

Hype Cycle for Consumer Goods, 2023

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Initiatives: [Manufacturing and Transportation Sector Dynamics in IT](#)

Consumer goods CIOs and IT leaders have many technologies and solutions to enable profitable business outcomes. This Hype Cycle provides CIOs an avenue for awareness and education on technologies to implement for competitive advantage in the market.

Analysis

What You Need to Know

In 2023, consumer goods (CG) manufacturing companies continue to tackle the revenue and cost impact of market uncertainty on their businesses. They are also investing in building more trusting relationships and enhancing collaboration with their B2B and D2C stakeholders.

The 2023 CG Hype Cycle positions innovations and offers profiles to enable CG CIOs to evaluate solutions to support product and service modernization, customer engagement, smart operations, and sustainability.

In recent months, the escalating hype around the capabilities of generative AI (GenAI) has captured the attention and energies of executives across all industries. However, GenAI is but one of the many tools needed to succeed. Companies are also investing time and money into many other technologies and processes that are represented on this Hype Cycle.

CG companies ignoring these technologies do so at their peril. CIOs and other IT leaders in CG manufacturing should actively track their progress. Ask questions, listen, observe and watch for results. Which innovations might have a significant positive — or negative — impact on your company's longevity?

This year, Gartner is tracking 27 CG manufacturing innovations that will be impactful and inform your strategic planning objectives.

The Hype Cycle

A flurry of activity surrounds expectations and hopes for digital products and experiences for consumers. First, new innovations added to the 2023 Hype Cycle include:

- Digital twin of a customer
- Non-fungible tokens (NFTs) in consumer goods
- Sustainable packaging
- Circular supply chain
- Digital product passport
- Generative AI in process manufacturing
- Shoppable media

Introduced by the [European Green Deal](#) and [Circular Economy Action Plan](#), **digital product passports** provide standardized product, sustainability and traceability information across suppliers, manufacturers and customers.

NFTs in consumer goods enable multifaceted customer engagement and allow manufacturers to extend their physical brands using blockchain technology.

In the IT world, it's difficult to go through a day without a mention of GenAI. The associated technologies are very high on the “cool” factor and available to anyone to use. Gartner encourages organizations to pay attention, but not overpivot when pursuing GenAI solutions. It is worth noting that the impact of GenAI on other items in this Hype Cycle is yet to be determined.

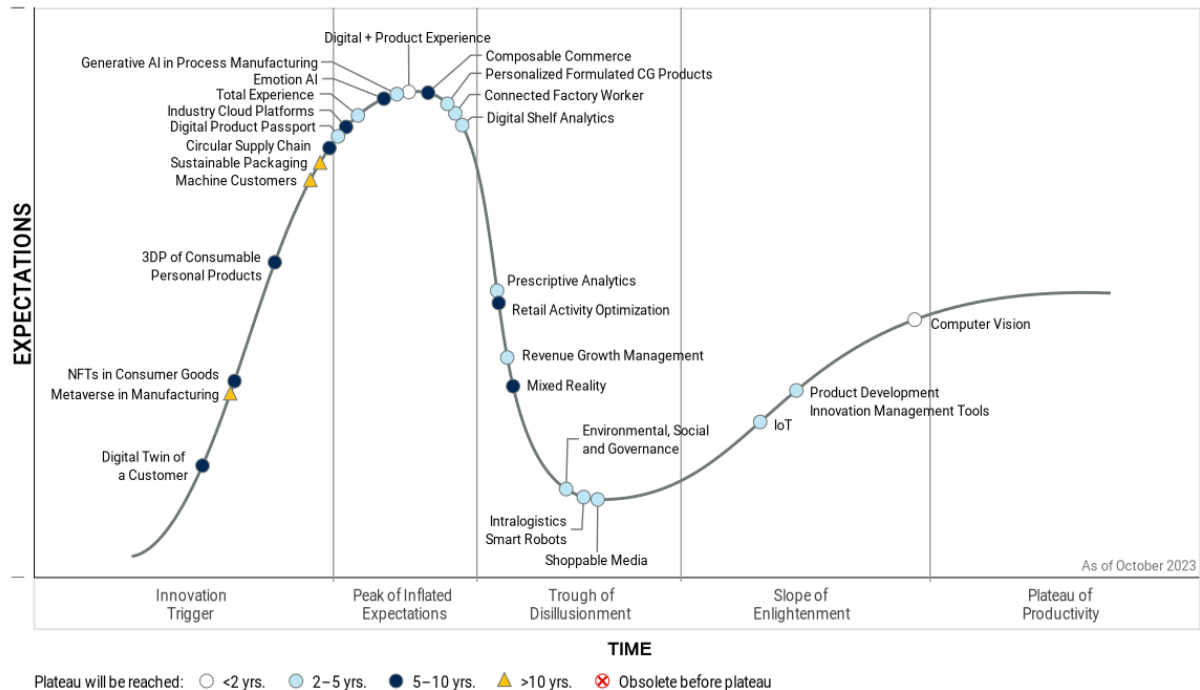
A circular supply chain in manufacturing decouples resource consumption from growth, enabling leaders to maintain business competitiveness while reducing environmental impact. Moving toward the Peak of Inflated Expectations indicates the method is gaining visibility in mainstream CG organizations.

In addition to new innovations entering this year's Hype Cycle, **composable commerce** has moved several places forward in 2023 to just past the Peak of Inflated Expectations. Composable commerce facilitates integration between multiple commerce solutions and is attractive to digitally mature manufacturers looking to adopt a modular approach to existing and future solutions.

Despite strong interest in **industry cloud platforms** over the past 12 months, it remains in last year's position as there are simply too many initiatives competing for budget and resources.

Figure 1: Hype Cycle for Consumer Goods, 2023

Hype Cycle for Consumer Goods, 2023



Gartner

The Priority Matrix

The Priority Matrix summarizes business impact versus priority to adopt for opportunities on the Hype Cycle.

In 2022, we wrote that computer vision would mature in the next two years. This has stayed true and is reflected accordingly. It is important to note that “mature” does not mean it is pervasive or obsolete, only that the technology is mature for many, many use cases. When coupled with something like GenAI, computer vision erupts even more. The same applies to the Internet of Things (IoT). It is not new, but the use cases and interactions are becoming even more compelling.

Several innovations are within the two-to-five-year window for reaching the Plateau of Productivity. They fall into two themes.

- **Experience** — The connected factory worker, personalization of formulated consumer products and digital product passports all have a strong connection to total experience. Without positive and evolving experiences, the organization and product will eventually fail.
- **Technology** — GenAI, intralogistics smart robots and the IoT advance capability and productivity. In turn, the evolution of products and manufacturing capabilities could move CG manufacturing companies to a new level of interaction with customers and consumers.

Table 1: Priority Matrix for Consumer Goods, 2023

(Enlarged table in Appendix)

Benefit ↓	Years to Mainstream Adoption			
	Less Than 2 Years ↓	2 - 5 Years ↓	5 - 10 Years ↓	More Than 10 Years ↓
Transformational	Computer Vision	Connected Factory Worker Digital Product Passport Generative AI in Process Manufacturing Intralogistics Smart Robots IoT Personalizing Formulated Consumer Goods Products Total Experience	Circular Supply Chain Composable Commerce Digital Twin of a Customer Emotion AI Industry Cloud Platforms NFTs in Consumer Goods	Metaverse in Manufacturing
High	Digital + Product Experience	Digital Shelf Analytics Environmental, Social and Governance Prescriptive Analytics Product Development Innovation Management Tools Revenue Growth Management	Mixed Reality Retail Activity Optimization	Machine Customers
Moderate		Shoppable Media	3DP of Consumable Personal Products	
Low				Sustainable Packaging

Source: Gartner (October 2023)

Off the Hype Cycle

In an effort to focus on solutions and technologies most often discussed with clients and in the forefront of those most currently in demand, these technologies have been removed from the 2023 CG Hype Cycle:

- **Technology** — Blockchain in manufacturing, edge AI, digital twin, hyperautomation, 4D printing, IT/OT integration, robotic process automation (RPA), 3D printing of consumable personal products

- **Data and analytics** — Master data management (MDM), MDM of product data
- **Customer** — Circular economy, immersive experience in manufacturing operations, crowdsourced product innovation
- **Solutions** — Quality management system applications, manufacturing operations management application suites

On the Rise

Digital Twin of a Customer

Analysis By: Melissa Hilbert, Michelle DeClue

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Embryonic

Definition:

A digital twin of a customer (DToC) is a dynamic virtual mirror representation of a customer that can be used to simulate and to emulate and anticipate behavior. Customers can be individuals, enterprise customer, personas, groups of people or machines.

Why This Is Important

DToCs help organizations of all sizes better understand their customers and anticipate their behavior. They increase efficiency and provide a personalized, empathetic service to customers, many of whose buying habits have changed during periods of disruption and change.

A DToC can be used to modify and enhance the customer experience (CX) and support new digitalization efforts, products, services and opportunities. It can be an engine of transformation and disruption.

Business Impact

Today, digital twins enable organizations to anticipate how a physical product will perform or need to be maintained in different conditions. Organizations can now use DToCs to simulate how a customer will react, given a specific set of ecosystem parameters, conditions, and control or input signals. DToCs help organizations selling products or services provide customers with better experiences, which results in increased revenue and lasting customer relationships.

Drivers

DToCs will help organizations drive revenue by:

- Gaining critical insights into customers

- Increasing revenue by enabling new ways to serve or capture customers, as well as by facilitating new data-driven business models
- Predicting and simulating behaviors with a view to making products, services, promotions and business campaigns more successful and reducing unnecessary costs of failure
- Improving customer engagement, customer retention, customer lifetime value and company growth
- Reducing churn, product failure and engagement abandonment

DToCs will help customers:

- Reduce friction in interactions with the supplier organization across their journey
- Increase positive outcomes, creating better value
- Engage in curated experiences and concierge-like experiences specifically tailored to drive value for them
- Protect privacy with the ability to change what personal data is collected and how organizations use it

Obstacles

- Privacy and cyber risk concerns may lengthen the time it takes DToCs to mature, and increase legal and regulatory risk.
- Organizations need competency in machine learning algorithms and some staff with data science skills to build or manage DToCs.
- Internal bias and concern exists about a DToC's ability to drive revenue or reduce costs. A strategy based on use cases of how to create value will be needed.
- The technology behind digital twins has focused on organizations and products. A customer focus is emerging, and lack of clear KPIs and other success measures limits the potential use of DToCs.

- Organizations need to establish trust with customers for customers to agree to share information. Customers will need transparency about what data is collected, how it will be used and the privacy and data controls that will be applied. For B2B, they need to know the benefits such as providing a more personalized experience, more relevant products or services, convenience and exclusive offers.

User Recommendations

- Align your activities with customers' privacy and cybersecurity concerns based on the availability of customer assets and establish a trust center to house these documents and expectations.
- Identify use cases for which DToCs could help deliver a better CX and for which suitable data is available by examining customer journeys and failure points.
- Define clearly KPIs and specific objectives that can be measured to validate improved business outcomes such as CX, demand forecastability or agility of responsiveness.
- Run a pilot, whether you build or buy a DToC, and compare results against a persona or C360 over a statistically significant period using significant data. Ensure your business and operating models are ready to support the endeavor.
- Encourage customers to share their data with you. Define benefits they can expect from a DToC, agree to the level of control they will have over their data including canceling the digital twin. Provide clear visibility into how their data will be used.

Sample Vendors

Absolutdata; Arrayworks; Fetch.ai; Infogain; Nstream; Salesforce; Tata Consultancy Services (TCS)

Gartner Recommended Reading

[A Digital Twin of a Customer Predicts the Best Customer Experience](#)

[Quick Answer: Privacy Basics for a Digital Twin of a Customer](#)

[Innovation Insight: Demystifying Digital Twin of a Customer for B2B Sales](#)

[Quick Answer: Is a Digital Twin of a Customer the Future of a 360-Degree View of the Customer?](#)

Supply Chain Executive Report: Drive Growth and Elevate Experiences With Digital Twin of the Customer

Metaverse in Manufacturing

Analysis By: Soharg Aggarwal

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Embryonic

Definition:

Gartner defines a metaverse as a collective virtual 3D shared space, created by the convergence of virtually enhanced physical and digital reality. A metaverse is persistent, providing enhanced immersive experiences. It will generate multiple opportunities across the manufacturing value chain including new ways of collaboration, productivity, product and service innovation, and hyperpersonal customer experience.

Why This Is Important

Four key innovations driving the development of metaverse in manufacturing are Web3, spatial computing, digital twins (of things and people) and enabling new ways of collaboration and interactions. The convergence of the physical and digital world will allow manufacturers to accelerate innovation, create agile supply chains, improve competitiveness, and deliver products and services that enable new channels of customer engagement, hyperpersonal experiences, and mass customization.

Business Impact

Manufacturers will expand and enhance manufacturing businesses in unprecedented ways, opening up innovative opportunities. Emerging categories of opportunities include:

- Shared experiences to improve employee experience/collaboration productivity and skills.
- Immersive training, remote assistance and product development.
- Customer service and task automation via digital humans.
- Virtual spaces — for live virtual events/product launches.

- Digital revenue through e-commerce and asset tokenization (non-fungible tokens [NFTs]).

Drivers

- **Demand for digital manufacturing operations:** Manufacturers are building digital capabilities to transform their manufacturing operations, product innovation and customer experiences. Immersive technologies such as head-mounted displays, AR/VR/MR and 3D are already reshaping the manufacturing industry and will be an integral part of the future of digital manufacturing.
- **Hybrid workforce enablement:** With the rise of hybrid workforce, manufacturers are seeking digital workspaces that improve employee engagement, productivity and collaboration. Metaverse will enable manufacturers to leverage immersive technologies to achieve this goal, for example, [BMW Group](#) and [Hyundai Motor](#). They can even provide employee training and deliver support to remote frontline workers, technicians and field service agents in real time (for example, [Jetblue's partnership with Strivr Labs](#)).
- **Immersive customer experience:** Emerging metaverse solutions are making it possible to deliver engaging customer experiences and to earn digital revenue. Gen Z's leverage of gaming, mobile devices and social media is also increasingly shifting behavior toward hyperpersonal immersive digital experiences (examples include Louis Vuitton's LOUIS THE GAME and [Gucci Garden](#)).
- **Digital business enablement and revenue creation:** Manufacturers will be able to use metaverse as an additional channel to meet customers' demand from e-commerce and direct-to-consumer (D2C) platforms (examples include [United Colors of Benetton](#) and [Inditex Group \[Pull&Bear\]](#)). They can further leverage blockchain-based asset tokenization (NFTs) to drive digital revenue (examples include [Mattel \[Hot Wheels\]](#), [McLaren Racing](#) and [ASICS](#)).

Obstacles

- **Metaverse is still fragmented and indiscernible:** Emerging solutions provide device-dependent, siloed experiences and limited functionality. Gartner expects that a complete metaverse will take eight to 10 years to emerge. Interoperability, persistence, decentralization and collaborativeness are key attributes of a complete metaverse.
- **Data and cybersecurity risks:** An avalanche of data would require manufacturers to proactively incorporate standards to protect the user information, identify or avoid deepfake/hacked avatars, monitor and report data breaches/cyberattacks, and meet regulatory requirements.
- **Digital maturity:** As manufacturers already manage a complex web of IT, OT and ET technologies, any new technology or solution must integrate with these existing technologies while enabling individual use cases. The subverticals or even individual organizations have different levels of digital maturity which may inhibit adoption.

User Recommendations

- Create a tiger team to identify metaverse-inspired opportunities and build an execution roadmap by evaluating current high-value use cases around digital business or new product/service introduction.
- Evaluate investment in enabling technologies and assess the impact of their deployment on the existing IT/ET/OT ecosystem. Business leaders are advised to proceed with caution since a complete metaverse does not exist yet.
- Since many metaverse-enabling technologies are emerging, creating newer interfaces and need for higher governance develop technology strategies to leverage the built-in infrastructure and participants of the metaverse.
- Build the visibility and interoperability of data and data sources by aggregating data from processes, machines, systems and real-time data sources. Then implement interoperability protocols for connecting, contextualizing and visualizing data across the value streams to support use cases identified earlier.

Sample Vendors

Animoca Brands (The Sandbox); Decentraland; Linden Lab; Meta; Microsoft; NVIDIA; Roblox; Siemens

Gartner Recommended Reading

[Quick Answer: What Is a Metaverse?](#)

[Top Strategic Technology Trends for 2023: Metaverse](#)

[Quick Answer: What Are the Five Essential Attributes of an Emerging Metaverse?](#)

[Top Strategic Technology Trends in Consumer Goods Manufacturing for 2023](#)

NFTs in Consumer Goods

Analysis By: Soharg Aggarwal

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

A non-fungible token (NFT) is a unique programmable blockchain-based digital item that publicly proves ownership of digital assets, such as digital art or music, or physical assets that are tokenized, such as houses, cars or documents. Most manufacturers today use NFTs to extend their product lines into the digital world, expanding how consumers engage with and experience the brand. NFTs can be used for managing digital customer identity and assets like warranty or loyalty data.

Why This Is Important

Consumer goods manufacturers are increasingly tokenizing real-world assets for many purposes, such as digital revenue streams, customer engagement, brand recognition and awareness. NFTs have broad applicability, including support for new economic models and entry into new types of marketplaces (for example, in metaverses) that are not possible without them. NFTs have the potential to become the basis for multifaceted customer engagement.

Business Impact

By tokenizing real-world assets, CG enterprises can create new economic opportunities, such as creating new classes of digital assets, establishing product provenance, managing intellectual property creation and distribution rights, and negotiating contracts represented as NFT records. Using blockchain technology makes NFTs tamper-proof and allows entities to ensure the validity, integrity and uniqueness of NFTs. This further enables content creators to manage, promote and monetize their assets.

Drivers

- **Digital asset creation and ownership** — NFTs provide a way for consumer goods brands to extend their physical brand identities into the digital world. These can act as expansion of product lines or create completely new digital assets that can be bought, sold and traded. By leveraging NFTs, authenticity and, in some cases, ownership can be validated in real time. NFTs can address customer demand for personalized products. and provides a way for brands to improve customer engagement.
- **Digital revenue streams** — Brands can easily monetize NFTs through existing marketplaces like OpenSea and Rarible. NFTs enable “creator economy,” where brands engage with content creators to build digital assets and share revenues with them.
- **Product provenance** — NFTs can enable manufacturers to track a product across its value chain and tokenize related supply chains like quality, origin or financial data related to payments and contracts.
- **Identification and certification** — NFTs can be used to authenticate customer identity and therefore link rewards, loyalty and warranty data to the token. This can be particularly important for organizations looking to engage in metaverse-based use cases.

Obstacles

- NFTs are unique within a single blockchain network. Blockchain interoperability needs to expand to ensure that NFTs retain their uniqueness and integrity across digital ecosystems.

- The value and longevity of tokenized assets will be dictated by user demand, engagement, regulations and market structures. Considerable investments in time, money and resources are required to build a better understanding of customer demands and needs, and assimilate that information into digital asset creation. Compared to other digital assets, rarity, utility (access to special events or merchandise) and significance (cultural, historical) are some drivers of NFT sales to the buyers.
- NFTs will introduce new product life cycles to manage issuance, usage and exchange of tokenized assets, and CG manufacturers must consider the feasibility of dedicated teams to design, launch and manage these product life cycles.
- CG manufacturers will need to develop expertise in token development, security, privacy and business model design to safeguard users and their own businesses from potential fraud, manipulation and scams.

User Recommendations

- CIOs and IT leaders interested in the potential of NFTs must engage with relevant business leaders to inform and advise on the risks, benefits and limitations of emerging tokenization technology, especially blockchain-enabled NFTs.
- Conduct proofs of concept using early-stage research to consider investigating how tokenized assets are made, distributed and monetized.
- Leverage good cybersecurity to ensure that risks are understood and mitigated. As NFTs increase in value, so will attacks.

Sample Vendors

Animoca Brands; Ava Labs; Centrifuge; Ethereum Foundation; Flow; Massachusetts Institute of Technology; OpenSea; Polygon Labs; Rarible; Solana Foundation

Gartner Recommended Reading

[Predicts 2023: Consumer Goods Manufacturers Must Adopt Data-Driven Innovation](#)

3DP of Consumable Personal Products

Analysis By: Ivar Berntz

Benefit Rating: Moderate

Market Penetration: Less than 1% of target audience

Maturity: Embryonic

Definition:

3D printing (3DP) of consumable personal products uses a 3D printer to create custom products that are edible or can be applied on the body.

Why This Is Important

While the concept of personalized and consumable 3D-printed products has been around for decades, Gartner has recently witnessed a rise in the commercialization of 3DP for food and personal care products. Though the number of 3D food printer manufacturers is low, research is taking place in academic institutions. Further, 3DP is being used to produce personal care products, which are augmented by the technology's capability of rapid prototyping and innovative product development.

Business Impact

Consumers want more-personalized choices, faster. 3DP and other customization technologies create the expectation that food and other consumable products can be personalized. We expect this technology and its applications to continue to develop and climb the Hype Cycle toward the Peak of Inflated Expectations. In select cases, consumers are already able to customize products through printers owned by them or by stores — for example, accessories for Ford cars or mobile phone cases and screen protectors.

Drivers

- **Personalization:** Consumers' demand for personalized products is increasing, which can be delivered more rapidly through 3DP. In use cases like customization of food products, such as cakes catered to a particular event, 3DP provides the opportunity to be creative and produce intricate food designs, saving both time and resources. Additionally, the use of 3DP to produce personalized medicine and cosmetics has surged, as the precision of 3DP helps in delivering treatments to better serve each unique consumer.
- **New product development:** 3DP offers design and structural freedom, leading to development of in-house capabilities, such as prototyping, design verification and consumer testing. The freedom to design products has also led to the use of technology in personal care product packaging, such as cosmetics and perfumes. Since it is an additive procedure, expensive raw materials and resources are not wasted.
- **Functional food and nutrition:** Due to the precise design process, the technology also helps create edible products with precise amounts of nutrients required by a particular consumer's health. Tracking the quantity of vitamins and carbohydrates in food products also helps meet quality and safety standards.
- **Sustainable sourcing:** With a growing population, there is an increased chance of food shortages around the world. 3DP can produce food products with fewer ingredients used, such as algae, insects and seaweed. Additionally, the technology helps reduce waste by converting imperfect or unsellable food into visually appealing food that individuals with digestive issues can consume.
- **Technology evolution:** Advancements across printing technologies, such as materials extrusion, powder-based printing technologies, selective laser sintering and binder jetting, are driving growth in use cases of consumable products.

Obstacles

- In line with 3DP adoption challenges across industries, the investment cost of equipment and limited materials options remain major challenges for the technology in the retail industry as well. The cost is further increased by the need for skilled labor to design consumable products.
- There is a high dependency on properly preparing edible materials to ensure consumers' safety and palatability. The ingredients required to produce 3D-printed food products need to be precooked or preprocessed to achieve the consistency necessary for extrusion.
- Additionally, fluctuating temperatures during the 3DP process of food products may result in the growth of microbes and contamination of the food.
- Technology adoption should meet regulatory and policy guidelines set by regulatory bodies, such as the U.S. Food and Drug Administration (FDA), which may be a challenge for some use cases.
- Further, there is a need to safeguard intellectual property related to personal products' design and ingredients.

User Recommendations

- Partner with the finance, marketing, engineering, operations and legal teams to validate the viability of 3DP technologies.
- Develop internal guidelines for policy, quality, practice and regulation to ensure consumers' safety, and apply them with the same rigor as for traditional modes of production.
- Hospitality and food service and processing industries: Explore unique benefit areas of 3DP, and offer high-value, high-price, custom-printed foods at weddings, social events and business meetings. Reconstitute imperfect or unsellable food to manage waste and create new, more visually appealing foods that individuals with digestive issues can consume.
- Cosmetics and consumer health product companies: Follow market development and government guidelines related to 3D printers and materials that could be leveraged to print topical products and medications, with an aim to ensure consumer safety.

Sample Vendors

3D Systems; byFlow; The Digital Patisserie; Mink; Natural Machines; PancakeBot; Print2Taste; SavorEat

Gartner Recommended Reading

[3D Printing Will Accelerate Design and Product Innovation in Existing Manufacturing Setups](#)

[Market Guide for 3D Printer Manufacturers](#)

[IT/OT/ET Alignment With 3D Printing Enhances Scalability](#)

[3D Printing Will Accelerate Design and Product Innovation in Existing Manufacturing Setups](#)

[The Manufacturing CIO's Role in Adopting and Scaling 3D Printing](#)

Machine Customers

Analysis By: Don Scheibenreif, Mark Raskino

Benefit Rating: High

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Definition:

Machine customers are nonhuman economic actors that obtain goods or services in exchange for payment. Examples of machine customers include virtual personal assistants, smart appliances, connected cars and Internet of Things (IoT)-enabled factory equipment. Machine customers act on behalf of a human customer or an organization.

Why This Is Important

Currently, there are more internet-connected machines with the potential to act as customers than humans on the planet. We expect the number of machine customers, such as virtual assistants with AI capabilities, to rise over time steadily. Machines are increasingly gaining the capacity to buy, sell and request services. Further, machine customers will advance beyond the role of simple informers to advisors and, ultimately, decision makers.

Business Impact

Over time, trillions of dollars are expected to be in control of nonhuman customers. This will result in new opportunities for revenue, efficiencies and managing customer relationships. Leaders seeking new growth must reimagine their operating and business models to take advantage of this emerging market of billions of machine customers. Organizations that miss this opportunity will be marginalized, just like those retailers who missed the digital commerce wave.

Drivers

- In the next few years, machine customers are expected to become significant players in the retail and consumer industry.
- In the forthcoming years, billions of connected products might have the potential to behave as customers — that is, to shop for services and supplies for themselves and their owners.
- Currently, most machines merely inform or make simple recommendations. However, some machines are emerging as more complex customers. For example, HP Instant Ink is a service that enables connected printers to automatically order their own ink when supplies run low. Also, some Tesla cars already order their own spare parts and Amazon offers its Dash Replenishment Service for a variety of household appliances. Advances in generative AI, and applications like ChatGPT, will accelerate the development and deployment of machine customers. These tools can diagnose and break down complex tasks to make the right recommendations, service requests and other functions.
- In B2B, Datapred uses machine learning (ML) to recommend optimized purchasing strategies and generate related financial risk reports based on commodity, raw material price predictions and organization-specific internal constraints. For example, in the future, an autonomous vehicle could determine what parking garage to take its human passengers to. This decision would be based on criteria such as distance from destination, price, online review score, parking space dimensions and valet options.
- Machine customers have the potential to generate new revenue opportunities, increase productivity and efficiency, improve health and well-being, and enhance the security of physical assets and people.

Obstacles

Machine customers across industries may not reach the Plateau of Productivity for the next 10 years because of:

- **Operating models:** Marketing, selling and serving a machine customer will upend your operating model. A new definition of customer experience (CX) for a machine customer will be needed.

- **Lack of trust:** Humans may not trust the machine customer technology they use to predict, execute and maintain privacy accurately. Conversely, machine customers may not trust the supplier organization to do the same.
- **Fear of machines:** Some humans may initially be uneasy about delegating purchasing functions to machines. Organizations must consider what ethical standards, legal compliance, fraud and risk mitigation are needed to operate in a world of machine customers.

User Recommendations

- Identify specific use cases where your products and services can be extended to machine customers. Initiate collaboration with your chief digital officer, chief data officer, chief strategy officer (CSO), sales leaders and chief customer officer (CCO) to explore the business potential of machine customers.
- Pilot the ideas compiled during the identification of use cases to understand the technologies, processes and skills required to implement machine customers adequately.
- Build your organization's capabilities around digital commerce and AI, especially generative AI, for the next few years. Use APIs and enterprise bots to enable machine customers for low-complexity transactions. Then, extend your organization's capabilities to other facets involved in machine customers processing information to make informed decisions and perform purchase transactions. Alternatively, join other platforms with these capabilities if you don't have the resources to build them yourself.
- Follow examples from organizations such as Amazon, AutoGPT, Google, HP Inc. and Tesla for evidence of capabilities and business model impact.

Sample Vendors

Amazon; Datapred; Google; HP Inc.; Significant Gravitass; Tesla

Gartner Recommended Reading

[Why Machine Customers May Be Better Than Human Customers](#)

[CIOs Can Maximize Product Lifetime Value by Embracing Machine Customers](#)

[Infographic: A Day in Your Life in a World of Machine Customers](#)

Podcast: When Machines Become Customers

Circular Supply Chain

Analysis By: Laura Rainier, Sarah Watt

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Circular supply chain is the application of circular economy principles to the end-to-end supply chain. A circular supply chain decouples consumption from growth using three principles: design out waste, keep material in use at the highest quality for as long as possible and return materials to the environment to have a positive impact. Benefits of the circular supply chain include enhanced customer engagement, raw material security and containment of inflationary-driven costs.

Why This Is Important

A circular supply chain decouples resource consumption from growth, enabling leaders to maintain business competitiveness while reducing environmental impact. According to the 2022 Gartner Future of Supply Chain Survey, engaging in circular economy activities is important to 75% of supply chain leaders. Additionally, 92% of high-performing supply chain leaders expect to have sufficient capabilities to enable circular economy benefits in three to five years.

Business Impact

A circular supply chain uses resources more efficiently by designing waste out of products, packaging and processes, and better-leveraging materials through product take-back, refurbishment, product life extension and other means. The approach shifts economic incentives toward durability and material efficiency and provides a hedge for materials volatility. Digital technology allows for product orchestration while also gathering insights into customer use, which is fed back into product design.

Drivers

- **Legislative drivers:** Various regulatory requirements are emerging to drive enhanced circularity. For example, the “right to repair” requires access to spare parts and technical information to enable products to be kept in use for as long as possible. EU waste policy aims to ensure that high-quality resources are not lost from the economic system. Concerningly, 60% of EU household waste still goes to landfill.
- **Supply chain resilience:** Circular supply chains enable the organization to meet customer demand amid disruption through second-life products or by reclaiming raw materials for manufacturing new products.
- **Impact on climate change and biodiversity:** A circular approach has the potential to reduce climate change impacts, as product embodied energy (and emissions) is used more efficiently. By slowing the rate of consumption, the circular supply chain reduces its reliance on the extraction/production of new raw materials and their associated emissions. Enterprises must undertake life cycle analysis to review the environmental impacts of end-of-life options, enabling trade-off decisions to be made.
- **Enhanced value:** The circular economy enables enterprises to access new markets, offer new business models and products, and build a differentiated sustainability narrative.
- **Innovation:** The circular economy is a catalyst for innovation. Examples include design for reuse and longevity, innovative business models and design for disassembly.
- **Customer expectations:** According to the 2022 Gartner Circular Economy Survey, customer demand for circular products is the biggest driver of changes to the physical supply chain network to enable circular economy outcomes.

Obstacles

- **Metrics:** Traditional ROI metrics do not effectively capture the benefits of the circular supply chain due to short-term focus, siloed thinking and a transactional approach. Circular strategies capture more value from materials, over a longer period of time.
- **Stakeholder engagement:** Scaling the circular supply chain relies on engaging with partners across the organization and ecosystem. Partnership is required to enable product return flows, materials recovery, industrial symbiosis between organizations and additional customer value offerings. Convening external stakeholders and sharing relevant data with the ecosystem is a key barrier.
- **Execution:** Take-back models enable remanufacturing and reuse, but the supply chain has less control over what is returned. This can create excess inventory without a productive next use.
- **Impact:** Standards are emerging to measure the impact of circular initiatives, but accurate assessment of environmental and other trade-offs is complex.

User Recommendations

- **Prioritize products:** Select the products best positioned for the circular strategy by assessing which products deliver the most financial and nonfinancial benefits, evaluating the customer appetite for circular products and assessing the feasibility of circular models.
- **Enable:** Apply circular design guidelines (for example, modularity, durability), craft circular business models (for example, reuse, product as a service), and implement processes that enable material loops (for example, reverse logistics, reverse planning).
- **Pilot:** Demonstrate how to overcome common leadership concerns, such as the cannibalization of market share.
- **Digitalize:** Leverage digital technology for product use insights, and to improve the speed, rate and quality of second-life products. Formulate performance scorecards to aggregate data from multiple parts of the organization.
- **Organize:** Organization structure is a key enabler in advancing circular economy strategy. Use centers of excellence to embed circular economy into operating models.

Gartner Recommended Reading

[3 Criteria to Select “Winning” Circular Economy Products to Enable Growth](#)

[3 Accelerators to Advance the Circular Economy in Supply Chain](#)

[Use Circular Economy to Mitigate Inflation, Drive Growth and Deliver Value Amid Economic Uncertainty](#)

[Craft a Reverse Supply Chain Strategy to Enable Circular Economy at Scale](#)

[How to Structure Your Organization to Drive Circular Economy Integration](#)

Industry Cloud Platforms

Analysis By: Gregor Petri

Benefit Rating: Transformational

Market Penetration: 20% to 50% of target audience

Maturity: Adolescent

Definition:

Industry cloud platforms address industry-relevant business outcomes by combining underlying SaaS, PaaS and IaaS services into a whole product offering with composable capabilities. These typically include an industry data fabric, a library of packaged business capabilities, composition tools and other platform innovations. IT leaders can use the composability of these platforms to gain the adaptability and agility their industries need to respond to accelerating disruption.

Why This Is Important

Cloud, software and service providers are launching industry cloud platforms (ICP) by combining SaaS, PaaS and IaaS offerings with industry-specific functionality and composable capabilities to create more compelling propositions for mainstream customers. Emerging industry cloud platforms are leveraging innovative approaches such as composable packaged business capabilities (PBCs), PBC marketplaces, data grids and fusion teams to accommodate faster change and platform adaptability.

Business Impact

Broader cloud adoption within enterprises requires more whole-product business solutions that enable defined industry scenarios and process models, rather than technology-oriented solutions that enterprises have to largely configure and integrate themselves. ICPs enable enterprises to adopt more holistic cloud strategies that span across established cloud service categories such as SaaS, PaaS and IaaS.

Drivers

- As the complexities of both business and technology continue to increase, enterprises are looking for more outcome-based engagements with their cloud providers. However, such outcomes must be flexible enough to be able to adapt to the changing circumstances.
- To be relevant and be able to resonate with enterprise audiences, such outcomes must be business relevant, specific, measurable and tangible — a goal that is easier achieved when approached in a specific industry context.
- Industry cloud platforms can create value for enterprises by bringing traditionally separately purchased solutions together in a composable and modular way. This simplifies the sourcing, implementation and integration process.
- Currently, industry cloud platforms are being initiated and created by various technology providers. In addition, we see some enterprises considering creating — often in collaboration with a technology provider — a dedicated industry cloud platform as the basis for a more autonomous industry ecosystem.
- Enterprises can gain business value from industry clouds through shared best practices; vertically specialized go-to-market and implementation teams; compliance of the infrastructure platform with industry-specific regulations.
- Value can also be gained through analytical capabilities to integrally mine the data from existing and new applications; industry-specific add-on functionality in front- and back-office enterprise applications; combined with collections of composable building blocks available from industry cloud marketplaces.
- Providers are on a pathway to creating whole-product offerings that cater directly to the established needs of vertical industry enterprises.

Obstacles

- Industry clouds are at risk of following the same path as classic government and community clouds where providers created difficult to support or slightly outdated copies of the original cloud with specific functionality.
- Industry cloud platforms can be overwhelming in terms of the wide breadth of functionality they potentially cover. Customers and providers must therefore be disciplined and not burn precious resources on fixing/replacing things that are not broken.
- Implementing an industry cloud platform must be approached as adding an exoskeleton, bringing new and improved capabilities rather than a vital organ transplant, replacing or repairing functionality that was already present.
- To reach their full potential, industry clouds will need to evolve into something best described as ecosystem clouds. Enterprises can leverage these ecosystems by participating in shared (business) processes, such as procurement, distribution, payment procession, and maybe even R&D and innovation.

User Recommendations

- Target ICPs to complement the existing application portfolio like an exoskeleton by introducing new capabilities that add significant value, rather than as full-scale replacements of largely already existing functionality with more up-to-date technology.
- Start building composability skills by engaging business technologists and fusion teams to create enterprisewide understanding and support for the ICP journey.
- Formulate rules for when to deploy ICP capabilities as a productive platform for optimization and modernization by improving existing processes, and when to actively recompose them for more differentiating transformation and innovation initiatives.

Sample Vendors

Amazon Web Services (AWS); Google; IBM; Infor; Microsoft; Oracle; Salesforce

Gartner Recommended Reading

[Top Strategic Technology Trends for 2023: Industry Cloud Platforms](#)

[Presentation: Industry Cloud Platform Adoption by Vertical Industry](#)

Analyzing Industry Cloud Offerings From CIPS Providers

Providers of Cloud Managed Services: Use Composable Industry Platforms to Productize Your Offerings

Changes and Emerging Needs Product Managers Must Address in the CIPS Market

Sustainable Packaging

Analysis By: John Blake

Benefit Rating: Low

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Sustainable packaging is the development and use of packaging that results in improved utilization of materials, and decreases the negative impact of packaging on the environment. It can include recycling, recycled content, reuse, material substitution and reduction in the carbon footprint of packaging.

Why This Is Important

Sustainable packaging has become a core aspect of sustainability commitments as packaging and plastics have been deemed major contributors to pollution and greenhouse gas (GHG) emissions. Organizations need to address packaging to meet their environmental, social and governance (ESG) goals and the expectations of customers and consumers in order to protect their brand's reputation. In addition, the rapid advancement of global packaging legislation is heightening the urgency to adopt sustainable packaging practices.

Business Impact

Consumer and customer sentiment drove voluntary sustainable packaging goals, but now there is a rise in packaging legislation globally that will mandate changes in how packaging is designed and utilized. Sustainable packaging is complicated and can be costly to implement. It's estimated that many 2025 commitments will be missed, risking brand reputation. Significant levels of innovation and investments may be required to meet voluntary and mandated targets.

Drivers

- **Consumer/customer pressure:** There is an awareness of the harm that products and packaging have on the environment and this is driving purchase decisions. Brand reputation, waste and the contribution to Scope 3 emissions are being scrutinized.
- **Legislation:** 2022 marked not only the first of its kind — a Plastic Packaging Tax implemented in the U.K. — but it also marked California becoming the fourth state in the U.S. to pass Packaging Extended Producer Responsibility (EPR) legislation. Meanwhile, 2023 ushered in new packaging taxes in Spain and there are (at the time of publication) over 10 states in the U.S. with proposed packaging EPR legislation. These are just a few of the examples of global packaging legislation.
- **ESG strategy:** As the value of having a clear and actionable ESG strategy becomes clear, organizations are moving beyond focus on Scopes 1 and 2 emissions and are increasingly setting their attention to Scope 3, which includes packaging. Further, boards are increasingly stepping up their oversight of ESG, as they recognize its necessity for long-term resilience and the very visible nature of packaging and packaging waste.
- **The war on plastic:** As awareness of the impact of plastics and plastic packaging on the environment increases, organizations need to develop a position regarding its use. There is a desire to replace plastics, drive a circular economy through recycling, eliminate or minimize use of virgin or petroleum-based polymers and move from single use to reusable packaging.
- **Costs:** The overuse or misuse of packaging has cost implications as well as sustainability implications. Another cost risk is the growth in legislation. Organizations will be penalized for the quantity and types of packaging they produce. However, reducing or optimizing packaging through the lens of sustainability can also reduce packaging costs.

Obstacles

- **Complexity:** Visions of fully recyclable, reusable and plastic-free are harder to implement than anticipated, due to financial and technical feasibility (such as product protection, costs, recycling infrastructure and sourcing limitations).
- **Data maturity:** Packaging specification data practices are at a low maturity level. Common challenges include insufficient processes and systems of record, as well as accuracy/completeness of data. Software for packaging specification management is an emerging market.
- **Infrastructure:** Investments in recycling infrastructure and by packaging suppliers has not kept up with the promises or needs of brand owners.
- **Costs:** Material shortages, reusable packaging supply chain and manufacturing assets are driving cost pressures.
- **Collaboration:** Packaging's impact is cross-functional, requiring stakeholder support to navigate change management challenges.
- **Greenwashing:** Overpromising, under delivering or misleading consumers poses risks of legal or consumer backlash.

User Recommendations

- **Data:** Establish the baseline for any sustainable packaging strategy by capturing data on current packaging consumption.
- **Upstream innovation:** Optimize products and packaging through the lens of sustainability and consumer needs.
- **Feasibility:** Assess the business impact and feasibility of sustainable packaging by engaging cross-functional teams in the process of setting or resetting packaging goals. Key considerations include sourcing and quality of packaging, material and capital costs as well as operational changes.
- **Stakeholders:** Engage stakeholders to support necessary changes and investments. Sustainable packaging often involves development, financial commitments and change management to advance beyond pilots.
- **Investment:** Determine where investments are needed to support sustainable packaging by starting with specification data visibility. This will prove critical as legislation evolves. Map required investments in manufacturing assets, as well opportunities for strategic investments with packaging suppliers.

Gartner Recommended Reading

[Quick Answer: How to Create a Sustainable Packaging Strategy](#)

[Quick Answer: How to Advance Sustainable Packaging Goals](#)

[Quick Answer: How to Comply With Sustainable Packaging Legislation](#)

[Market Guide for Packaging and Product Specification Management](#)

At the Peak

Digital Product Passport

Analysis By: Soharg Aggarwal, Lillian Oyen-Ustad

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

Definition:

Digital product passport (DPP) is part of the proposed Ecodesign for Sustainable Products Regulation and one of the key actions under the European Commission's Circular Economy Action Plan (CEAP). It provides a method of digitally recording and sharing information about a product across its entire value chain. In particular, this includes traceability of the finished product, its components and usage, and end of life.

Why This Is Important

DPP as a tool and a regulation aims to capture product data from suppliers, manufacturers and customers, enabling transparency, traceability, and consistency across the value chain. By providing data on a product's environmental footprint, it enhances trust, allows consumers to make informed buying decisions and can lead to circular models. Because of regulatory requirements and expected fast-track adoption (EU-specific regulation in effect by 2024), DPP is at its Peak of Inflated Expectations.

Business Impact

Any manufacturer selling a product on the EU market will need to provide a product passport for both the finished product and each of its individual parts. This will require them to:

- Centralize and standardize product information.
- Provide access to reliable and comparable product sustainability information.
- Promote innovative thinking on circularity, resource optimization and energy efficiency.
- Enable sustainable investment decisions by exposing manufacturers' environmental, social and governance (ESG) credentials.

Drivers

- Regulatory changes and proposals under the [European Green Deal](#) and [Circular Economy Action Plan](#), with a long-term target of enabling the European Economic Area to reach net zero emissions by 2050, are primary drivers for the introduction of DPPs. Other geographies are exploring similar initiatives; most notable is the [U.S. FDA's Food Safety Modernization Act \(FSMA\)](#).
- According to the 2023 Gartner CEO and Senior Business Executive Survey, environmental sustainability became a top 10 business priority for manufacturing CEOs. Customers, investors, regulators and employees are further creating pressure to act on or invest in sustainability initiatives. This includes supporting material and energy efficiency, extending product lifetimes, and optimizing product design, manufacturing, use and end-of-life handling.
- DPP is important to provide new business opportunities to economic actors through circular value retention and optimization (for example, product-as-a-service activities, improved repair, servicing, remanufacturing, and recycling), based on improved access to data.
- Government, regulatory authorities and customers alike are demanding more reliability, transparency, and credibility in ESG reporting and compliance. A simple, faster and predictable framework will enable manufacturers to better differentiate their sustainable products and claims.
- The 2022 Gartner Circular Economy Survey shows that only 21% of manufacturers have been applying circular economy principles in their strategy over the past 3.2 years to just 16.7% of their product portfolio showing the need to accelerate adoption. Legal obligations like DPPs will be a catalyst to accelerate adoption of circular economy principles, establish responsible sourcing policies, design out waste and maximize resource utilization.
- Consumer demand for easily digestible information and transparency to a product's environmental footprint, replacement parts, and warranties is further driving demand for such initiatives.

Obstacles

- The creation of a DPP requires a full understanding of a product life cycle, which is only possible by collecting product information across the supply chain, much of which is not currently available.

- Lack of trustworthy and verifiable information about product, components, usage, and recycling potential remains a challenge.
- Manufacturing already struggles with complexity related to multitiered supply chains, service providers, transporters, and others who need to provide trusted data and make it shareable. Getting visibility across their extended supply chain would be key to success, but will require significant change management.
- DPP mandates all participants to make information electronically available in machine-readable and interoperable formats and services. Given that organizations vary in their digital maturity and data sharing capabilities, this will require significant organizationwide efforts.

User Recommendations

- Familiarize yourself with the requirements and implications of DPP. Prepare to follow the legislation as it evolves across stages.
- Champion deployment of technologies such as product information management (PIM), product life cycle management (PLM), and life cycle impact assessment (LCA) tools and data management techniques.
- Engage with caution and conduct due diligence before adopting DPP, as the market for DPP-specific technologies is quickly emerging.
- Include circular principles in your design and sourcing. Look for strategic partnership with suppliers, vendors and business partners as part of an ecosystem to make this implementation a success.

Sample Vendors

Amazon Web Services; DNV; iPoint; Kezzler; Siemens; Twintag

Gartner Recommended Reading

[Quick Answer: What Data and Analytics Leaders Need to Know About Digital Product Passports](#)

[Predicts 2023: Consumer Goods Manufacturers Must Adopt Data-Driven Innovation](#)

[Leverage Digital Initiatives to Enable Sustainability in Manufacturing Organizations](#)

Total Experience

Analysis By: Michelle DeClue, Jason Wong

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Total experience (TX) is a strategy that creates superior shared experiences by intertwining four disciplines: customer experience (CX), employee experience (EX), multiexperience (MX) and user experience (UX). The goal is to drive greater customer and employee confidence, satisfaction, loyalty and advocacy using digital and nondigital techniques.

Why This Is Important

The march toward mobile, virtual and distributed customer and employee interactions has accelerated, making a compelling case for TX adoption. TX is about using technology and interactions to enhance, empower and embolden both customers and employees. Executive leaders must evaluate the intersections between these experiences and increase both customer and employee confidence and lifetime value. It's about how these experiences make the customer and employee *feel about themselves and the decisions they have to make*.

Business Impact

TX is designed to retain and cultivate greater **customer and employee lifetime value**, a calculation based on the longevity of the relationship and the value they bring to the organization. Losing profitable customers can harm the financial position of an organization. Employee lifetime value also has financial repercussions:

- Loss of institutional knowledge and productivity when an employee leaves.
- Impact to existing team members in terms of morale and load management.
- Cost of recruiting, onboarding and training new talent with no guarantee of productivity.

Drivers

- Technology advancements allow greater opportunities to connect across multiple platforms with multiple ways of engagement (voice, gestures, immersion, etc.).
- Edge devices with cloud-based applications have proliferated across multiple organizations and in consumer electronics and vehicles, providing more opportunity to connect and understand employees, customers and the technology data points at a higher level.
- Employees can facilitate better CX through digital solutions, such as giving a discount or promo code, adding additional time to due dates and deadlines, unlocking exclusive content, or providing next best actions.
- Initial investments can be scaled to add external ecosystem partners to increase the long-term value.
- AI can be applied to see how other similar customer issues were resolved and offer the solution to rectify a customer's issue. Machine learning can recognize where gaps are and either refine the process or notify a developer to address the issue. Recurring patterns or orders can be used to identify how to improve products and services, such as with personalized products or most-requested additional services for a venue.

Obstacles

- **Concept:** The TX concept in the early stages of permeating into organizational roadmaps for joining CX and EX initiatives. Some organizations may feel like they've already been doing some aspects of TX. While they may have focused on each of the four disciplines of TX separately, many have not interlinked or aggregated them from a holistic perspective of the multiparty experiences to have seamless and frictionless UX.
- **Ownership:** Ownership over digital employee experience is also unclear in many organizations. Expanding the aperture to the more expansive TX can have knock on improvement effects to EX, which then yields a better CX — not only digitally, but within employee-to-customer interactions.
- **Inertia:** Organizations making it through the disruptions of the last couple of years without drastic changes to the CX may be inclined not to adopt a new TX strategy.
- **Technology:** Even as organizations transform digitally, they still struggle to modernize digital experiences. This prevents them from achieving richer MX customer and employee journeys across multiple devices with multiple touchpoints and modalities.

User Recommendations

- Form a TX fusion team that crosses activity silos by engaging with CX, EX, UX and MX leaders or centers of excellence across your organization. Use intersecting performance plans (such as OKRs), to incentivize interteam cooperation.
- Start small by applying total experience to a single customer or employee journey, to be built upon further in the future. Engage with business stakeholders and product managers by conducting workshops to determine how TX strategy can transform their roles and make the organization more agile.
- Identify critical gaps in customer and employee interactions by encouraging project teams to also consider how to leverage MX and UX initiatives to improve those experience gaps.
- Use TX strategy to determine future-state business capabilities, which, in turn, will drive targeted business outcomes. This should include customer and employee journey mapping.
- Apply TX to close the strategy to execution gap by finding important business opportunities that have been held back by their siloed CX, EX, UX or MX efforts.

Sample Vendors

Deloitte; Qualtrics; Salesforce; ServiceNow; TechSee; Valtech; Zoom

Gartner Recommended Reading

[Achieve Best-in-Class CX Wins Through Total Experience](#)

[Quick Answer: How Do I Get Started With Total Experience?](#)

[Tool: Total Experience Scoping Guide](#)

[Case Study: Connect Customer and Employee Journeys to Deliver Superior Experiences \(the LEGO Group\)](#)

Emotion AI

Analysis By: Annette Zimmermann

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Emotion artificial intelligence (AI) technologies (also called affective computing) use AI techniques to analyze the emotional state of a user (via computer vision, audio/voice input, sensors and/or software logic). Emotion AI can initiate responses by performing specific, personalized actions to fit the mood of the customer.

Why This Is Important

Emotion AI is considered transformational as it turns human behavioral attributes into data that will have a large impact on human-machine interface (HMI). Machines will become more “humanized” as they can detect sentiments in many different contexts. Furthermore, applying deep learning to computer vision or audio-based systems to analyze emotions in real time has spawned new use cases for customer experience enhancements, employee wellness and many other areas.

Business Impact

Contact centers use voice analysis and natural language processing (NLP)-based algorithms to detect emotions in voice conversations, in personal chat conversations and chatbots. Computer vision (CV)-based emotion AI has already been used for more than a decade in market research with neuromarketing platforms that test users' reactions toward products. In addition, we see the technology expanding to other verticals and use cases, i.e., healthcare (diagnostic), sales enablement and employee wellness.

Drivers

The increasing number of use cases we have identified indicates an increase in commercialization as emotion AI finds applicability in new domains:

- One of the drivers for detecting emotions/states is the need for a system to act more sympathetically. For instance, it creates anthropomorphic qualities for personal assistant robots (PARs) and virtual beings, making them appear more “human.” This “emotional capability” is an important element in enhancing the communication and interaction between users and a PAR.
- This can be an empathic avatar or an emotion-detection-enabled chatbot. A person's daily behavior, communication and decisions are based on emotions — our nonverbal responses in a one-to-one communication are an inseparable element from our dialogues and need to be considered in the human-machine interface (HMI) concept.
- Combinatorial technology solutions such as computer-vision-based and audio analytics, or language-based and computer vision, enable customer experience enhancements.
- Strongest adoption is currently happening in the context of contact centers where voice-based emotion analysis supports multiple use cases such as real-time analysis on voice conversations, emotion detection in chat conversations, emotional chatbots and more.
- Market research and neuromarketing tools are continuously leveraging emotion detection in various user scenarios including focus groups and product testing. Vendors have been extending their offerings toward remote/online interviews during 2020 — due to the pandemic.
- In the creation of virtual beings in customer service or other consumer-facing scenarios, emotional responses are a critical element.

- As the metaverse unfolds, virtual beings will play an important role as business models evolve and the entire ecosystem of this new digital world emerges.

Obstacles

- Privacy concerns are the main obstacle to rapid adoption in the enterprise. This is especially a concern in real-life situations (vs. lab/research environments) for both consumer-facing (e.g., monitoring emotions in a retail environment via cameras) and employee-facing situations. Research environments like product testing have the advantage that the emotion AI is used for this specific purpose and the user (product tester) is fully aware that their emotions are being captured to improve usability or other features.
- Bias: When using facial expression analysis, models are likely to be retrained in different geographies to get the system to detect the different nuances present due to different cultural backgrounds.
- Variation across modalities. Certain emotions can be better detected with one technology mode than with another. For instance, “irony” can be detected using voice-based analysis while this is close to impossible to detect with facial expression analysis.

User Recommendations

- Review vendors’ capabilities and reference cases carefully. As the market is currently very immature, most vendors are focused on two or three use cases in two or three industries. At the same time, identifying and processing human emotion is currently a gray area, especially in the EU. The EU Commission has started an initiative to review the ethical aspects of AI technologies, and emotion AI will certainly be part of this debate.
- Enhance your customer analytics and behavioral profiling by applying emotion AI technologies bringing your customer experience strategy to the next level.
- Be use-case-driven. The use case will determine the emotion AI technology to be used and vendor selection.
- Appoint responsibility for data privacy in your organization — a chief data privacy officer or equivalent.
- Work with your vendor on change management in order to avoid user backlash due to sensitive data being collected.

Sample Vendors

Behavioral Signals; Cogito; DAVI; Intelligent Voice; kama.ai; MorphCast; Soul Machines; Superceed; Symanto; Uniphore

Gartner Recommended Reading

[Competitive Landscape: Emotion AI Technologies](#)

[Emerging Tech: Computer Vision, Voice Analysis and CGI Evolve Into Emotionally Intelligent Virtual Beings](#)

[Tool: Vendor Identification for Natural Language Technologies](#)

Digital + Product Experience

Analysis By: Michelle DeClue

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Digital + product is the combination of physical products and digital services for unique product offerings to B2B customers and consumers. Digital + product is not just about having embedded technology in a product. It is about a better customer experience that includes digital content that adds value to the physical product through tutorials, videos and/or smart devices connecting to an intelligent platform with additional services.

Why This Is Important

Digital + product experience (D+P) offers manufacturers the ability to create a more cohesive customer experience with the ability to connect more with the brand as well as with brand experts, other customers and advanced users. This can also include curated experiences that provide additional value, such as subscriptions, unique video content and augmented reality.

Business Impact

- D+P's impacts on the business include: Manufacturers can gain a richer understanding and continued engagement with consumers.
- D+P offers opportunities for manufacturers to expand into new business models providing continuous revenue, through subscription models or sponsored partnerships with other companies.
- D+P is a foundational step toward implementing a total experience (TX) strategy. The main difference between the two is that TX also includes the employee experience.

Drivers

- Organizations continue to want greater customer engagement to drive insights and revenue.
- Consumers/customers have only increased expectations in what their engagement with manufacturers/brands should be. They expect more return on their investment of time and data shared with the manufacturer.
- Digital + product can take an organization to the next level by scaling into additional services and subscriptions, such as aggregated data from other users that provide increased convenience to the consumer. This can be something that is directly consumer-facing or can be machine learning to proactively mitigate potential issues, such as preventative maintenance for a smart appliance.
- Embedding digital technology in products can also improve product functionality and performance. For example, home appliances embedded with voice assistants deliver new ways of interaction with products.
- Manufacturers can also use digital technology to deliver useful content and services like "how-to" or tutorial videos, information related to traceability, ESG, or one-on-one interaction with brand experts and more.

Obstacles

- Technology platforms are required to provide secure connections. Antiquated systems will not be able to support more robust IoT and edge computing devices.
- Latency issues with streaming content services need to be able to support tutorials and live classes/services.
- Data governance and warehousing to be able to store data points when needed without creating lags in service.
- Consumers have privacy concerns about how their data is being used and who has access to it. This includes cybersecurity to protect from hackers, as well as your company's use of consumers' data.
- Measuring return on investment to enable such products is also a challenge and manufacturers will need robust metrics to track the impact.

User Recommendations

- Leverage how other companies elevated their product innovation initiatives using edge AI by reviewing use cases in this research.
- Engage business units, partners and suppliers to identify opportunities and technology needed for edge AI within your organization.
- Identify and prepare to mitigate potential risks such as privacy, security and data monetization rights.
- Evaluate how your products can enrich from additional digital experiences.
- Embed an IT resource to innovate with your R&D team.

Gartner Recommended Reading

[Consumer Goods Trend: Digital + Product](#)

[Consumer Goods Trend: Customer Engagement](#)

[Taking a Deeper Dive Into the Top Strategic Tech Trend Total Experience for Consumer Goods and Retail](#)

Generative AI in Process Manufacturing

Analysis By: Ellen Eichhorn, Sohard Aggarwal

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Definition:

Generative AI technologies can generate new derived versions of content, strategies, designs and methods by learning from large repositories of original source content. Generative AI has profound business impacts, including on content discovery, creation, authenticity and regulations; automation of human work; and customer and employee experiences. In process manufacturing, it generates insights for efficiency for factory floor, product formulation, consumer behavior and marketing effectiveness.

Why This Is Important

Generative AI (GenAI) will impact all processing manufacturing subindustries, including food and beverage, chemicals, forestry and agriculture. It can reduce time to market (through alternative product formulation, package design) and improve process efficiency and customer experience (better UI/UX, natural language based insights). However, regulation discussions are similar to the introduction of the internet — the appeal is tremendous, but so are the potential risks.

Business Impact

GenAI can:

- Transform smart manufacturing, providing a new ecosystem of open-source AI models and communities optimizing a variety of use cases. Examples are design optimization, factory and service frontline worker support, and augmentation of product formulation.
- Mimic natural language conversations and contextualizes large volumes of data from multiple sources. This can help to identify trends, patterns and sentiments and therefore accelerate product development which is a key priority in the process industry.

Drivers

- New foundation models and their new versions, sizes and capabilities are rapidly emerging, impacting language, images, molecular design and computer code generation. They can combine concepts, attributes and styles, create original images, videos and art from a text description, or translate audio to different voices and languages. This has the following impacts on creative work: Marketing – campaign design and content generation; Customer service – content creation and crafted responses in text, images, video and sound, improving customer experience via self-service; NLP – personalized copywriting; videoconferencing – noise cancellation and visual effects.
- Process manufacturers are looking at ways to improve efficiency and optimize cost. By using GenAI to combine different types of data (structured, semistructured and unstructured) from multiple sources (like IT, operational technologies and engineering technologies) they can: accelerate role-based and context-specific insights to predict failures, optimize processes and detect anomalies resulting in cost savings, higher asset utilization and decision intelligence; generate new ideas, design possibilities and product performance enhancements to meet evolving customer needs (for sustainable, innovative and personalized formulated products), shorten time to market and potentially increase revenue; apply natural language context to improve translation accuracy for work instructions, manuals and other training documents at a faster pace and free human capital for more productive work.
- In consumer goods, it generates consumer insights and advice. In e-commerce, it helps customers “try on” makeup and outfits. In manufacturing, GenAI helps create new materials targeting specific properties to optimize catalysts, agrochemicals, fragrances and flavors.
- GenAI can enable robots to deliver enhanced results from remote inspections of raw material silos and hazardous areas in the shop floor where human capital could be at risk.

Obstacles

- Applications in product design, shop floor, remote inspection etc., will require skills, long time frames and deep pockets, and may result in high costs.
- Low awareness and knowledge of GenAI-related legislative and regulatory changes from government/industry representatives can mean uninformed decisions.
- High-quality data is required for training domain/use case specific models. Data quality is already a huge concern and generative AI will only add to this complexity. It may adversely affect scalability.
- Synthetic data/output generated from generative AI tools may suffer from inaccuracies. Without proper validation and oversight use of such data/outputs may result in poor decisions or safety concerns, and may cause reputation damage.
- Concerns around ownership of GenAI-created information/product may result in loss of intellectual property, indemnity and liability when utilizing open-source software.

User Recommendations

- Establish a GenAI COE to start a clearinghouse for questions, policies and governance. Put the COE in charge of understanding the organization's intellectual property, liability and indemnity implications from use of GenAI.
- Collect information on domain-specific developments to identify high-value use cases by evaluating risks, opportunities, technical feasibility, internal readiness and external readiness.
- Embrace and democratize use of GenAI tools in different functions by creating an education program (for reskilling/upskilling), setting common definitions, governance on usage and encouraging discussion and questions.
- Improve your data quality. The quality of any algorithm is limited to the quality of data it receives. Identify critical data assets impacting prioritized use cases and focus on use of data governance and technology to improve their quality and maximize success probability.

Sample Vendors

Adobe; Amazon; Google; Hugging Face; Microsoft; OpenAI; Salesforce

Gartner Recommended Reading

[Quick Answer: How Can Manufacturing CIOs Leverage ChatGPT Outside the Factory?](#)

[ChatGPT Research Highlights](#)

[Top Strategic Technology Trends in Consumer Goods Manufacturing for 2023](#)

Composable Commerce

Analysis By: Jason Daigler, Sandy Shen, Mike Lowndes

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Composable commerce is an architectural approach to digital commerce whereby applications are constructed with packaged business capabilities (PBCs). It requires loosely coupled back-end application capabilities, which are used to compose new commerce functionality and custom experiences. This approach contrasts with a platform-centric approach, in which monolithic commerce platforms are deployed to manage most aspects of the commerce customer experience.

Why This Is Important

Digital commerce solutions must be flexible and nimble to respond quickly to changing customer expectations. Companies must respond quickly with new products, processes, delivery methods and customer experiences. Composable commerce enables solution changes to be made, deployment to production environments, and achieve scaling more flexibly, whereas a monolithic platform includes many tightly coupled components that are not changed in every release.

Business Impact

Composable commerce will provide:

- Benefits to digital commerce teams that want a more flexible architecture.
- Greater ability to move quickly in response to customer demand.

- Less reliance on large version upgrades.
- Business user tools to help replace capabilities when new vendors emerge, expand into new channels more easily, and develop more innovative solutions.
- Proactive and experimental innovation that's faster and more efficient than direct software engineering.

Drivers

- Many of the individual components of full digital commerce solutions — such as personalization engines, commerce search and content management applications — have been around for several years and have been sold and integrated independently. Therefore, the concept of using best-of-breed, individual applications to construct commerce experiences is not new.
- Modular commerce takes this concept a step further by offering granular functional components within the core commerce offering. Composable commerce is a further evolution in which business users may construct commerce experiences using low-code tools.
- Most companies are increasing investments in digital commerce, often in response to global events. Increased investment often leads to the need for best-of-breed modules — easy integration of those modules is enabled by composable approaches.

Moves toward composable commerce are often driven by:

- The desire for better business-IT alignment when adopting product management best practices. With composable commerce, fusion teams share common goals and metrics.
- The need to enable fusion teams to work on and deploy individual commerce components without impacting other components. These teams will then be able to move more quickly in order to respond to market trends and act more autonomously. They will control their own roadmaps, based on their own expertise in the module they are responsible for, and deploy their changes to production environments according to their own schedule.
- The desire to move away from inflexible, slow-to-update and monolithic digital commerce platforms.

- The need to adopt a modular approach that provides more flexibility to a digital commerce technology stack by allowing companies to swap out functionality with best-of-breed modules from a different vendor, or a solution that they develop themselves.
- The opportunity to consolidate software investments through reuse by reducing redundancy of functionality across applications and departments.

Obstacles

- Confusion abounds in the digital commerce market as vendors use terms like “headless,” “microservices” and “API first.” Many companies struggle to determine if the solutions they are purchasing are as modular and flexible as the vendors claim.
- Companies with smaller development teams or fewer solution integration resources may be more comfortable with a larger commerce suite with a single business user administration console.
- Adopters of composable commerce need digital maturity: strong architectural, process, integration and API orchestration skills, and governance to be successful.
- Composable commerce is still in the early stages of evolution and adoption. User-friendly integration tools, such as low-code application platforms, will need to emerge before it can become mainstream. Unless standards emerge for specific application areas, vendors will need to work together to ensure interoperability.

User Recommendations

Companies considering composable commerce should:

- Evaluate their commerce technology stack and identify inflexible, tightly coupled components that could benefit from composable commerce. Advance toward composable commerce in small increments, ensuring the presence of governance at each step before proceeding further.
- Assess their own maturity. Succeeding with composable commerce requires a digitally mature perspective that embraces processes such as digital product management, fusion teams and DevOps.
- Work with the individual product teams responsible for functional areas of digital commerce to build the business case for composable commerce.

- Plan for integration complexity. Low-code or no-code integration tools are nascent between PBCs for commerce, especially if PBCs come from different vendors. Resources to build and maintain integrations over time will be required. Give preference to application vendors that deliver well-articulated business-modular applications.

Sample Vendors

Broadleaf Commerce; commercetools; Elastic Path Software; fabric; Infosys Equinox; Kibo Commerce; Spryker Systems; Virto Commerce; VTEX

Gartner Recommended Reading

[Innovation Insight for Digital Experience Composition](#)

[Quick Answer: What Are the Steps to Prepare for Composable Commerce?](#)

[Quick Answer: What Does It Mean to Be 'Composable'?](#)

[Composable Commerce Must Be Adopted for the Future of Applications](#)

[Quick Answer: Who's Who in the Life Cycle of Composable Applications?](#)

Connected Factory Worker

Analysis By: Simon Jacobson

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Connected factory workers leverage digital tools and data management techniques to improve and integrate their interactions with both physical and virtual surroundings. This improves decision accuracy, proliferates knowledge and reduces variability – improving engagement, satisfaction and retention.

Why This Is Important

Digitization in factories is intensifying while operational know-how fades. Factory workers struggle to embed new technologies into their daily work, negatively impacting the broadening of core skills and building digital fluency eases labor constraints.

Manufacturers are investing in their factory workforces. The solution is as much a technology construct that changes how factory workers access information and knowledge to work differently as it's a change management exercise in workforce development, behavioral shifts and integrated continuous improvement.

Business Impact

Frontline workers are indispensable and the convergence of technology innovation and investment in their experience is critical for improving engagement, satisfaction, and retention:

- Increasing operational excellence, flexibility and quality of outputs by continuous learning but also context specific operations to limit deviations from standard procedures.
- Ensuring safe but challenging working conditions to improve work motivation and retention and to open up prospects for career development.
- Extension of standard work procedures for more efficient use of resources, but also appropriate social behavior in communication with colleagues and supervisors.
- Greater, intangible returns appear when initiatives are part of a formal workforce development strategy.

Drivers

- Labor availability and up-to-date skills are constraints. Meanwhile, smart manufacturing is a net job creator and demand for capable frontline workers is soaring. Organizations seek a factory workforce that can seamlessly operate between the virtual and physical worlds.
- Generational gaps in factories can impact technology acceptance. New workers are tech-savvy but lack access to best practices and know-how. Tenured workers have detailed process knowledge and digital savvy as consumers — the tools supporting them on the job have to evolve.
- The nature of work in factories is being (re)designed, digitized and improved, impacting total productivity and peer-to-peer communication — not to mention job families and role profiles.
- Growth in vendor solutions to provide frontline workers the right information available contextualized at the moment of need.

Obstacles

- Accepting operational excellence as “good enough” ROI when the impact and benefits are often intangible.
- Curating relevant datasets across existing technologies, manual and undocumented knowledge, and informal know-how from tenured workers. In parallel, the risk of information overload when moving away from manual tasks could be burdensome versus aiding.
- Involving workers in the solution design and implementation process helps set demand and adoption.
- Learning and development evolution, from classroom and episodic to experiential and continual, is nascent.
- Patience with AI: Although attractive for decision support, curating the knowledge that provides guidance, ensuring IP is protected, and an ethical stance are all critical. Mishaps can impact recommendations, pay or career advancement and lessen trust.
- Underinvesting in governance: Providing workers with tools to build their own experiences or redefine standard work eliminates time and effort. Yet, shadow IT and anarchy arise without dedicated operational excellence/continuous improvement teams to manage common requirements and risks.

User Recommendations

- Strike a balance between digital enablement and cultivating future competencies by framing your initiative as part of a broader manufacturing workforce development program.
- Consider architecture over applications. This will limit point solutions and the complexity of managing multiple vendors. This includes a focus on pulling in data from other transactional systems such as MES as means to link production data with employee-led improvement opportunities.
- Invest in upgrading learning and development (L&D) programs to ensure that skills development matches technology capabilities.
- Make your focus the creation of a “data-driven” culture in manufacturing operations by diligently avoiding a scenario where employee creativity and ingenuity is stifled.
- Prepare to balance governance and flexibility during implementation by having clarity on where enterprise standards must give way to local ways of working.

Sample Vendors

4Industry; Covalent Networks; L2L; Microsoft; Operations1; Poka; QAD Redzone; SAI Global; SwipeGuide; Zaptic

Gartner Recommended Reading

[Innovation Insight for the Connected Factory Worker](#)

[How to Take a Life Cycle Approach to Developing the Connected Factory Worker](#)

[Future of Work Trends: 5 Trends Shaping the Future of Frontline Workers](#)

[Supply Chain Executive Report: Developing the Supply Chain Professional of 2025](#)

Digital Shelf Analytics

Analysis By: Jason Daigler

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Digital shelf analytics applications provide brands and manufacturers with data from the third-party digital channels where their products are sold, such as online marketplaces and retailers' digital commerce sites. These applications either scrape websites or consume data from APIs to improve governance of product listings or monitor performance metrics used for optimizing product discovery and conversion.

Why This Is Important

Companies must sell in the optimal mix of channels to reach their ideal customers. This channel mix continues to evolve as consumer behaviors evolve and companies learn which channels provide the best results. DSA applications help ensure and improve the quality of online product listings so sellers can make better decisions about their channel mix, protect their brand images, monitor inventory and optimize listings for maximum findability and conversion rates.

Business Impact

DSA applications allow brands and manufacturers to:

- Gain visibility to product content on the digital shelf
- Improve search results positioning
- Improve responsiveness to ratings and reviews
- Monitor minimum advertised price (MAP) violations
- Highlight inventory issues, even at local store levels
- Automate actions to update product listings
- Integrate with other applications such as product information management (PIM) systems to provide a holistic product experience management (PXM) system

Drivers

- Online sellers continue to leverage an increasing number of channels to reach their customers, and customers continue to demonstrate a preference for online buying.
- Brands and manufacturers often lack comprehensive oversight of their products' performance on the digital shelf, which increases the difficulty of making decisions about their chosen channel and product mix.
- Many companies that were manually monitoring their digital shelves quickly realized their homegrown solutions, which often involved recording information in offline sources such as spreadsheets, were not scalable as their channel mix increased.
- While it is most heavily used by consumer packaged goods (CPG) companies, DSA remains a viable option for any consumer goods company that leverages digital channels it doesn't own, such as marketplaces, retailers' digital commerce sites and social channels.
- For retailers that do not sell on other retailer sites and sell less frequently on marketplaces, data and insight from DSA applications will primarily emanate from social channels or other locations where the retailers syndicate their products. Retailers can benefit from competitive pricing insight and promotional information. They can also track new product additions from competitors and identify internal assortment gaps as well as competitors' assortment gaps.
- Some DSA applications also provide competitive pricing information. As digital commerce grows and more marketplaces emerge, brands will experience increased pricing pressure. Leveraging DSA applications will help them ensure they are pricing products correctly.
- Preventing items from going out of stock and understanding inventory challenges has become a critical priority for many companies.

Obstacles

- Brands must ensure their DSA vendor has added any new or required channels to the application.
- DSA applications are not beneficial without strong processes, technologies and integration with other systems. Brands must develop a process of gaining insights using a DSA application, identifying changes to make, implementing those changes in a PIM or other system, then resyndicating or publishing content to channels. They can then “close the loop” by using the DSA application to ensure the changes appear.
- Even with strong “closed loop” processes, the amount of required optimizations can be overwhelming as product portfolios and channels expand. Automation is needed for simple changes, yet many vendors do not have strong automation functionality, or integrations aren’t adequate to achieve automation.
- For retailers with physical stores, there is one digital shelf per store, especially for inventory. This increases the data sources and the amount of data returned, making analysis cumbersome.

User Recommendations

- Identify all channels where products are currently sold and the data available for defining the performance of the products in those channels.
- Use DSA applications to not only monitor performance of the company’s products on digital shelves but also develop competitive insights about other companies’ products.
- Manage the end-to-end product content life cycle by developing a closed loop process whereby the DSA applications uncover insight and then product teams make changes in other systems, such as digital commerce, marketing and merchandising, to optimize performance. This may require strict offline processes for making changes in multiple systems; tight integration between the DSA application and other systems such as PIM, PXM and DAM applications; or selecting a vendor that offers a closed loop system.
- After a closed loop system is in place, invest in automation, whereby changes are made in internal systems and automatically pushed to external commerce sites without human intervention.

Sample Vendors

Amber Engine; Ascential; CommerceIQ; DataWeave; inriver; PriceSpider; Publicis Groupe (Profitero); Salsify; Stackline; Syndigo

Gartner Recommended Reading

[Market Guide for Digital Shelf Analytics](#)

[Scaling Digital Commerce Requires Product Content Life Cycle Optimization](#)

[Market Guide for Product Information Management Solutions](#)

Personalizing Formulated Consumer Goods Products

Analysis By: Michelle DeClue, Sohard Aggarwal

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Definition:

Personalized products is a manufacturing methodology that allows customers to personalize a product based on selections of predefined constraints. This design allows for significant personalization without a significant increase in the time or cost to produce. Personalized products may differ considerably from a mass-produced good, but each product must still comply with government regulatory issues, including safety, serialization and package labeling.

Why This Is Important

Mass customization has already been widely adopted by industrial equipment, electronic, automobile and apparel manufacturers. Formulated and recipe-based products were slower to adopt due to the complex nature of recipe management, compliance and labeling. However, personal care, food and beverage manufacturers have started to differentiate from their competitors with personalized product options.

Business Impact

Personalized products can provide new streams of revenue, new buyers and increased engagement opportunities:

- Personalized products can be priced at 25% or higher and have higher consumer retention than mass-produced products.
- Gartner research for the next generation of customers also shows that millennials and Generation Z are more likely to purchase products based on personalized experience and pay a premium for unique or artisanal products.
- Manufacturers can assess the data from personalized products to determine what products will be successful in mass production.

Drivers

- Traditionally, fast-moving consumer goods (FMCG) manufacturers sell their products to retailers to sell in their stores. This provides the delivery channel needed but can obscure trends that the consumer goods (CG) manufacturer needs to see to better predict future product launch success.
- Personalized products offer FMCG an opportunity to create unprecedented customer engagement as they offer opportunities to collaborate by making personalized products. This approach can be less threatening than directly competing with their retail partners.
- Aggregated data from personalized product interactions will provide FMCG manufacturers with greater insight and ability to understand their consumers at a deeper level and ensure brand loyalty by providing an enhanced customer experience (CX) with a unique product offering.
- More niche manufacturers specializing in direct-to-consumer or luxury personal care launched formulated product customization, such as personal hair care or beauty products: [Proven Skincare](#) and [Skinceuticals](#). Personal care is moving faster with personalized products than the food/beverage sectors, with expectations to plateau in two years or less.
- While [Mars](#) may have been one of the first with customizable M&Ms, more traditional FMCG manufacturers have begun exploring varying levels of customization, such as [Blendbee](#) tea, where you can create your own custom blend of tea with easy reorders. Another example is [Kraft Heinz REMIX](#) sauce dispenser with 200 flavors in restaurants to appeal to consumers and learn what new condiments it should launch in grocery stores. While consumers can truly customize personal care products, personalization for food/beverage has been more focused on packaging. Although, we are seeing more entries in truly personalized food/beverage recipes emerging, with expectations to plateau in two to four years.
- Other FMCG manufacturers have opted to personalize packaging. While not the same as personalizing the formulation, it increases customer engagement by creating a unique customer experience for both the consumer ordering the product and the recipient, such as with [Guerlain](#) perfume bottles.

Obstacles

- Mass customization requires both methodology and technology to be successful. In particular:
- A front end for consumers allowing them to configure products intuitively while visualizing the end product as well as the labeling.
- A back end that references modular formulas/recipes from PLM and creates a plant-specific BOM for MES/ERP
- Ideally, CIOs should have already scaled a digital PLM platform that has harmonization between ERP, PLM and MES. As each configuration requires additional validation to ensure quality and compliance, disparate spreadsheets do not allow this to scale.
- CIOs will need to facilitate the coordination of product specifications to be available for customization and define workflows based on each selection entered. This coordination must include R&D, regulatory and supply chain leaders to ensure compliance with regional government regulatory issues.
- CMOs must first engage with business units from R&D and regulatory along with product managers to identify products that can be customized, approximate costs for personalization and potential pricing to determine ROI.

User Recommendations

Business leaders looking to engage will need to:

- Acquire a configurator application, which provides a selected set of options for each customizable product with conditional formatting workflows, to continually narrow options as each additional option is selected.
- Add the configurator to the digital PLM platform to identify the product specifications in PLM and generate a final plant-specific BOM to both the ERP and MES applications.
- Integrate the configurator into the digital commerce platform to create a seamless, secure and frictionless buying experience.
- Generate the final production and shipment with an enterprise labeling application to ensure traceability.

- Harmonize with a CRM application with event-driven notification to the customer and, ideally, a customer-specific landing page with the order history and digital asset management library for future reorders.
- Add additional security to ensure patient privacy for personalized medications.

Sample Vendors

ConfigureID; Hapticmedia; Valtech

Gartner Recommended Reading

[Consumer Goods Trend: Personalized Products](#)

[Consumer Goods Trend: Direct-to-Consumer](#)

[Predicts 2023: Consumer Goods Manufacturers Must Adopt Data-Driven Innovation](#)

[CG Manufacturing CIOs Must Enable Organizations to Deliver Personalized Products at Scale](#)

Sliding into the Trough

Prescriptive Analytics

Analysis By: Peter Krensky

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Prescriptive analytics is a set of capabilities that specify a preferred course of action and, at times, take automated actions to meet a predefined objective. The most common types of prescriptive analytics are optimization methods, a combination of predictive analytics and rules, heuristics, and decision analysis methods. Prescriptive analytics differs from descriptive, diagnostic and predictive analytics in that the technology explores multiple outcomes and provides a recommended action.

Why This Is Important

Prescriptive analytics capabilities either automate or augment decision making to improve business responsiveness and outcomes. From a “purist” perspective, the term “prescriptive analytics” is a broad category with little hype, encompassing components with varying positions across the Hype Cycle and various levels of maturity. Such components include optimization, rules combined with predictive techniques and decision intelligence. The increasing focus on composite AI is further propelling the importance of prescriptive analytics.

Business Impact

Prescriptive techniques support:

- Strategic, tactical and operational decisions to reduce risk, maximize profits, minimize costs, or more efficiently allocate scarce or competing resources
- Recommendations for a course of action that best manages the trade-offs among conflicting constraints and goals
- Exploration of multiple scenarios and comparison of recommended courses of action

- Strategic and tactical time horizons as well as real-time or near-real-time decision making

Drivers

- Prescriptive analytics benefits from maturing and expanding data science initiatives, better algorithms, more cost-effective cloud-based computing power, and a substantial increase in available data.
- With improvements in analytics solutions, data quality and user skills, prescriptive analytics will continue to advance.
- The increasing popularity of graph techniques provides a great substrate for prescriptive analytics. Graph techniques highlight early signals, causality links and paths forward, facilitating the implementation of decisions and actions.
- Demand is shifting away from traditional reactive reporting to actionable, proactive insight, placing greater focus on optimization, advanced techniques, composite AI and prescriptive analytics.
- AI platforms and decision management tools increasingly include prescriptive techniques, driving user acceptance and potential value to the organization.
- Prescriptive analytics continues to evolve, ranging from relatively straightforward rule processing to complex simulation and optimization systems. To respond to ever-greater complexity in business, organizations need more advanced prescriptive analytics and composite AI (e.g., combining rules/decision management with machine learning or optimization techniques).
- Organizations continue to improve, optimize and automate their decision making by applying decision intelligence and decision modeling. Prescriptive analytics is a key enabler of this approach.

Obstacles

- Expertise on how and where to apply prescriptive techniques is lacking.
- The industry lacks formal operationalization methods and best practices.
- Historically, organizations have required separate advanced analytics software specializing in prescriptive techniques. Such point solutions offer little cohesion across the analytics capability continuum from descriptive to diagnostic to predictive to prescriptive.

- Even established use cases can fall victim to common data science challenges, such as data quality issues, bias and talent shortages.
- Although it is a necessary competency, prescriptive analytics does not automatically result in better decision making.

User Recommendations

- Start with a business problem or decision involving complicated trade-offs, multiple considerations and multiple objectives.
- Explore the breadth of prescriptive analytics approaches and decision models available. Identify the ones that best cater to your specific business problems and skills.
- Analyze packaged applications to determine which provide specific vertical or functional solutions, and which service providers have the necessary skills.
- Make sure that the enterprise is willing to rely on analytics recommendations, by gaining buy-in from stakeholders — ranging from senior executives to frontline workers carrying out the recommended actions.
- Ensure that your organizational structure and governance program will enable the enterprise to implement and maintain functional, as well as cross-functional, prescriptive analytics recommendations.

Sample Vendors

AIMMS; Amazon Web Services; FICO; Frontline Systems; Google; Gurobi Optimization; IBM; Microsoft; River Logic; SAS

Gartner Recommended Reading

[Combine Predictive and Prescriptive Analytics for Better Decision Making](#)

[Innovation Insight for Composite AI](#)

[How to Use Machine Learning, Business Rules and Optimization in Decision Management](#)

Retail Activity Optimization

Analysis By: Soharg Aggarwal

Benefit Rating: High

Market Penetration: More than 50% of target audience

Maturity: Early mainstream

Definition:

Retail activity optimization (RAO) leverages advanced analytics to substantially improve the financial return of field sales force efforts in the consumer goods industry. RAO solutions report on conditions, generate insights and drive in-store activity plans for field sales personnel. RAO relies on mobile devices to link field personnel with data and algorithms that enable near-real-time decisions.

Why This Is Important

Consumer goods manufacturers face an increasingly analytical, metric-driven, sophisticated brick-and-mortar retail environment. Competitors in retail trade will continue to accelerate their ability to use advanced analytics to make faster, higher-impact decisions, making RAO an advantage in the short term and a necessity in the long term.

Business Impact

Successful RAO offers agility to the sales force and parts of the retail organization. RAO can offer productive, fact-based, collaborative discussions between a sales force and its retail partners. The goal is to improve sales performance, drive revenue and margin per square foot while also reducing cost to serve. Leveraging RAO effectively requires time and consistent usage across the sales team, which will require a significant change management effort.

Drivers

- Consumer goods manufacturers are constantly looking to build new routes to markets and maximize their return on time and effort to optimize in-store activities.
- Consumer goods manufacturers face an increasingly analytical, sophisticated retail environment. Competitors and the retail trade continue to accelerate their ability to use advanced analytics to make faster, higher-impact decisions.
- As retail execution and monitoring (REM) solutions evolve, all of them now provide some form of RAO as part of their product.
- The observations and recommendations driven by an RAO solution should promote continuous improvement in merchandising, pricing, planogram management and other related activities by utilizing better and more granular data, linking the performance and choices of various activities. Illuminating these insights allows field sales to tailor recommendations to realize potential benefits.
- The scope of services in RAO continues to expand. Activities such as optimal routing, prioritization of merchandising, order recommendations and compliance reporting are based on predictive analytics. In addition, on-site order entry is becoming common in a solution.
- Consistent scoring of activities provides the mechanism to identify best practices for focused sales force coaching, incentive tracking and gamification.
- Output from RAO solutions can also be linked to other business applications for improved supply chain execution, promotion planning and revenue growth management.

Obstacles

- Hesitancy in adoption is common without proper change management. Retail execution capabilities have been absorbed in the broader solution of retail activity optimization. Open communication and the development of a clear vision are essential to move forward.
- Efficiently realizing the full scope of RAO can be difficult as activities are completed in multiple applications. Business professionals need to evaluate the landscape of solutions to recommend the best process for RAO.
- It is challenging to achieve full engagement from field teams with technologies that change the way they do their jobs. Leaders must consider sales incentives and rewards to encourage behaviors needed for new business processes.
- Data availability and integrity are concerns in nearly every solution. Governance and stewardship are essential for teams to have confidence in the results that drive the outcomes and a clear linkage to other sales systems.

User Recommendations

- Build a communication mechanism and leverage REM solutions to communicate field successes driven by RAO. Many of these solutions have a social component to leverage peer recommendations on how to do the job more efficiently and effectively. Harvesting these insights is invaluable to the adoption and success of the initiative.
- Drive the greatest return by intelligently applying RAO. Goals may differ by geography, brand and even individuals. Apply RAO to high-leverage activities and as data sources evolve and the technology gets better, expanding the use cases will become easier.
- Leverage evolving capabilities, such as image recognition and the associated analytics, to improve the focus on the highest-impact activities.
- Proceed with caution and conduct due diligence before selecting vendors as the market for RAO solutions is rapidly evolving and not all vendors have all the capabilities needed for a holistic RAO.

Sample Vendors

FORM; GoSpotCheck; Kantar Retail IQ; Movista; Pepperi; Repsly; Spring Global; StayinFront; Trax; Vincle

Revenue Growth Management

Analysis By: Ellen Eichhorn

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Emerging

Definition:

Revenue growth management (RGM) optimizes the customer's perceived product value with the supplier's availability, product variants and pricing. RGM extends beyond trade promotion management and optimization solutions to include the multiple levers of trade, supply chain, pricing, advertising, brand, and category as the base elements of influence.

Why This Is Important

RGM is a comprehensive approach that leverages the elements of trade, pricing, category, brand mix and "cost to serve." These are the primary levers that determine the price and demand elasticity to achieve financial revenue goals. The integrated practice of RGM is different from the traditional spreadsheet approach to revenue growth because it utilizes advanced analytics with predictive modeling and multiple data sources.

Business Impact

Business leaders implementing RGM can expect a 2% to 7% return on sales (ROS) as a return on investment (ROI). ROS is calculated by dividing net income by net sales. Disruption to the workforce will be open to improvement recommendations from other departments because the once-isolated department information, such as budget, goals and work plans, is now visible. Solutions continue to evolve with new AI technology.

Drivers

- Traditionally, the focus has been strictly on trade. Trade is the second-highest cost to consumer goods (CG) companies behind the cost of goods sold (COGS). Trade spend averages 18% to 25% of gross sales. Trade is, indeed, a considerable efficiency opportunity. To fully realize it, manufacturers should incorporate the additional levers of RGM.
- Trade promotion management and optimization solutions continue to underdeliver the promise of dramatically improved trade spend effectiveness. It has been 40 years since the first trade solution became available. Still, there are no clear winners that consistently provide the expected 3% to 5% increase toward effective trade spending.
- Technology, consumer expectations and channels of commerce continue to evolve in unprecedented ways. Social media alone can instigate surprising positive returns and equally surprising negative impacts on a brand, category or company. The traditional view that trade to the retailers is the sure-fire way to guard and grow market share is simply no longer valid.
- Business leaders identify growth and digital investments as priorities among CG manufacturers. As an extension of digitalization, RGM collects information from multiple sources for consideration in everything, from pricing to customer performance. Consumer goods CIOs looking to accelerate digitalization can promote the benefits of RGM to their leadership team by sharing use cases where other manufacturers have realized tangible benefits.

Obstacles

- RGM is both a process and a software solution. RGM requires executive change management support to resolve naturally conflicting goals. For example, finance wants long-term growth and the quarterly quota is vital for sales. Supply chain leaders need to minimize the cost to serve the business, and marketing hopes to run as many campaigns as possible. Business leaders must beware of ROI measurements that are contrary to departmental goals.
- Technical resources with advanced analytics skills remain elusive for any long-term employment within the manufacturing industry.

User Recommendations

- Prepare your IT teams to examine existing data sources, perform data cleansing, create process workflows and harmonize data. Ongoing data stewardship from both the business and IT is critical to the success of the RGM process.
- Evaluate a third party to conduct due diligence. Third parties are often a welcome player because they bring an unbiased evaluation, which is often difficult in RGM projects. Additional resources may be found by exploring local, technical college or university talent as a supplement, if the budget allows. Both parties win in further development of skills.
- Organize and facilitate a team of empowered individuals that will serve as a neutral party to address disputes and conflicting organizational goals with executive leaders.
- Secure essential executive support to drive behavior from siloed department goals to a common company revenue management goal. Align yourself with executive colleagues to strengthen support for the initiative.

Sample Vendors

Acumen; Circana; Deloitte; Kantar; McKinsey & Company; o9 Solutions; SymphonyAI; Vendavo; Vistex; Visualfabriq

Gartner Recommended Reading

[Market Guide for Consumer Goods Trade Promotion Solutions](#)

[Consumer Goods Trade Promotion Selection and Implementation Practices](#)

[Top Strategic Technology Trends in Consumer Goods Manufacturing for 2023](#)

Mixed Reality

Analysis By: Tuong Nguyen, Marty Resnick

Benefit Rating: High

Market Penetration: Less than 1% of target audience

Maturity: Adolescent

Definition:

Mixed reality (MR) is the merging of real and virtual worlds, where physical and graphical objects appear to interact and integrate naturally. MR, in concept, is a single technology. However, MR includes an underlying group of technologies encompassing the spectrum of immersive displays and interactive systems that spans from the digitization of real environments to augmented reality (AR) and virtual reality (VR).

Why This Is Important

MR enhances the user's surroundings with real-time, relevant, interesting and/or actionable information, but adds a layer of sophistication through advanced, contextual understanding of the scene and situation. This makes MR (as a digital filter) more dynamic, relevant and immersive, creating a more seamless experience or interface between the digital and physical world. For example, an AI Avatar walking around furniture rather than through furniture or walls.

Business Impact

Today, MR capabilities focus on optimizing "hands busy" work environments, such as maintenance and repair. Over time, MR will expand to include experiences that can visually enhance everyday objects. New business models will emerge, which will change how customers buy products using MR or how they conduct operations by visually connecting the user's view of the real world with their data-driven virtual world counterparts. For example, rapid prototyping and testing of products and marketing

Drivers

- Growth and maturity of underlying technologies, such as computer vision, scanning technologies, geopose, AR Cloud, mapping, modeling, head-mounted displays, edge processing and high-bandwidth, low-latency networks, and generative AI, are making MR experiences more viable.
- Metaverse hype (especially for the spatial computing aspects) has also provided positive momentum on MR.
- Cross-pollination benefits digital twins for support, design and collaboration purposes, and MR as a 3D visualization and interaction tool.

Obstacles

- **Content:** Digitization efforts have seeded the market with some content, but will need to be increased by orders of magnitude to make MR useful for the mass market.
- **Control:** MR adds a layer of control complexity over AR because it moves beyond a simple digital overlay. It includes active interaction with and of the digital aspects of a physical scene. For example, “touching” and “feeling” a digital object, or hearing a digital object coming from a distance or overhead. This also requires systems that are sufficiently sophisticated to understand the environment, context and the processes of a scene/situation.
- **Convenience:** Head-mounted displays (HMDs) are the primary device for MR experiences. They are both high priced and purpose built. Until there is better access to form factors that make these experiences seamless and valuable, this will be a hindrance. For example, handheld devices deliver a poor user experience for extended MR usage, and HMDs are both high priced and purpose built.

User Recommendations

- Apply MR technology to enable new types of experiences and interactions involving 3D visualization and manipulation of digital objects in the real world. Use cases such as just-in-time checklists and remote support with simple telestration are better served with AR.
- Assess the tactical value of MR. While it may be the culmination of AR and VR technologies, MR will demonstrate more value in scenarios which benefit from physical interaction and manipulation where digital are aware of or need to interact with the physical environment. For example, fitting new surgical equipment into dimensional constraints of an operating room, or redesigning a public space.
- Evaluate ROI potential by focusing on a small number of pilots benchmarked against traditional, non-MR experiences as well as AR and VR experiences.
- Build in-house expertise for MR experiences by hiring developers with immersive skills (such as gaming engine, 3D modeling and UI design).

Sample Vendors

Google; Magic Leap; Microsoft; Nreal; ThirdEye Gen; Viewpointssystem

Gartner Recommended Reading

[Emerging Technologies: Tech Innovators in Augmented Reality — Spatial Web](#)

[Emerging Technologies: Tech Innovators in Augmented Reality — AR Cloud](#)

[Emerging Technologies: Find Success With Head-Mounted Displays Despite Modest Market Growth Expectations](#)

[Emerging Tech: Venture Capital Growth Insights for Head-Mounted Display Technologies](#)

[Emerging Technologies: The Future of the Metaverse](#)

Environmental, Social and Governance

Analysis By: Malcolm Murray

Benefit Rating: High

Market Penetration: More than 50% of target audience

Maturity: Early mainstream

Definition:

Environmental, social and governance (ESG) is the process for setting, managing and reporting strategy and metrics for an organization's environmental and social impacts, governance mechanisms, and related policies. It allows the board and company leadership to synthesize and weigh stakeholder interests to inform corporate strategy, manage a new set of risks, and communicate ambitions and progress to external audiences.

Why This Is Important

ESG finds itself at a crossroads. After many years of being a top priority, the uncertain economic conditions, geopolitical volatility and evolving regulatory requirements are chipping away at the once-impenetrable armor of ESG. ESG is still a must-have for organizations' long-term sustainability; it is requested by customers and employees, and it is required or about to be required by regulators in several large jurisdictions. But the ESG journey has become a more complex one to navigate.

Business Impact

ESG impacts organizational strategy and operations through:

- **Risk-balanced progress:** ESG impacts both the risks (e.g., regulatory, reputational) and the opportunities (e.g., access to capital, customer loyalty).
- **Wide-ranging touchpoints:** ESG now impacts all areas of organizational decision making — suppliers, mergers and acquisitions, etc.
- **Decision timing:** ESG impacts the timing of decisions — too soon may lead to additional costs, while too late may lead to stranded assets or regulatory noncompliance.

Drivers

- **ESG investing:** Investor appetite for ESG assets rose significantly for many years. It took a bit of a breather in 2022, due to geopolitical concerns and changes in how ESG funds were labeled. The year 2023 looks likely to continue the long-term trend, however, as the benefits of ESG investing remain solid.
- **Regulatory disclosures push:** Most of the world's largest economies (the U.S., EU, the U.K., China, India and Japan) now either have in place or are soon to release new guidelines or regulations for ESG disclosures.
- **Customer preferences:** Customers are increasingly concerned about enterprises' environmental and social impact, and are making value-based choices in their purchases of products, choice of employers and votes for officials.
- **Policy:** Enterprises are increasingly impacted by the incentives and disincentives being put in place by policymakers. To hit targets, policymakers are putting in place taxation, bans, penalties and new market mechanisms.
- **Social pressure:** Enterprises increasingly need valid supplier ESG performance and data from deeper in the value chain for Scope 3 greenhouse gas (GHG) emissions. They are focused on responsible sourcing, assessing labor, health safety and environmental risks.
- **ESG strategy:** As the value of having a clear and actionable ESG strategy becomes clear, 94% of public companies now either have or are in the process of setting up an ESG program. Further, boards are increasingly stepping up their oversight of ESG, as they recognize its necessity for long-term resilience.

Obstacles

- **Political backlash in the U.S.:** In the U.S., some states have seen political backlash against ESG and bans on using ESG in investments.
- **Competing demands:** The Russian invasion of Ukraine created geopolitical risk and energy crises that were at cross-purposes to ESG.
- **Macroeconomic environment:** The uncertain macroeconomy has led to a focus on cost, leaving less room for ESG investments.
- **Internal governance:** There is no one place for an ESG program to sit in the organization and there is often duplication of work and unclearly defined responsibilities.
- **Data alignment:** ESG data gathering and comparability remain challenging due to the lack of standardization and the lack of maturity in the vendor space.
- **Quantifying benefits:** Improving ESG performance is often seen as an intangible benefit, where it is difficult to connect to direct financial rewards.
- **Visibility of impact:** The majority of impact is further down in the value chain and organizations struggle to get visibility of supplier performance.

User Recommendations

- **Link ESG objectives to long-term financial stability:** ESG needs to drive a business outcome of long-term sustainability of financial performance.
- **Build capabilities, not program components:** In order to make ESG truly integrated, think ESG building capabilities, not program components.
- **Build in, don't bolt on ESG capabilities:** Don't create new processes where not needed; leverage existing capabilities and processes.
- **Create governance:** Create a governance framework that enables the organization to set goals, targets, KPIs and metrics, and monitor and report on them consistently.
- **Include the value chain:** Identify environmental and social impacts, not only under direct control, but also in the value chain. Track supplier performance.
- **Align key performance indicators (KPIs) with compensation:** Build ESG measures into senior leaders KPIs, tying performance to compensation.

Gartner Recommended Reading

[Market Guide for ESG Management and Reporting Software](#)

[Predicts 2023: Achieving ROI With ESG — Leadership Perspective](#)

[Anatomy of an ESG Program](#)

[Maverick Research: To Do Good, Stop Following ESG Standards](#)

[Prepare for the SEC's New Proposed Climate Disclosure Requirements](#)

Intralogistics Smart Robots

Analysis By: Kelsie Marian, Sandeep Unni, Max Hammond

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Intralogistics smart robots (ISRs) are a class of smart robots that perform work and can be mobile or stationary, operating autonomously or collaboratively with humans or other robots within a retail store or restaurant. AI-powered, these machines are designed to autonomously execute one or more physical tasks through a combination of processes for orchestrating, optimizing, automating, monitoring and managing internal material, assets and people flows within the store.

Why This Is Important

Beyond the initial opportunities for cost savings, one of the most significant impacts from intralogistics smart robots will result from transforming how people work. Workflow transformation will take place through the analysis of data collected by smart robots as well as offloading repetitive tasks from people. A fundamental restructuring of retail work and the workplace will usher in new, previously unworkable opportunities for retailers and employees.

Business Impact

Intralogistics smart robots can do repetitive work with greater reliability at lower cost, increased safety and higher productivity. They can capture and process large volumes of on-shelf data in real time — a specific use case in retail enabling retailers to make inventory decisions faster and more accurately. In the near future, generative AI may be used to teach robots new tasks at scale with minimal image and language data input, potentially decreasing the costs of current training methods like motion planning.

Drivers

- Retailers are undergoing significant reevaluations of the existing human-machine mix and shuffling of strategic investment priorities to support the effort. As a result, retailer pilots and rollouts of intralogistics smart robots in stores across all segments continue to grow.
- Labor shortages and the need to augment and upskill existing workers are driving increased interest for intralogistics smart robots in segments such as grocery, mass merchandise, club and convenience and QSR segments.
- Retail-specific use cases driving adoption include inventory and pricing audit work, cleaning, picking and packing, handling and disposal of hazardous wastes. Other use cases include prescription filling/delivery, food preparation, running and dispensing, stock auditing and replenishment, order assembly, finished goods movement, e-commerce order fulfillment, and package delivery.
- Significant business opportunities are taking shape at the intersection of AI, the Internet of Things (IoT), 5G and edge computing, providing lower latency to deliver real-time-type interactions for consumer-facing tasks.
- Intralogistics smart robots are nearly into the Trough of Disillusionment as retailers in all segments wrestle with determining the right mix of humans and machines for their stores in order to enable excellence in unified commerce execution.
- The technology is likely to reach the Plateau of Productivity within the next three to four years, as early adopters experience productivity gains and a clearer understanding of value delivery.

Obstacles

- Variability and variety of processes and products can make identifying the right robot for a particular use case difficult. Not every robot vendor offers multipurpose robots. Hence, retailers may have heterogeneous fleets of robots over the next decade, making integration and work orchestration critical.
- Concerns over ROI and frontline acceptance of robotic co-workers have placed intralogistics smart robots further toward the trough; however finding the optimal mix of human and machine talent will prove to be difficult without experimentation.
- Competition for share of wallet as retailers are also piloting alternative IoT technologies in store, like smart shelves, which can be used for inventory and pricing audit work.
- Significant cultural changes are required to leverage intralogistics smart robots to substitute and complement the human workforce — retailers run the risk of alienating store employees.
- The complexity of the change management needed to accommodate and optimize the use of robots including adjustments to store processes and integration to relevant applications.

User Recommendations

- Assess robot capability and quantify benefits, such as the impact on employee and customer experiences. Longer-term implications such as new roles and upskilling opportunities are created for humans as a result of co-working with robots.
- Identify which processes can be quickly handed off or redesigned to take advantage of the benefits of intralogistics smart robots (for example, inventory audit and cleaning).
- Examine the current business, material handling and supply chain processes into which intralogistics smart robots can be deployed.
- Work with store operations leadership to ensure that intralogistics smart robots communicate and integrate with existing in-store applications.
- Decompose processes and tasks into the lowest common denominator to identify where automation/robotics fits or does not and where it can provide value. Recognize that humans remain more adaptable than robots so identifying valuable use cases is critical to achieving ROI goals.

Sample Vendors

Badger Technologies; Bear Robotics; Brain Corp; Karakuri; KEENON Robotics; Keonn Technologies; Miso Robotics; Pudu Robotics; Simbe Robotics

Gartner Recommended Reading

[Market Guide for Intralogistics Smart Robots in Retail](#)

Shoppable Media

Analysis By: Matt Moorut

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Shoppable media refers to prerecorded interactive images, videos and other media formats, which enable an online path to purchase when a user clicks an object that is showcasing merchandise. Object examples include a “shop” button overlaid on an image or video displaying products. Various digital shoppable media formats are available and viewable via both mobile and desktop, with notable momentum visible in social media apps.

Why This Is Important

Customers expect to shop and buy when and how they want, seeking a seamless purchase experience. Shoppable media is a merchandising technique that empowers brands to close the gap between product inspiration and direct purchases, reducing friction in a customer’s current context. For example, if consumers are interested in purchasing a dress featured in a streamed TV show, they could click or tap on it directly through the video rather than switching to a retailer app or website.

Business Impact

Shoppable media provides a bridge between promotional content and commerce, often reducing the number of steps required for customers to make a purchase. By streamlining purchase journeys, shoppable media can increase direct-to-customer engagements, provide near-real-time insight on campaign performance, reduce drop-outs, and increase revenue. It can also provide further impact on business operations and technology, as these require change to support the commerce channel.

Drivers

- Consumer preference for online shopping continues to grow. According to the 2022 Gartner Consumer Values and Lifestyle Surveys, 24% of U.S. consumers said they prefer making all clothing, shoes and accessory purchases they can online.
- Major retailers and media companies are investing in shoppable media to expand customer reach and monetize the traffic. For instance, in mid-2022, Walmart partnered with Roku to enable TV streamers to purchase featured products fulfilled by the retailer directly on their streaming platform. An example of shoppable media innovation can be seen from NBCUniversal, which is partnering with KERV Interactive to leverage AI to surface relevant products within its “Must ShopTV” product. This is being used on its streaming service, Peacock.
- The shoppable media market is maturing, as multiple digital commerce technology providers fill different use cases. For instance, PriceSpider and Shoppable offer where-to-buy and universal check-out technology, respectively, while Amplience and Bazaarvoice (Curalate) help brands manage shoppable content in social media.
- Sales in the U.S. still lag behind China. This encourages analysts to forecast strong growth in shoppable media, as best practices from Taobao Live flow through to large, international players.

Obstacles

- **Low consumer adoption:** Social commerce is still nascent in North America and Europe relative to China. Low consumer adoption of social commerce means that marketers prioritize other investments.
- **Margin erosion:** Seller fees or commissions paid to platforms providing direct check-out experiences can pressure profit margins. Brands that sell high-margin products are in a better position to offset those fees. Those with low margins may find more profit by using media to drive traffic to brand-owned product landing pages and check-out experiences.
- **Lack of control of surroundings:** The placement of media on third-party platforms, such as TikTok, exposes brands to more risk from surrounding assets, such as objectionable or inflammatory content.
- **Limited use cases:** Shoppable media is better suited for impulse purchases than high-consideration goods. As such, beauty, fashion, housewares and consumer packaged goods brands can benefit more than other industries.

User Recommendations

- Pilot content formats and platforms that provide a more engaging view of products than traditional digital storefronts. Options include shoppable ads, social media posts, video streaming platforms and enriched content assets.
- Partner with customer experience leaders to assess the impact of broadening the range of commerce channels to the brand experience. Work with finance and sales teams to assess the potential impact to margin performance, given the rising costs of execution.
- Establish what execution resources are necessary for a seamless commerce execution, using shoppable media formats.
- Assess the overlap of your target audience with captive audiences on streaming services to ascertain campaign objectives and sales targets.

Sample Vendors

Bazaarvoice; ChannelSight; Firework; KERV Interactive; NBCUniversal; PriceSpider; Roku; SmartCommerce; talkshoplive

Gartner Recommended Reading

[Design Social Commerce Features That Convince Consumers to Buy](#)

[Decode the Social Commerce Ecosystem to Execute Effectively](#)

[Infographic: 7 Key Trends in Digital Commerce](#)

[Digital Commerce Maturity Model for Marketing](#)

[Understand How Shoppers Use Digital Tools to Combat Higher Prices](#)

Climbing the Slope

IoT

Analysis By: Alfonso Velosa, Scot Kim, Emil Berthelsen

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

The Internet of Things (IoT) is an enabler and accelerator for digital transformation of enterprises. IoT enables enterprises to improve business processes and enhance decisions with asset information, via embedded technology, to communicate and sense/interact with their internal states or external environment. IoT solutions span assets, IT and OT systems, communications, applications, data and analytics, and AI. Enterprises use IoT-enabled solutions to develop new revenue and operating models.

Why This Is Important

IoT is an enabler and accelerator for composable business initiatives. Most enterprises lack granular data or information about their assets' or products' state, adding cost and inefficiency to their processes. For operators of assets such as airports or utilities, adding IoT capabilities provides new understanding of the asset, enabling them to optimize operations. For OEMs, IoT insights into how products are used help improve new designs and to enable product-as-a-service models.

Business Impact

IoT will impact enterprise business operations, customer engagement, competitive position and product strategies by enabling:

- **Process optimization:** This covers the spectrum from costs to operations, while improving asset health and conserving resources.
- **New revenue strategies:** This includes generating revenue via improved products, services and data monetization.
- **Safety and compliance focus:** This includes documenting alignment to regulations, preventing dangerous breakdowns and employee injury.

Drivers

- Enterprises globally are increasingly implementing business objectives that use IoT solutions at large scale, internally and across ecosystems.
- Early majority enterprises, from hospitals to manufacturers to building management companies, are using IoT-enabled solutions to engage customers and optimize operations, reflecting business requirements across the spectrum of low-to-high asset-intensive industries.
- OEMs increasingly add IoT-enabled capabilities to improve value, meet competitive pressure, drive differentiation and add new revenue streams.
- Leading-edge enterprises are using IoT to drive transformative strategies. For example, product as a service or SLA-compliance asset uptime or new digital twin or data management value propositions.
- Shorter payback time frames (six to 18 months on average) make IoT-enabled business projects attractive.
- Technology and service providers have realigned their go-to-market strategy to highlight value to enterprise customers. This includes IoT enabled applications, AI solutions optimized for IoT, and engaging partners to provide training and culture change.

Obstacles

- Many enterprise leaders underestimate the political capital required to support IoT projects, since these are really business transformation projects that require engagement with business and frontline OT workers, to change culture and processes.
- There is a lack of a cross-functional enterprise center of excellence to focus on developing best practices for IoT-enabled business projects and sharing them, driving IT-OT alignment and allocating budgets, personnel and resources.
- The lack of standards inhibits the ability of enterprises to deploy large-scale IoT solutions that involve multiple vendors, from sensors, gateways and communications, to implementation, integration and analysis. This adds cost increases and schedule delays to IoT-enabled projects and programs.

- The cluttered market of IoT hardware and software vendors often lacks the vertical domain understanding to quantify business solutions to the core business, operations and IT stakeholders.

User Recommendations

- Forge IoT centers of excellence across business units and cross-functional business, engineering and IT stakeholders for business transformation objectives. Invest time and effort on culture change, such as incentives to foster cross-organizational collaboration around desired IoT-enabled business outcomes and IT/OT/ET alignment. Use it to drive enterprisewide best practices and objectives.
- Ensure teams focus on IT and operational architectures to address key technology complexity, security and integration challenges, and start building roadmaps for long-term composability and multiyear deployments.
- Plan to implement a multivendor approach for IoT platforms, analytics and applications when implementing multiple use cases across different business units or countries.
- Establish accountability, participation, predictability and transparency policies for IoT to address sponsorship, budgets, digital ethics, data ownership and rights to monetize IoT data.

Sample Vendors

AT&T; Endurance Solutions; Falconry; GE Digital; Hexagon; Litmus; Oracle; Samsara; Siemens; Wiliot

Gartner Recommended Reading

[Magic Quadrant for Global Industrial IoT Platforms](#)

[Magic Quadrant for Indoor Location Services](#)

[Infographic: IoT Use-Case Prism for Sustainability and ESG](#)

[Toolkit: 5 Digital Twin/IoT Project Success Drivers](#)

[Important and Compelling Innovations for Commercial IoT Use Cases](#)

Product Development Innovation Management Tools

Analysis By: Michael Shanler

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Innovation management tools for product development shepherd new product and process ideas for the business. The software helps users collect, rank, store and facilitate collaboration on scientific, engineering, health, and new therapeutic ideas. It supports open innovation and crowdsourcing where product development teams harvest valuable information from both internal and external parties. It harmonizes the collection, refinement and development of new intellectual property.

Why This Is Important

- Innovation management tool vendors have broad functionality impacting the front end of innovation and portfolio value.
- Until recently, these tools were only capable of storing and ranking ideas; however, now they can be integrated with ideation portals, product information management (PIM), product development, portfolio management and product life cycle management (PLM) solutions.
- As CEOs have made innovation a higher priority, these tools are moving to the center of the innovation process.

Business Impact

Product development innovation management tools enable:

- Leaders responsible for the innovation process to execute with greater effectiveness and speed for commercialization
- R&D, strategic marketing and innovation teams to drive an automated and collaborative process
- Innovation leaders to share information and collaborate while facilitating more transparency among functions

- Companies that adopt these technologies to see healthier pipelines, as well as an increase in downstream patent applications

Drivers

- Vendors are adding key capabilities, such as ideation and patent drafting, which is attractive to next-generation research operations leaders.
- Technology advances allow for more efficient and faster ideation, rapid evaluation and smarter selection to support the overall innovation portfolio. Most R&D teams have increased their spending on SaaS innovation platforms.
- The establishment of idea management technologies with enhanced collaboration capabilities is taking root, enabling and expediting the refinement of ideas with more automation. Analytics and reporting for innovation management tools are much improved, with enhanced graphics, analytics and trending capabilities. Also, the new social software features that support different functional disciplines, dispersed facilities and extended partners allow users to tag a running commentary to ideas and create opportunities for enhanced collaboration across the enterprise and beyond.
- In the next one to two years, Gartner believes that at least 50% of consumer goods and life science companies with innovation strategies will have elements of innovation systems in place. Additionally, easy user access to “open innovation” technologies and marketplaces is putting more pressure on user organizations to have a solid outside-in innovation process backed by the right enabling technology.
- Many midsize and large organizations have already adopted this technology for managing elements of product innovation and are expanding its use for full-service capabilities for innovation management. As such, this technology is on the Slope of Enlightenment.

Obstacles

- Simply adopting the tools is not enough. Firms need to adjust product development processes to capitalize on the opportunities these technologies enable.
- The original wave of innovation management technologies had overpromised capabilities with a focus on “platforms.” Integrations with other R&D and product-development-related solutions are required to maintain a dynamic portfolio.
- Sustaining innovation is a continuous process and requires changes to corporate governance, skills and even organizational models.
- Many adjacent groups and business units struggle with building process connections with these tools, especially when innovation cultures are lagging.
- Several other software categories, including CRM, PPM and PLM, have elements of these tools, which can create conflicts with organizations’ architecture and competing platforms.

User Recommendations

- Prioritize investing in these tools when you need to accelerate innovation, especially if you have a complicated organizational structure and diverse portfolios and customers.
- Identify the tools that will fit into your R&D-oriented systems and the specific vertical you occupy within life sciences. While you can tailor other systems like CRM, PIM, idea management and PLM to handle elements of innovation management, they may be too complicated to adjust to dynamic workflows.
- Include key functional stakeholders (marketing, quality and operations) when outlining the deployment strategy.
- Focus on opportunities where tools can enhance synchronous and asynchronous collaboration.
- Evaluate how to use the tools with innovation boards, scientific advisory team meetings, NPD team meetings, brainstorming sessions, focus groups, patent explorations, social media monitoring sessions and social network analyses.
- Maintain a digital thread among ideas, product data and audit logs when making design changes.

Sample Vendors

Alludo (Corel); Anaqua; IdeaScale; Inova; Jive Software; MindMatters Solutions; Planbox; Planview; Sopheon; Wazoku

Gartner Recommended Reading

[Market Guide for Innovation Management Tools](#)

Computer Vision

Analysis By: Nick Ingelbrecht, Shubhangi Vashisth

Benefit Rating: Transformational

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Computer vision is a set of technologies that involve capturing, processing and analyzing real-world images and videos to extract meaningful, contextual information from the physical world.

Why This Is Important

Computer vision comprises a transformational collection of technologies that are essential to sensing and understanding the physical environment. Computer vision technology is driving innovation across many industries and use cases and is creating unprecedented business applications and opportunities.

Business Impact

Computer vision technologies are used across all industries and address a broad and growing range of business applications. These include physical security, retail and commercial property, automotive, robotics, healthcare, manufacturing, supply chain/logistics, banking and finance, agriculture, government, media and entertainment, and Internet of Things (IoT). Computer vision exploits the visible and nonvisible spectrum, including infrared, hyperspectral imaging, lidar, radar and ultraviolet.

Drivers

Computer vision adoption is being driven by improvements in the application of machine learning methods, tools and services, hardware processing efficiencies, and data generation and augmentation techniques:

- **New neural network architectures, models and algorithm enhancements** are steadily improving the price/performance of computer vision applications; combinations of CNNs and vision transformers are delivering leading levels of performance; model compression and chip advancement enable larger workloads to be run on edge devices.
- **The economics of computer vision are being enhanced by the growth of the market for computer vision tools and services.** These include annotation and data preparation services and automated machine learning (autoML) capabilities, reaching across computer vision data pipelines, from model development and training through to deployment and model management, maintenance, and governance.
- **The proliferation of cameras and other sensors is generating exponential increases in image data,** creating a critical and growing demand for methods to automate analysis and manage and extract value from that data. Dynamic vision systems and lower cost lidar products are opening new areas for innovation.
- **Edge-enabled cloud frameworks,** developer ecosystems, products and support are further expanding the opportunity and enabling non-experts to train and deploy their own computer vision models.
- **New business models and applications** are emerging, ranging from smartphone cameras and fun filters, through to global video content production and distribution, life-saving medical image diagnostics, autonomous vehicles, video surveillance for security, robotics and manufacturing automation.
- **Sensor fusion,** multimodal analysis, generative AI, multispectral and hyperspectral imaging are expanding the opportunities.
- **Improved reliability,** price, performance and functionality are generating compelling business value and driving adoption.

Obstacles

Enterprises struggle with how best to exploit their visual information assets and automate the analysis of exponential volumes of image data:

- High-end systems are expensive to maintain and support, and building business cases with adequate ROI is challenging.
- The computer vision market lacks independent standardization and performance benchmarks, and advanced solutions are far from being commoditized.
- Integration with existing systems is problematic due to a lack of open interfaces, off-the-shelf solutions and plug-and-play capabilities.
- Enterprises struggle to activate computer vision models in business processes and face data security and privacy risks.
- Scaling solutions is challenging due to the high levels of customization and service support needed.
- Adequate training and testing data may be hard or expensive to acquire, especially in areas where available open-source computer vision datasets are declining.
- Proprietary algorithms and patent pools deter innovation.

User Recommendations

- Assess change management impacts of computer vision projects on the organization and its people.
- Focus initially on a few small projects, using fail-fast approaches and scale the most promising systems into production using cross-disciplinary teams.
- Test production systems early in the real-world environment because lighting, color, object disposition and movement can break computer vision solutions that worked well in the development cycle.
- Build internal computer vision competencies and processes for exploiting image and video assets.
- Exploit third-party computer vision tooling and services to accelerate data preparation and reduce costs.
- Evaluate legal, regulatory, commercial and reputational risks associated with computer vision projects at the outset.
- Reduce the barrier to computer vision adoption by addressing two of the main challenges, lack of training data and costly and constrained hardware, by investing in synthetic and augmented data solutions and model compression to improve model performance and expand the range of more valuable use cases.

Sample Vendors

Amazon Web Services; Baidu; Clarifai; Deepomatic; Google; Matroid; Microsoft Azure; Tencent

Gartner Recommended Reading

[Emerging Technologies: Emergence Cycle for Computer Vision](#)

[Emerging Tech: Revenue Opportunity Projection of Computer Vision](#)

[Emerging Technologies: Computer Vision Is Advancing to Be Smarter, More Actionable and on the Edge](#)

[Emerging Technologies Tool: Video Analytics Functionality Matrix](#)

[Emerging Technologies: Tech Innovators for Computer Vision](#)

Appendixes

See the previous Hype Cycle: [Hype Cycle for Consumer Goods, 2022](#)

Hype Cycle Phases, Benefit Ratings and Maturity Levels

Table 2: Hype Cycle Phases

(Enlarged table in Appendix)

Phase ↓	Definition ↓
<i>Innovation Trigger</i>	A breakthrough, public demonstration, product launch or other event generates significant media and industry interest.
<i>Peak of Inflated Expectations</i>	During this phase of overenthusiasm and unrealistic projections, a flurry of well-publicized activity by technology leaders results in some successes, but more failures, as the innovation is pushed to its limits. The only enterprises making money are conference organizers and content publishers.
<i>Trough of Disillusionment</i>	Because the innovation does not live up to its overinflated expectations, it rapidly becomes unfashionable. Media interest wanes, except for a few cautionary tales.
<i>Slope of Enlightenment</i>	Focused experimentation and solid hard work by an increasingly diverse range of organizations lead to a true understanding of the innovation's applicability, risks and benefits. Commercial off-the-shelf methodologies and tools ease the development process.
<i>Plateau of Productivity</i>	The real-world benefits of the innovation are demonstrated and accepted. Tools and methodologies are increasingly stable as they enter their second and third generations. Growing numbers of organizations feel comfortable with the reduced level of risk; the rapid growth phase of adoption begins. Approximately 20% of the technology's target audience has adopted or is adopting the technology as it enters this phase.
<i>Years to Mainstream Adoption</i>	The time required for the innovation to reach the Plateau of Productivity.

Source: Gartner (October 2023)

Table 3: Benefit Ratings

Benefit Rating ↓	Definition ↓
Transformational	Enables new ways of doing business across industries that will result in major shifts in industry dynamics
High	Enables new ways of performing horizontal or vertical processes that will result in significantly increased revenue or cost savings for an enterprise
Moderate	Provides incremental improvements to established processes that will result in increased revenue or cost savings for an enterprise
Low	Slightly improves processes (for example, improved user experience) that will be difficult to translate into increased revenue or cost savings

Source: Gartner (October 2023)

Table 4: Maturity Levels

(Enlarged table in Appendix)

<i>Maturity Levels</i> ↓	<i>Status</i> ↓	<i>Products/Vendors</i> ↓
<i>Embryonic</i>	In labs	None
<i>Emerging</i>	Commercialization by vendors Pilots and deployments by industry leaders	First generation High price Much customization
<i>Adolescent</i>	Maturing technology capabilities and process understanding Uptake beyond early adopters	Second generation Less customization
<i>Early mainstream</i>	Proven technology Vendors, technology and adoption rapidly evolving	Third generation More out-of-box methodologies
<i>Mature mainstream</i>	Robust technology Not much evolution in vendors or technology	Several dominant vendors
<i>Legacy</i>	Not appropriate for new developments Cost of migration constrains replacement	Maintenance revenue focus
<i>Obsolete</i>	Rarely used	Used/resale market only

Source: Gartner (October 2023)

Document Revision History

[Hype Cycle for Consumer Goods, 2022 - 22 July 2022](#)

[Hype Cycle for Consumer Goods, 2021 - 21 July 2021](#)

[Hype Cycle for Consumer Goods, 2019 - 29 July 2019](#)

[Hype Cycle for Consumer Goods, 2018 - 23 July 2018](#)

[Hype Cycle for Consumer Goods, 2017 - 17 July 2017](#)

[Hype Cycle for Consumer Goods, 2016 - 14 July 2016](#)

[Hype Cycle for Consumer Goods, 2015 - 17 July 2015](#)

[Hype Cycle for Consumer Goods, 2014 - 21 July 2014](#)

[Hype Cycle for Consumer Goods, 2013 - 31 July 2013](#)

[Hype Cycle for Consumer Goods, 2012 - 24 July 2012](#)

[Hype Cycle for Consumer Goods, 2011 - 25 July 2011](#)

[Hype Cycle for Consumer Goods, 2010 - 26 July 2010](#)

[Hype Cycle for Consumer Goods, 2009 - 20 July 2009](#)

[Hype Cycle for Consumer Goods, 2008 - 9 July 2008](#)

[Hype Cycle for Consumer Goods, 2007 - 13 July 2007](#)

[Hype Cycle for Consumer Goods, 2006 - 30 June 2006](#)

Recommended by the Authors

Some documents may not be available as part of your current Gartner subscription.

[Understanding Gartner's Hype Cycles](#)

[Tool: Create Your Own Hype Cycle With Gartner's Hype Cycle Builder](#)

[Hype Cycle for Advanced Technologies for Manufacturers, 2023](#)

[Top Strategic Technology Trends in Manufacturing and Transportation for 2023](#)

[Top Strategic Technology Trends in Consumer Goods Manufacturing for 2023](#)

[2023 CIO and Technology Executive Agenda: A Consumer Goods Perspective](#)

[Use-Case Prism: Generative AI for Manufacturing](#)

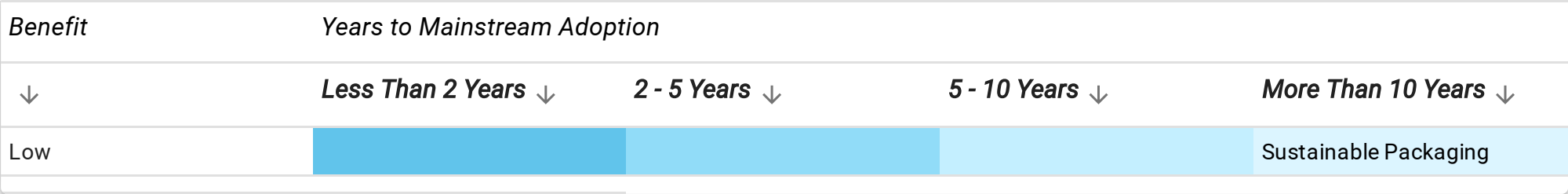
[Innovation Insight: Implement Digital Threads for Long-Term Flexible Access to Critical Data](#)

[Predicts 2023: Consumer Goods Manufacturers Must Adopt Data-Driven Innovation](#)

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Table 1: Priority Matrix for Consumer Goods, 2023

Benefit	Years to Mainstream Adoption			
↓	Less Than 2 Years ↓	2 - 5 Years ↓	5 - 10 Years ↓	More Than 10 Years ↓
Transformational	Computer Vision	Connected Factory Worker Digital Product Passport Generative AI in Process Manufacturing Intralogistics Smart Robots IoT Personalizing Formulated Consumer Goods Products Total Experience	Circular Supply Chain Composable Commerce Digital Twin of a Customer Emotion AI Industry Cloud Platforms NFTs in Consumer Goods	Metaverse in Manufacturing
High	Digital + Product Experience	Digital Shelf Analytics Environmental, Social and Governance Prescriptive Analytics Product Development Innovation Management Tools Revenue Growth Management	Mixed Reality Retail Activity Optimization	Machine Customers
Moderate		Shoppable Media	3DP of Consumable Personal Products	



Source: Gartner (October 2023)

Table 2: Hype Cycle Phases

Phase ↓	Definition ↓
<i>Innovation Trigger</i>	A breakthrough, public demonstration, product launch or other event generates significant media and industry interest.
<i>Peak of Inflated Expectations</i>	During this phase of overenthusiasm and unrealistic projections, a flurry of well-publicized activity by technology leaders results in some successes, but more failures, as the innovation is pushed to its limits. The only enterprises making money are conference organizers and content publishers.
<i>Trough of Disillusionment</i>	Because the innovation does not live up to its overinflated expectations, it rapidly becomes unfashionable. Media interest wanes, except for a few cautionary tales.
<i>Slope of Enlightenment</i>	Focused experimentation and solid hard work by an increasingly diverse range of organizations lead to a true understanding of the innovation's applicability, risks and benefits. Commercial off-the-shelf methodologies and tools ease the development process.
<i>Plateau of Productivity</i>	The real-world benefits of the innovation are demonstrated and accepted. Tools and methodologies are increasingly stable as they enter their second and third generations. Growing numbers of organizations feel comfortable with the reduced level of risk; the rapid growth phase of adoption begins. Approximately 20% of the technology's target audience has adopted or is adopting the technology as it enters this phase.
<i>Years to Mainstream Adoption</i>	The time required for the innovation to reach the Plateau of Productivity.

Phase ↓

Definition ↓

Source: Gartner (October 2023)

Table 3: Benefit Ratings

Benefit Rating ↓

Definition ↓

Transformational

Enables new ways of doing business across industries that will result in major shifts in industry dynamics

High

Enables new ways of performing horizontal or vertical processes that will result in significantly increased revenue or cost savings for an enterprise

Moderate

Provides incremental improvements to established processes that will result in increased revenue or cost savings for an enterprise

Low

Slightly improves processes (for example, improved user experience) that will be difficult to translate into increased revenue or cost savings

Source: Gartner (October 2023)

Table 4: Maturity Levels

<i>Maturity Levels</i> ↓	<i>Status</i> ↓	<i>Products/Vendors</i> ↓
<i>Embryonic</i>	In labs	None
<i>Emerging</i>	Commercialization by vendors Pilots and deployments by industry leaders	First generation High price Much customization
<i>Adolescent</i>	Maturing technology capabilities and process understanding Uptake beyond early adopters	Second generation Less customization
<i>Early mainstream</i>	Proven technology Vendors, technology and adoption rapidly evolving	Third generation More out-of-box methodologies
<i>Mature mainstream</i>	Robust technology Not much evolution in vendors or technology	Several dominant vendors
<i>Legacy</i>	Not appropriate for new developments Cost of migration constrains replacement	Maintenance revenue focus
<i>Obsolete</i>	Rarely used	Used/resale market only

Source: Gartner (October 2023)