

The background of the entire page is a photograph of a large industrial factory. In the foreground, there are rows of orange plastic caps on a conveyor belt. In the background, there are complex metal structures, pipes, and machinery. A digital overlay of a yellow wireframe grid is visible on the left side of the image. The Siemens logo and tagline are positioned in the top left corner.

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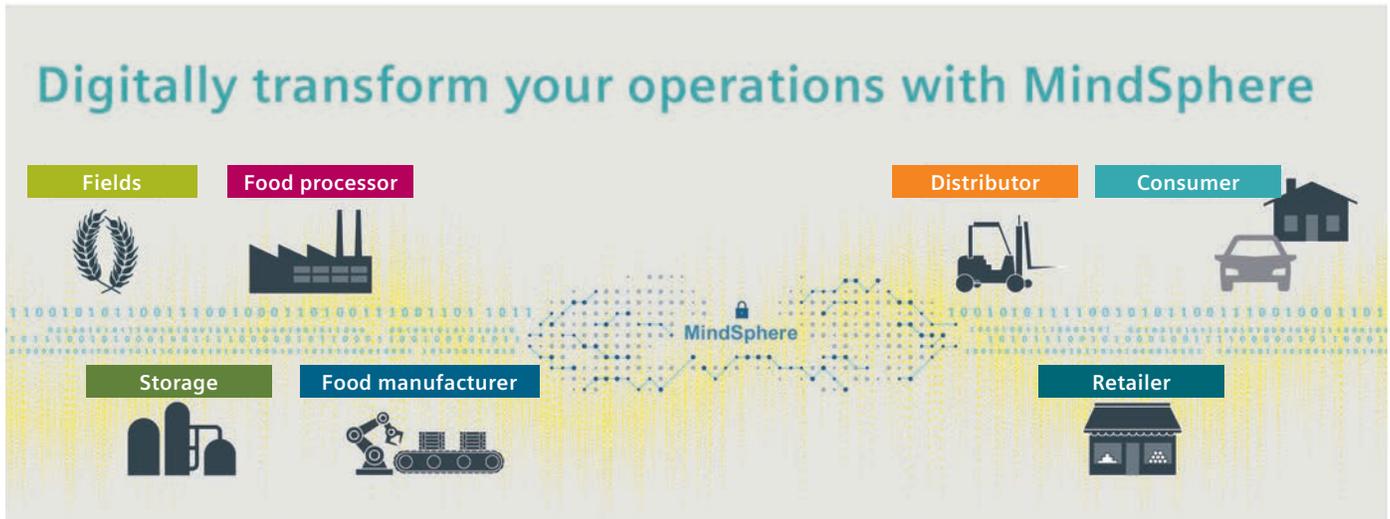
Siemens

## Three ways food and beverage executives will use IoT data to gain a competitive edge

### Executive summary

Food and beverage producers face fast-changing consumer preferences, variable costs with ever-tightening margins, increasing regulatory demands, aging infrastructure and upstart competition. MindSphere, the cloud-based, open Internet of Things (IoT) operating system from Siemens, can help drive a low-risk, cost-effective, digital transformation to address these challenges. Comprehensive asset data collection and analysis with MindSphere can boost productivity, track-and-trace visibility and closed-loop product design to increase innovation rates. MindSphere provides an end-to-end IoT solution so you can get started quickly with minimal costs, unleashing competitive advantage almost immediately.

# From farm to table: The transparent supply chain



Today's supermarket shelves carry as many as 50,000-plus stock keeping units (SKUs), giving consumers more food and beverage choices than ever before. But aisles crowded with product choices make brand differentiation difficult. What's more, slotting fees, merchandising costs and advertising expenses impact thin margins already subject to variable costs associated with commodity feedstocks.

On top of that, markets are now global and there are many channels. Products are tailored to ever-more specific consumer preferences via mass customization production models. With the proliferation of local products and direct sales via online shopping, traditional mass production and market entry barriers, such as economies of scale and mass-media marketing budgets, the barriers are no longer as prohibitive as they once were. These new conditions open doors to start-up competition with the ability to innovate faster than their long-established larger rivals.



### Turbocharging innovation with farm-to-fork digitalization

Although digitalization along the value chain – farm to fork – has enabled unprecedented choice and change, it's made consumers more demanding, even as they remain loyal to their favorite brands. And it's driving industry innovations like never before, allowing producers to accelerate offering high-quality branded goods to the market despite complex regulatory and safety requirements.

Critically, as digitalization continues turning the industry on its head year after year, executives must answer the strategic question: Will their company be an industry disrupter or will it be buried by the disruption?

### How to innovate and disrupt with closed-loop digitalization

In today's food and beverage industry, being big still counts, but soon being fast will count even more. For decades, time-to-market has been a key metric. Now time-to-innovate is its companion.

Digitalization can help boost both profitability and market response time by expanding production scalability, visibility and agility. With closed-loop digitalization, input and output can now be integrated across marketing, research and development (R&D), planning, procurement, manufacturing, sales and distribution.

Across the full product lifecycle, users can access digital threads of recipes, packaging, labeling, track-and-trace provenance and more right from their workstations, laptops, or even tablets and smartphones.

With digitalization, R&D teams around the globe can collaborate more easily – not only with each other, but also with production, supply chain and other functions that are traditionally siloed – to react quickly and confidently to new opportunities identified by their marketing colleagues. Together, they can develop and debut new products, customized to local tastes.

At the same time, planning, manufacturing, sales and distribution teams can offer their inputs to digital recipes by running them through digital plant simulations and logistics models for validation. Digitalization can bring information technology (IT) and production operational technology (OT) teams together, too. In real ways, now everyone can be on the same page across the organization with access to a digital twin of each new product and its production.

### Key technologies: IoT, cloud and big data

**1. Internet of Things (IoT).** Increasing access to the internet – coupled with IoT sensors costing less and less – enables legacy equipment to provide valuable information. Their data can then provide more real-time insights to what production assets are actually communicating.

This makes it much easier to identify motors running hot, pumps or valves needing attention, batch quality diminishing, or any number of other indicators of reduced functional or quality performance.

**2. Cloud technology.** This offers unlimited pay-as-you-go scalability of highly secured computing, networking and variable storage capacities. Cloud services eliminate weeks or months of IT procurement, setup and commissioning time, while cutting capital expenses to a minimum, helping to improve the balance sheet.

**3. Advanced analytics of big data,** drawing insights from the large and ever-growing data sets generated by IoT sensors and devices. By having access to your data from disparate locations in one location, all in a highly secured cloud, you gain the ability to make multi-faceted inferences about the condition of your production assets, processes and work-in process.

Advanced analytics can help plant operators better manage variability – especially in mass-customization scenarios.

To sum it up, today's digitalization not only supports continuous improvement across the product functional areas, but also fosters continuous innovation to make food and beverage makers more productive, profitable and competitive.

## Three ways digitalization can enhance food and beverage production

**1. Increase efficiencies and productivity.** From R&D to production to marketing to supplier and channel performance, digitalization can streamline processes and bring diverse functions together. This can help improve process efficiencies and cut waste and energy use, while wringing more profitability out of thin margins. Condition monitoring of equipment is possible, too, making maintenance less schedule-based and more proactive (as needed), helping save labor and parts.

By enabling predictive maintenance and reducing production commissioning and changeover times, digitalization can also improve equipment uptime and availability, minimizing costly downtime. Shifting software applications to the cloud can cut capital costs.

**2. Improve track-and-trace capabilities.** With digitalization, production assets can communicate with sensors via automation networks to manufacturing execution systems (MES) and enterprise resource planning (ERP) systems – not just inside one plant, but across all of a food and beverage maker’s plants worldwide.

Mining production data for insights can answer many core operational questions about a particular product. Are quality issues associated with processes or feedstocks? If the latter, which supplier is it? Can the packaging design be altered a bit to save costs?

In these sorts of ways, increased transparency can improve quality control. It can also make track-and-trace much easier and faster, while streamlining compliance and reporting for safety regulations.

**3. Enable closed-loop product development.** By abstracting the physical properties of actual products into their digital twins – including their recipes, packaging, labeling, production models and so on – food and beverage makers can take greater advantage of closed-loop market feedback.

They can connect voice-of-the-customer data, including buying behaviors, surveys and focus group interviews with quality control data and R&D models. Food scientists can measure variances between their product designs and outputs, noting variances for future development efforts. This can drive faster innovation in products and services. They can mass customize products for local markets, even for individual consumers.

## The cloud-based, open IoT operating system

As the world becomes increasingly connected, digitalization – using digital technologies to transform business operations – is a key differentiator that will enable companies to remain competitive. With MindSphere, Siemens is realizing these opportunities across our entire business and enabling other companies to unlock their full potential with IoT data.

MindSphere running on leading cloud infrastructure, uses Siemens industry domain expertise to securely connect your products, plants and systems to create a digitally networked industrial landscape. MindSphere can help food and beverage makers drive innovative IoT solutions across their organizations with minimal investment and operational disruption.

In addition, MindSphere users get:

- On-demand IT infrastructure, always updated and highly secured with virtually limitless scale and no bother with maintenance, patches, updates, security and other ownership chores
- Capital expense savings, plus savings in time, effort and skills to acquire, deploy, commission and maintain needed hardware
- Flexible pay-as-you-go cost models via consumption-based pricing helps food and beverage producers to avoid up-front capital costs of hardware – while aligning costs with usage – a model that original equipment manufacturers (OEMs) can pass through to their customers, too, as both a benefit and a competitive differentiator
- Cost-effective access to platform as a service (PaaS) functions, such as high-performance computing, and to software as a service (SaaS) applications, such as advanced data analytics and MindSphere APIs
- Food and beverage industry applications to quickly begin to optimize the entire product lifecycle

### Siemens' MindSphere protects your asset connectivity and data from cyber threats

MindSphere is hardened by our years of security experience in automation technology, providing industrial-grade cybersecurity that aligns with International Organization for Standardization (ISO) 27001 and International Electrotechnical Commission (IEC) 62443.

#### Avoid intrusion into your automation system

- **Only outbound connections:** Only outbound HTTPS connections are established from the connection device to the MindSphere platform
- **Separation of automation and communication networks:** Two separate network interfaces are used plus an internal firewall in between
- **Read-only access to automation systems:** It is not possible to modify data or send control signals to the data source

#### Secured connections between automation systems and the cloud

- **Highest level of encryption:** All communications between the connection device and the MindSphere platform are encrypted
- **State of the art authentication:** All connection devices have a unique identifier for authentication

#### Protect your data

- **Confidentiality:** All data stored in MindSphere is treated confidentially in accordance with ISO 27001
- **Authorization:** The customer controls authorization levels and is the data owner. Siemens does not have access to the data
- **Data loss prevention:** Redundant systems guarantee data consistency and prevent data loss
- **Access control:** MindSphere supports single-sign-on and two-factor authentication

Risk assessments for the MindSphere platform and the connection devices are performed at regular intervals to identify potential threats and vulnerabilities.

### Taking the next step toward end-to-end, closed-loop digitalization

Globally, the digitalization trend among food and beverage makers will only accelerate. That's especially true as they modernize rapidly aging equipment to stay profitable, competitive and agile.

With operational costs of old machinery rising with more frequent maintenance, repairs and hard-to-find spare parts, finding cost-effective options to increase the life span of existing machines is a challenge. Also, plant engineering and maintenance experts are retiring in ever-greater numbers, taking their know-how with them.

MindSphere now makes it practical and economical for food and beverage makers to leverage data from both new and old machines to create digital twins and analyze IoT data from their plant assets to achieve significant gains in product innovation, operational transparency, productivity and competitiveness.

Given the low entry cost and plug-and-play connectivity of MindSphere, it's time for food and beverage makers to investigate what they can gain with industrial IoT capabilities – all with little risk to today's operations, and the potential for tremendous upside. With MindSphere, they can get started fast and begin monitoring equipment immediately to pave the way for using advanced analytics to improve performance and lay the groundwork for transformational innovation.

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