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The future of manufacturing in food and consumer products

From *lean* foundations to *smart factories*, and how leaders can act with confidence

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Executive summary



Smart Factory is:
a digitally enabled manufacturing operating model that improves execution and accelerates learning.

The key test:
does it improve trust in data → trust in decisions → trust in execution?

Food and Consumer Products (F&CP) manufacturers are entering a decisive phase in the evolution of manufacturing. Rising cost pressure, chronic labour constraints, increasing SKU complexity, tighter customer service expectations, and sustainability requirements are converging at the plant level.

Smart Factory is increasingly the lever leaders are exploring to unlock capacity and improve conversion performance—but results are uneven. The difference is rarely technology. It is whether the operating foundation is strong enough for digital investments to amplify execution instead of automating instability.

For most C-suites, Smart Factory is funded first as an efficiency and conversion-performance agenda because that is where ROI is immediate: lower conversion cost, higher OEE, more throughput from existing assets, and less waste. The strategic upside is an operating model that also improves agility, resilience, and sustainability by creating reliable operational truth, data-driven decision making and faster learning cycles across sites.

Our practical point of view is that Smart Factory is a manufacturing operating model, not a technology initiative or an automation program. It is built on disciplined Lean practices, enabled by leadership behaviors and a performance-based culture, supported by a minimum viable IT/OT backbone, and scaled through standardized solutions that can be deployed consistently across plants.

To frame the conversation, three decisions matter most:

- **Where to start:** Choose the constraint-driven value pool and prove impact on one line.
- **What to standardize:** Define the minimum standard for operational truth (loss model, definitions, cadence, action tracking).
- **How to scale:** Use a replication engine, Prove → Package → Replicate → Govern, so use cases become standardized solutions.



Why food and consumer products manufacturing is fundamentally different

Much of the Smart Factory narrative has been shaped by discrete and heavy industrial environments, but F&CP manufacturing operates under a different set of realities that change which solutions matter most, and how they must be implemented.

In F&CP, economics and performance are often dominated by yield and giveaway, sanitation-driven downtime, frequent changeovers due to high product mix, and packaging constraints. Complexity shows up as product and packaging variety, shorter runs, and tight service expectations. These realities heighten the need for operational truth, rapid data-driven problem solving, and consistent execution.

Manufacturing networks, and their equipment, are also typically heterogeneous, built and modernized over decades and often expanded through acquisitions. The question is not whether maturity is uneven; it is how leaders define a scalable minimum standard that enables consistent performance and repeatable improvements across a network.

What Smart Factory looks like on the shop floor: Imagining the day-to-day reality

In Food and Consumer Products plants, Smart Factory value is created where digital automation and human leadership reinforce one another—not by replacing the frontline, but by giving teams better signals, faster routines, and more reliable execution.

Imagine a typical day in a plant where the operating system is digitally enabled. The experience feels different—not futuristic for its own sake, but more predictable, more proactive, and easier to run well.



Shift start: operational truth is immediate. Instead of supervisors reconciling paper logs and debating what happened overnight, the shift begins with a shared view of the facts: where time was lost, what changed during changeovers, where yield and giveaway drifted, and which constraints are most likely to limit today's schedule. Digital performance management replaces manual routines so operational variances are captured at the point of execution, escalation starts earlier, actions are tracked consistently, and learning doesn't get lost between shifts enabling a faster and more efficient ramp-up.

During production: the process tells you it's drifting before it fails. Sensors and analytics continuously monitor the equipment that drives food manufacturing economics—ovens, fryers, blenders, grinders, slicers, and fillers—so the plant can protect yield, energy use, and uptime without relying on operator intuition alone. Rather than manually adjusting equipment parameters based on real-time results, smart centerlining systems dynamically adjust settings, learning from recent optimal production runs. Instead of discovering problems after scrap or downtime appears, teams see early signals of drift and correct course while the cost of correction is still low.

Quality becomes in-line prevention, not end-of-line discovery. Vision systems perform real-time inspection and identify defects, variation, and process drift as it happens. That enables faster containment and root cause action, and it shifts quality from inspection toward control.

Automation shows up where it matters most—supporting, not substituting. Robotics and targeted automation take on repetitive, hazardous, or ergonomically challenging tasks, improving safety and consistency while freeing operators and mechanics to focus on running and improving the process.

This is not a lights-out factory. It is a people-led, digitally enabled environment where frontline teams are better equipped to run the operation—delivering stronger performance and making improvement durable.



Throughout the day: leaders manage proactively, not reactively. Line supervisors and plant leaders use real-time views to anticipate issues rather than react to failures. The daily management cadence becomes more effective because everyone is working from the same operational truth—enabling faster prioritization, clearer accountability, and more consistent follow-through.

Critically, this starts with no-regrets capabilities, then expands. In most plants, this day-to-day reality doesn't appear all at once. It starts with foundational moves—digitizing performance visibility and the management system - so the organization can run on facts. From there, sensing, decision support, and selective automation compound value as the operating foundation stabilizes.

This is why Smart Factory is best understood as a new way of working—an operating model that makes performance visible, decisions faster, and execution more reliable in the realities of F&CP manufacturing.

Smart Factory is a manufacturing operating model, not a technology program

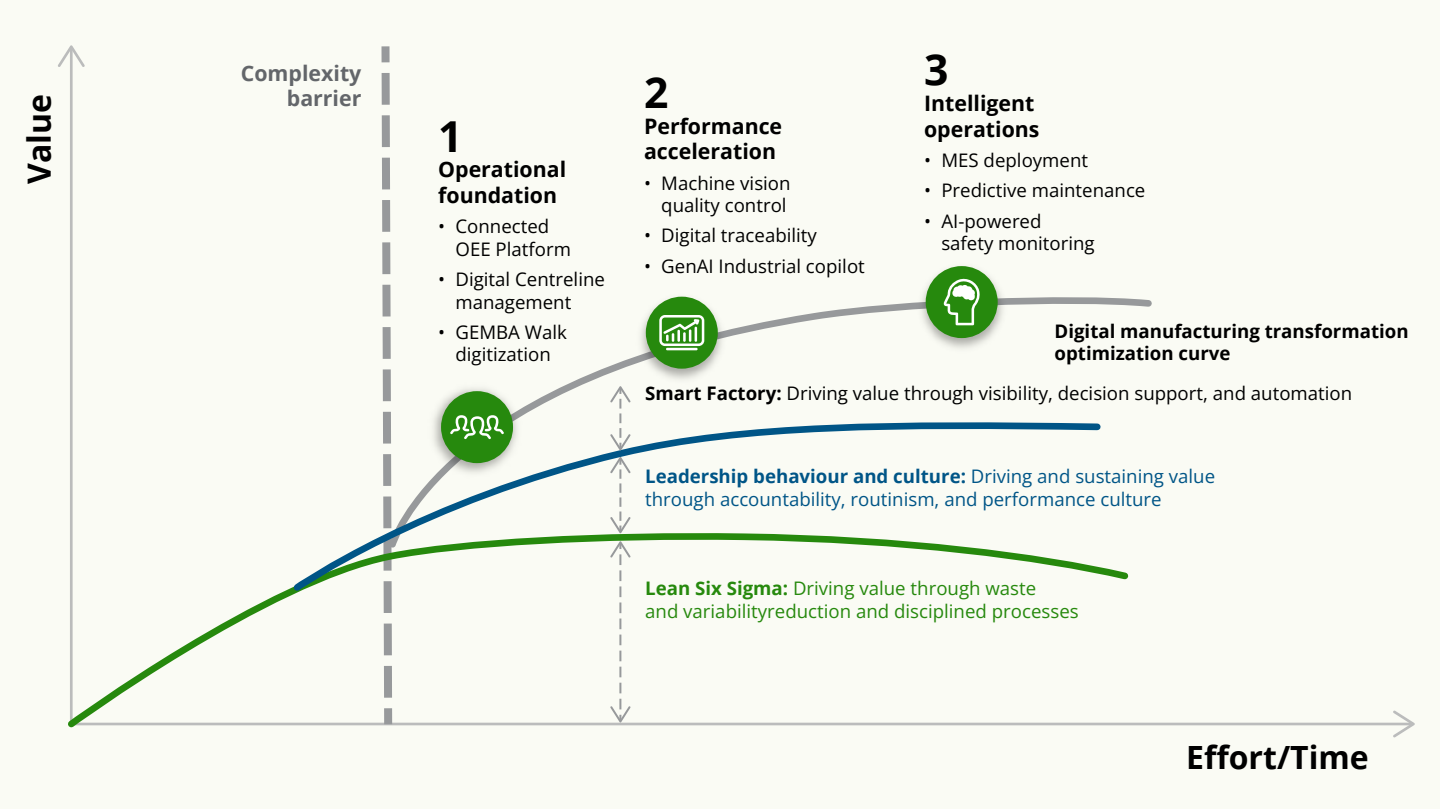
Leading manufacturers do not treat Smart Factory as an IT project or a portfolio of pilots. They treat it as the operating model for how manufacturing runs, including how information is created, how decisions are made, and how work is executed day to day.

In practice, Smart Factory delivers value when it strengthens the fundamentals of manufacturing excellence: it makes losses visible, compresses learning cycles, and increases the reliability of daily management. It enables plants to run with higher fidelity and faster response than manual routines and fragmented systems can sustain, especially under labor volatility and complexity.

In practice, Smart Factory delivers value when it strengthens the fundamentals of manufacturing excellence...

Figure 1: Elevating performance with Smart Factory solutions

Sequence matters. Stabilize first, then digitize and automate for step-change impact, beyond what traditional lean practices can deliver



The system of trust: why Smart Factory delivers measurable performance

Smart Factory programs deliver measurable performance when they create a shared "system of trust": trust in data, trust in decisions, and trust in execution. This is what moves organizations beyond dashboards to sustained operational improvement.



In food manufacturing, trust is practical: leaders need confidence that losses are measured consistently, that prioritization reflects the true constraint, and that countermeasures will be executed and sustained across shifts.

- **Trust in data:** The line is telling the truth. Losses, changeovers, yield/giveaway, downtime, and quality signals are captured consistently and defined the same way across shifts and sites.
- **Trust in decisions:** Everyone sees the same operational facts. Prioritization is faster, debates shift from opinions to evidence, and leadership aligns quickly on what matters now.
- **Trust in execution:** Issues escalate early, actions stick, and countermeasures are sustained. Learning replicates across lines and sites instead of remaining trapped in local heroics.

This system of trust amplifies Lean. It increases the speed and effectiveness of Lean disciplines beyond what bandwidth-limited routines can sustain at scale. Smart Factory does not replace Lean. Rather, it makes Lean durable in complex, labor-constrained environments.

From efficiency to agility, resilience,

Once operational truth is reliable and shared, the same operating model that improves conversion performance also enables outcomes executives increasingly need but often struggle to connect to shop-floor execution: agility, resilience, and sustainability.

These outcomes are not separate programs. They emerge when the organization can sense issues early, decide quickly, and execute consistently across lines, shifts, and plants.

What agility, resilience, and sustainability mean in F&CP manufacturing

Agility

Agility is the ability to reconfigure quickly—to change what you make, how you make it, and how fast you make it—without destabilizing quality, cost, or service. In F&CP plants, agility shows up in four practical ways:

1. **SKU agility:** faster, more repeatable changeovers and line reconfiguration to handle frequent product and packaging variation.
2. **Volume agility:** the ability to ramp up or ramp down quickly as demand signals change (promotions, channel shifts, seasonality) or constraints shift, without relying on excess inventory buffers.
3. **Innovation agility (NPI speed):** faster and more reliable new product introductions using digital twins, simulation and production data to reduce trial-and-error, compress commissioning/qualification cycles, and improve right-first-time launches.
4. **Constraint agility:** adapting to supply variability (ingredient substitutions, packaging availability, allergen and sanitation constraints) by making trade-offs visible and executable with fewer surprises.



Resilience

Resilience is the ability to operate reliably through disruption—labour volatility, equipment instability, quality events, and supply interruptions —without constant heroics or over-reliance on buffers. Resilience improves when issues are detected earlier, escalated faster, and resolved more consistently through a disciplined management operating system.

Sustainability

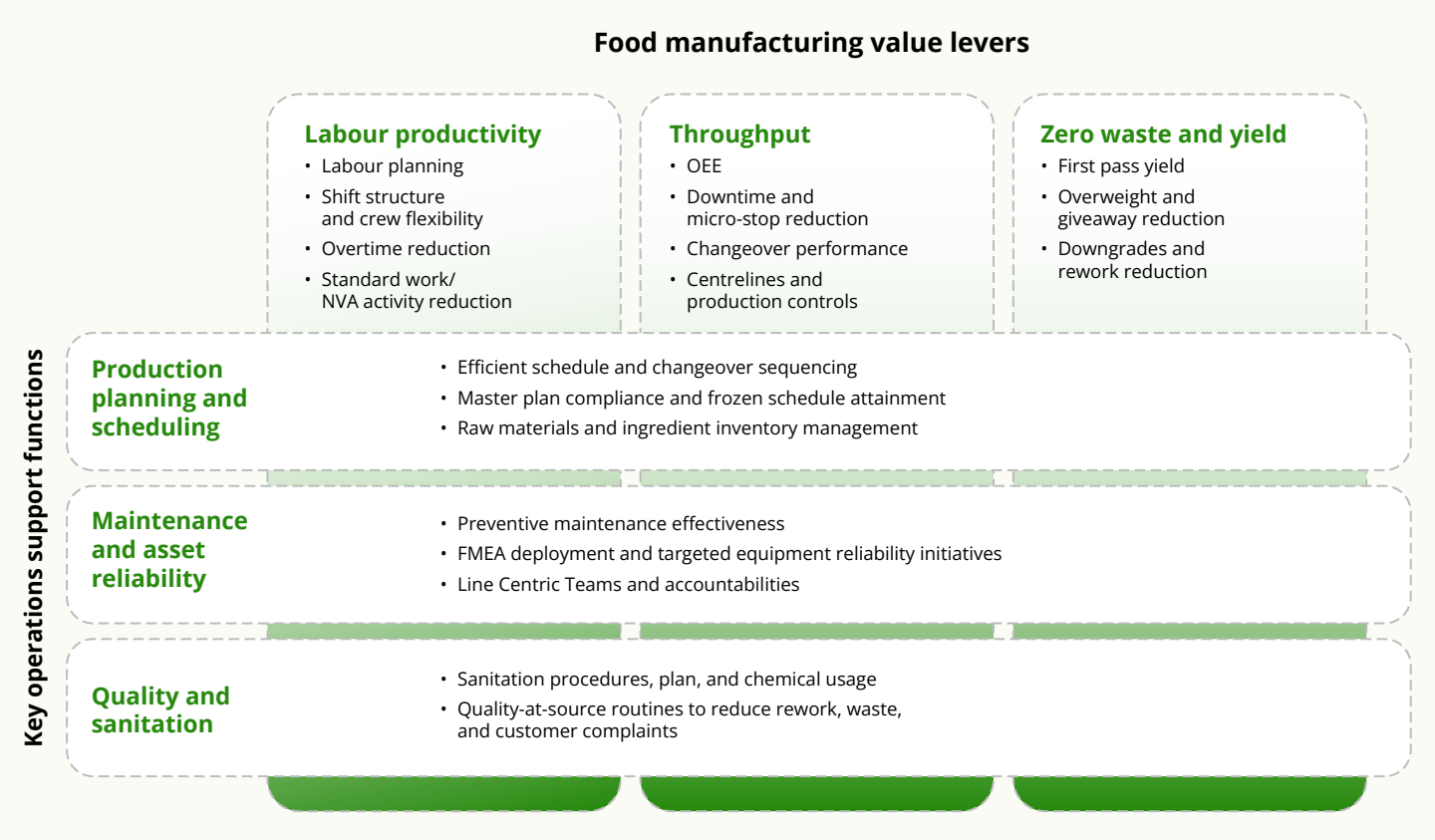
Sustainability improves when the operating model reduces waste and stabilizes execution: less scrap and rework, improved yield/giveaway control, fewer sanitation deviations, and lower energy and water intensity through better process control and fewer disruptions.

The F&CP value equation: where ROI really comes from

In F&CP manufacturing, Smart Factory ROI typically concentrates in a set of recurring value pools. These value pools are measurable and translate directly into conversion cost performance and service outcomes:

- Yield, giveaway, and rework reduction
- Changeover performance and rapid line reconfiguration
- Downtime and micro-stoppage elimination (often packaging constraints)
- Labor productivity and staffing flexibility
- Quality-at-source and food safety risk reduction
- Energy, water, and sanitation optimization
- Working capital reduction through greater stability (less buffer inventory, fewer expedites)

Figure 2: Foundation for food manufacturing excellence



Evidence of value achieved (selected public examples)

Public evidence suggests smart manufacturing programs are delivering real outcomes at scale. In Deloitte's 2025 Smart Manufacturing and Operations Survey, respondents reported up to **20% improvement in production output**, up to **20% improvement in employee productivity**, and up to **15% unlocked capacity**.

Deloitte has also invested in a global Smart Factory experience network, spanning facilities in Germany, Japan, the United States, and Canada. This offers physical and virtual environments designed to help leaders visualize, test, and scale smart manufacturing capabilities. Together with our ecosystem partners, we have a unique perspective on unlocking value in F&CP manufacturing.

At an industry level, the World Economic Forum's Global Lighthouse Network provides a reference set of sites that have demonstrated step-change performance through technology-enabled transformation. In September 2025, the Network expanded to 201 sites. The latest cohort reported, on average, a **40% labour productivity increase** and a **48% reduction in lead time**.

Scaling is not risk-free. Common challenges include workforce and talent gaps, cybersecurity/OT risk, IT/OT disconnection and operational disruption during transformation. This makes operating model discipline and a minimum viable IT/OT backbone critical enablers.

Importantly, these results are not exclusive to the largest companies. The Lighthouse community has intentionally included diverse sites (including smaller operators), and WEF research suggests use cases can deliver **~4–5× ROI** over five years with typical implementation timelines of 10–20 months, making the approach scalable when the operating model is right.

Selected food and consumer products Lighthouse examples (illustrative):

Danone (Opole, Poland)

Reported **~19% cost improvement** and **~12% efficiency improvement**, while reducing greenhouse gas emissions by close to **50%**.

Unilever (Tinsukia, India)

Reduced planning frozen periods from **14 days to one**, enabled a threefold increase in unique SKUs, and cut sustainable packaging trial time by **84%**.

Mondelēz (Beijing, China)

Achieved **28% net revenue growth** and **53% labour productivity improvement**, while reducing GHG emissions by **24%** and food waste by **29%**.

Procter & Gamble (Takasaki, Japan)

Accelerated **innovation lead time** by **72%**, **reduced shutdown days** for trials by **21%**, and **improved customer order horizon 14-fold**.

The Coca-Cola Company (Singapore)

Delivered a **28% throughput increase**, **70% labour productivity boost**, **80% reduction** in **shortages**, **31% improvement** in **on-time deliveries**, and a **34% reduction** in Scope 2 emissions.

Capturing these value pools repeatedly requires scaling standardized solutions—packaged capabilities with common definitions, routines, and governance—supported by a replication engine: prove → package → replicate → govern.

Foundations of scalable Smart Factory success

Smart Factory programs that scale reliably balance three foundations. These are enabling conditions that make Smart Factory repeatable and sustainable across a network.



Foundation 1:
Disciplined Lean manufacturing practices (nonnegotiable)

Manufacturing excellence in F&CP begins with Lean rigor: elimination of waste, reduction of variation, standard work and centerlines, and structured problem solving. When executed well, Lean shifts plants from reactive firefighting to predictable execution. Smart Factory reinforces Lean by digitizing routines, making losses visible in near real time, and increasing the velocity of learning and countermeasure replication, moving from episodic improvement to sustained performance.



Foundation 2:
Leadership and a performance-based culture (the management operating system)

Smart Factory success requires visible, aligned leadership and a management operating system that turns transparency into action. The Plant Manager and frontline supervisors are the keystone: where the operating model either becomes real, or becomes a dashboard.

- Enterprise leaders set direction, capital discipline, and the expectation that Smart Factory becomes "how we run manufacturing".
- Plant leadership operationalizes this through short interval control walks, tiered daily management, escalation routines, and disciplined problem solving.
- Enabling functions (maintenance, engineering, quality, CI, IT/OT) ensure standards, capability, and systems evolve together, operating as one team within a line-centric philosophy.



Foundation 3:
Minimum viable IT/OT backbone (pragmatic, scalable, secure)

Smart Factory success does not require perfect IT/OT maturity. It requires a minimum viable foundation with enough capability to enable execution, learning, and replication across an uneven plant network.

On the OT side, that includes secure connectivity and practical data capture that accommodates legacy assets. On the IT side, it includes consistent definitions and governance so data can be trusted and reused across plants.



Avoiding *pilot purgatory*: scaling standardized solutions, not disconnected pilots

The most common Smart Factory failure is pilot purgatory: value proven locally but not replicated; tools deployed without changes to daily management; unclear ownership between operations, maintenance and reliability and IT/OT.

Avoiding pilot purgatory requires scaling standardized solutions—repeatable solution patterns that reinforce the operating model, rather than a loose menu of optional use cases.

What "standardized solutions" means in practice

Standardized solutions are packaged capabilities deployed consistently across plants (common definitions, workflows, visual management, role-based routines, organizational structures), with local configuration for product and process differences.

In F&CP, high-value standardized solutions typically begin with digital performance management, real-time loss visibility, digital problem solving/RCA, connected worker routines, and targeted analytics once execution discipline is ready.



No-regrets actions for the next 90 days

1. Make losses visible on one priority line (standard loss model; baseline; lightweight connectivity).
2. Digitize the daily management system (short interval control walks, tier meetings, action tracking, escalation routines).
3. Define the minimum viable IT/OT foundation (secure connectivity, common definitions, governance for scaling).

Executive marching orders: five decisions to scale Smart Factory in F&CP

1. **Where to start:** Choose the constraint-driven value pool that matters most (yield/ giveaway, changeovers, packaging downtime, sanitation/CIP discipline, labour flexibility, energy) and prove impact on one line before scaling.
2. **What to standardize:** Define the minimum standard for "operational truth" (loss model, definitions, reason codes, escalation cadence, action tracking). Standardize what must be common; configure what must be local.
3. **Who owns the operating model:** Make operations accountable for adoption and benefits (VP Ops, Plant Managers, line leaders). IT/OT enables and secures the backbone; it does not "own" performance.
4. **What to measure:** Track a small set of outcome KPIs (conversion cost, OEE/loss tree, yield/giveaway, schedule adherence, quality-at-source, energy intensity) with a consistent cadence and clear decision rights.
5. **How to scale:** Use a replication engine—prove → package → replicate → govern—so successful use cases become standardized solutions with prerequisites, playbooks, and benefits tracking.



Closing perspective

Smart factories are not a destination. They are an enabler of sustained manufacturing excellence. In Food & Consumer Products, success belongs to organizations that treat Smart Factory as the manufacturing operating model - built on disciplined Lean practices, enabled by leadership and a performance-based culture, supported by a pragmatic IT/OT backbone, and scaled through standardized solutions that reinforce how work gets done every day.

This is how manufacturers deliver not only efficiency and conversion performance, but also the agility, resilience, and sustainability the future supply chain demands.

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