



From Hype to Hero: A Look at Artificial Intelligence in the Consumer Packaged Goods Industry

Learn how to measure your company's AI maturity and ramp up your results.

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The authors would like to acknowledge Isabelle Inder, Thijs Bootsma and Isabella Smulders for their contributions to this report. Thanks also to Sanjin Bicanic, Sumner Makin, Florian Mueller, Suzanne Tager and Joëlle de Montgolfier for their contributions.

At a Glance

- ▶ As a whole, the consumer packaged goods (CPG) industry is in artificial intelligence (AI) infancy.
- ▶ CPG companies struggle to evaluate their AI maturity compared with peers.
- ▶ CPGs stand to gain a wide range of benefits across business functions when they apply AI as a means, not an end.
- ▶ We have identified five AI maturity archetypes and classified AI use case categories according to scalability and potential value to provide CPGs with a starting point.

Most consumer packaged goods companies (CPGs) have struggled to find solid footing in a turbulent industry. Bain research has found that 34 of the world's top 50 consumer goods companies experienced a decline in revenues, profits or both in recent years¹, forcing CPG executives to find new ways to compete.

Emerging technologies, including AI, have given a sharp advantage to firms in other sectors. Companies at the forefront of AI are household names, known for changing the playing field and reinventing their industries: Amazon, Facebook, Microsoft, Apple. To stay ahead, these leaders are investing heavily in technology. Amazon, for example, ranks No. 1 in R&D, spending more than 10% of its revenues on IT while retailers manage 1% to 2%.

Likewise, insurgent CPG brands with little operational history but deep data are investing in AI to develop an edge. Smaller firms have used data to engage customers through personalization at scale.

Compared with other industries, large CPGs have lagged in AI adoption, possibly put off by early buzz that fizzled into disappointing results (*see Figure 1*). Despite an uneven track record, CPGs are still expected to increase the number of AI use case attempts over the next three years.

While AI is seen as a way forward, the roadmap at most CPG firms is unclear.

Measuring AI maturity

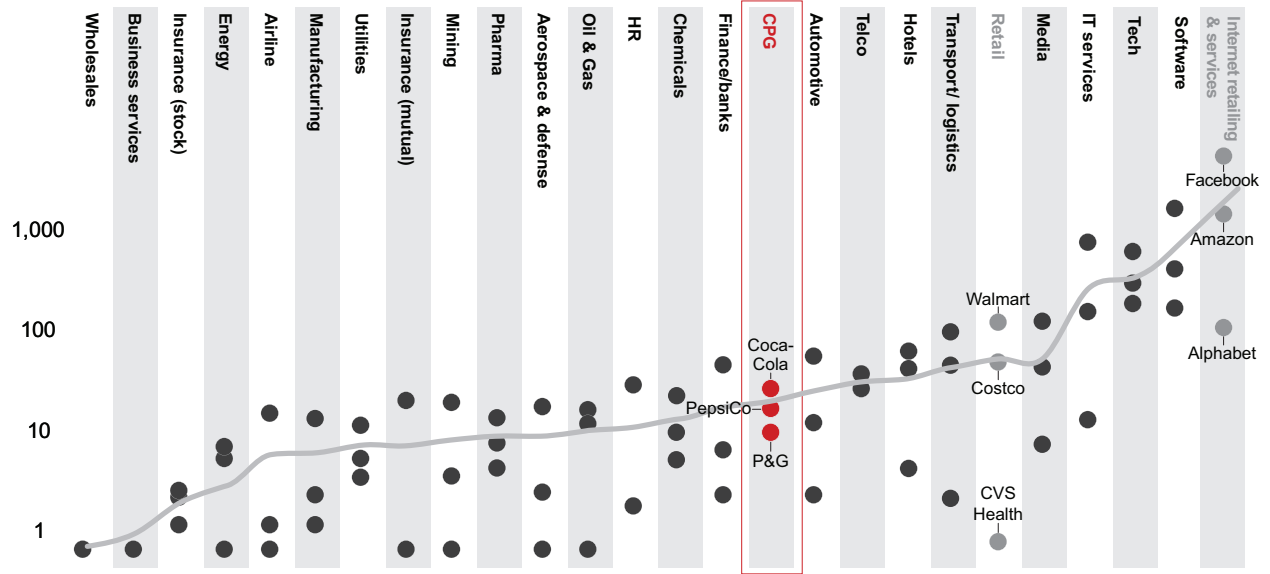
AI is defined as a machine's ability to autonomously perceive, understand, make decisions about and react to its environment. In this report we focused on the forerunner to this ultimate vision: advanced analytics and automation technologies aimed at solving one narrowly defined task or problem. We included applications of advanced machine learning in our study.

As a whole, the CPG industry is in AI infancy and lags far behind about a dozen other industries. Of note, industries that are leading in AI, such as retail and tech, are investing more in AI than CPGs—but still not mastering the technology.

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Figure 1: Analysis of companies associated with artificial intelligence shows large disparities within industries and a large range among them, with consumer products lagging other industries

Relative position of the top 3 companies in each industry measured by search results that associate the company name with machine learning or AI* (last 12 months, relative log scale)



*Chart uses Google Trends, which analyzes company mentions, with category set at "machine learning" and "artificial intelligence"; the average score is the largest 3 companies within a given industry for the last 12 months
Sources: Fortune 500, 2017—top 3 per industry; Google Trends (point of reference: BASF—15)

To determine where CPGs stand in terms of AI maturity, we assessed the AI landscape to create a baseline. We measured our sample set of companies against two criteria: AI portfolio size and scale realization.

- Portfolio size accounted for the number of AI use case categories a company planned to implement or currently had in progress, as well as any use case categories it had attempted over the past three years.
- Scale realization was calculated by dividing the number of successfully scaled use cases by the total number of use cases attempted. A use case was determined successful if it was later implemented on a larger scale (e.g., across multiple business units or markets) and the results were measured and achieved, even if only partially.

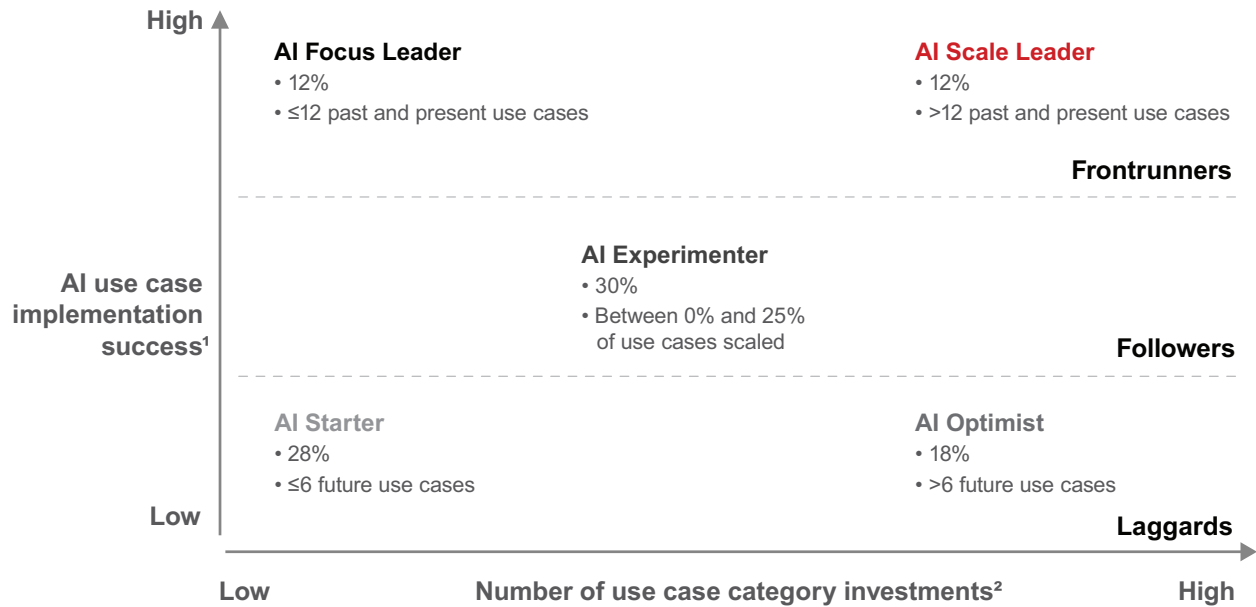
From this data, five AI maturity archetypes emerged (see Figure 2):

AI Scale Leaders

By definition, AI Scale Leaders attempted and scaled more use cases than any other group, and they explored a variety of use cases across functional areas (see Figure 3). With multiple victories and more than half of their use cases scaled, Scale Leaders are eyeing higher-value AI applications. About 12% of respondents fell into this category.

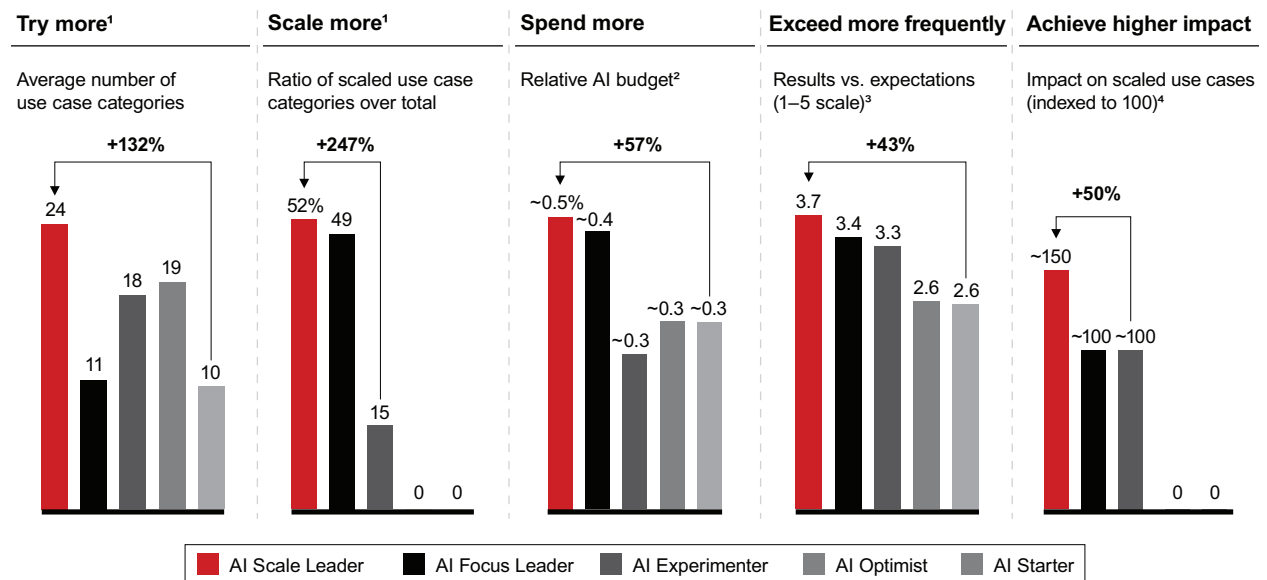
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Figure 2: We identified five AI archetypes that distinguish leading companies as AI frontrunners



¹Implementation success is the number of scaled use case categories divided by the total number of use case categories
²Number of investments in unique use case categories (past and present investment in Use Case A counts as 1 investment)
 Source: AI in CP Survey, Q4 2018 (n=353)

Figure 3: AI Scale Leaders attempt and scale more than any other group



¹Scale Leaders try and scale more use cases by definition
²Relative AI budget is budget allocated in the next 3 years divided by 3x company size
³Results vs. expectations is asked for 2 use cases per respondent, prioritizing scaled use cases, then MVP, then scoped, then prototyped use cases
⁴Impact is the percentage impact overall (average of cost, revenue and satisfaction), here indexed to 100
 Source: AI in CP Survey, Q4 2018 (n=353)

AI Focus Leaders

Compared with other archetypes, AI Focus Leaders invested in fewer use cases but spent a higher percentage of their budget on each use case. AI Focus Leaders scaled nearly half of their attempted use cases, which were targeted on select parts of the organization. Another 12% of respondents matched this profile.

AI Experimenters

AI Experimenters are accomplished in AI in terms of volume, but struggle to achieve consistent results. This group, which comprised about 30% of respondents, scaled only 15% of their AI initiatives.

AI Optimists

AI Optimists are enthusiastic about AI, but have failed to scale any use cases over the past three years. They had the second-largest AI portfolio (19 use cases), although most use cases were planned rather than completed or in progress. About 18% of respondents fell into the AI Optimists category.

AI Starters

About 28% of companies in our sample set were either new to AI and its applications or skeptical about its feasibility and impact. Called the AI Starters, this set tried and planned the fewest use cases of any archetype and didn't achieve scale on any AI projects. AI Starters are distinguished from Optimists by their lack of interest or intent to pursue AI in the future.

All CPGs, regardless of archetype, struggled to evaluate their AI maturity compared with peers. Most self-assessed their AI maturity as high and believed they were performing above their peers. In reality, fewer than a quarter of CPGs earned leadership status.

Besides the perception gap, other deltas exist. Within the CPG industry, there are deep divides between categories and AI maturity; for example, consumer electronics and food and nutrition are at the forefront, while cosmetics and luxury products are further behind. This points to a link between overall digital maturity and AI readiness.

Learning from AI Leaders

First and foremost, AI leaders use technology to create bespoke solutions to business problems, rather than applying new, powerful technology generically.

Here are two examples where a distinct business problem was solved by AI:

Excessive perishable waste—five times above the industry average—was costing a global packaged food company as much as \$100 million per year. Before applying a technology solution to the issue, the company engaged its front line to understand the existing process and its shortcomings. They found that manual forecasting and order processing methods were inaccurate and labor-intensive. The company needed a more streamlined and efficient ordering process to reduce waste and set a clear target to define success.

Then came the technology. To address the business problem, the company created an advanced model platform to forecast demand more accurately. A prototype of a new order management system was built from the model platform and then extensively tested and modified. More than 250 changes were made to the solution over a three-month period before a pilot was launched in four key locations.

The proof of concept showed a 40% to 50% reduction in waste, as well as a 50% reduction in dedicated labor hours. The solution also proved repeatable and additional functionality was identified for scale over an 18-month period.

As a second example, a major apparel maker was faced with high supply chain costs and complex product variations. Those challenges resulted in poor availability, making lost sales a major issue. Even a 1% improvement could provide sizable benefits to its bottom line.

Using AI rather than a manual planning process, excess inventory and manpower both declined. And customers experienced better availability.

With a good IT infrastructure and enabling technologies in place, the firm deployed AI to analyze its products for sales transferability from the customer's point of view. The firm also used data to automate size curve planning and to predict more accurate breakdowns by item and by store. Using AI rather than a manual planning process, excess inventory and manpower both declined. And customers experienced better availability.

Pilots and build-out phases leveraged business and functional experts, and country-specific teams helped embed the technology and the new, underlying processes in each market. The apparel firm succeeded, in part, because it had effective change management in place to support the shift. The company understood it wasn't enough to deliver the right technology; it needed to bring its people on the journey to reach its fullest potential.

These examples, combined with comments from the executives we surveyed and experts we interviewed, helped us identify six key factors that repeatedly contribute to successful AI implementations: a specific business problem with a clearly defined target or goal; availability of high quality data; sufficient time and budget; agile ways of working; enabling technologies; and a compelling AI vision.

The importance of each factor changes with AI maturity. Leaders should assess their firm's current AI maturity (and vision) to determine which factors are most influential to their journey. Focusing on a few enabling factors at the right time will reap the most benefit.

Where to begin

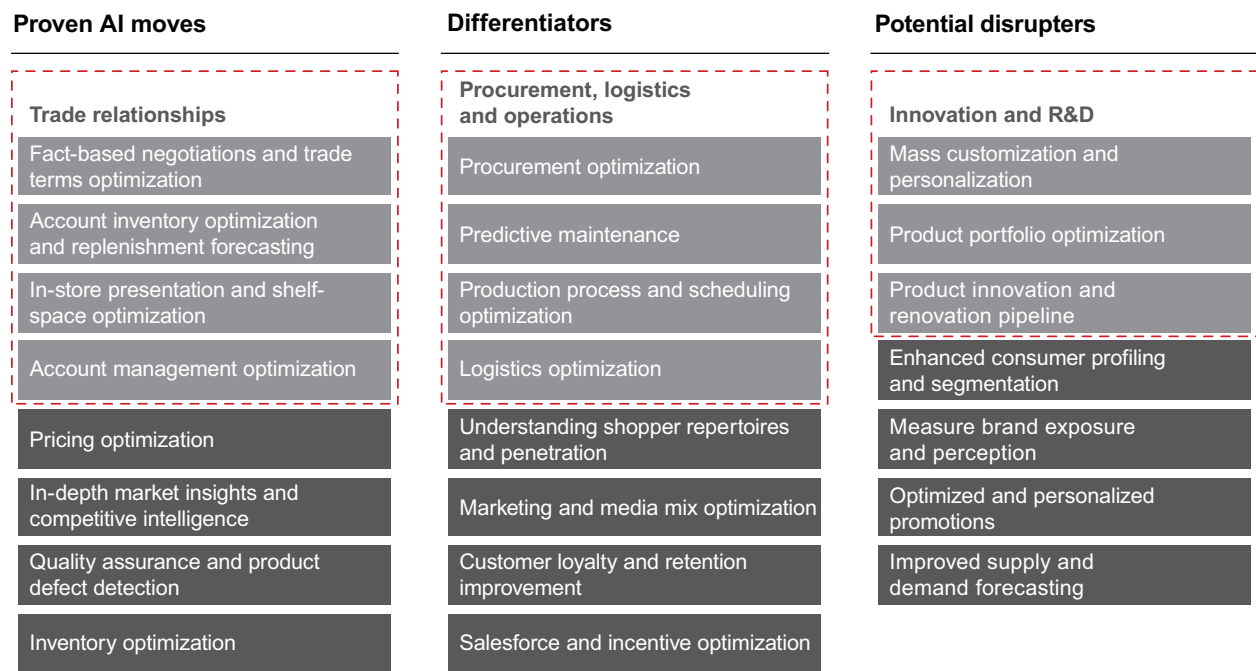
Thousands of potential AI use cases exist. Without a clear starting point, most CPGs have invested in AI use cases randomly. Of the use case categories surveyed, the most frequently trialed were neither the highest value nor the easiest to implement. Clearly, CPG leaders need to develop an AI strategy.

To identify trends, we grouped hundreds of use cases into 31 categories. The categories covered seven applications, which we clustered into three operational buckets: marketing, supply chain and support (see Appendix).

We further classified these use case categories according to scalability and potential value to provide CPG leaders with a starting point for their AI journeys (see Figure 4). Each wave has a dominant functional area; marketing and consumer intelligence use case categories are relevant across all stages of AI maturity because they form a basis for understanding key business needs.

Less-experienced CPGs should build experience and excitement in lower-wave use case categories and then apply their success to larger endeavors found in later waves. With each wave, complexity and the need for cross-departmental collaboration increases.

Figure 4: Based on the survey data, we placed use cases into three categories depending on their scalability and value



Source: Bain & Company

As CPGs gain AI experience, they can progress across three waves:

Wave 1: Proven AI Moves are easier to implement and consistently achieve scale compared with other use case categories. These experiences build momentum and enthusiasm, which is critical to getting organizational buy-in.

Trade relationships are a key theme among Proven AI Moves and serve as a typical starting point. In this functional area, AI can be applied to address tougher trade negotiations, pricing pressure and competition for shelf space.

Wave 2: Differentiators create higher returns for the organization but are more difficult to coordinate and scale. Procurement, logistics and operations are key themes in this wave and have the potential to differentiate firms. For example, AI could be deployed to drive manufacturing agility or customer responsiveness among larger CPGs that are forced to compete with smaller, more nimble firms.

Wave 2 use case categories include predictive maintenance, customer loyalty and retention programs, and procurement.

Wave 3: Potential Disrupters are “next frontier” implementations, including innovation and R&D work. They require extensive AI experience to successfully scale, as well as cross-functional coordination. While higher risk, Potential Disrupters help AI frontrunners “future-proof” their portfolios and maintain their leadership positions through innovation and R&D.

Examples include product innovations, mass personalization and customization efforts, consumer profiling and segmentation, brand measurement and sophisticated promotions. Achieved at scale, these AI use cases pay off: For example, Crobox is an Amsterdam-based firm that combines psychology and AI to optimize online buying experiences. Online retailers that use Crobox’s machine learning algorithms to generate customer intelligence and detailed shopper profiles have seen average order values increase from 5% to 10% and experienced ROIs of 6x–7x.

Finding your path to leadership

The path to AI leadership varies based on a company’s current AI maturity (*see Figure 5*). To start, apply our portfolio size and scale realization ratio to pinpoint your archetype (using data to deter overestimation). From there:

- **AI Starters** should focus on the strategic groundwork needed to support an AI program: data availability, clearly defined metrics of success and agile work processes. Enabling technologies and quality requirements must be established before AI Starters can implement, improve or scale AI. Data and platform investments have driven AI success among the leaders.

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Figure 5: The path to AI leadership varies based on a CPG’s current AI maturity

	AI Scale Leader	AI Focus Leader	AI Experimenter	AI Optimist	AI Starter
What are your key AI use case categories?	<ul style="list-style-type: none"> • Double down on potential disrupters • Encourage continuous improvement on proven AI moves and differentiators 	<ul style="list-style-type: none"> • Go deep on differentiators and advance into potential disrupters • Spur continuous improvement on proven AI moves 	<ul style="list-style-type: none"> • Assess which proven AI moves still hold value and shift focus to differentiators 	<ul style="list-style-type: none"> • Before investing broadly, gain experience with relevant proven AI moves 	<ul style="list-style-type: none"> • Select 2 or 3 use case categories from proven AI moves to solve urgent business needs
How do you make AI a success?	<ul style="list-style-type: none"> • Enhance cross-functional governance, ensure frontline involvement and further develop talent 	<ul style="list-style-type: none"> • Realize full potential by defining metrics, and fill capability gaps with strategic partnerships 	<ul style="list-style-type: none"> • Deploy advanced agile ways of working • Devote sufficient budget to spur growth 	<ul style="list-style-type: none"> • Install the basics: Data availability, defined metrics, enabling technologies and agile ways of working 	
What are your next steps?	<ul style="list-style-type: none"> • Build internal AI capabilities and infrastructure • Realign your operating model to achieve cross-collaboration • Focus on categories across the value chain 	<ul style="list-style-type: none"> • Deepen your focus or broaden across categories • For scale: Spread budget across use cases and use partnerships • For focus: Monitor use case value 	<ul style="list-style-type: none"> • Evaluate and deploy best practices consistently • Allocate sufficient budget (up to ~0.5% of revenue) • Prioritize by value realized 	<ul style="list-style-type: none"> • Define key business problems and how to measure success • Test and learn to start small and win quickly • Allocate sufficient budget (up to ~0.5% of revenue) 	<ul style="list-style-type: none"> • Define key business problems and how to measure success • Lay foundation for data availability and establish quality requirements • Allocate sufficient budget (up to ~0.5% of revenue)

Source: Bain & Company

- **AI Optimists** need to test, learn and repeat. Before investing in a broad portfolio of use cases, AI Optimists should pursue small and quick wins to build a learning mindset and a culture of purposeful iteration. For this archetype, optimism must turn into momentum.
- **AI Experimenters** should aim for greater consistency. As they notch wins, they should transfer their “lessons learned” into best practices. Throughout the organization, there should be a ruthless pursuit of improvement. Leveraging agile work methods and experiences, this group should quickly launch—or halt—pilots to solve differentiating business problems.
- **AI Focus Leaders** can decide to deepen or broaden their focus. They may choose to remain a Focus Leader by successfully scaling more use cases in a narrow set of categories. Or they can develop into Scale Leaders, reaching AI scale across functional areas. Importantly, AI Focus Leaders are likely to need to fill capability gaps as they advance.
- **AI Scale Leaders** should extend AI across functional areas and across the value chain. To maintain leadership status, they must pursue cross-functional investment, involvement and governance, as well as the right mix of talent. By doing so, they can gain disruptive competitive advantages.

Across all archetypes, two needs are common: budget and strategy.

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AI needs to be sufficiently resourced. For some groups, more funding is needed to be successful. AI Experimenters, for example, could stand to double their current AI investment. Other groups need to reallocate or spread their resources across use cases to accelerate their programs.

Aside from funding, AI programs need to be supported by the right mix of talent and capabilities. “Build or buy” is always going to be a critical decision, according to one expert, who urged executives to evaluate their current and future internal capabilities and decide who is best equipped to build and scale the technology.

Upfront, leaders must set an AI vision that is in sync with the overall business strategy. Across every archetype, experts also recommended cross-functional collaboration.

Establishing an AI strategy: Practical questions for CEOs

Strategy is paramount to any AI endeavor, regardless of a company’s maturity or ambition. Upfront, leaders must set an AI vision that is in sync with the overall business strategy. Across every archetype, experts also recommended cross-functional collaboration.

As part of the strategy, CEOs must ask:

- Based on trends, gaps or benchmarks, where do we need to improve performance?
- What is the business case for improving performance?
- What are the critical business issues hindering performance? Is a model the bottleneck, or is it something else?
- Do we have the right quantity and quality of data to apply AI?
- How well do our current models perform?
- How do we put predictive ideas and hypotheses to work?
- Is there an existing AI solution that is readily available or easy to deploy?
- Do we have the right mix of talent and capabilities to maintain and evolve such a solution?

Conclusions

If hype often precedes progress, then CPGs may be right on time to benefit from the AI boom. The technology and advantages have been widely accepted. Now, CPGs can dive directly into best practices and proven methodologies forged by other industries.

By examining companies that have charged ahead, we know that:

- CPGs stand to gain a wide range of benefits across a number of business functions when they apply AI as a means, not an end.
- AI should be implemented as the right tool for the job, not applied generically to every business problem.
- Experience matters; CPGs should match use cases to both their business needs and their AI maturity.

One of the experts we spoke to asserted that “any problem solved with AI is actually a human problem.” That is, organizations must effectively address the human element along with the technical, or else the solution will fail to reach its full potential.

With results, internal momentum will build. But excitement and enthusiasm aren't substitutes for strategy. Leading AI companies need clear vision, firm leadership commitment and dedicated financial and human resources.

To be successful, leaders must stop thinking about AI as “projects” and embrace AI as a way of doing business. Change management and sponsorship play important roles in successfully deploying AI. “Employees are used to operating on experience and intuition,” said one expert. “Switching to data-driven models can be a difficult and contentious change. Ensure that strong sponsorship is established and that you are bringing everyone along on the journey.”

With results, internal momentum will build. But excitement and enthusiasm aren't substitutes for strategy. Leading AI companies need clear vision, firm leadership commitment and dedicated financial and human resources. Change will persist in the industry. But with AI in its arsenal, CPGs may have the means to ride out—or thrive through—the turbulence.

Research approach

This is the first report produced by Bain & Company on AI and the global CPG industry. Bain defined AI as a machine's ability to autonomously perceive, understand, decide about and react to its environment. Narrow applications of advanced analytics and automation technologies were the focus of our study.

Bain surveyed 350 executives globally to inform these recommendations. The interviewees were all C-level executives in CPG companies with more than \$500 million in annual revenue who had exposure to AI within their organizations. We surveyed their current and historical AI investments, use cases, outcomes and future plans.

In addition, we consulted four experts in the global CPG industry and leaders from an Amsterdam-based AI start-up with experience in the CPG industry. Bain experts were also interviewed extensively, and we leveraged the company's Advanced Analytics use case library.

Excerpted comments from our interviews are included in the report. In most cases, the identities of participants have been anonymized at the request of the interviewees or their organization.

We developed a framework to evaluate AI maturity that accounts for both effort and result; and distinguishes five distinct levels of AI maturity among CPGs. We also identified six criteria that significantly enable successful AI deployments.

With this insight, we offer concrete steps and strategic questions to help CPG leaders in each phase of AI maturity advance their programs and realize a competitive advantage.

¹ Meacham, Matthew, François Faelli, Eduardo Giménez and John Blasberg. "Overcoming the Existential Crisis in Consumer Goods." Bain.com, March 7, 2018.

Appendix: We defined 31 broad AI use case categories across seven application clusters within the consumer products industry

Marketing and commerce

Market and consumer intelligence

In-depth market insights and competitive intelligence: Generate real-time market and competitive insights to improve planning and category dynamics, enabled by new sources of data like social media and AI-powered tools like web scraping

Enhanced consumer profiling and segmentation: Develop dynamic consumer profiles to improve segmentation, powered by social media, search engines and other new sources of data

Understanding shopper repertoires and penetration: Define consumer repertoires and analyze penetration to understand the way consumers purchase product categories

Marketing and consumer journey

Marketing and media mix optimization: Determine the best mix of advertising and targeted campaigns across channels, to maximize returns on marketing expenditure

Measure brand exposure and perception: Assess online exposure (text, images, videos), to measure marketing and PR value, using AI-powered tools

Personalized content: Create customized content (dynamic landing page) to enable omnichannel personalization

Consumer journey optimization: Use data on consumer behavior, key interaction patterns and process bottlenecks to personalize each step of the consumer journey, including after-sales care

Product portfolio and assortment

Mass customization and personalization: Analyze consumer preferences to offer a customized product range and assess transferability to other locations by using a wide variety of data

Product portfolio optimization: Use online, current and past data to optimize the assortment and size curve of the product portfolio and enable event-based recommendations

Product innovation and renovation pipeline: Analyze trends and consumer feedback to prioritize R&D efforts and optimize innovation and renovation, using real-time and new sources of data and AI algorithms

Pricing and promotion

Pricing optimization: Optimize prices across product categories, brands and channels based on up-to-date consumer buying behavior

Optimized and personalized promotions: Use real-time market and consumer data to deliver top ad content in channels, personalizing for consumer types to spur individuals to action

Sales and customer care

Salesforce and incentive optimization: Enhance understanding of salesforce performance across regions, customers or both with new sources of data and incentivize accordingly to optimize performance

Fact-based negotiations and trade terms optimization: Conduct negotiations with real-time market insights and customer data, and optimize trade terms

Channel optimization: Determine the right mix of channels and assortment in channels aligned to latest shopper preferences, fueled by AI-powered market insights

Account management optimization: Use real-time predictive analytics to align investments and individuals to where they will be most effective (accounts, regions, etc.)

Upselling and cross-selling enablement: Employ simulation tools, in-market tests and conjoint analysis to identify trade-up and incremental sales potential

Account inventory optimization and replenishment forecasting: Determine and deliver right inventory levels for key accounts combining store data with external sources to boost sales

In-store presentation and shelf-space use: Optimize in-store presentation, displays and shelf-space use with new methods and data (image recognition, real-time pathway)

Customer loyalty and retention improvement: Understand the causes of client attrition and identify at-risk to provide targeted insights on retention actions

Customer experience optimization: Use automated customer service and feedback analysis to personalize the customer experience with chat bots and other AI-powered communication

Supply chain and operations

Market and consumer intelligence

Improved supply and demand forecasting: Predict supply and demand (including “hero” products, new launches, seasonal products) to optimize production planning, inventory and sales

Marketing and consumer journey

Procurement optimization: Understand key procurement incentives (speed, reliability, price) in order to select, negotiate and order from most efficient supplier, using AI algorithms

Visualization of end-to-end supply chain: Visualize the complete network to enable tracking and management of the full supply chain and identify risks (cost, service, sustainability)

Plant network optimization: Analyze the full supply chain network to choose plant locations and capacity as well as distribution locations

Production process and scheduling optimization: Use AI-powered automation and algorithms to refine the product process set-up and develop schedules that minimize waste across the system

Predictive maintenance: Enhance prediction of asset maintenance by collecting data through sensors in an IoT network, unleashing analytics to minimize asset downtime and maintenance cost

Quality assurance and product defect detection: Digitalize product characteristics with sensors and photos and use machine learning algorithms to analyze data to minimize product defects

Inventory optimization: AI recognizes and counts inventory in the warehouse and determines optimum inventory level to minimize out-of-stock of materials and products, as well as inventory costs

Warehousing optimization: Decide how to set up and manage the warehouse, through AI and robots that can perform some warehousing activities

Logistics optimization: Optimize routes and fleet maintenance, algorithm-based batching or usage of new delivery methods (drones, autonomous vehicles)

Strategy and support

Other functional categories (HR, finance, strategy)

Note: These use case categories are likely to include sub-use cases
Source: Bain & Company (2018)

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