

A Frost & Sullivan Whitepaper

Enabling CPG industry growth without compromising profit, people or the planet

**Leveraging Plant iT and brewmaxx Process
Control System, MES inside with the EcoStruxure
platform**





Contents

| | |
|--|----|
| Enabling CPG industry growth without compromising profit, people or the planet | 2 |
| CPG Industry at the Crossroads | 2 |
| Agility | 2 |
| Sustainability | 4 |
| Health and Safety | 5 |
| Workforce Empowerment | 5 |
| Profitability | 7 |
| Barriers to Addressing the Strategic Imperatives | 7 |
| Leveraging Plant iT and brewmaxx with MES inside..... | 8 |
| Identifying and Working with a Trusted Technology Partner | 11 |
| Conclusion | 12 |
| About Frost & Sullivan..... | 13 |
| About Schneider Electric..... | 13 |

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The Paper was completed in March 2022.

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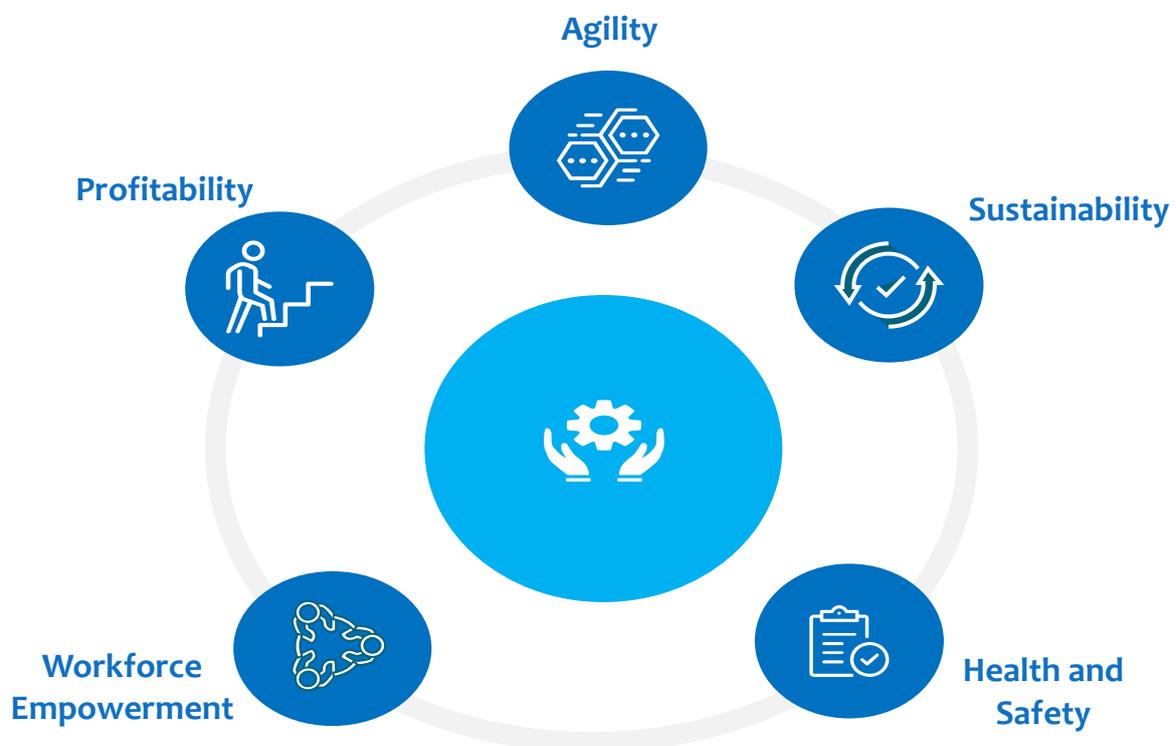
Enabling CPG industry growth without compromising profit, people or the planet

CPG Industry at the Crossroads

Frost & Sullivan identifies five **strategic imperatives** that impact the consumer packaged goods (CPG)¹ industry today.

Failure to address these imperatives proactively will almost certainly lead to loss of competitive advantage and accelerated decline. On the other hand, successful companies overcome the challenges posed by these imperatives and leverage them to drive innovation and growth.

Figure 1: Strategic Imperatives for the CPG Industry



Source: Frost & Sullivan

Agility

Consumer shifts towards self-care (spurring demand for **health and wellness and free-from**² products), indulgence and reward (driving demand for **premium** products), and sustainable/ethical choices (underpinning uptake of **clean/green** products) – along with the

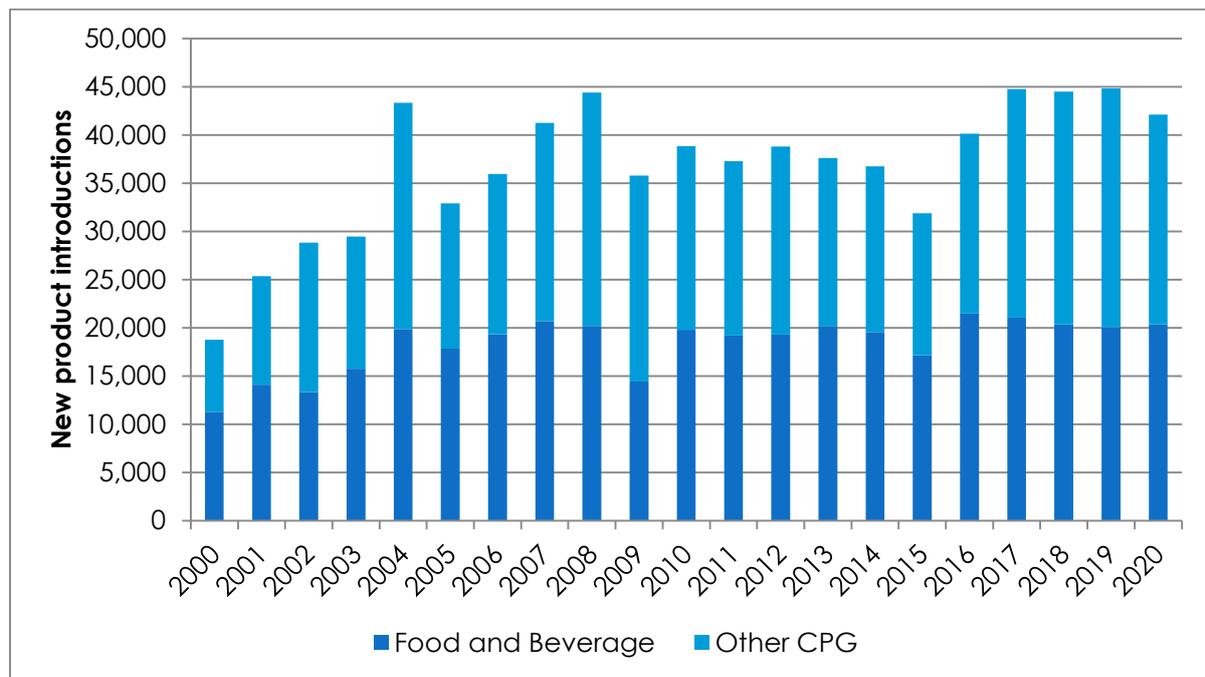
¹ CPG includes fast moving consumer goods such as food & beverage (F&B) products (from breweries, dairy, beverage, bakeries and other F&B), home and personal care products, life science products (e.g. pharmaceuticals), etc.; Frost & Sullivan

² For example, gluten-free, lactose-free, allergen-free, artificial flavour-free, chemical-free, dairy-free, meat-free, etc.

continued demand for **convenience** – is prompting CPG manufacturers to raise market-led innovation and **new product development** activity levels. For example, new functional³ food/drink launches increased 59% between 2016 and 2020.⁴

Despite the negative impact of the Covid-19 pandemic on new product launch activity in 2020, historical data shows a continued upward trend. In the United States, the total number of CPG new product introductions grew 124% between 2000 and 2020.⁵

Figure 2: New Product Introductions, CPG Industry, USA, 2000-2020



Source: USDA, Economic Research Service, using data from Mintel, Global New Product Database

For CPG manufacturers, shorter product lifecycles and increased number of new product launches demand **greater operational agility and flexibility**. This translates into more diverse production datasets to be tracked, analysed and acted on, as well as shorter intervals between new production runs.

Finally, **demand fluctuations and supply disruptions** (from black swan events,⁶ extreme weather events, pandemics, the rapid and continued acceleration of e-commerce, and trade tensions) force CPG manufacturers to focus on achieving supply chain resilience. In part, this means having to de-risk sourcing by diversifying the supplier base. This in turn, creates the need for applying contextualised data⁷ to ensure consistency of produced output (despite any differences in raw material inputs).

³ Food and beverage with a clear health and wellness benefit beyond nutrition

⁴ Innova Market Insights, quoted in 'A New World Order for CPG Companies', A. Elizabeth Sloan, Institute of Food Technologists, 1 October 2021

⁵ Calculated by USDA, Economic Research Service, using data from Mintel, Global New Product Database

⁶ "A black swan is an improbable event with three principal characteristics - It is unpredictable; it carries a massive impact; and, after the fact, we concoct an explanation that makes it appear less random, and more predictable, than it was." (The Black Swan, Nassim Nicholas Taleb, 2009)

⁷ Combining data from different but relevant data sources and types

Sustainability

The CPG industry is increasingly focused on becoming more sustainable and carbon neutral, with environment-conscious consumers ready to pay a premium for the environmentally-sensitive ingredients and products. In addition, investors, employees and government regulators have raised their expectations around the industry's sustainability performance. This has translated into more **sustainability commitments/pledges** by CPG manufacturers, with many of them aligning company-wide transformation to global **environmental, social and governance (ESG) frameworks** such as the UN Sustainable Development Goals (SDGs),⁸ the Global Reporting Initiative (GRI), Carbon Disclosure Project (CDP), Climate Disclosure Standards Board (CDSB), International Integrated Reporting Council (IIRC) and Sustainability Accounting Standards Board (SASB). It is also translating into greater uptake of certified labels and the use of third-party certification agencies.

Whilst partnering with green and renewable energy sources will be at the forefront of carbon neutrality initiatives, reducing overall **energy** and **water** consumed, **emissions** generated, as well as **waste** generated in production processes is a priority. For example, despite **clean-in-place (CIP)**⁹ being a critical requirement to prevent fouling and contamination in process equipment, it comes at a significant cost - it accounts for 30% of the energy used in dairy production and 35% of the water used in beer brewing.¹⁰

Around 0.6 billion tons of CO2e are associated with the processing stage of the food and beverage sector.

"Inefficiencies in corporate operations can lead to emissions as well as lost revenue. (One example of ways companies can enhance operational efficiency:

Increase efficiency in food and beverage processing and manufacturing by maximising the use of ingredients and optimising production efficiency."

Global Sector Strategies: Recommended investor expectations for food and beverage, Climate Action 100+, August 2021

Sensor data, Internet of Things (IoT)¹¹ solutions, and real-time analytics can be leveraged to ensure optimal energy/water usage, minimal waste generated, lower emissions and effective asset optimisation and to monitor plant environment conditions to reduce overall carbon footprint.

⁸ The SDGs remain a key foundational framework for development, monitoring and update of sustainability strategies at CPG production sites.

⁹ The automated cleaning of the interior surfaces of pipes, vessels, and associated equipment without disassembly.

¹⁰ Eide M., Homleid J., Mattsson B. 'Life cycle assessment (LCA) of cleaning-in-place processes in dairies' and Eide M., Homleid J., Mattsson B. 'Life cycle assessment (LCA) of cleaning-in-place processes in dairies', quoted in 'Intelligent Industrial Cleaning: A Multi-Sensor Approach Utilising Machine Learning-Based Regression', A Simeone, E Woolley, J Escrig, and N J Watson, Sensors (Basel), July 2020

¹¹ IoT is when objects are connected, virtualised and imbued with data measurement capabilities (giving physical and virtual objects an identity, interconnecting the objects that can monitor and interact with each other and having the ability to generate real-time insights from data that can be incorporated into existing organisational processes.

Health and Safety

Increasing risk of reputational damage from **safety breach/product defect** scandals, causing consumer mistrust, is driving demand for more transparent systems. In addition, governments are recognising the co-dependent risk to their export industries (from safety breaches), thus driving greater **regulatory oversight** of traceability. As a result, CPG manufacturers are increasingly committed to ensuring their processes and operations comply with relevant **safety standards** (such as Hazard analysis and critical control points (HACCP)¹², SQF,¹³ FSSC 22000¹⁴ and BRC¹⁵).

"The global IoT and traceability solutions market (hardware, software, networking and services) for food & beverage manufacturing is forecast to reach USD8.4 billion in revenue by 2025."

Frost & Sullivan

This has spurred the uptake of digital tools such as sensors, RFID tags, real-time location systems (RLTS), biometrics, diagnostic/rapid testing kits, safety management software systems, condition monitoring software systems, as well as a range of analytics and reporting solutions.

Workforce Empowerment

One of the most formidable near and long term challenges for the CPG industry is **finding and retaining skilled labour**.

Figure 3: CPG Industry Jobs Filled vs Requirement, USA, October 2021



Source: Consumer Brands Association's analysis of the U.S. Bureau of Labor Statistics October 2021 data

¹² A systematic approach to the identification, evaluation, and control of food safety hazards

¹³ Safe Quality Foods (SQF) Code is a Global Food Safety Initiative (GFSI)-benchmarked food safety standard

¹⁴ FSSC 22000 contains a complete certification Scheme for Food Safety Management Systems based on existing standards for certification (ISO 22000, ISO 22003 and technical specifications for sector prerequisite programs).

¹⁵ British Retail Consortium standards

Beyond the pandemic, the challenge remains with the **ageing workforce** trend and particularly the retirement of the baby boomer¹⁶ workforce (and exit or early retirement of the Gen X¹⁷ workforce), which will lead to the exit of a large cohort of experienced operations personnel.

While the lockdowns and movement restrictions of the Covid-19 pandemic triggered a large scale **shift to remote working practices** (with about 40–50% of the workforce in advanced economies working from home at the height of the pandemic),¹⁸ long term mega trends suggest that this approach is likely to persist (the share of paid jobs offering remote work nearly doubled between November 2020 and November 2021).¹⁹

Over the long term, the future workforce will be characterised by a higher proportion of Gen Z²⁰ workers (digital natives, quick to adapt to technological changes, and with higher expectations around enabling technologies for work). This will also mean increased worker safety and productivity through leveraging cloud solutions, mobile tablets, smartphones, intelligent glasses, augmented reality (AR)/virtual reality (VR), digital twin technology, and drone technology for training, operations, and maintenance scenarios. From a CPG manufacturer perspective, it will require seamless and secure convergence of IT and OT environments so that **connected workers** are empowered effectively and connected processes support agile decision-making by management.



¹⁶ Born between 1946 and 1964

¹⁷ Born between 1965 and 1980

¹⁸ Taneja et al. 2021, Barrero et al. 2021 a, Davis et al. 2021, quoted in 'Teleworking is not going anywhere - here's why', World Economic Forum, 15 February 2022

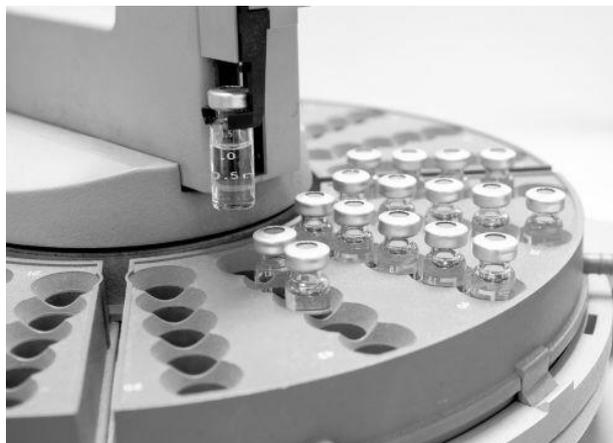
¹⁹ 5 forces driving the new world of work, Allen Blue, LinkedIn, World Economic Forum, 18 January 2022

²⁰ Generation born between 1996 and 2010

Profitability

15 of 34 advanced economies saw **inflation** in 2021 running above 5% (a trend not seen in two decades) and 78 out of 109 emerging market and developing economies faced annual inflation rates above 5%.²¹ Currently, for the CPG industry, formidable challenges to profitability include rising commodity prices, surging packaging, transport and logistics costs, as well as labour shortages across manufacturing and supply chain.

Historically, the CPG industry's growth objectives have been met more by **profitability growth** as opposed to total revenue growth. Between 2009 and 2019, for the top 30 CPG companies in terms of absolute economic profit growth, margin expansion contributed twice as much as revenue growth to absolute value creation.²² Between 2016 and 2019, CPG companies that were able to achieve both organic growth and margin expansion delivered nine times the average total returns to shareholders (TRS) compared to all others.²³



To enable increased profitability, CPG manufacturers are looking to reduce design costs, extend asset life, as well as achieve savings in operational expenditure. One approach gaining traction is the shift in focus from initial capital expenditure outlays alone to **total expenditure (TOTEX)** i.e. capital expenditure + lifecycle operational expenditure; to provide a whole-of-life view that is more holistic and outcome-based. However, this can only be done effectively if the data collected is reliable, contextualised and up-to-date, and if operational and business systems are well integrated.

Barriers to Addressing the Strategic Imperatives



Unfortunately, it is often the case that CPG workforces operate in **siloed departments** and units, impacting the ability of the company to extract and connect key operational data points and insights. As a result, many of these data points and insights take too long to reach the relevant operator or plant manager, impacting the ability to take action. In addition, a **conservative mindset** to change, **ageing plants**, **outdated IT and OT environments**, **incomplete existing documentation**,

and **in-house teams lacking relevant implementation experience** hamper the ability of

²¹ The Return of Global Inflation, The World Bank, 14 February 2022

²² What got us here won't get us there: A new model for the consumer goods industry, McKinsey & Company, 30 July 2020

²³ Charting a winning course for CPG value creation, McKinsey & Company, 2 November 2021

the CPG manufacturer to progress on its digital transformation journey. This is aggravated by the **low tolerance for any downtime or disruption to ongoing operations** on account of any changeover to new control systems.

Hence the need for **trusted external experts who understand the strategic imperatives** of agility, sustainability, health and safety, workforce empowerment and profitability and who have the **experience** of enabling these outcomes by **leveraging smart and integrated solutions and services**.

Leveraging Plant iT and brewmaxx with MES inside

Vertical and horizontal integration between Enterprise Resource Planning (ERP),²⁴ Manufacturing Execution Systems (MES)²⁵ and Process Control Systems (PCS) to access to all relevant data within the IT and OT domains can ensure systems fully support plant staff in making the most informed, accurate and effective business decisions.

"Recipe management, the detailing of bills of material, the entire materials management chain, including the booking of consumed raw materials: Plant iT ensures significantly improved overall transparency when it comes to monitoring and controlling processes. In terms of batch tracking, we are able to determine specifically which raw material has been processed in which product."

**Herbert Schrobenauser, Adelholzener Alpenquellen
(Beverage manufacturer), Germany**

To enable this outcome specifically for CPG manufacturers managing batch or continuous processes or a hybrid, Schneider Electric offers **Plant iT²⁶ and brewmaxx²⁷ object-oriented PCS with the EcoStruxure platform, and embedded MES functionalities**. This facilitates **integration across the various layers** of the technology stack – from connected products to Programmable Logic Controllers (PLCs)²⁸ and on up

to the MES. It also enables **intuitive configuration or parametrisation** of the object-oriented PCS/MES system at the front end, instead of extensive PCS coding and MES integration by automation and IT specialists. As a result, CPG plant staff can optimise the system themselves over HMI based on the latest usability requirements. **Standardisation** by

²⁴ ERP applications have become critical business tools covering accounting, cost, financial, order, procurement, project, and purchase management, manufacturing, distribution and warehousing, as well as human resources (HR).

²⁵ MES is the layer of controller software that connects the ERP with the actual production shop floor process. The true value of MES is that it offers complete interoperability, allowing shop floor information to be easily visible to the management team. Decisions are made that go back to the shop floor for instant implementation. MES takes all the data from smart sensor, condition monitoring, as well as customer production orders and combines it into a readable dashboard view with details on what the cycle times and idle times are and how much energy is being used by the machines in the shop floor.

²⁶ For all CPG industries

²⁷ Specifically designed for breweries

²⁸ PLC is a digitally operating electronic system that uses programmable memory for the internal storage of user-oriented instructions to execute specific functions such as logic, sequencing, timing, counting, and arithmetic. In addition, a PLC uses both digital and analogue inputs and outputs (I/O) to control various types of machines or processes.

end-use vertical ensures the same look and feel across interfaces, which enables faster and easier implementation and modification. **Operator oriented features** such as extended visualisation options and optional add-on of on-screen recording of online process visualisation data allow plant staff to go beyond mere assumptions to clear diagnosis of causes of failure or inefficiencies. They also aid in training/on-boarding of new operators. **Modular package units** also make it possible for CPG manufacturers to scale up in features based on digital maturity, scale in size as the manufacturer grows and adapts, and scale across the EcoStruxure platform to adopt further efficiencies.

Integration with the Modicon M580²⁹ edge controller and the EcoStruxure architecture ensures access to process data plant-wide. The ability to leverage **EcoStruxure Augmented Operator** provides immediate access to AR-formatted real-time information by allowing operators to superimpose current data and virtual objects onto a machine or plant. The ability to use **EcoStruxure Plant Advisor – Clean-in-Place** enables real-time data and analytics for monitoring, optimisation and continuous improvement of CIP operations across the key metrics of time, temperature, velocity, and chemical concentration (as well as ensuring adequate documentation for reporting and compliance). It also ensures the efficiency, effectiveness and sustainability of cleaning processes (resulting in no wasted chemicals and food-safe equipment after cleaning).

Figure 4: EcoStruxure Architecture, Example for a Brewery Plant



Source: Schneider Electric

²⁹ Ethernet-enabled programmable automation controller (PAC) with safety functions integrated

"Thanks to the upgrade to (the current version of) Plant iT, we are now able to visualise and operate all programs with an accessible, updateable and understandable system. We're able to work with the latest hardware and software without having to reprogram any existing programs in the controllers. Any new controllers that we set up are fully integrated under Plant iT."

Richard Rosenberger, Bauer (Dairy product manufacturer), Germany

errors and reduce start up time in the real world. In cooperation with key users, behaviour that conforms to expectations is checked. This helps reduce any disruption to ongoing production and minimise any downtime as a result of new control system implementation.

The ability to access, customise and perform tasks on Plant iT and brewmaxx using smartphone, tablet or PC also facilitates **location-independent monitoring and control**.

Importantly, the **increase in profitability** for CPG manufacturers can be significant. This comes through several avenues:

- CPG manufacturers can **optimise design costs and reduce design risks** by working with Schneider Electric's proposed **reference architecture technical documentation** that is based on extensive experience across diverse successful implementations.
- By leveraging Plant iT and brewmaxx and the EcoStruxure platform, CPG manufacturers enjoy the benefit of an **adaptable and agile solution** capable of

Using clear mapping and pre-defined automation classes from a large module library, as well as modelling and parametrisation of technical and technological components based on standards such as **ISA-88³⁰** and **FDA 21 CFR Part 11³¹** ensures that less time is required to set up or modify sub processes.

Digital twin simulations for Plant iT and brewmaxx both during the design phase and during factory acceptance tests (FAT) simulate the real factory virtually to minimise

"We did not need to reinvent the wheel, we have got a new system (brewmaxx) with compatible hardware and software that incorporates a maximum of improvements with a minimum of shutdown time - both in terms of functionality and reliability as well as from a costing point. As a result of the switchover, we save not only in training and maintenance costs; we have got a new system that we can extend at any time."

Werner Pieters, Bavaria Brewery, Netherlands

³⁰ The International Society of Automation (ISA) that sets out models and terminology addressing batch control

³¹ Title 21 of the Code of Federal Regulations that establishes the United States Food and Drug Administration (FDA) regulations on electronic records and electronic signatures

switching automatically to unused or underutilised assets to optimise plant performance and throughput.

- Plant iT and brewmaxx, MES inside, together with the EcoStruxure platform – through effective planning and management of order and recipe-controlled production processes – also helps **reduce material losses, waste and rework**.
- **Modular and open architecture** allows easy integration with existing plants or seamless expansion; thus minimising high upfront investments in complete system overhauls.
- **Integration with MES** helps align production line operations to market demand in real time, and so reduces time-to-market, as well as extending asset life through efficient scheduling of maintenance.
- Faster and more effective **training and on-boarding** of new operators also positively impacts profitability.
- The breadth of Schneider Electric's 24x7 **support and services** – which begins with a comprehensive assessment of process optimisation requirements, through to provision of relevant documentation and application notes, as well as facilitating proactive system monitoring and predictive maintenance within service level agreements (SLAs) – helps CPG manufacturers reduce TOTEX (CAPEX and OPEX), whilst getting the best possible outcome.

Identifying and Working with a Trusted Technology Partner

To address the key strategic imperatives effectively, CPG manufacturers need to “begin with the end in mind” by defining what success looks like and then uncovering what the real issues impacting growth, profitability and ESG outcomes are.

To support them on this journey, it is critical that they identify and work closely with a **trusted technology partner** who brings more than smart design and engineering of solutions. It is vital that the technology partner has a team with special **competency in and process knowledge of the CPG industry** along with the relevant advanced control technology solutions. In other words, a team with **deep domain expertise** that understands the unique dynamics of the CPG industry, and that speaks the language of the CPG manufacturer. With Plant iT and brewmaxx used in over 2,100 production facilities across 110 countries,³² CPG manufacturers can be confident that they are working with a team that has not only the right solution, but also the service expertise that comes from a wealth of **CPG project execution experience**.

Also, given the evolving threat landscape, CPG manufacturers need to work with technology partners who can facilitate secure remote access, centralised monitoring, access to **cybersecurity** experts, robust audits and reliable patch management services.

Finally, it is crucial that the technology partner has a **wide systems integrator network** and a strong **connection with process equipment OEMs** used by the CPG industry.

³² Schneider Electric

Conclusion

As the CPG industry contends with disruption arising from significant shifts with consumers, regulators, suppliers and competitors, the ambition is to **grow without having to compromise on profit, people or the planet.**

Analysis of CPG companies that achieved the most profitable growth in the years preceding the Covid-19 pandemic (2016 to 2019) shows that **superior execution capabilities** is the main (and accelerating) differentiator.³³ However, to execute efficiently and successfully, CPG manufacturers will need to maintain an undivided focus on operational excellence and making production more customer-centric.

The leverage of Plant iT and brewmaxx with MES inside, together with the EcoStruxure platform, can deliver for CPG manufacturers:

- **Faster and more effective project implementation** by replacing extensive programming with intuitive parametrisation;
- **Comprehensive and seamless integration** that reduces time spent on contextualised data collection and enables agile incident resolution;
- Leverage of **smart energy, water and waste management**;
- Effective **track and trace** to address safety and compliance objectives;
- **TOTEX savings** through analytics and simulation of assets using an adaptable solution, as well as proactive SLAs; and
- **Workforce empowerment** through a more integrated, intuitive and easy-to-use system, which places the **right information** in the hands of the **right people** at the **right time**, so they know what to do to improve the way the plant runs.

³³ Charting a winning course for CPG value creation, McKinsey & Company, 2 November 2021



About Frost & Sullivan

For over six decades, Frost & Sullivan has helped build sustainable growth strategies for Fortune 1000 companies, governments, and investors. We apply actionable insights to navigate economic changes, identify disruptive technologies, and formulate new business models to create a stream of innovative growth opportunities that drive future success. www.frost.com

About Schneider Electric

Schneider's purpose is to empower all to make the most of our energy and resources, bridging progress and sustainability for all. We call this Life Is On. Our mission is to be your digital partner for Sustainability and Efficiency. We drive digital transformation by integrating world-leading process and energy technologies, endpoint to cloud connecting products, controls, software and services, across the entire lifecycle, enabling integrated company management, for homes, buildings, data centers, infrastructure and industries. We are the most local of global companies. We are advocates of open standards and partnership ecosystems that are passionate about our shared Meaningful Purpose, Inclusive and Empowered values. www.se.com

