives understand the benefits of big data and analytics. The clear majority of respondents to the Industry Week research stated big data and analytics were important or very important across a wide range of their business activities.[4] Yet when asked, fewer than 20 percent of respondents had extensively implemented big data analysis for those activities (See Figure 1). But there are signs that some organizations are catching on—and seeing benefits. A study by OpenText and SAPIO Research found more than half of northern European manufacturers surveyed were using big data to derive business insight, while 30 percent believed a major benefit of digital transformation was improved decision-making from big data analytics.[5]

To date, most manufacturing sector analytics have been in the form of business intelligence (BI). This has encompassed data visualizations to demonstrate operational efficiencies or analyze historical, siloed data sets to improve areas such as product quality and sales forecasting. Traditional BI has an important role to play in understanding performance in production, operations and the supply chain. But big data analytics represents a step forward from more traditional BI analytics and offer impressive rewards to organizations that successfully exploit its potential.

1  451 Group Voice of the Enterprise: Digital Pulse, Budgets and Outlook - Quarterly Advisory Report (Jan 2018).

2  The Economist, Intelligence Unit, Perspectives, Automation and the data driven future of automation. https://www.eiuperspectives.economist.com/technology-innovation/data-dimension-robotics-and-automation/blog/automation-and-data-driven-future-manufacturing
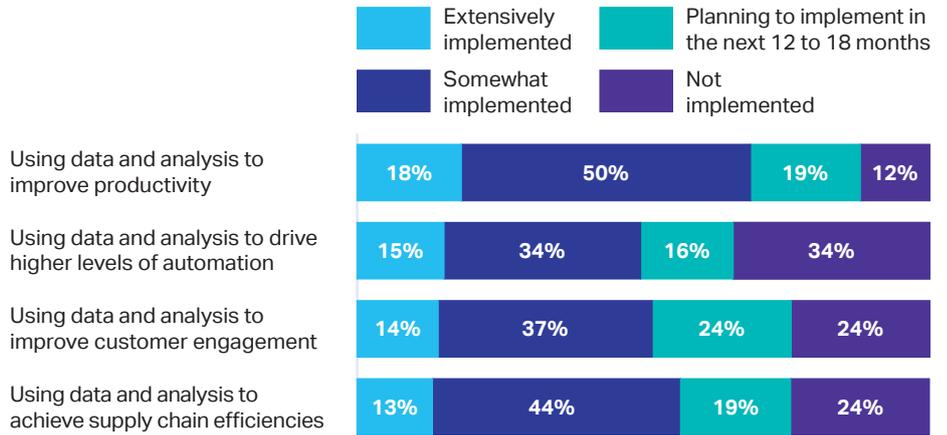
3  Industry Week, Manufacturing's Digital Transformation: Is Your Company Leading the Way or Falling Behind? (2017) http://www.industryweek.com/sponsored/manufacturing-s-digital-transformation-your-company-leading-way-or-falling-behind-research

4  Industry Week, Manufacturing's Digital Transformation: Is Your Company Leading the Way or Falling Behind? (2017) http://www.industryweek.com/sponsored/manufacturing-s-digital-transformation-your-company-leading-way-or-falling-behind-research

5  Sapio. Digital Transformation in Manufacturing – Drivers, Benefits, and Challenges – OpenText (2017). http://sapioresearch.com/our-work-1/2017/7/20/digital-transformation-in-manufacturing-drivers-benefits-and-challenges-opentext

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Beyond the descriptive analytics of BI, a new generation of predictive helps and prescriptive analytics enables accurate forecasting of future performance and help identify the best actions to take. Artificial intelligence, combined with machine learning, provides a continually improving analytics platform, well suited to the repetitive processing of big data. The potential exists to automate decision-making in real time with less human intervention.

| | | | |
|---|---|---|---|
| ■ Extensively implemented | | ■ Planning to implement in the next 12 to 18 months | |
| ■ Somewhat implemented | | ■ Not implemented | |

| | Extensively implemented | Somewhat implemented | Planning to implement | Not implemented |
|---|---|---|---|---|
| Using data and analysis to improve productivity | 18% | 50% | 19% | 12% |
| Using data and analysis to drive higher levels of automation | 15% | 34% | 16% | 34% |
| Using data and analysis to improve customer engagement | 14% | 37% | 24% | 24% |
| Using data and analysis to achieve supply chain efficiencies | 13% | 44% | 19% | 24% |

(Source: Industry Week)

Figure 1: Implementation of big data analytics to key business activities

## Defining big data analytics

Manufacturing companies have been generating and storing growing volumes of data in a multitude of systems, but have left this vast, yet highly lucrative asset virtually untapped.

Big data analytics exploits this data in many ways, but only if the organization takes an enterprise-level, end-to-end view of its various data sets. LNS Research defines big data analytics in Manufacturing as "using a common data model to combine structured business system data, like inventory transactions and financial transactions, with structured operational system data, like alarms, process parameters and quality events, with unstructured internal and external data like customer, supplier, web and machine data to uncover new insights through advanced analytical tools."[6]

This holistic approach required for big data analytics relies on two key capabilities in areas where many manufacturers have weaknesses:

### Enterprise Information Management (EIM)

In addition to the data in enterprise resource planning, product lifecycle management, enterprise manufacturing intelligence and manufacturing execution systems, the Internet of Things generates an incredible amount of data. A single sensor monitoring one element of a production line can be producing thousands of data sets every minute. These are stored in massive data pools, which are often siloed by enterprise application, business division or operational process, with analysis conducted for tracking purposes, rather than business improvement. It is simply unsustainable for an organization to retain vast amounts of data from every connected device over a long period. By deploying edge analytics—analytics conducted at the device or network point level—allied to information governance policies, EIM helps demonstrate which data has long-term strategic value and which can be erased.

6  Littlefield, Matthew. LNS Research, What is big data analytics in manufacturing? (2015). http://blog.lnsresearch.com/what-is-big-data-analytics-in-manufacturing

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## Comprehensive data federation

Organizations lack an understanding of how to federate different sources and types of data. It is not uncommon for manufacturers to have large amounts of production and quality data. But bringing them together is difficult. Added to these internal data pools are new data sources, including social channels, trading partner systems and IoT data. Only by analyzing data from all of these sources together, can the insight derived be set in the proper context to effectively improve processes and productivity. Big data solutions can release the value from these large data sets. They extract information from existing data sets to understand how things are operating today, as well as to identify patterns and anomalies that predict future trends and outcomes.

Due to the volume and velocity of data, these solutions need to be massively scalable and capable of identifying and accessing data—structured and unstructured—from many sources inside and outside the factory walls. By applying predictive algorithms to big data, manufacturers can generate accurate, forward-looking insights to help them make better decisions. Manufacturers will be able to answer questions such as: What will our customers want from us? How will the weather affect production? Are our products trending on social media and will this impact demand?

Importantly, the right people need access to the right insights in a format they can easily understand, which is where visualizations and graphical storytelling come into play.

This is where expert data scientists can present and create visualizations of the data to make it relevant and useful to business users. For example, once a data scientist has developed and trained a machine learning algorithm, any business user could easily apply it using a simple drag and drop interface.

## 5 key areas for big data analytics in Manufacturing

While big data analytics has the potential to benefit almost every part of an organization, it is particularly suited to the following areas:

### Product development

Big data analytics can help within product design and quality, where the costs are typically high and the failure rate for new industrial products is more than 50 percent.[7] Within design, the advent of natural language processing (NLP), allows unstructured information, such as from customer support conversations and social media channels, to be processed for key concepts, entities and sentiment. This 'voice of the customer' can pinpoint trends or market changes and feed into the design of new products. For quality, big data analytics captures machine-level information to boost production yield and throughput. Data on how many products are produced and at what cost and effort can feed into quality systems to quickly identify problem areas and predict issues in real-time, rather than using root cause analysis to learn what has historically gone wrong. When quality defects in production can cost as much as 30 percent of a manufacturer's revenue[8], analytics can help improve production while significantly reducing costs.

7   Collins, Mike. Forbes, Reducing the failure rate of new products (2015). https://www.forbes.com/sites/mikecollins/2015/04/30/reducing-the-failure-rate-of-new-products/#20e44b685318

8   Sapio. Digital Transformation in Manufacturing – Drivers, Benefits, and Challenges – OpenText (2017). http://sapioresearch.com/our-work-1/2017/7/20/digital-transformation-in-manufacturing-drivers-benefits-and-challenges-opentext

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Knorr-Bremse's iCOM (intelligence conditioned oriented maintenance) platform provides advanced diagnosis and maintenance for both large and small rail and truck fleet operators. iCOM is an Internet of Things platform that uses on-board sensor units in about 30 subsystems, such as brakes, heating and ventilation, wipers and doors to collect data. iCOM uses the data to enable condition-based scheduled maintenance, designed to identify any issue before it becomes a serious safety problem or needs a more costly repair. The company worked with OpenText to embed analytics into iCOM to allow customers to perform more predictive analytics on iCOM data to predict when components would fail, extend the life of a component or to understand the causes of failure. Since going live, the company has reduced maintenance costs by 20 percent.

### Product line extension through digital services

Innovative manufacturing companies are beginning to leverage the insight they receive from the production process to develop new products and services. Over the lifecycle of a product, after-sales and service are often more profitable than the original purchase. Big data analytics allows organizations to create data-driven service packages, as well as completely new data-driven products to generate entirely new revenue streams.

### Better customer focus

Excellent customer experience has become an essential part of every business. Big data analytics draws customer data from a variety of sources to provide a 'single source of the truth' for every customer. Organizations can identify customer preferences, buying trends and engagement levels while beginning to personalize communications via customer touchpoints, such as account or service information. In addition, big data analytics helps in areas such as demand forecasting, by replacing the manual interpretation of Microsoft® Excel® spreadsheets with the automated collection and analysis of information, for a comprehensive view of data across business processes and to more effectively identify recurring trends.

### Operational improvements for enhanced profitability

Operational efficiency focuses primarily on machine availability in the production process and matters relating to Health, Safety and Environment (HSE). Big data analytics minimizes incidents, lost time and environmental impact by autonomously analyzing critical sensor data. Manufacturers can monitor the status of machines and their major components, forming the basis for a preventive maintenance regime that automatically reports when a part is likely to break. This could even include reordering replacement parts in advance of a failure occurring. Preventing breakdowns or incidents before they happen is a critical step in ensuring a manufacturer effectively manages risks associated with HSE and has its plant operating at maximum efficiency.

### Automation

Outside of direct production activities, advanced analytics are beginning to revolutionize back-end processes. Robotic process automation (RPA) combines analytics, machine learning and rules-based software to capture and interpret existing data input streams for processing a transaction, manipulating data, triggering responses and communicating with other enterprise applications. RPA 'analytics robots' can more efficiently and accurately conduct most repetitive, data-intensive tasks and workflows that were previously input manually. While industrial robots change the production line, RPA can bring similar benefits to business areas such as accounting, HR and customer service.

## Types of Manufacturing analytics

Four distinct types of analytics can be applied to manufacturing. Each has its own benefits and loosely builds upon the previous analytics type:

### Business intelligence (BI)

Business intelligence solutions gather, organize and analyze information from all levels of an organization. For manufacturers, BI analyzes for business operations, production activities and the supply chain to give an accurate view of what is happening at that moment. The analyzed data is made available to the people who need it through highly accessible exception reports, dashboards and scorecards showing key performance indicators and other important business metrics.

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### Predictive analytics

While BI allows manufacturers to better understand their existing processes, predictive analytics can forecast future performance. Predictive analytics is primarily a data mining solution combined with specific algorithms and analytics techniques to determine potential outcomes based on trends and patterns in historical data. One of the key benefits of this analytics type is its ability to monitor machinery and use past data to predict future breakdowns as a basis for predictive maintenance. As well as reducing operational expense, predictive analytics can optimize supply chain performance. Manufacturers can analyze big data to inform on supply chain performance, reduce costs and accelerate delivery times.

### Prescriptive analytics

While predictive analytics forecasts future outcomes, prescriptive analytics can inform users what action they should take based on the potential outcomes. It attempts to quantify the effect of future decisions to advise on possible outcomes before the decisions are actually made. Prescriptive analytics uses a combination of techniques and tools such as business rules, algorithms, machine learning and computational modeling procedures. Within manufacturing, prescriptive analytics can have a positive impact at every stage of the design and build lifecycle. It can gather all the data in manufacturing execution operations—data that is rarely analyzed except for performance improvement—and turn it into a source for operational intelligence, product performance and production process improvement.

### AI-enhanced analytics

While prescriptive analytics suggests the best action to take, AI-enhanced analytics provides real-time answers found in vast amounts of big data, reducing the need for human intervention. It combines advanced analytics capabilities with AI features, such as machine learning and natural language recognition, to uncover what is contained in content. An AI-enhanced analytics solution will get smarter and more accurate over time, as it is continually learning. As digital transformation and Industry 4.0 increase data volumes, AI-enhanced analytics is ideally suited to analyzing vast pools of structured and unstructured data across processes, workflows, systems and equipment to deliver actionable insights, organization-wide.

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**Customer story**

**Demand forecasting North Star BlueScope**

North Star BlueScope wanted to improve demand forecasting that had previously relied on Microsoft® Excel® spreadsheets. This approach was costly, as well as time and labor intensive. The company worked with OpenText to implement a big data analytics solution that provides a faster and deeper analysis of costing data. With this solution, the steelmaker can pinpoint higher profit potential and upselling prospects. By having a much clearer understanding of customer needs and trends, the firm has improved decision-making and allowed sales teams to concentrate on higher value customers and market segments.

## Conclusion

Manufacturers understand they must evolve to stay ahead of competitors. However, research shows that only about a quarter of manufacturers feel the millions of dollars they have invested in digital technologies have delivered real advantage.[9] Implementing a comprehensive big data analytics strategy can help these organization see the benefit from these investments. They can gain the insight into operational productivity, business efficiency and customer demand that will create the competitive edge they need.

## About OpenText Analytics

OpenText Analytics provides the powerful reporting, analytics and data visualization technology that organizations need to build high-scale, on-demand, data-driven applications. Analytics Suite 16 comprises OpenText™ Magellan™, OpenText™ Big Data Analytics and OpenText™ Information Hub (iHub). Working together, the products offer an integrated platform for data preparation, data exploration and advanced analytics, taking data from a wide range of sources.

### AI-enabled analytics with Magellan

Magellan is a flexible, AI-enhanced analytics platform that combines open source machine learning with advanced analytics, enterprise-grade business intelligence and natural language recognition capabilities to acquire, merge, manage and analyze big data and big content stored in Enterprise Information Management systems. Magellan enables machine-assisted decision-making, automation and business optimization at speed and scale.

## About OpenText

OpenText, The Information Company™, enables organizations to gain insight through market leading information management solutions, on-premises or in the cloud. For more information about OpenText (NASDAQ: OTEX, TSX: OTEX) visit: opentext.com.

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9  Industry Week, Manufacturing's Digital Transformation: Is Your Company Leading the Way or Falling Behind? (2017)
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