

Sharpening your digital edge for Industry 4.0

Digital Reinvention in industrial products

IBM Institute for Business Value

Executive Report

Digital Strategy

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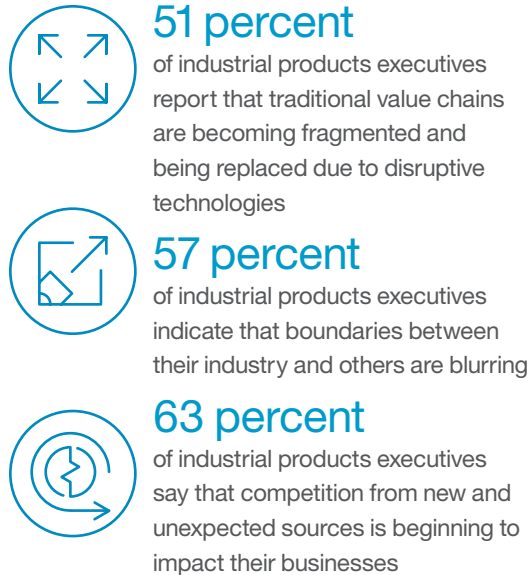
Reimagining the enterprise

Digital technologies are altering how people and businesses interact. Digital forces are creating unprecedented levels of industry dislocation, fundamentally changing the economics of business. To succeed in this disruptive environment, organizations need to offer compelling new experiences, establish new focus, build new expertise and devise new ways of working. Business-to-business (B2B) organizations are not immune to these forces. Like their end-customer-facing counterparts, industrial products leaders will ultimately face a stark choice: either digitally reinvent their enterprises and value chains, or watch as their businesses decline around them. Industry 4.0, or digital manufacturing, is at the heart of this value chain makeover. Successful Digital Reinvention™ will involve a fundamental reimagining of how an organization operates and how it engages with its environment.

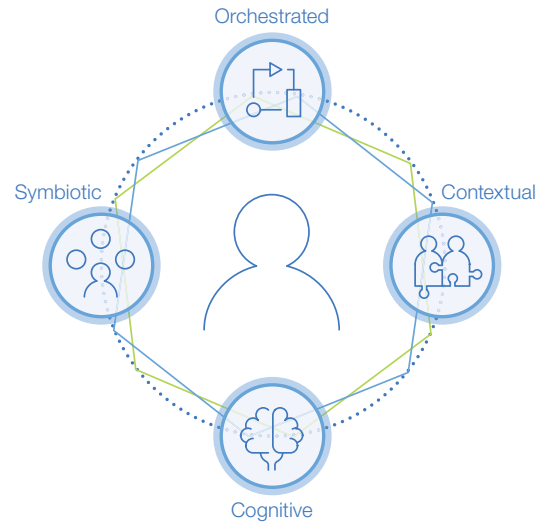
Everyone-to-everyone economy

The pace of change in the industrial products industry is accelerating. Markets have evolved from a state of organizational centrality, in which manufacturers and service providers largely define what to produce and market to customers, through one of individual centrality, in which empowered consumers demand insight-driven, customized experiences. And they are continuing to evolve into new forms in which customers, clients and colleagues are becoming active participants rather than passive recipients.

This environment is best understood within what we call the everyone-to-everyone (E2E) economy. The E2E economy has four distinct elements: It is orchestrated, based on business ecosystems, which are both collaborative and seamless. It is contextual, in that customer and partner experiences are calibrated and relevant to their specific actions and needs. It is symbiotic, in that everyone and everything, including customers and businesses, are mutually interdependent. And it is cognitive, characterized by data-enabled self-supported learning and predictive capabilities (see Figure 1).

**Figure 1**

The E2E economy consists of four elements



Source: IBM Institute for Business Value analysis.

While impacting end-customer-centered sectors – such as retail, automotive and consumer electronics – first, the E2E economy now also is permeating business-to-business (B2B) industries, including industrial products. Digital technologies such as 3D printing, the Internet of Things (IoT) and adaptive robotics are altering how customers and industrial businesses interact, fundamentally changing the economics of industrial businesses. Interconnectivity of machinery sensors and control systems allows real-time optimization of manufacturing and production processes, and of supply chain networks. The industrial products industry must digitally reinvent its enterprises to keep up with this technological disruption.

Technological disruption and industrial products

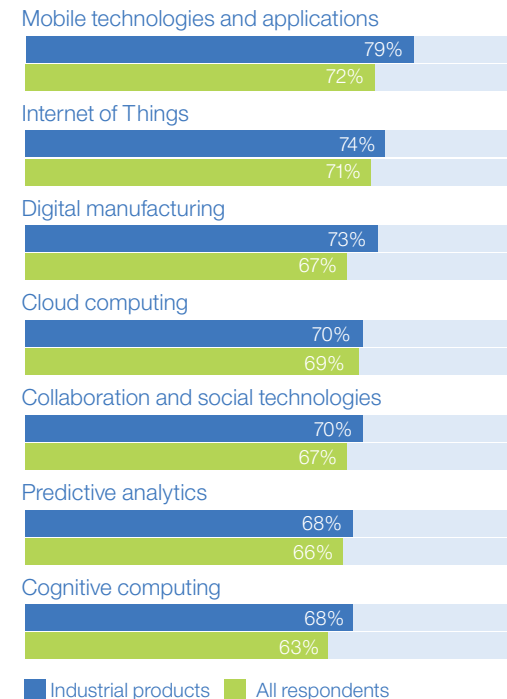
Technological disruption in the industrial products industry has increased significantly. The pervasive use of smart phones and wearable technology is forcing organizations to rethink how they engage with their customers and how internal processes are designed. For example, Lockheed Martin is using augmented reality glasses to help engineers assemble components. The use of cameras, depth sensors and motion sensors allows engineers to “see” renderings of parts and assembly instructions. This new wearable technology has increased engineers’ accuracy levels to 96 percent, while reducing task time by 30 percent.¹

The increasing maturity of analytics and the IoT is leading industrial businesses to interconnect products, value chains and business models. In an IBM Institute for Business Value global digital operations survey, conducted in collaboration with Oxford Economics, 51 percent of industrial products executives cited increasing innovation as a top business initiative (versus 41 percent of respondents from other industries). Perhaps unsurprisingly, industrial products companies are more likely than those in other industries to have created new business models around digital technologies, including Industry 4.0 modernization (see Figure 2).

For example, Daimler AG gathers data on more than 500 attributes of cylinder-head production to enhance manufacturing processes and reduce defects.² And in the process of transitioning from a sales to a rental business model, globally recognized brand Rolls-Royce’s Aircraft Division has developed deeply robust data and analytics capabilities that support an unprecedented level of predictive maintenance.³

Figure 2

Industrial products companies are more likely to favor digital technologies in their business strategies



Source: IBM Institute for Business Value global digital operations survey, 2016. Question: How important are the following technology trends to your company’s business strategy: “Quite important” and “Highly important” responses.

Similarly the growing emergence of 3D printing could either be a significant threat or an enormous opportunity for traditional industrial businesses, depending on whether they choose to ignore or embrace the innovation. And some leading businesses are opening up new opportunities that were once unfathomable. For example, California-based Deep Space Industries is planning to deploy 3D printing technology to manufacture metal parts in space from asteroid materials that can be used to build space platforms with little-to-no terrestrial content.⁴

Ever-growing customer demands are causing industrial products businesses to pursue best practices from other industries, such as retail, to improve the way they engage. For example, U.S.-based FLEXE created a warehousing marketplace in which participating organizations can buy or sell empty warehouse space among themselves, driving major efficiency savings and opening a new avenue for revenue.⁵

As a consequence, more than half of the industrial products executives who participated in the 2016 IBM Institute for Business Value global ecosystem survey of more than 2,000 global business leaders, conducted in collaboration with the Economist Intelligence Unit, say that traditional value chains are being fragmented and replaced through the growing impact of disruptive technologies. Fifty-seven percent of industrial products executives believe that the boundaries between their industry and others are blurring. And 63 percent say that competition is beginning to impact their businesses from new and unexpected sources.⁶

Digital Reinvention in the age of E2E

The most successful industrial products businesses will embrace new and emerging technologies to create compelling customer experiences and drive new efficiencies, opportunities and innovations. In the process of advancing their digital agendas, leading industrial products businesses will develop new focus, build new expertise and devise new ways of working. In short, they will digitally reinvent their enterprises.

Defining Digital Reinvention

Digital Reinvention combines multiple digital technologies – including cloud, cognitive, mobile and IoT – to reconceive customer and partner relationships and operations (see sidebar, “Cyber-physical systems model the industrial enterprise”). It involves creation or orchestration of unique, compelling experiences for customers and other stakeholders by way of emergent business ecosystems. The most successful digitally reinvented businesses establish a platform of engagement for their customers, acting as enabler, conduit and partner.⁷

Digital Reinvention differs in concept from both digitization of individual capabilities or functions, and the process of digitally transforming major business processes or activities (see Figure 3).

For industrial products organizations, digitization might involve digital automation of specific processes such as inventory optimization or factory modernization. But digital transformation ultimately involves integrating across multiple digital processes. An example would be the development of online marketplaces that are fully integrated into supply chains and distribution networks.

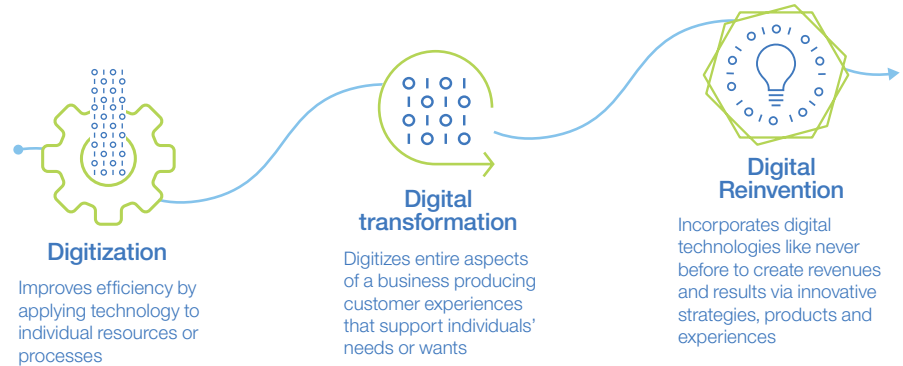
Cyber-physical systems model the industrial enterprise

Industry 4.0, or digital manufacturing, 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 and lifespan. Industrial products companies increasingly use IoT applications to enhance workers' safety, and increase productivity and maintenance uptime.

Figure 3

Digital Reinvention follows a path that starts with digitization and progresses through digital transformation



Source: IBM Institute for Business Value analysis.

Digital Reinvention, however, goes much further. It involves fundamentally reimagining the way a business operates and engages with its stakeholders. It relies on a range of digital applications and technologies supporting, for example, the construction of deep, collaborative relationships through a fully integrated ecosystem – one in which customers and partners can participate at will. Within that context, Digital Reinvention is not fragmented or specific. It requires rethinking how an industrial products organization operates, and how it engages with its partners, customers and its environment as a whole.

The digital advantage

Digitally conceived organizations are often advantaged in the Digital Reinvention stakes. Untethered by a legacy organization, they frequently already possess Digital Reinvention attributes. And many digitally born startups are already establishing footholds in traditional markets, putting new competitive pressures on traditional industry leaders.

For example, Japanese startup Spiber is leading a fundamental shift in global materials manufacturing. The company is using technology to improve the DNA design of spiders to develop artificial materials that are both elastic and tougher than steel. Spiber has partnered with Kojima Industries, a supplier to Toyota, to supply artificial spider silk that will make cars lighter, more durable and more resistant to shock.⁸

In mining, Uearthed, founded in Perth, Australia, in 2014, is bringing open innovation to the resources industry. Uearthed successfully organizes open accelerator programs to generate innovations for the mining industry. Uearthed has engaged 2,000 industry experts and entrepreneurs to formulate new solutions and has already identified 150 new innovation solutions to longstanding problems since 2014.⁹

And San Francisco-based digital startup Plethora employs advanced 3D printers, robots and traditional milling machines to deliver fast, relatively inexpensive manufacturing. Upon receipt of customer CAD files, Plethora manufactures parts as soon as the following day, servicing a 3D-printing market expected to grow in excess of USD 30 billion within 5 years.¹⁰

Readying for reinvention

For successful Digital Reinvention, organizations need to pursue a new strategic focus, build new expertise and establish new ways of working (see Figure 4).

Figure 4

Digital Reinvention operating environment revolves around new experiences



Source: IBM Institute for Business Value analysis.

Pursue a new focus: Industrial products businesses need to develop new ways of realizing and monetizing value. Initiatives might include spawning new business models, tapping new forms of financing and developing better, more holistic ways of conducting risk assessments. Leaders will also need to create strategies and execution plans to deliver deep, contextual experiences, treating B2B clients like end consumers.

Build new expertise: Industrial products businesses will need to digitize products, services and processes that help redefine customer experiences. They will need to augment these steps with predictive analytics and cognitive computing, along with IoT and automation, to create fully integrated, flexible and agile operating environments.

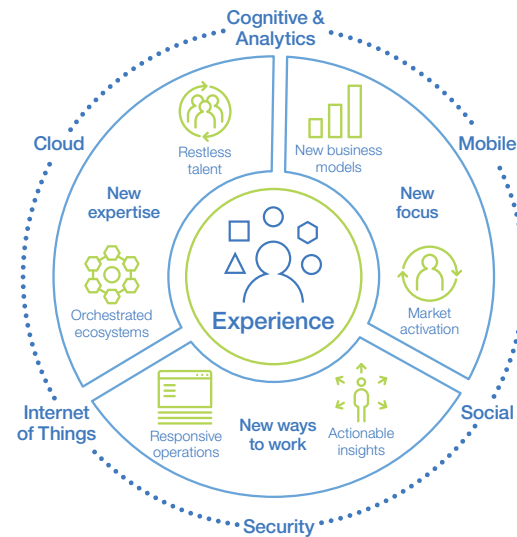
Establish new ways of working: Industrial products businesses will need to identify, retain and build the necessary talent to create and sustain a digital organization. The most successful among these will create and perpetuate innovation-infused cultures incorporating design thinking, agile working and fearless experimentation. Leaders will need to contextualize organizational priorities within business ecosystems, seeking new forms of partnering and new ways to build value within overall systems of engagement.

Adopt a self-funding approach: Industrial products businesses need to deploy technology to drive optimization and support scalable growth and market share. They will need to use digital enhancers to optimize existing operations and processes, thereby increasing earnings before interest, tax, depreciation and amortization (EBITDA). Some have termed this approach “radical cost reduction and efficiency.” Leaders need to endeavor a growth agenda of revenue enhancement and new market penetration through product extensions and new market opportunities enabled by digital capabilities.

Embrace digital drivers: Industrial products businesses will need to become proficient in digital technologies. Technologies can underpin creation of new organizations that can build the deep experiences customers desire. Rather than incrementalism, Digital Reinvention provides a path for visionary organizations to adopt an experience-first approach to planning, employing the strengths of ecosystem partners to create truly unique experiences (see Figure 5).

Figure 5

Digital Reinvention framework combines the strengths of ecosystem partners



Source: IBM Institute for Business Value analysis.

Surfing the digital wave

To set out on the path toward Digital Reinvention, industrial products leaders can take four initial steps: envision possibilities, create pilots, deepen capabilities and orchestrate environments.

Step 1: Envision possibilities: Conduct envisioning sessions based on design thinking to produce a definitive reinvention blueprint. For example, through deep conversations and in-depth marketing analysis, develop a better understanding of customer needs, aspirations and desires; brainstorm new ideas to enhance engagement; and visualize unexpected customer scenarios. Incorporate external stakeholders in these sessions, including customers, to encourage thinking that goes beyond business-as-usual.

Step 2: Create pilots: Develop prototypes using agile development, test them with customers and get them to market quickly to promote feedback and iteration. Establish communities of interest to create safe environments to beta test innovations, and incorporate them as a central part of design and development processes.

Step 3: Deepen capabilities: Augment digital capabilities with strategic initiatives, and continue to build and deploy necessary applications aligned to the target Digital Reinvention operating model and ecosystem strategy. As pilots evolve, impediments around development will emerge, highlighting limitations in existing capabilities. Adopt a continuous, iterative strategy to address these limitations by building new or extending existing capabilities.

Step 4: Orchestrate ecosystems: Embrace a strategy based on holistic reinvention rather than a series of point solutions, maintaining a clear focus on deep needs, aspirations, or desires of customers, clients (such as partners) and colleagues (such as service providers). Focus on ecosystems to expand and align a broader set of capabilities and to help create and deliver on customer promises.

Digitally reinvented industrialists

Leading businesses sharpen their digital edge.

Cemex reinvents customer and distributor experiences¹¹

Mexico-based global industrial products company Cemex is advancing Digital Reinvention to support real-time mobile engagement with its building materials customers and distributors. Cemex is creating a suite of customer-centered, made-for-business apps, which when deployed will transform how the company does business. For example, the way foremen, field operations managers, cement masons, concrete finishers, truck drivers and other construction professionals do their jobs and interact will be based on real-time, technology-supported collaboration and engagement.

Woodside Energy uses analytics to dramatically improve facilities construction¹²

Australia's Woodside Energy is using sophisticated data analytics and cognitive computing based on more than 30 years of knowledge and data to design, fabricate and construct major oil and gas facilities. Instead of combing through technical evaluations, reports and decision logs, employees use cognitive systems to source answers and critical information as required. Woodside is able to digitally combine information from millions of reports and the best advice of thousands of engineers in a contextually relevant manner, enabling employees to quickly obtain the right advice in any situation.

AGCO brings cognitive capabilities to farming¹³

U.S.-based agricultural equipment manufacturer AGCO is now accessing real-time and "learning" farming content to produce better crops to feed more people more efficiently. Agriculture equipment data and intelligence is merging to create new knowledge and expertise on crop yields and analytics for the farming industry. Farmers can now access expert advice when they need it, where they need it and in the needed format. The cognitive machine-learning model, "trained" by agriculture experts, includes weather data, crop data, marketplace data and more, in structured and unstructured formats.

Key questions

- What can your organization do to make your digital strategy ambitious enough to deal with disruption?
- How can your organization become more agile, so it is better equipped to respond to unexpected challenges and opportunities as they occur?
- How can you make your workforce open and flexible enough to quickly embrace new ways of working and new strategic priorities?
- What actions can help your leadership become more visionary in conceiving what customers want before they know it themselves?
- How will you use Industry 4.0 automation technologies, such as wearable technology, IoT and robotics, to differentiate and achieve advanced operational efficiencies?

For more information

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