



The artificial intelligence effect on industrial products

Profiting from an abundance of data

Executive Report

Industrial Products

How IBM can help

IBM delivers cognitive platforms and services, industry-specific offerings and expert consulting to support industrial products companies. We engage clients in identifying cognitive manufacturing entry points that can move beyond cost cutting to transforming production. Capabilities include accelerators and services that allow quick starts to key cognitive manufacturing use cases in visual inspection and quality, maintenance and plant-level IoT. Please visit ibm.com/industries/manufacturing/

How to unlock hidden insights

The industrial products industry is awash with data. Instrumentation, sensors, machinery, automation systems, production and operation, maintenance records, and health and safety applications collectively produce a constant flow of data. Industrial products enterprises need technology that supports the vertical delivery of insightful data throughout the organization, both to meet consumer needs and to aim for continuous process improvement. To address operating and market concerns – and deliver on the promise of Industry 4.0 – a small group of financial outperformers is using artificial intelligence (AI)/cognitive to do things differently. Here, they share their AI successes.

Overview

Organizations in the global industrial products industry face significant challenges: cost pressures, increased regulations, disruptive technologies and the increasingly costly delivery of raw resources. High volatility in commodity prices has put severe pressure on company margins and can quickly expose inefficient operations.

Processes, workflows and the understanding of performance are dramatically changing. Operations can no longer work in linear execution, or in isolation of other functional work streams such as engineering, maintenance and planning. Instead, the value chain needs to perform as an integrated whole to support the fluctuating demand cycles and higher cost supply activities.

New AI technologies have the capacity to make sense of the abundance of data through systems that can adapt and learn. By expanding digital intelligence adoption, AI technologies can help executives translate data into insights to drive greater innovation, and better operational and financial decisions.

To understand how organizations can better plan for AI adoption, the IBM Institute for Business Value (IBV), in collaboration with Oxford Economics, surveyed more than 6,000 C-suite members and heads of functions worldwide – including 300 industrial products respondents. The goal was to better understand their considerations, expectations and objectives in applying AI solutions to the most pressing business challenges and opportunities.

**64%**

of surveyed CxOs from outperforming industrial products companies have already begun investing in AI/cognitive capabilities

**67%**

of surveyed industrial products CxOs expect AI/cognitive to play an important role in their organizations' future

**89%**

of surveyed CxOs from outperforming industrial products companies say they plan to invest in AI/cognitive for quality control

This report explores how industrial products executives perceive the readiness of the technology, the industry and their organizations for AI adoption. It identifies how companies are currently applying AI and their plans in the next few years. We also identified a select group of outperformers that are ahead of others in AI adoption and examined what they're doing differently compared to similar organizations.

Digital manufacturing/Industry 4.0:

Digital manufacturing, sometimes referred to as Industry 4.0, uses intelligent IoT for dynamic response to product demands. Interconnectivity of machinery sensors and control systems allows real-time optimization of manufacturing and production processes, and supply chain networks.

These cyber-physical systems also extend to asset management for predictive maintenance, statistical evaluation and measurements to increase asset reliability.

Why AI and why now?

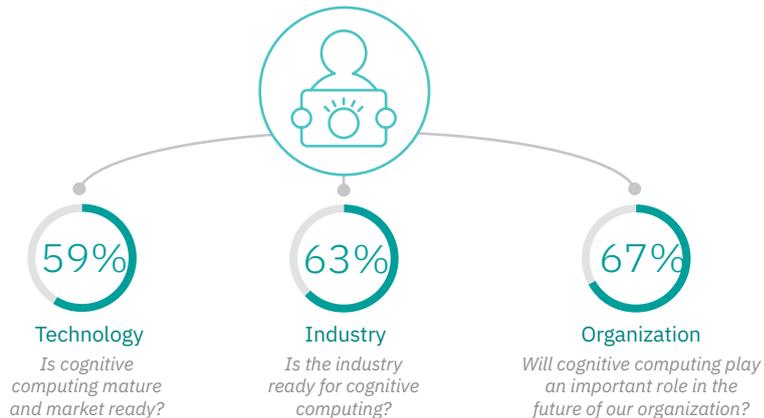
AI enables organizations to synthesize vast amounts of structured and unstructured data, query results in natural language and apply machine-learning capabilities to data analysis. Together, these capabilities can significantly enhance insights, efficiency and speed.

Industrial products companies are at a critical inflection point in their adoption of AI. Surveyed executives recognize that the technology is market-ready, and well over half say the industry and organizations are ready to adopt it (see Figure 1).

Figure 1

Sixty-seven percent of industrial products executives say cognitive will play an important role in the future

Dawn of the cognitive era in industrial products



Artificial intelligence/cognitive:

Cognitive computing refers to next-generation information systems that understand, reason, learn and interact. These systems do this by continually building knowledge and learning, understanding natural language, and reasoning and interacting more naturally with human beings than traditional programmable systems.

Figure 2

Quality control is the most-cited priority for AI/cognitive investment in the next three years



So where do industrial products organizations specifically want to invest in AI (see Figure 2)?

Each of these three priorities presents significant opportunities to improve efficiency and decision making. For quality control, AI systems can analyze data from raw materials, production lines, finished products, maintenance records and customer complaints to identify causal factors that led to quality problems.

In production operations, AI systems can continuously learn from process data and actions taken by top-line operators. Similarly, it helps predict and identify impacts and recommend actions to improve production. For machine maintenance, AI can identify anomalies, assess their criticality, determine the root cause and help maintenance technicians correctly perform the repair the first time.

Industrial products leaders gain value from AI

How can enterprises capitalize on new AI capabilities? To help answer this question, we analyzed the survey responses and identified a small group of industrial products outperformers, consisting of 12 percent of our study. This group self-reported that it significantly outperformed revenue compared to competitors over the past three years, and was significantly more efficient and profitable.

What do these outperformers do differently? They use data to glean insight, and are confident their organizations are ready for an AI future. Over seven out of ten of these leaders strongly agree that their organization is ready to adopt AI, compared to two out of ten of all other respondents. Given the potential benefits, not surprisingly, a number of industrial products outperformers have already begun to adopt AI – nearly two thirds (64 percent) versus only 32 percent of all others surveyed.

Industrial products outperformers seem likely to continue outperforming their peers since they plan to invest earlier and more heavily in AI capabilities that can improve speed and depth of insight. Sixty-five percent of outperformers said they will invest in AI within three years versus 47 percent of all others. In addition, 73 percent of industry outperformers said they will dedicate over 10 percent of their IT spend in three years on AI, compared to 43 percent of all others.

By examining these leaders, other organizations can understand the need to take action in the AI era. They can then begin to:

- Build an AI data foundation
- Focus on new skills
- Create a new level of intelligence.

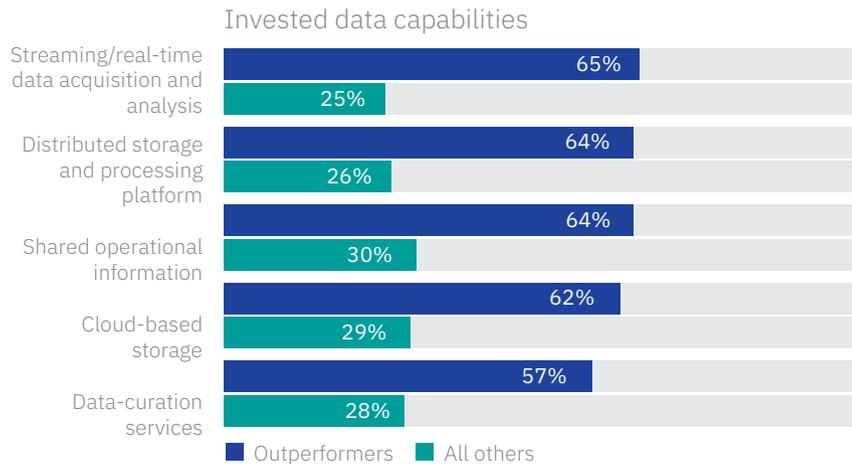
Building an AI data foundation

For outperformers, an AI data foundation starts at the top with a clear view of what they want to achieve with their data governance and accountability. Sixty-eight percent have a data and analytics strategy in place compared to 53 percent of others. Fifty-nine percent have a Chief Data Officer or equivalent to oversee that strategy versus 42 percent of others. Outperformers have also established a more mature data governance strategy. Seventy-six percent use an enterprise-wide system for managing data versus 52 percent of others, and 68 percent centralize decision making for data compared to 53 percent of others.

In their investment in advanced data capabilities, industrial products outperformers are far outpacing others (see Figure 3). Nearly two-thirds of these leaders have made investments in technologies to support distributed storage and processing, ingesting and analyzing streaming data and shared operational information. Industrial products outperformers have invested two times more in cloud-based storage and data-curation services than all others surveyed.

Figure 3

Outperformers report substantial investments in advanced data capabilities



Focusing on new skills

In the 2016 IBV Global Skills Study, 65 percent of industry respondents said that AI will have a significant to moderate impact on demand for skills in the next five years. Already, the rapid growth of AI demand in the industry has created a much greater need for data science and applied engineering talent. An overwhelming 86 percent of industrial products outperformers recognize employee roles and skills will need to change to support AI, compared to 70 percent of all others.

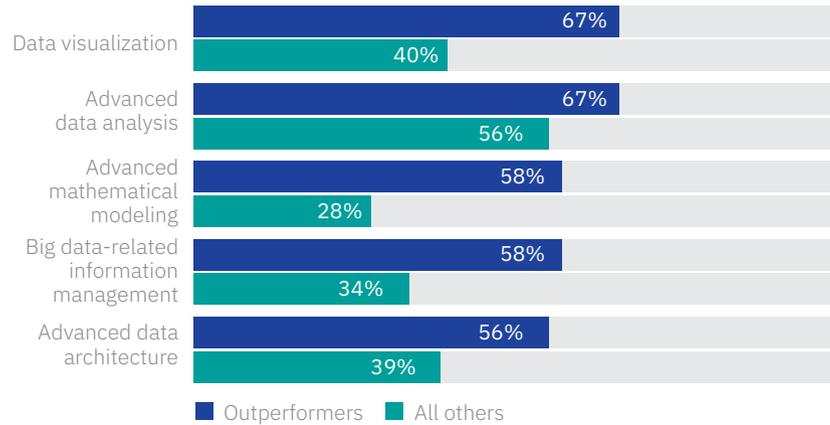
Augmenting human knowledge and diagnostic skills with AI discovery

For an Asian steel producer, harsh conditions make equipment failures inevitable. It needed to understand the machine behavior to identify anomalies and fix problems. However, much of the data the company needed was “dark,” for example, hidden in unstructured reports written by technicians and stored in siloed file servers.

An AI discovery solution helps technicians diagnose, fix and prevent failures. Mining vast pools of siloed, unstructured text, the solution responds to natural language queries such as, “What is the criticality and root cause of this vibration in the hot rolling mill?” By helping technicians reduce the frequency and duration of production stoppages, the AI solution is expected to help the steel producer achieve its corporate initiative to reduce costs by USD 1.3 million annually.

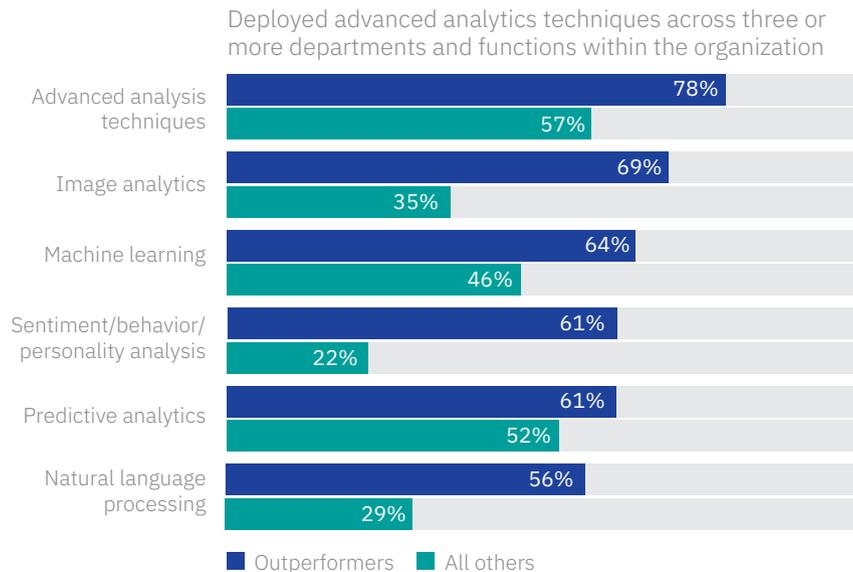
Eighty-nine percent of these leaders, compared to 51 percent of all others, have the skills in-house to implement AI technologies. And these outperformers are targeting specific skills, including data visualization, advanced data analysis and advanced mathematical modeling (see Figure 4).

Figure 4
Outperformers are relying on a range of new analytics skills



Outperformers use a number of different analytics techniques pervasively across three or more departments and functions within their organizations (see Figure 5). More than 60 percent use machine learning, sentiment analysis and predictive analytics, and more than half use natural language processing. The use of any one of these capabilities can serve as an entry point for the AI journey, and the use of a combination often amplifies the results.

Figure 5
Over three-fourths of industrial products outperformers use advanced analysis techniques



Using AI and analytics to find valuable answers to questions not yet asked

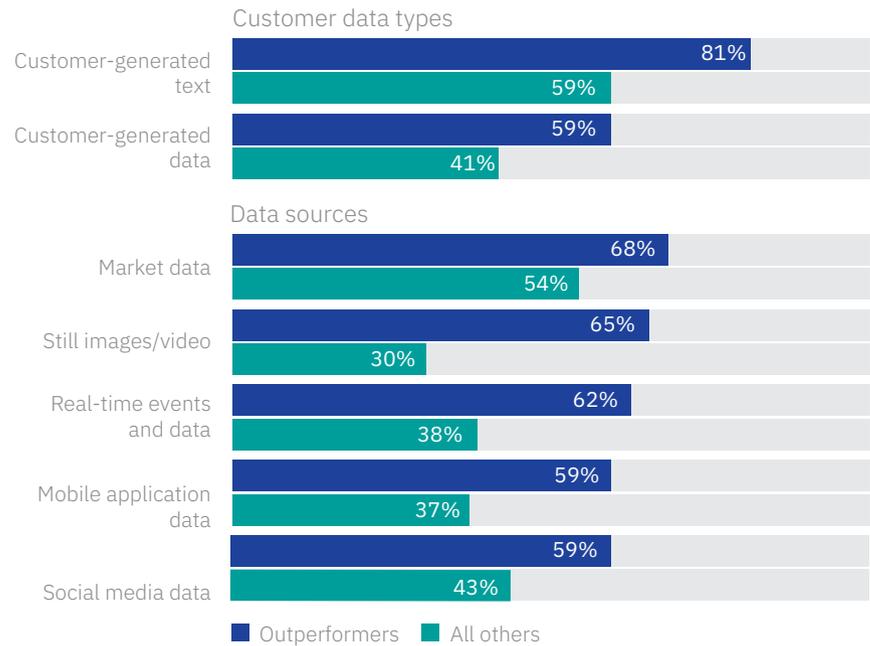
To remain competitive, a US-based retailer and manufacturer of pre-engineered metal buildings and metal roofing products must be as nimble as small companies, and as scalable as larger competitors. Yet its business intelligence platform lacked the ability to derive insight from unstructured data. An AI analytics solution helps business leaders analyze new datasets for unrecognized trends and patterns, providing insight and answers to questions not yet considered. It has implemented AI systems to assist with revenue forecasting, supply chain management, marketing, employee health and safety and talent management. By accelerating analysis by a factor of ten, the company can unlock new marketing opportunities, improve supply chain management and virtually eliminate worker safety incidents.

Creating a new level of intelligence

AI systems require the ability to ingest a wide variety of both internal and external data sources. Ninety-two percent of outperformers utilize both internal and external data versus 64 percent of all others. Outperformers go beyond by collecting customer data from multiple sources much more than the rest of our sample (see Figure 6).

Figure 6

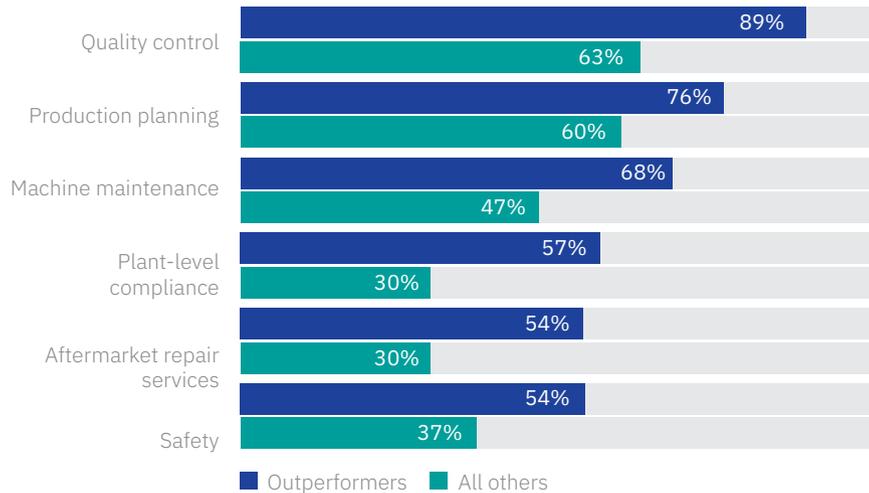
Outperformers place a higher importance on gathering multiple types of customer data from key sources



With respect to specific AI investments, industry outperformers emphasize the top three areas of quality control, production operations and machine maintenance. However, they also plan to add investments in plant-level compliance, aftermarket repair services and safety, all of which offer potential benefits from AI technology (see Figure 7).

Figure 7

Top AI/cognitive investment areas for outperformers



Insights can help stakeholders make decisions to better manage compliance initiatives. Plant-level compliance can use AI capabilities to explore and evaluate current procedures, complaints, upcoming marketplace changes and environmental changes that may have direct or indirect impacts on products.

With aftermarket repair services, each solution requires expert product repair. AI can assist technicians in performing the repair correctly the first time. The technology helps product technicians sort through product usage questions and provide remedies faster.

For safety, AI technologies can analyze worker movement in real-time and predict unsafe situations that could lead to an accident. Furthermore, it can identify near-misses where an accident could have happened to recommend preventive actions.

Becoming a leader

Leaders maintain a laser focus on the issues and opportunities AI can address, design the necessary data strategy and adopt an agile approach to execution. Areas to prioritize might include those that: take extensive time to identify answers and insights from various information sources; require ranked responses to queries; and can leverage new data sources. The value of AI could come from improved decision making, reduced operational risk and greater cost savings.

To aim to join the ranks of the outperformers, industrial products executives can take specific actions:

Pinpoint a small number of high-value opportunities that AI technologies can help address, and make the appropriate investments.

- Identify business problems that can be addressed by AI technologies. Clearly define the scope of AI intervention and communicate to all stakeholders.
- Define the differentiated value AI can bring early in the process. Explore as many opportunities as possible and be realistic about potential benefits.
- Revisit and validate the investment strategy periodically. Measure actual versus expected benefits and adjust the strategy based on incremental benefits gained.

Confirm the data strategy targets the information and skills needed to address identified opportunities.

- Establish the data ecosystem that is needed to support AI systems. Include the necessary infrastructure and develop the ecosystem.
- Augment the ecosystem with new types and sources of data. Conduct due diligence on the existing data and ecosystem and add new internal and external data sources.
- Diversify capabilities through new skills. Adapt roles to prepare people for new ways of working with technology, and revise the processes and content associated with those roles. Assess the jobs impact and augment in-house talent through acquisition or hiring of specialized skills.

Adopt an agile approach to execution.

- Define specific pilots. Identify the scope, business use case and outcomes for the pilots that can be transformed by AI technologies.
- Conduct rapid “proofs-of-value” using an agile approach: succeed or fail-fast. Capture the data that supports the pilots and validate iteratively to optimize the outcomes.
- Learn from the proofs-of-value and scale your findings to operationalize them for the business. Document learnings and enable rollout across the organization.

Are you ready to start using AI technologies?

- Which areas within your organization do you think could benefit from AI?
- What is your plan to encourage and support revenue growth, including the expansion of AI technologies?
- How effective is your organization in bringing together data from various sources to solve important business problems? In what ways can effectiveness be improved?
- What new skills or competencies would be required in your organization to take advantage of AI?

Related reports

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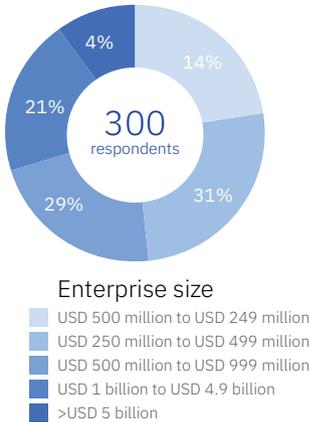
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Study approach and methodology

In cooperation with Oxford Economics, the IBM Institute for Business Value surveyed 6,050 global executives representing 18 industries, including leaders of government departments and educational institutions. Roles of responding executives included major C-suite members – CEOs, CMOs, CFOs, CIOs, COOs and CHROs – as well as heads of customer service, information security, innovation, manufacturing, risk, procurement, product development and sales. A total of 300 industrial products respondents participated in the study.



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