Why Frontline Workers are Critical to the Digitization of Manufacturing

By Dr. Ing. Erhan Serbest, Senior Director, Manufacturing Solutions, Hitachi
The manufacturing world stands on the brink of the Fourth Industrial Revolution sparked by dramatic technological advances in genetics, artificial intelligence (AI), robotics, nanotechnology, biotechnology, and 3D printing.

Companies have been spending billions of dollars on ambitious digital transformation projects for their factories. Nevertheless, over the past five years, several major companies have put the brakes on their plans as they struggle with several issues including gaps in IoT knowledge, skills and capabilities, and uncertainties in realizing business value and a return on their investment (ROI).

One of the biggest challenges companies face is the lack of a clear vision for how the Internet of Things (IoT) and digital transformation fit in with their business strategy. In addition, traditional manufacturing organizations often feel that they lack the expertise, in-house skills and capabilities to support digital initiatives.

However, digitization can be highly successful when companies capitalize on the highly-valuable, existing skills, knowledge and experience already contained within the organization. In most cases, this vast knowledge set comes from factory workers who are at the heart of most traditional manufacturing facilities. These employees have accumulated years of specialized knowledge—and this information is often vital to the success of digitization initiatives. Thus, the key to success is placing people—specifically frontline workers—at the heart of digital transformation.

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The Human Factor in Digitization

Jobs must evolve to meet the changing needs of a digital world. People will play a critical role in more than management and maintenance; they will provide the expertise to develop and train the new systems.

Frontline workers will begin to take on a larger role in the data-driven decision-making process. “Smart” factories enabled by AI are becoming a reality, and companies hope to take advantage of the latest developments in data collection and data harvesting to deliver productivity improvements, as well as shorter lead times and smaller inventories. But this can only happen if people are empowered to act on the insights that technologies like AI and analytics deliver.

It’s important to understand the difference between “automation” and “digitization.” With automation, the role of people in decision-making is reduced, as robots take on manual, repetitive tasks and simple decisions. With digitization, people are critical to the process, but their work is more strategic. As AI takes care of routine tasks like data crunching, those on the shop floor can use the resulting insights to make better decisions and dedicate time to higher value activities.

Understanding this distinction between automation and digitization—and designing different approaches—is critical for a successful digital transformation program. For a smart factory program to succeed, workers must be integrated into the new system quickly—from the very first design stage all the way through to the start of production—to achieve meaningful business results.

The question is: How can companies best integrate workers into their new digital vision?

The Hitachi Approach

Rather than minimizing the role of people in the manufacturing process, we believe in using the power of technology, such as AI, to augment human intelligence—not replace it. At Hitachi, we’ve developed solutions to do just that. It’s a human-centric approach to digital transformation, integrating the four key components of a successful project: man, machine, materials and method (or process).

We purposefully place “man” at the front of the list because digital transformation projects must emphasize the human component to be successful. Hitachi has solutions that enable manufacturers to focus and leverage the critical human factor in the manufacturing process.
Today, most factories rely on manufacturing execution systems that improve productivity by collecting such information as component lot numbers, process data from production equipment, and the results of visual inspections by stewards on the shop floors. With the Hitachi approach, we go a step further, using advanced analytic technologies to identify the source of productivity problems—whether a worker, supplier or piece of factory machinery—to get a deeper understanding of manufacturing processes.

An example of how IoT can help detect errors would be installing panoramic cameras above the shop floor to capture body movements and spot when workers deviate from standard practice or using fixed cameras on key points in the production line to detect anomalies in either the product or the equipment.

With access to the new and enriched data collected from new sensing technologies, companies can make the changes necessary to boost performance. If the problem is defective materials, then the company can discuss this with suppliers. If the problem is poorly functioning machinery, this can be repaired or replaced. To capitalize on the power of the data, it will be necessary to invest in retraining and upskilling frontline workers and senior managers and ensure there are appropriate resources in place to analyze the data for actionable insights.

Frontline workers are at the forefront of any digital transformation. They’re experts in the core operations of your factory and have a wealth of experience that spans from fixing mechanical issues to maximizing yield from production lines. The challenge is transitioning their skills and tools—from screwdrivers to tablets—that will allow them to take on new roles in service and maintenance, specifically using smart tools to proactively solve mechanical problems instead of reacting afterward.

Senior managers need training too, including those running operations and factories. They must also learn how to use the wealth of new data and become familiar with the new digital machinery and AI software.

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At a Japanese machine tool builder, senior managers are being taught how to use systems that can monitor production flows, identify bottlenecks, and implement countermeasures to address problems. At the company’s factory of the future prototype, senior managers are actively searching for ways to achieve a two-fold increase in productivity and cut production lead times by 50 percent.

But retraining and upskilling programs aren’t enough. Companies must also recruit a new generation of data scientists to work alongside shop-floor workers. These data analysts, usually university graduates, know how to read and interpret the data to address quality issues, optimize machine operations, gain business insights that can help achieve competitive advantage, and make real-time decisions without having to escalate every issue to management.

The sensing and analytic technologies that lie at the heart of our Hitachi approach enable manufacturers to tackle any problems that relate to a product’s components, the frontline workers who make it, and the machinery they operate.

Also, these technologies have the potential to help manufacturers build what is known as a “digital twin”—an advanced model that describes the real-world operational or manufacturing process in a digital way.

The digital representation of the manufacturing process combined with the power of artificial intelligence will better enable companies to continually improve complex operational processes and better identify the root causes of quality issues.

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Challenges and How to Overcome Them

There are three significant challenges for effectively implementing the Hitachi approach and, with it, digital transformation.

1. Resistance to Change
Frontline workers are critical to the success of digital transformation projects. But like all employees, changes to work processes or technologies can make them worry about job loss. In addition to implementing effective change management programs, company leaders should upscale employees by helping them understand that even though their role has changed, they’re still a valuable part of the team. Including employees and getting consensus on digital transformation initiatives will not only add value to these efforts as well as greatly increase the likelihood of their success.

This means training frontline workers on how to interpret data, work with the information, and limit escalations to only those that are critical. For example, IT operators who previously fixed machines when they would break down should develop skills to transition to a service provider or equipment analyst mindset.

It’s important to communicate the critical role that frontline workers have in the newly-digitalized company. They’ll use their new data analysis skills to make decisions without needing the approval of a foreman or shift leader – something that will save time and enhance their status in the smart factory. Their wealth of experience will also be valuable for mentoring the next generation of workers.

A multinational air conditioning manufacturer takes care to ensure the smooth transfer of knowledge from experts to trainees. The company detects differences in the way experienced employees and new trainees use the manufacturing tools and equipment using advanced image analysis of digitized motion data. This information is a crucial input into their training program for new hires, helping them acquire the necessary skills quickly and efficiently, leading to higher quality and productivity.

2. Data Scientist Shortage
The second big challenge companies face with digital transformation is recruiting and retaining enough data scientists. Studies\(^1\) have shown that by 2018, the United States alone could face a shortage of 140,000 to 190,000 people with deep analytical skills, as well as 1.5 million managers and analysts with the know-how to use the analysis of big data to make effective decisions.

Although the study uses the United States as an example, analysts believe that the data scientist shortage will be global. In general, data scientists are motivated by using data to solve big problems. One way to help attract and retain top talent is developing a culture of innovation and providing an environment where individuals can see the value they are providing. At Hitachi, we’re fortunate to have tightly integrated operations and information technology, so our data scientists can quickly see their work on a smart factory reflected in improvements on the shop floor.

3. Digital Twins
The third challenge is arguably the biggest: the development of a fully operational digital twin that takes into account the human factor. Companies

\(^1\) Studies refer to various research and analysis reports, but specific sources are not mentioned.
that succeed in developing a digital twin will have a system that can leverage implicit and explicit knowledge of experienced workers. However, the challenge of capturing and leveraging human knowledge is monumental.

Companies will need to collaborate with strategic information and operational technology partners who also have strong design teams. This requires a partner who has a clear vision, a strategy, and understanding of the customer’s challenges, including their people and culture.

At Hitachi, for example, we’re working with a global automotive manufacturer to deliver a digital transformation project. With our Lumada IoT platform, our goal is to refine the company’s manufacturing processes and establish a system that prevents facility failures while improving overall quality. The next step in this transformation will be the development of a holistic digital twin.

Put Your People at the Heart of Your Transformation

Many companies have found that their digital transformation projects are harder to implement than they expected and have experienced budget and timeline overruns. The most common reason for this is not having made people their top priority. If people—especially frontline workers—don’t top your list of transformation priorities, perhaps it’s time to put them there.


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Dr. Serbest has worked with global aeronautics engineering and manufacturing companies including Airbus Military, ABB and Bombardier, leading large-scale projects (aircraft and trains), managing strategic partnerships and implementing strategic plans. He holds degrees in Aerospace engineering with a Doctoral thesis in the field of thermodynamics and fluid mechanics and is an active member of Plattform Industrie 4.0 Deutschland.