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Briefing Paper

THE FACTORY OF THE FUTURE

Manufacturers Invest in Data and Skills to Achieve Efficiency Goals

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Digital transformation is fundamentally shifting the way manufacturers operate and empower their employees at every level. It requires delivering a modern workplace designed to meet evolving employee expectations and the challenges of an increasingly complex digital landscape. In manufacturing, a truly modern workplace equips employees with the tools and solutions to create products through collaboration, optimized operations, and more efficient business models. A successful digital transformation requires all workers to participate, from the board members to the executive team all the way down to employees on the factory floor.

ÇAĞLAYAN ARKAN

GENERAL MANAGER, MANUFACTURING INDUSTRY

MICROSOFT

Firstline Workers are the more than two billion people in roles that make them the first points of contact between a company and the world it serves. They are often the first to engage customers, the first to represent a company's brand, and the first to see products and services in action. They, in other words, are the ones who bring the ambitions and strategies of company leaders into the real world. In the manufacturing industry, they're the employees who assemble products from start to finish. Their intimate knowledge of what goes into a product and how that product functions, as well as the manufacturer's daily operations, can provide a wealth of insight. Firstline Workers' on-the-ground experience, for example, offers real-time insight into how a product is made and can ignite new ideas on how to save time or increase output. These workers have huge potential to promote growth, spark innovation, and accelerate a manufacturer's success in the digital age—and that potential is largely untapped at the moment.

At Microsoft, our mission is to empower every person and every organization on the planet to achieve more. Recognizing the unique potential of Firstline Workers in the manufacturing industry, we aim to build tools to close long-standing technology gaps that separate employees from the data, resources, and expertise they need to do their best work. By reducing the routine parts of their jobs and connecting them to each other and back to the organization more often, we can enable everyone in the organization to turn their ideas into action.

In our faster, more competitive world, it should be one of the top priorities of every leader in the industry to unleash this potential by empowering their Firstline Workers. When these employees are equipped with the right technology, their perspectives, insights, expertise, and ingenuity can help shape the business, spark new ideas, and craft a superior product.

We've partnered with Harvard Business Review Analytic Services to examine the unique and critical role Firstline Workers play in manufacturing's digital transformation. This is part of a broader series exploring the opportunity organizations have to build a more intuitive, immersive, and empowering experience for Firstline Workers and provide new solutions that reshape how employees think, innovate, and take action for their customers and business.

THE FACTORY OF THE FUTURE

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INTRODUCTION

In the manufacturing sector, firstline workers are what one IT leader called "the deskless people." That group includes the salespeople who deal directly with the customer; the employees operating machinery, making products, and keeping the processes running on the factory floor; and technicians out in the field servicing the manufacturer's equipment at the customer site.

Traditionally, their work has been based on job experience and gut feelings, said Bobby Bono, leader of the Industrial Manufacturing Practice at PricewaterhouseCoopers LLP. Today, "what you're starting to see is an evolution toward using more data and IT for that front-line worker, which might mean they have a tablet that tells them information related to the machine they're operating so they can make decisions based on key data points," he said.

However, it's an evolution "that's going slowly because, frankly, the old way was not necessarily broken," Bono said. "So it's hard to figure out a value proposition for the investment in the technology and the data. I think the answer [to the value question] is that you can make something more efficiently and with better quality by using this data if you use it correctly."

In a recent survey about Firstline Workers conducted by Harvard Business Review Analytic Services, 78% of respondents strongly agreed with the statement "To be successful in the future, our organization must connect and empower its firstline workers with technology and information." Respondents said the primary drivers for customer-facing firstline workers are to increase productivity and efficiency (named by 67%), enhance customer engagement/satisfaction (62%), and improve product and service quality (59%). FIGURE 1 Customer engagement dropped to a distant third place for firstline workers who do not deal regularly with the public, such as factory workers.

HIGHLIGHTS

78 %
of respondents strongly agreed with the statement "To be successful in the future, our organization must connect and empower its firstline workers with technology and information."

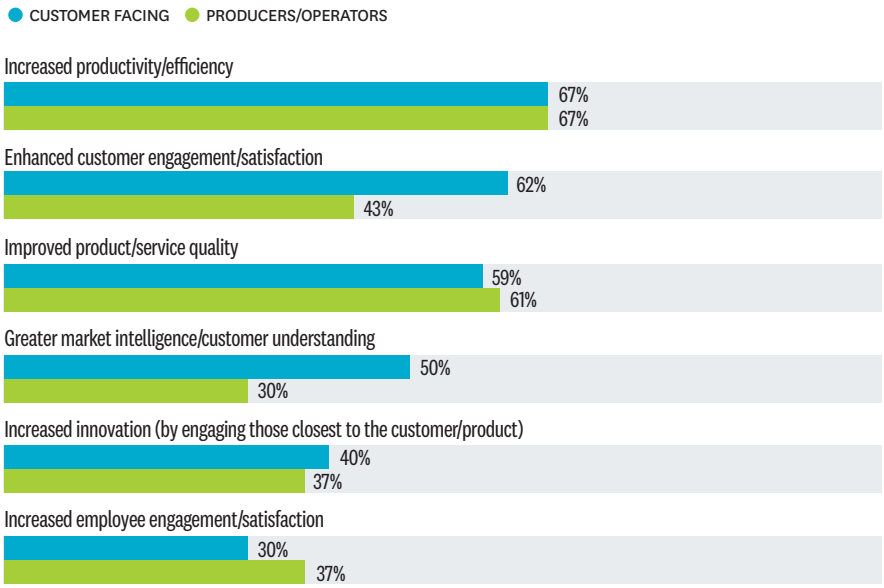
67%
of respondents said the primary driver for producer/operator firstline workers is to increase productivity and efficiency.

"THE MORE YOU CAN REDUCE SCRAP AND PRODUCE THE PRODUCT RIGHT THE FIRST TIME, THAT PUTS YOU IN A MUCH BETTER COMPETITIVE SITUATION." THOMAS MCKEE, KENNAMETAL INC.

FIGURE 1

PRIMARY DRIVERS

What are the primary drivers for creating a more digitally connected and empowered firstline workforce?



SOURCE: HARVARD BUSINESS REVIEW ANALYTIC SERVICES SURVEY, JULY 2017

Facing Global Competition

IT leaders in manufacturing also cite one more overarching driver for a sector that faces intense domestic and international competition: being cost-competitive.

Consider $2.1 billion Kennametal Inc., a global industrial technology provider of materials science, tooling, and wear-resistant solutions that employs more than 11,000 people worldwide. Thomas McKee, vice president and CIO, said the overall goal of the company's digital modernization effort is to better serve customers "with higher quality, reduced lead times, better inventory availability. We have to be competitive in the marketplace. So the faster, the more efficient, the more effective, the more you can reduce scrap and produce the product right the first time, that puts you in a much better competitive situation."

In a very different market—making glass products—Owens-Illinois Inc. has a very similar goal: "Making sure we're making quality products for our customers, that we're driving better cost-efficiency, and ultimately trying to drive lower cost of goods so that we can be increasingly more competitive in the marketplace," said Rod Masney, vice president of technology service delivery. From HQ in Perrysburg, Ohio, Masney directs a global staff of 150 IT professionals located on five continents.

With such a globally dispersed company, a key theme at Owens-Illinois is using technology to create "one team" and enable more collaboration, Masney said. With online collaboration tools, Owens-Illinois can reduce the time it takes for far-flung staff at 79 separate plants to resolve common manufacturing quality problems or collaborate on continuous improvement activities. Employees can post a message online like, "Have you ever seen this problem? If so, what did you do to fix it?" or "Hey, I've learned a new, better way of doing things."

Previously, Masney said, "they had to find their own problem resolution in their own factory, with their own people, which makes it quite difficult if a problem is beyond the capability of the team or it wasn't easy to find others who had experienced a similar problem and how they resolved it." With collaborative technologies, "we're able to do that nearly in real time" on a global basis, he said. By making such tools available to all workers, manufacturers are enabling everyone in the organization to contribute, collaborate, and turn their ideas into action.

A More Connected Workplace Drives Efficiency at All Levels

Employees at Owens-Illinois are also using online collaboration and videoconferencing systems to meet virtually with customers and suppliers—and each other—yielding a dramatic 20% reduction in travel expenses, according to Masney. "It's hard, expensive, and exhausting to move people around the organization through travel," he said. Sometimes face-to-face meetings are still necessary, of course, but online tools make it possible for all employees, from the boardroom to the factory floor, to meet more frequently, regardless of their location.

Salespeople are also empowered with mobile devices for presenting and configuring complex products when they meet prospects and customers, and with the data analytics that could help them make a timely sale. "The thing about sales is that if you understand the data of your customers' buying habits and know at what point they order—for example, a certain customer buys around the 15th of every month—you can be a lot more targeted in your sales effort," said PricewaterhouseCoopers' Bono. And connecting salespeople with other firstline workers—in manufacturing or engineering, for example—can bring new insight and greater customer value to both the sales process and product development.

A connected firstline workforce can **tap expertise anywhere and anytime** and drive insights back into the organization.

Kennametal is implementing the company's first CRM system and providing salespeople with mobile devices to yield a 360-degree view of their customer, McKee said. The CRM system holds information that previously "was contained somewhere in a spreadsheet or PowerPoint presentation or in somebody's head. When these individuals left the company, you lost all that history and knowledge about a specific customer or market," he said. Now salespeople—at the customer site—can check on inventory, open orders, late orders, and open customer complaints, for example.

Being able to capture and share knowledge is just as valuable on the factory floor and in the field. A connected firstline workforce can tap expertise anywhere and anytime and drive insights back into the organization.

At Kennametal, this starts with replacing manual processes, paper notes, and a hodgepodge of spreadsheets with real-time data displays in the work cell on the factory floor, McKee said. Plant managers and firstline workers can receive real-time alerts about quality problems, machine breakdowns, and schedule slippage via monitors or mobile devices.

Out in the field, the automation goals for service technicians include using data analytics for predictive maintenance to replace "the old model of when it's broke, you call me up and I come out and fix it as soon as I'm available," PwC's Bono said. "Predictive maintenance is based on sensors monitoring your equipment to determine when we think it's about to break so you can go out there and provide maintenance before it breaks. Think about the benefits for the customer if you reduce their downtime when the machine is broken."

AS MORE SENSITIVE DATA FLOWS TO THE FRONT LINES AND THE CLOUD, IT NEEDS TO BE KEPT OUT OF THE HANDS OF HACKERS AND COMPETITORS.

No Easy Path

But the challenges involved in implementing this vision of automation are many. The Firstline Workers survey identified the top barriers as the cost of deploying digital technologies to a broader employee base, a lack of effective change management and adoption processes, and a lack of workforce skills.

Bono agreed that the workforce is a top challenge. Current workers need retraining, and managers need to "make them feel like they need to get on board with this," he said. "We're seeing apprenticeship programs. We're seeing companies do their own internal training. We're seeing them partner with community colleges to work on curriculum to help retrain and retool them to get the skills that you need."

Achieving workforce adoption of new technologies and processes is a big challenge, said Heather Ashton, research manager at IDC Manufacturing Insights. "We definitely have seen the fastest way for something like this to fail is for a company to make a decision to go forward with a technology like augmented reality or mobile apps and not really gain the buy-in of the workers themselves or involve them early on," she said.

IT leaders agreed that achieving employee buy-in is best handled through an abundance of communication, from tip sheets to brown-bag lunches. "It's nonstop, just really trying to explain the value proposition in small bites: Why are we doing this, what does it mean to me as a Kennametal team member, and how does it add value for our customers?" said CIO McKee at Kennametal.

IT leaders agreed that **achieving employee buy-in** is best handled through an abundance of communication, from tip sheets to brown-bag lunches.

Other challenges include data management issues:

- **Secure data:** As more sensitive data flows to the front lines and the cloud, it needs to be kept out of the hands of hackers and competitors. Masney at Owens-Illinois said this requires more attention to employee education about information security, such as thwarting phishing campaigns. Making data more accessible to employees requires a commitment to making it "harder for others to get at," he said.
- **Integrated data:** Firstline workers "need access across different data silos," said IDC's Ashton. "That is a huge undertaking, not to be underestimated. Many of these companies struggle with that because you have various owners of the different data—and some protectionism going on," she said. "You need to have a corporate evangelist who is able to gain buy-in across those various [data] owners to show that, by sharing, everybody benefits."
- **Trustworthy data:** "If we're going to provide employees data and tell them to make decisions based on this data, you've got to help people trust the data," Bono said. "This is not going to work if the employee on the front line gets the data and says, 'I don't really trust the data. I'm going to make the decision based on something else because I don't think this data is complete or reliable or accurate.'"

These are key issues to consider when choosing a solution to connect the enterprise at large.

Empowering firstline workers with better, more timely information will **drive both efficiency and value** to the enterprise.

Collaborative Robots, Wearables, and Sensors Ahead

There's widespread agreement that the future of manufacturing includes more robots—including those that collaborate with humans and augment their work (sometimes known as cobots)—plus technologies such as mixed reality (MR) and the industrial internet of things (IIoT), with sensors everywhere. The new types of robots will require different skills for factory workers, both to configure and service the robots and to work with them in new ways and in shared space. Mixed-reality interfaces help workers act upon data generated by instrumented/intelligence devices and connect seamlessly with others across physical space. This enables design collaboration, remote service and maintenance, and training—for example, letting field service technicians get expert advice while troubleshooting complex equipment, thereby improving the "first-time fix rate" metric.

But that vision will happen only through investments in technology, data, and skills. The missing ingredient is a holistic, long-term digital strategy for getting there, Bono said.

"I've seen too many companies not be as successful as they want to be [with digital transformation] because it is just fragmented," Bono said. In other words, they have a smattering of digital projects but no comprehensive strategy that considers how to deal with issues such as data quality, security, worker buy-in, and skills. "If you have a long-term strategy of here's where I want to get to, here's what I want, you have to have employees that have that skill set," he said. "But if you're just looking at the next 12 months, that's short-sighted. I think the companies that invest and have a strategy are the ones that are going to do better."

Increasingly, manufacturing leaders realize this strategy includes all workers, from the boardroom to the factory floor, connected through a digital fabric of technology and information. Empowering firstline workers with better, more timely information will drive both efficiency and value to the enterprise. The ability to tap into their unique insight and expertise and leverage it across the organization will, in part, define the modern workplace.

METHODOLOGY AND PARTICIPANT PROFILE

A total of 383 respondents drawn from the *Harvard Business Review* audience of readers (magazine/enewsletter readers, customers, HBR.org users) completed the survey.

SIZE OF ORGANIZATION

ALL RESPONDENTS' ORGANIZATIONS HAD 250 EMPLOYEES OR MORE.

30%	39%	31%
250–999 EMPLOYEES	1,000–9,999 EMPLOYEES	10,000 OR MORE EMPLOYEES

SENIORITY

18%	25%	40%
C-LEVEL OR EXECUTIVE MANAGERS	VICE PRESIDENT OR DIRECTOR	MANAGERS, SUPERVISORS, SENIOR MANAGERS, OR DEPARTMENT HEADS

KEY INDUSTRY SECTORS

15%	12%	9%	8%	8%	6%	5%	5%	5%
FINANCIAL SERVICES	MANUFACTURING	TECHNOLOGY	EDUCATION	GOVERNMENT/ NOT FOR PROFIT	TELECOMM	ENERGY/ UTILITIES	HEALTH CARE	OTHER

JOB FUNCTION

18%	10%	7%	7%	6%	6%	5%
GENERAL/ EXECUTIVE MANAGEMENT	SALES/BUSINESS DEVELOPMENT/ CUSTOMER SERVICE	MARKETING/ COMMUNICATIONS	STRATEGIC PLANNING	FINANCE/RISK	HR/TRAINING	OTHER

Figures may not add up to 100% due to rounding.

NOTES

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