Breakthrough technologies fundamentally change the game

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The right combination of breakthrough technologies (such as 3-D printing, machine-to-machine communications, and advanced robotics) can help CPG companies achieve breakout performance.

Breakthrough technologies, collectively known as Industry 4.0, are changing the game in manufacturing in myriad ways. For example, skyrocketing levels of computational power and data availability allow for real-time production steering, while life-like simulations and unprecedented degrees of automation are revolutionizing work on the shop floor. Among the foundations is machine-to-machine (M2M) communication, which has seen notable advances in compatibility and speed. Many more innovations—including 3-D printing, human-machine interfaces, smart vision, and advanced robotics—are changing the manufacturing landscape. In aerospace, for instance, additive printing has opened new avenues for component production, and in automotive, collaborative automation is disrupting decades-old ways of working on the assembly line.

Although consumer-packaged-goods (CPG) manufacturers have been relatively slow to adopt breakthrough technologies, their factories will not escape the wave of change in the coming years (exhibit). Following the pattern seen in other industries, the early CPG adopters are gaining a competitive edge by capturing significant improvements in operational performance. For example, smart-vision technology has reduced quality losses by 10 to 20 percent, a blend of hardware and software that enables machines to detect their own performance and plan their maintenance has reduced downtime by 30 to 50 percent, and self-directed vehicles have reduced costs in warehouses and shop floors.

Exhibit

Disruptive technologies will soon arrive on the consumer-packaged-goods 'factory of the future' shop floor.

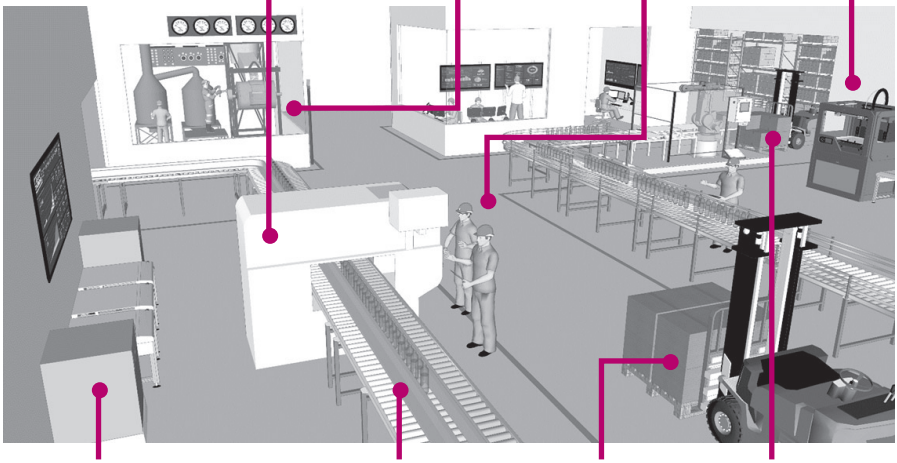
Incorporate flexible manufacturing technology where possible to improve ability to customize according to customer needs.

Sensors and high-resolution cameras continuously monitor quality parameters and adjust process based on operating windows. Potential failures and mechanisms to correct are identified early in process. **Cost of quality reduced 10–20%**.

Smart-energy monitoring allows for real-time parameter adjustments to improve yield and reduce energy consumption based on both internal and external factors (eg, pricing).

Smart glasses and augmented reality devices to support maintenance and complex problem solving.

3-D printing of components as required. Long lead time or expensive components to be printed as needed directly in facility to reduce inventory costs and downtime.



Machines plan own maintenance, plans are automatically generated based on performance and tracking of parameters. Maintenance orders raised automatically, replacements directly ordered from suppliers and potential root causes identified. **Potential 30–50% reduction of total machine downtime**.

Self-adjusting equipment maximizing its performance. Equipment settings are self-adjusted based on quality and raw-material parameters. Feedback provided directly to suppliers once outside operational range.

Self-directed vehicles in operating floor. Intrafactory transportation paths and priority optimization to move raw materials and finished products in facility.

Fully integrated and widely automated closed-loop demand and supply planning, breaking traditional boundaries between planning steps and producing on-demand plans for operations.

Source: McKinsey analysis

CPG companies must understand the new possibilities and find the right combination of technologies to address their business needs. Investing is typically triggered by a pilot case that demonstrates the potential—for example, a visionary plant that can test a specific solution and prove its value. Although these isolated areas of excellence provide confidence about the impact, the chief technology officer and COO will ultimately drive the adoption effort and determine which investments to prioritize to support business strategy.

To help CPG leaders understand how implementation of these disruptive technologies can address business demands, provide distinctive value, and shape the future of operations, we look at early examples of how companies are deploying them in the end-to-end flow of production.

Develop and source: Shorten the time frame from concept to product

The speed at which CPG companies can test and launch a new product is typically restricted by the availability and flexibility of concepts and prototypes. The time required for the development process, from concept to product, ranges from months to, in some cases, years. In order to produce goods that can be tested and then introduced to the market, this process normally involves time-consuming and expensive adaptations of existing technology. In today's world of ever-changing market trends, this approach is no longer viable. Manufacturers must use breakthrough technologies to enable more flexible and faster processes for testing, pilots, and scale-up.

For example, 3-D printing and rapid prototyping now make it feasible for designers to print packaging or components, thereby shortening the time frame from concept to full-scale production. In footwear, designers and reviewers print design concepts as prototypes as part of their normal development process, slashing new-product development cycles from weeks to hours.

Make: Understand and optimize operations in real time

The depth and breadth of data available to CPG companies has reached unprecedented levels. To predict issues and challenges, factories have traditionally depended on the experience and know-how of operators. However, their capabilities are not always reliable and have limited scope. Most factory operations use programmable logic controllers for various systems. These controllers independently track the performance of individual assets but rarely connect to each other or provide a holistic picture. Typically, CPG companies end up in "firefighting" mode, reactively responding to issues, rather than using the insights at their fingertips to proactively optimize operations.

Breakthrough technologies are disrupting this traditional approach to identifying and addressing issues on the shop floor. The availability of reliable and economical sensors, combined with data clouds, compatible protocols that communicate with each other, and huge processing capabilities, has enabled companies to access big

data and shape it into insights much faster and more flexibly. The combination of new sensor hardware and potentially infinite computing power provides manufacturers with the tools to truly understand their operations in real time and gives them greater flexibility when optimizing processes.

In a variety of industries, companies are finding innovative ways to capture value from cost-effective smart sensors. A basic-materials company was able to reduce fuel usage while increasing throughput by about 156 percent by using real-time tracking of operational parameters to make decisions. An automotive company is leading the way in predictive maintenance by deploying condition-monitoring systems. The company gathers vibration data and other operating data (such as oil temperature and purity, currents, and pressure), compares the readings with the permissible range of values, and documents deviations. A traffic-light system visualizes the results for users.

Move: Use technology to cope with complexity

CPG companies need to transport products throughout their operations, sometimes at the rate of thousands of units each hour. The increasing complexity of operations has intensified companies' traditional challenges. Because human intervention is required to navigate spider webs of equipment, inefficiencies and errors are common. Fortunately, this old-age problem is being tackled through new installations and technical solutions that ease the burdens of accurately picking, moving, and placing products.

A global e-commerce company deployed autonomous robots to pick and place products, reducing warehousing costs by 30 to 40 percent. The robots lift racks with products up to operators based on the orders they need to process, bringing the work to them. Because the process is optimized for the operators, it promotes their productivity by reducing the waste generated in searching for products and improves the quality of their work.

Check: Detect, correct, and prevent quality issues

Quality is an imperative for all manufacturers. This is especially true in the consumer-goods industry—in the worst case, even a single error may severely damage a brand. Similarly, the imperative to be cost competitive has increased the pressure to get results from productivity measures, such as optimizing labor utilization. Many manufacturers may be caught in a dilemma as they try to strike the fine balance between attention and capacity.

Manufacturers can use technology to enable quality assurance and greater agility and responsiveness to quality issues that arise. Because operators are released from constantly manning and intervening with equipment, the opportunities are increased for automation and labor savings.

Wearable technologies, such as smart glasses, are already assisting quality inspectors in consumer-products manufacturing. The glasses gather information that a manufacturer can communicate in real time to production equipment in order to trigger adjustments. The technology not only helps to ensure that quality checks are more reliable and consistent but also enables the upstream process to adjust responsively, which minimizes the chance of issues recurring.

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Breakthrough technologies are bringing tremendous changes throughout each leg of the product journey in CPG manufacturing. And it is still early days. However, manufacturers must appreciate that technology, by itself, is not a panacea. Businesses should recognize the real risks of chasing the "latest and brightest" innovations and regarding their adoption as the "holy grail." It is common to hear senior executives talk about the adoption of Industry 4.0 as solving all of their operational, cost, or delivery problems. But, so far, their implementations have been disjointed efforts that typically fail.

The adoption of Industry 4.0 should be framed as enabling a well-defined vision and business strategy. As we discuss in the next chapter, companies should support the deployment of new technologies by building the right enablers, such as having capable talent, agile organizations, and meaningful partnerships. To operate in this new era, leaders should very carefully design their road map to the future and select the right solutions to support their strategies. Success requires a collaborative effort across functions, including HR, engineering, operations, and strategy.

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