Hype Cycle for Retail Technologies, 2023

Published 21 July 2023 - ID G00790857 - 115 min read

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Initiatives: Unified Retail Commerce for Digital Business Execution

> Retail CIOs can use this Hype Cycle to advise the business on how to cut through market hype when prioritizing retail technology investments to support unified retail commerce execution in a disruptive and unpredictable digital business environment.

More on This Topic

This is part of an in-depth collection of research. See the collection:

- 2023 Hype Cycles: Deglobalization, AI at the Cusp and Operational Sustainability

Analysis

What You Need to Know

Retailers are accelerating investments in technology that supports accurate near-real-time business intelligence, protects and secures net profit margins, and delivers operational efficiency and immersive experiences in the physical store. Retail CIOs can use this Hype Cycle to cut through market hype and identify transformative technologies that drive critical business results.

The Hype Cycle

Technologies such as cloud, mobile, Internet of Things (IoT), AI, and augmented reality/virtual reality/mixed reality (AR/VR/MR), as well as the democratization of information, have accelerated the rapid expansion of digital touchpoints. In the enterprise, this is leading to more automation, as well as the creation of hyperimmersive experiences for both customers and associates. More recently, a high level of hype surrounding technologies underpinning Web 3.0, metaverse and generative AI has reenergized retailers to consider increasing their investments in digital.

At the same time, the uncertain macroeconomic climate has dampened retailers' enthusiasm for digital transformation projects. High inflation, the slowing e-commerce growth rate and constrained supply chains are causing retailers to refocus on the basic existential principles of retailing.

As a result, Gartner expects retail CIOs to refocus their attention on improving their net profit margins, which is critical to remaining competitive in the market. The most obvious route is to invest in the digitalization of their most profitable channel — their physical stores, which are the hub of unified retail commerce.

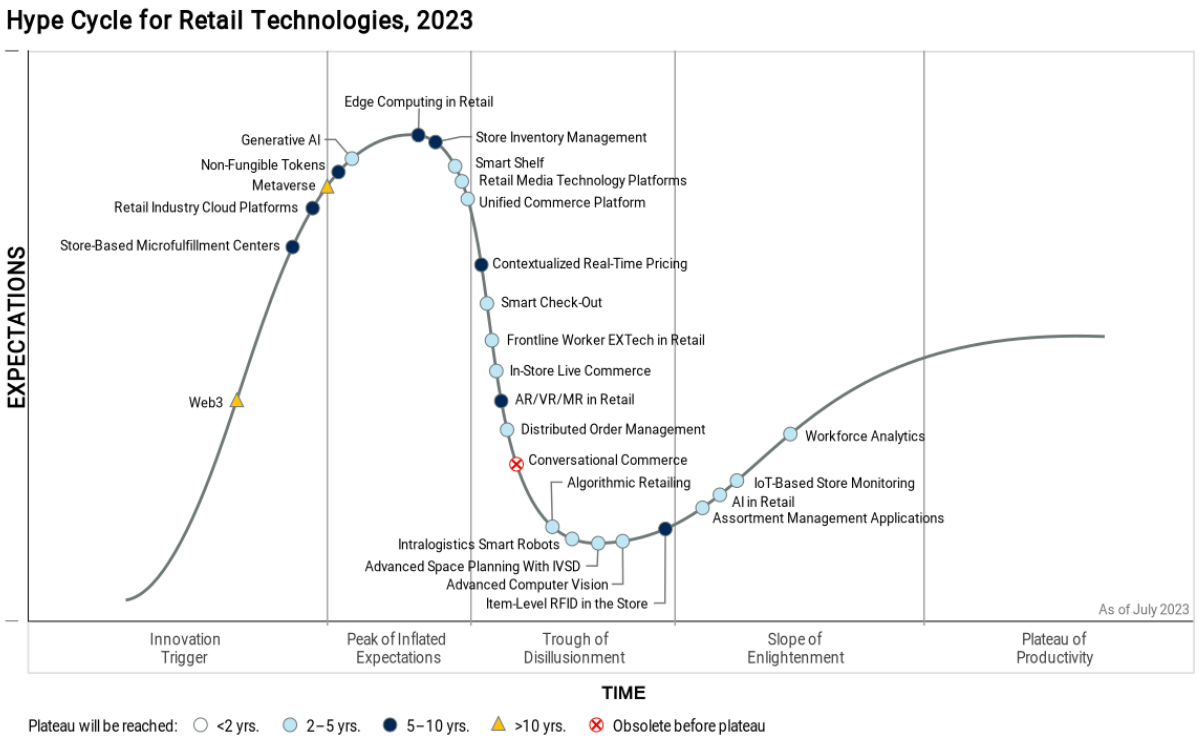
Retail CIOs can use this Hype Cycle to evaluate innovative technologies that support an operationally "omniscient store." In this context, an omniscient store is one capable of continuously monitoring operational data signals from both inside and outside the store to provide relevant intelligence and near-real-time business insights that will allow retailers to:

- Generate immersive experiences to increase customer engagement.
- Enable frontline store associates to take ownership of the execution of store-operations decisions in the context of unified retail commerce.
- Improve automated execution and efficiency of in-store activities like price changes, inventory management and out-of-stock detection, in sync with online channels.
- Support data-driven decisions, including taking corrective action, based on information processed and optimized locally at the edge in individual store locations.
- Reinforce the commitment to environmental, social and corporate governance (ESG).

There are 27 innovations included in the 2023 Hype Cycle for Retail Technologies the majority of which are positioned between the Peak of Inflated Expectations and the Trough of Disillusionment. We expect these technologies will reach adoption maturity in 10 years or less. These include two new additions:

- Generative AI
- Retail media technology platforms (RMTPs)

Figure 1: Hype Cycle for Retail Technologies, 2023



The Priority Matrix

Selected Transformative Technologies

- Generative AI is a new addition to the Hype Cycle for Retail Technologies, 2023. This innovation is approaching the Peak of Inflated Expectations due to the extensive hype across all industries. Use cases include enhanced search/upsell/cross-sell, automated content creation, conversational chat interfaces, rapid trend identification and the development of accurate and actionable customer behavior models, as well as the ability to improve the efficiency and accuracy of unified retail commerce operations. This innovation is expected to reach the Plateau of Productivity within the next two to five years.

- Advanced computer vision (ACV) has moved further into the Trough of Disillusionment in 2023. ACV offers retailers transformational potential in several areas. These include the ability to break down barriers between digital and physical touchpoints, improve loss prevention, significantly increase store associate productivity, deliver accurate real-time business intelligence and provide data and analytics to support AI-led customer-centric merchandising and compliance. We expect this innovation to accelerate in the next 12 months, reaching the Plateau of Productivity in the next two to five years.

Selected High-Priority Technologies

- Retail media technology platforms is another new addition to the Hype Cycle for Retail Technologies, 2023. This innovation is situated on the cusp between the Peak of Inflated Expectations and the Trough of Disillusionment. RMTPs automate and optimize retailers' collaboration with brands to deliver timely and relevant shoppable ads for their customers. They enable the monetization of first-party consumer and purchase data with higher margins. This newly emerging advertising revenue stream will help retailers to offset margin erosion due to supply chain challenges and low-margin activities associated with the sale of physical products. Our research indicates this innovation will reach the Plateau of Productivity in the next five to 10 years.

Table 1: Priority Matrix for Retail Technologies, 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		Advanced Computer Vision AI in Retail Algorithmic Retailing Frontline Worker EXTech in Retail Generative AI Intralogistics Smart Robots IoT-Based Store Monitoring Smart Check-Out Unified Commerce Platform	Edge Computing in Retail Non-Fungible Tokens Retail Industry Cloud Platforms Store Inventory Management	Metaverse Web3
High		Advanced Space Planning With IVSD Assortment Management Applications Distributed Order Management Retail Media Technology Platforms Smart Shelf Workforce Analytics	AR/VR/MR in Retail Contextualized Real-Time Pricing Item-Level RFID in the Store Store-Based Microfulfillment Centers	
Moderate		In-Store Live Commerce		
Low				

Source: Gartner (July 2023)

Off the Hype Cycle

Technology name changes in 2022 include:

- EXTech in retail is now named frontline worker EXTech in retail to more accurately identify the benefits of this innovation to frontline workers.

- Live commerce in retail has been changed to in-store live commerce to better associate this innovation to the physical store.
- Retail assortment management applications (RAMAs) is now named assortment management applications to match the applications' current naming convention in the market.
- Web3 in retail has changed to Web3.
- Metaverse in retail has changed to metaverse.

On the Rise

Web3

Analysis By: Robert Hetu, Adrian Leow

Benefit Rating: Transformational

Market Penetration: Less than 1% of target audience

Maturity: Embryonic

Definition:

Web3 is a new stack of technologies for the development of decentralized web applications that enable users to control their own identity and data. These technologies include blockchain as a trust verification mechanism, privacy-preserving and interoperability protocols, decentralized infrastructure and application platforms, decentralized identity, and support for applications like decentralized finance. These will eventually realize the vision of a partly decentralized web.

Why This Is Important

Retail consumers' interactions through new business models will be enabled by Web3. Smart contracts run applications that eliminate intermediaries and administrative overhead of controlling centralized entities. Tokens (including cryptocurrencies) power the business models and economics of Web3, and are built into blockchain protocols. Web3 also provides building blocks for new types of applications and the monetization of non-fungible tokens (NFTs) in new metaverse applications.

Business Impact

Web3 enables peer-to-peer interactions with no reliance on centralized platforms and intermediaries. It offers:

- New features to manage digital assets and ownership rights for content creators
- Trustless transaction verification
- Smart contract automation
- Tokenization of digital or physical assets
- Self-sovereign identity

However, although future internet technologies will be more decentralized, this is unlikely to eliminate centralized authorities from most enterprise B2B and B2C use cases.

Drivers

- Retailers are increasingly developing personalization techniques that leverage customer data from various internal and external sources to improve conversion. Web3 will improve consumer trust by enabling them to have more control.
- Alternative commerce approaches including live interactions, social media platforms, influencers and generative AI are leading the retailer away from an environment of total control of data.
- Expanding peer-to-peer marketplaces will drive more interest in information control across consumer segments.
- AR/VR/MR technologies are starting to accelerate into several retail functions and customer experiences are paving the way for an increase in immersive experiences.
- Retailers are interested in, and experimenting with, NFTs, crypto payments and other emerging technologies as they prepare to monetize in metaverses.
- Traditional web-enabled social media and e-commerce have revolutionized social interactions, bringing suppliers and consumers of information, goods and services together in a peer-to-peer setup on a global scale.
- With Web 2.0, interactions and transactions require a centralized digital platform acting as a trusted provider or broker between retailers and consumers. These platforms have created a valuable e-commerce channel, but they also define the relationship rules and host all of the participants' data. This has proven to be an unscalable environment, as these platforms are forced into the roles of "policing" bad actors and misinformation.
- Web3 promises to enable true peer-to-peer interaction and transactions with no reliance on centralized retail platforms and intermediaries. Centralized social media is an early example of online communities that operate independently from the retailer but provide connection and influence.

Obstacles

- Web3 poses many risks, such as a lack of customer protections, security threats and swings toward centralized control. Although future internet technologies will be more decentralized, they will not eliminate centralized authorities from most retail applications.
- Retailers will be unwilling to give up governance, oversight and control of most business applications. We expect enterprises to continue using Web 2.0 for most applications through 2030 and use Web3 only for applications that benefit from new blockchain-enabled business models, and social and gaming networks.
- Some early Web3 activities have achieved success, but much work remains to improve performance, governance, risk management and user interfaces. Additionally, success in well-established industries including retail is sparse.
- The current lack of widely applicable Web3 business applications for enterprises, for example in B2B use cases, is hindering enterprise adoption of Web3.

User Recommendations

- Pay attention to innovative and successful Web3 initiatives in areas such as gaming, art, consumer goods manufacturers, entertainment, and sports for ideas and retail partnerships.
- Keep abreast of developments in Web3 protocols and standards by monitoring the initiatives of Ethereum, Web3 Foundation and ISO/TC 307 for blockchain and distributed ledger technologies.
- Evaluate and pilot blockchain applications that implement a Web3 vision by giving consumers control of their own identity data and compliant access to Web3 apps. These applications include decentralized identity, verifiable claims, cryptocurrency payments and investments, and new apps that are yet to appear.

Sample Vendors

Avalanche.org; Bitcoin.org; ethereum.org; Polygon Labs

Gartner Recommended Reading

DeFi, CeFi and How Blockchains Interoperate: Case Study in Carbon Trading

How to Mitigate Web3 Blockchain Risks and Security Threats

Web3 and the Metaverse: Incomplete but Complementary Visions of the Future Internet

Store-Based Microfulfillment Centers

Analysis By: Mim Burt, Sandeep Unni, Max Hammond

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Store-based microfulfillment centers (MFCs) are modular, goods-to-person installations within, or adjacent to, a physical store. They leverage automation, AI, real-time data and robotics to enable the picking process for fulfillment execution. MFCs can accommodate high-density storage of products and deploy material handling automation (MHA), including shuttle systems to put away and retrieve products for consumer orders at high speed.

Why This Is Important

Customers' increasing move toward digital commerce has created unprecedented demand for execution of unified commerce fulfillment through buy online, pickup in store (BOPIS) and buy online, pickup at curbside (BOPAC) processes. A semiautomated store-based MFC has the potential to quickly scale up the profitable execution of fulfillment picking processes more cost-effectively than other labor-intensive, in-store or warehouse models.

Business Impact

Store-based MFCs are helping to:

- Optimize profitability of larger-format stores struggling with long-term leases, less customer footfall and reduced merchandise.
- Deliver a rapid, cost-optimized, store-based, semiautomated, high-throughput fulfillment execution model to service growing online demand.
- Reduce last-mile costs and boost profitability through semiautomated picking combined with curbside picking, while satisfying the customer promise.
- Grow revenue by shifting in-store, human labor toward customer-facing activities.

Drivers

- Although the rate of growth of online demand has slowed down, we observe retailers' continued high levels of hype around store-based MFCs in the retail market. This is because the store-based microfulfillment model, with accelerated execution during the COVID-19 pandemic, stands as a viable method of fulfilling online demand in a timely, cost-effective and profitable manner.
- Deploying an MFC enables the retailer to optimally allocate inventory curated for a local market, reduce stagnant inventory and decrease last-mile logistics costs while meeting consumer demand for locally sourced and sustainable products. Some retailers deploying this model are combining it with curbside pickup and quick delivery services to optimize fulfillment costs.
- As more implementations and pilots roll out, two notable events on the mergers and acquisitions front have occurred in the past 12 months. Walmart acquired Alert Innovation, a specialist in store-based grocery microfullfillment, and Kroger is in the process of bidding to merge with Albertsons. Although initial deployments are primarily grocery-focused, this could shake up the vendor market as well as increase the momentum of both food and nonfood retailers' interest.
- These developments have moved this innovation further up on the Innovation Trigger in 2023, although deployment momentum is slow.
- We expect retailers to continue to evaluate implementation of operational best practices as well as robust support models over the next 12-24 months. This IP is a slow burner, and we expect it to reach the Plateau of Productivity over the next 10 years.

Obstacles

- There is a lack of comprehensive mapping of complex, cross-channel processes (BOPIS, BOPAC, buy online, return in store [BORIS] and buy online for home delivery) to evaluate the impact on store labor portfolio and costs of execution of in-store fulfillment processes.
- The initial startup costs of implementation are high. Many retailers struggle to justify the capital investment needed, which can impede payback and ROI.
- Some store formats may not be conducive to the space and size requirements needed for a store-based or store-adjacent MFC buildout.
- The vendor market is relatively nascent with few established vendors, some of whom have not been adequately tested in very large rollouts and are, as yet, unable to demonstrate capability to scale and support retailers.

User Recommendations

- Use order volume forecasts to evaluate store capacity for online order fulfillment as well as to gauge MFC suitability versus other fulfillment models.
- Learn how MFC vendors' solutions differ from each other, such as cost of infrastructure and required labor.
- Model CAPEX investments in MFC installations as part of your distribution network of warehouse fulfillment centers, customer fulfillment centers, distribution centers, regional hubs and dark stores.
- Evaluate stores with potential for MFCs taking into account the location in store as well as modeling impact on store operations, workforce strategy and consumer experience. Include MFCs in the design of relevant new store builds.
- Assess how in-store IoT solutions like smart-shelf or RFID can improve MFC inventory accuracy and evaluate the benefit of combining these with voice picking.
- Investigate the impact of generative AI on speed and accuracy on curating the best subset of assortments suitable for in-store MFCs.

Sample Vendors

Alert Innovation; AutoStore; Dematic; Exotec Solutions; fabric; Swisslog; Takeoff

Gartner Recommended Reading

Competitive Landscape: Retail Store-Based Microfulfillment Center Providers for Tier 1 Multichannel Retailers

Infographic: The Retail Store of Tomorrow

Market Guide for Intralogistics Smart Robots in Retail

Market Guide for Retail Distributed Order Management Systems

Retail Industry Cloud Platforms

Analysis By: Sandeep Unni

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Definition:

Retail industry cloud platforms address retail industry requirements and satisfy use cases and business outcomes specific to retail. They combine underlying SaaS, PaaS and IaaS services with composable capabilities such as an industry data fabric, a library of packaged business capabilities, composition tools and other platform innovations into a whole product offering.

Why This Is Important

- Cloud deployment decisions in retail are underpinned by outcomes that can progress retailers' broader digital business transformation goals through cloud models.
- According to the 2023 Gartner CIO and Technology Executives Survey, 49% of retail respondents ranked increasing investments in cloud platforms in 2023 as a top five priority.
- Retail cloud adoption will be accelerated by the ability to meet retail-specific use cases without costly or significant development, integration or configuration efforts.

Business Impact

Impacts include:

- The retail industry is one of the fastest-growing vertical markets for IaaS cloud services, with a $13 billion market opportunity in 2023 forecasted to grow at over 26% over the next five years according to Gartner's IT spending forecasts.
- Retail industry clouds are blurring the lines between established cloud services such as IaaS, PaaS and SaaS, offering more modularity compared to retail SaaS applications in functional areas such as merchandising, personalization or store offerings.

Drivers

- Integrated data models and capabilities offered by cloud offerings can enable retailers to unify data across multiple disparate data sources, a pressing driver for cloud-first investments in retail. Retailers can extract meaningful customer insights, improve customer relationships, increase inventory management and supply chain efficiencies to deliver meaningful unified retail commerce.
- Retail industry cloud platforms have the potential to cover a “full stack” of functionality combining the functional breadth of SaaS, PaaS and IaaS with integrated retail-specific data capabilities. Until the advent of these offerings, this need was being met through dedicated retail SaaS applications, or as a horizontal technology stack in the form of IaaS/PaaS services.
- Gartner’s industry cloud research shows that retailers are considering supply chain planning/demand forecasting, POS/unified commerce, digital commerce, store inventory management and merchandise planning as some of the key workload capabilities for industry cloud offerings, which will further drive adoption.
- Retail industry cloud platforms are being launched by large hyperscale cloud providers and application software vendors with an already established retail customer base and channel presence, which will increase the scale of adoption.
- Retail clouds can create value for retail IT and procurement organizations by bringing together solutions that were traditionally purchased separately in a built-for-retail, preintegrated solution. This can in turn simplify the sourcing, implementation and integration efforts of cloud solutions.
- ICPs offer the underpinning capability to deliver and scale generative AI and large language model services built natively for retail-specific workloads and applications.
- This innovation is expected to gain more traction over the next 24 months as vendor solutions continue to mature and retailers convert early adopter initiatives into scaled deployments. It is expected to reach the Plateau of Productivity in five to 10 years.

Obstacles

- Retail industry clouds are still emergent, with some early vendor launch announcements and vision statements leading to skepticism from retailers and “wait and see”’ inertia.
- The whole-product value proposition of these offerings may run counter to the multicloud or hybrid best-of-breed approach typically undertaken by large Tier 1 retailers. Tier 2 retailers have been faster to adopt cloud solutions with lower vendor lock-in concerns.
- Cloud providers have not yet demonstrated the ability for retailers to create truly holistic, composable offerings that combine prebuilt capabilities as well as retail ISV and partner solution components.
- Some large retailers continue to be deterred from considering implementation of retail offerings from a leading cloud provider.

User Recommendations

- Assess the retail solutions promoted by cloud providers and vendors to distinguish between technology functionality and launch announcements.
- Engage with your business leads and evaluate integrated data capabilities offered by the provider to unify disparate data sources of master data across your enterprise and construct customer behavior insights (this is a prerequisite for algorithmic retailing, leveraging advanced analytics and AI).
- Undertake requirement mapping of retail cloud offerings to validate that they meet strategic business requirements from stakeholders such as merchandising, marketing or store operations, in addition to IT/cloud requirements.
- Conduct a thorough assessment of the vendor’s retail solution roadmap to evaluate out-of-box capabilities and interoperability with retail partners and ISV components.

Sample Vendors

Alibaba; Amazon Web Services; Google; Microsoft; Oracle; SAP

Gartner Recommended Reading

Quick Answer: What Must Retail CIOs Know About Industry Cloud Platform Adoption by Their Peers?

Top Strategic Technology Trends for 2023: Industry Cloud Platforms

Quick Answer: What Makes Industry Cloud Platforms Different From Traditional Cloud Offerings?

Analyzing Industry Cloud Offerings From CIPS Providers

Forecast: Enterprise IT Spending for the Retail Market, Worldwide, 2021-2027, 1Q23 Update

At the Peak

Metaverse

Analysis By: Robert Hetu, Sandeep Unni

Benefit Rating: Transformational

Market Penetration: Less than 1% of target audience

Maturity: Embryonic

Definition:

A metaverse is 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. Gartner expects that a complete metaverse will be device-independent and will not be owned by a single vendor: It will have a virtual economy of itself, enabled by digital currencies and non-fungible tokens (NFTs).

Why This Is Important

As traditional e-commerce ceases to differentiate, retailers seek alternative ways to satisfy digitally savvy customers' expectations, and to close the gap between online's unappealing past and its engaging future. The immersive nature of the metaverse will bring new unified retail commerce experiences that cross digital and physical realms. Advances in metaverse technologies, including AR/VR/MR, NFT, generative AI, and Web3 technologies, give retailers an opportunity to offer persistent immersive experiences to increase loyalty and retention.

Business Impact

The metaverse will allow retailers to expand and enhance their current businesses in unprecedented ways, opening up innovative opportunities as people enhance and/or augment their lives in digital and physical realities. Early examples include leveraging NFTs that augment physical products, creating virtual experiences on gaming platforms, and enabling new forms of loyalty marketing.

Drivers

- Generative AI models will vastly improve the ability for retailers and branded manufacturers to create virtual environments through automated responses to text and image prompts.

- E-commerce has ceased to be a differentiator in the retail marketplace because it is no longer enough to satisfy customer demand at scale.
- Immersive technologies such as AR/VR/MR are already reshaping the retail industry and will be an integral part of the future of shopping.
- Web3 evolution and the creator economy will require retailers to address consumers' desire to participate in product design and development.
- Gen Z's leverage of gaming, mobile devices and social media is also increasingly shifting behavior toward immersive digital experiences.
- Gen Z will be the preeminent metaverse consumer for the next decade. According to a survey by Snapchat, 92% of Gen Z want to use augmented reality tools for e-commerce.
- Gaming tech improvements from vendors such as Unreal Engine 5 that offer dynamic environments, enhanced graphics, avatar creation and social integration have further driven adoption of AR/VR/MR as part of immersive retail experiences.
- When part of a larger market demographic shift opportunity, metaverse can help retailers to align with the young gaming demographic — for example, the success of Nike, adidas and Under Armour in the athletic shoe industry.

Obstacles

- Metaverse had an unfortunate over-early and inopportune hype spike in 2022 that stifled understanding of the future of the technology.
- Hype has transferred to generative AI, so the allure of metaverse initiatives may be tarnished by negative press.
- Planning for this wide-ranging change, while remaining relevant in the present, will challenge all retailers.
- There is no one metaverse; retailers will experiment in multiple metaverse arenas while learning what works best.
- Early metaverse investments may only represent sunk costs; consistent revenue is unlikely for years.

- AR/VR/MR uses have languished thus far in physical retail. In-store customer-facing AR/VR/MR experience pilots were often “choppy” and clumsy due to inadequate connectivity and operations that required advanced technical support from associates, and cooperation from customers. This potentially impedes the future development opportunities for retail.
- Controlling brand messaging will continue to be difficult in a metaverse too, for example limiting brands that are exposed in the same environment.
- Deepfakes will become a nemesis across industries as there is a great risk of reputation damage and losing control of messaging.
- Valuations of NFTs can vary widely and cannot be easily forecast.
- Cryptocurrency acumen and usage will be required for any large-scale implementations.

User Recommendations

- Educate the organization on the impact of foundational Web3 technologies, including blockchain.
- Advise the leadership team to name a lead who will coordinate metaverse strategies.
- Learn about immersive experiences, as these will be on the critical path for metaverse developments. Identify at least one customer-facing use case for AR/VR/MR interactions, and implement by the end of year 2023.
- Leverage AR/VR/MR internally for training, space planning, visual merchandising and store design.
- Inventory your digital asset catalog and implement a protection plan for corporate digital assets and images, as metaverse development and NFT usage are expanding daily.
- Review your customer payments portfolio and prepare to include cryptocurrency payments over the next 12 months.
- Investigate communications infrastructure to ensure that appropriate and timely action is taken to strengthen connectivity for seamless and uninterrupted customer experiences.

Sample Vendors

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

Gartner Recommended Reading

Quick Answer: Should Retailers Take The Metaverse Plunge?

Metaverse's Implications for Retail Technology and Service Providers

Emerging Tech: Top Enabling Technologies for Metaverse

Emerging Tech Impact Radar — The Metaverse

Infographic: Impact Map of the Metaverse

Generative AI

Analysis By: Robert Hetu, Brian Burke

Benefit Rating: Transformational

Market Penetration: Less than 1% of target audience

Maturity: Emerging

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.

Why This Is Important

Retailers' interest in generative AI (GenAI) is growing exponentially as the hype around OpenAI's ChatGPT peaks. Immediate use cases for investigation include creative work in marketing, merchandising, e-commerce, product development and store design. Generated synthetic data supports the privacy and speed of AI delivery. GenAI is becoming more common and accessible. GenAI will be a major component for the future of metaverse in retail.

Business Impact

GenAI will progress rapidly in both scientific discovery and technology commercialization. Use cases span a wide range, including the creation of new products or services. Retailers will find many ways to improve the efficiency and accuracy of unified retail commerce operations through GenAI. However, it can generate dangerous artifacts such as deepfakes and expose organizations to intellectual property risk. Technologies for AI trust and transparency will become indispensable for the adoption of GenAI.

Drivers

- The hype around GenAI is accelerating. In retail, generative AI can be used to assist in content creation, image management, marketing activities such as generated ad copy, and merchandising needs including item attributing.
- As the technology progresses and retailers discover the variety of use cases for generative AI specific to retail, the hype among retailers, consumers and vendors will continue to progress toward the Peak of Inflated Expectations over the next 12 months.
- In 2022, metaverse became overhyped and its promise was unattainable. Its elements, such as digital humans and assets, rely on GenAI and will be pivotal to achieving progress.
- Retailers need accurate and actionable customer behavior models built through a greater understanding of natural language and localization as well as better ways of digital communication with potential shoppers through contextualized chat.
- Easier interactions through prompts enables merchandising to seek quicker trend identification for diverse markets to limit inventory risk and optimize sales.
- Direct cost savings through automation processes including creation and management of images, product descriptions and attributing, and scripting of personalized messaging and offers.
- Retailers need ever faster development of products and services when data may be incomplete or limited. Notably, OpenAI's DALL·E 2, Midjourney and StableDiffusionAPI can create original images and art from a text description.
- Generative AI will disrupt software coding which will benefit retailers with internal software development expertise. Combined with development automation techniques, Gartner predicts that by 2027, generative design AI tools will automate 70% of the design effort for new web and mobile apps (see Predicts 2023: How Innovation Will Transform the Software Engineering Life Cycle).

Obstacles

- GenAI research may be hindered in the future by regulations and external forces, as leading governments and organizations grapple with the nature and future of AI, data privacy and intellectual property rights..
- Large language models (LLM) skills are lacking in all but the largest retailers. Most organizations will obtain these technologies from packaged solutions and third-party partnerships.
- Prompt engineering skills for using tools like ChatGPT will be in high demand as the technology keeps evolving.
- GenAI can be used for fraud, malware, disinformation and instigation of negative actions. Full and accurate detection of generated content will remain challenging for years and may not be completely possible.
- Generated deepfakes misusing products, services, executives or spokespeople are dangerous for a retailer's reputation. We will see unusual collaborations, even among competitors, to solve the problem of deepfakes and other ethical issues rooted in GenAI.
- Reproducibility of GenAI results will be challenging in the near term.
- Fragmented and specialized technology offerings (such as generating only images or only text) currently lead to using a combination of Gen AI tools.

User Recommendations

- Identify initial use cases where you can rely on purchased capabilities or partner with researchers.
- Determine how synthetic data could accelerate the development cycle, lessen regulatory concerns, mitigate data bias, facilitate data monetization and lower the cost of data acquisition.
- Examine and quantify the advantages and limitations of GenAI. Use it first to improve an existing process. Supply guidelines when it could bring breakthroughs, as it requires skills, funds and caution. Weigh technical capabilities with ethical factors.
- Prepare to mitigate the impact of deepfakes which can cause serious risk to retailers' reputations through the erosion of customers' trust. Methods like algorithmic detection and authenticating content provenance to do this are evolving. Technical, institutional and industry organization interventions will be necessary to fight deepfakes and fraudulent uses.
- Pay close attention to the GenAI techniques, as we expect their rapid adoption.

Sample Vendors

3DLOOK; Adobe; Bitext Innovations; Datagen; Google DeepMind; Hugging Face; MOSTLY AI; OpenAI; Microsoft

Gartner Recommended Reading

Quick Answer: What Should Retailers Know About ChatGPT?

Infographic: Artificial Intelligence Use-Case Prism for Long Life Cycle Retail

Infographic: Artificial Intelligence Use-Case Prism for Short Life Cycle Retail

Innovation Insight for Generative AI

Top Strategic Technology Trends for 2022: Generative AI

Non-Fungible Tokens

Analysis By: Robert Hetu, Avivah Litan

Benefit Rating: Transformational

Market Penetration: Less than 1% 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. Many NFTs today are unique ERC-721 tokens that live on Ethereum, but other blockchain platforms support them as well. NFTs store data and logic and typically link to off-chain records for storage purposes.

Why This Is Important

Non-fungible tokens (NFTs) offer retailers the promise of digital ecosystems, where owners of digital content (and in some cases physical content) can use NFTs to allocate digital ownership and rights, and monetize new revenue streams to the retailer. NFTs have broad applicability in many retail markets and will open new types of marketplaces, which could not be possible without them.

Business Impact

NFTs present new ways for retailers to leverage their digital content, and to manage, promote and monetize NFTs as assets via ecosystems. Growth of the creator economy will require retailers to engage with and support content creators for customer interactions, digital products and marketplaces that are NFT-enabled. Blockchain technology brings tamper resistance to the notion of NFTs, which is traditionally hard to do with many other kinds of digital assets.

Drivers

- Expanded reach into new consumer segments, including Gen Z, through digital marketing and loyalty programs.
- New methods offered to ensure trust and integrity with digital and physical content. NFTs enable the technology and support the standards that allow content creators, retailers and buyers to transact with trusted digital (and sometimes physical) content.
- Facility for retailers to sell digital-only products. Retailers from Gucci to Walmart are applying for NFT-related trademarks. More than 5,000 trademark applications were filed in 2022, which is more than double when compared to 2021.
- Retailers and brands are expanding their trademark portfolio to protect their digital assets which will further spur activity.
- Retailers and brands have the capability to authenticate/validate digital and physical goods. For example, by leveraging NFTs, authenticity, and in some cases, ownership can be validated in real time. A 1956 Rolex Milgauss is the first watch to have both its authenticity secured and its provenance recorded on the blockchain.
- Capitalization on growing consumers' interest in leveraging augmented reality (AR)/virtual reality (VR)/mixed reality (MR) as part of the sales process.
- Expansion of social platforms and live commerce as active sales touchpoints that can leverage NFT.
- Generative AI capabilities expand the reach of image creation to more business users through diffusion models. DALL-E 2 from OpenAI is a recent example of a text-to-image technology leveraging diffusion models.

Obstacles

- NFTs have yet to demonstrate lasting business models and monetization for content creators, retailers and buyers, meaning that adoption is currently low.
- The NFT marketplace is currently experiencing price deflation and wild variations, making it difficult to ensure value is maintained.
- Retailers have little to no experience in dealing with cryptocurrencies or volatile valuations of any kind.
- Currently, Ethereum leads the charge with NFT approaches and bridges for interoperability with other blockchains.
- With NFTs just starting to become a reality, from a product and solution perspective, business models and approaches haven't fully been realized.
- Consumers and retailers are not aware of the numerous risks/constraints on their ownership rights. For example, copyright issues that prohibit transferring the object to other forms, or storage configurations that don't provide persistence and security for their objects.

User Recommendations

- Conduct early-stage research, and consider investigating how NFTs are made, in addition to NFT ecosystems. Partner with the business leaders to engage in a proof of concept.
- Engage with merchandising and marketing business leaders to inform and advise on the risks, benefits and limitations of emerging NFT technology. Conceptualize potential business and monetization models.
- Leverage good cybersecurity to ensure that risks are understood and mitigated.
- Implement a protection plan and an inventory digital asset catalog for corporate digital assets and images, as metaverse development and NFT usage are expanding daily.

Sample Vendors

Animoca Brands; Ethereum; OpenSea; Rarible

Gartner Recommended Reading

Quick Answer: How Can Executive Leaders Explore NFT Opportunities?

FAQ for NFTs on Blockchains and Web3 Ecosystems

How Can Blockchain Non-Fungible Tokens (NFTs) Accelerate Digital Transformation?

Emerging Technologies: Blockchain-Based Tokenization Is for More Than NFTs and Cryptocurrencies

Edge Computing in Retail

Analysis By: Sandeep Unni, Max Hammond, Kelsie Marian

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Edge computing in retail is a distributed computing topology in which data storage and processing takes place closer to or in the retail physical store where people (or things) produce and/or consume that information. The resulting lower latency and bandwidth needs for the underlying applications can improve resilience, support operational intelligence in real time, lower operational costs, and enhance consumer and store associate experiences.

Why This Is Important

Data-driven, intelligent in-store execution to increase operational visibility and efficiency as well as improved customer engagement and associate experience is urgently needed for survival in the retail industry. Edge architectures facilitate the processing of large volumes of data from IoT technologies at the “store edge,” such as smart shelves, smart freezers, item-level RFID, smart robots, smart check-out as well as traditional store systems like point of sale (POS).

Business Impact

Edge computing helps retailers leverage algorithmic retailing and AI to make intelligent, data-driven decisions based on information processed and optimized locally at the edge in individual store locations. Implementing edge architectures can increase resilience and performance, create new revenue streams, raise real-time operational visibility and decrease overall operational costs for the business. Generative AI algorithms may be run in the future to analyze the large volumes of edge operational data and generate curated sets of assortments.

Drivers

- Retailers continue to struggle with gaining real-time visibility and intelligence of store operations, thereby limiting their ability to bridge the gap between the physical store and digital channels.
- Several store IoT solutions are proliferating, generating large swathes of data. Analysis and inference of this data, particularly in real time, is a daunting task requiring significant amounts of compute and processing.
- In-store, on-shelf availability of stock has been an urgent business driver not only to facilitate customer satisfaction and store revenue but also to meet rapid rises in store-based fulfillment of e-commerce orders.
- Shrinkage continues to be a major contributor to inventory loss and operational costs, estimated by the NRF to cost almost $100 billion in FY21. Edge AI solutions can proactively enable monitoring and prevention of loss through incidents such as shoplifting and returns fraud.
- Merchandising and demand forecasting functions can react sooner with real-time feedback on inventory status as well as customer preferences from the stores.
- Adoption of edge topologies and networking architectures continues to gain wider application in retail along with in-store IoT solution deployments while also providing the means to extend the efficiency and life cycle of legacy systems.
- Large retailers have continued to make significant investments over the past year to scale implementations. Retail continues to be a fertile early adopter of edge investments to extend the power of the cloud into the store as well as to address store “edge-in” scenarios. Further, edge computing could be instrumental for running generative AI inference to generate decision intelligence in upstream processes by virtue of the faster, more real-time data feeds it can drive from stored data.
- We expect more retail workloads to be implemented with edge topologies over the next five years. We have positioned this profile at peak with a Time to Plateau to five to 10 years, as barriers to IT architectures and cultural changes need to be overcome for widespread adoption.

Obstacles

- Edge computing and emergent architectures such as edge AI go hand-in-hand with significant cultural changes, bridging legacy people and process gaps that often inhibit retail transformational efforts.
- Many retailers approach edge deployments in a tactical manner focused on specific use cases and lacking a holistic strategy. This can lead to nonextensible architectures and wasted investments.
- Adoption of edge computing and enabling technologies such as AI and IoT in the store often requires modernization of IT store infrastructure.
- Retailers with existing store systems on legacy architectures and lacking edge domain expertise or IT staff could end up adding complexity to IT operations and further creating technology silos by adding new edge workloads.
- Several early adopter edge implementations gaining retailer traction are in pilot stage, and do not have common architectures or standards established yet to trigger widespread deployments at scale.

User Recommendations

- Establish an edge innovation team or an edge architect position on your enterprise architecture team, or expand the role of cloud architect to encompass edge and formulate a strategic plan.
- Direct your edge architect to identify legacy architectures, and upgrade paths to migrate to edge architectures to evaluate your current store systems and applications.
- Investigate investment opportunities by identifying a handful of store use cases where edge computing can be trialed in a store pilot within the next 12 months, such as smart check-out or AI-based video analytics.
- Map data linkages between real-time data generated from the store, and demand forecasting, allocation and replenishment processes by engaging business stakeholders in store operations and merchandising.

Sample Vendors

Acumera; Amazon Web Services (AWS); Deep North; Microsoft; NCR; NVIDIA; Platform9; Sunlight

Gartner Recommended Reading

Market Guide for Edge Computing

Emerging Tech Impact Radar: Edge AI

Building an Edge Computing Strategy

Emerging Tech Impact Radar: Edge Computing

Store Inventory Management

Analysis By: Sandeep Unni, Max Hammond

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Store inventory management (SIM) refers to the efficient and effective management of the quantity and value of inventory across all in-store processes down to SKU/item-level granularity. SIM applications must be capable of enabling store personnel to easily manage daily stock operations across key functional processes, and must also be an integral part of the retailer's overall enterprise-level inventory management.

Why This Is Important

Retailers continue to support online order fulfillment using store inventory. The cost of goods sold (COGS) line, which includes costs of inventory carried, is by far the biggest expense on a retailer's balance sheet. SIM applications streamline visibility of store inventory thereby contributing to optimizing overall inventory carrying costs. Real-time visibility and effective management coupled with planning intelligence from inventory locations across the enterprise, leads to dramatic value creation across the retailer's channels.

Business Impact

SIM applications can substantially impact a retailer's operations:

- Store inventory management is a complex cross-channel endeavor and a precarious balancing act. Storing too much inventory or misaligned positioning across locations impacts sell-through and cash flow. Too little leads to out-of-stocks, dissatisfied customers and lost sales.
- Executing SIM processes with data intelligence will have a transformational impact in optimizing inventory levels, reducing waste, boosting sales and enhancing customer experience.

Drivers

- The use of store inventory to fulfill online orders continues to increase across segments. For example, according to research by the Gartner supply chain team, most retail respondents offer to buy online, pickup in store and curbside delivery services.
- Gartner research has also shown that item-level store inventory accuracy is typically much lower than that in DCs; retail respondents cited store inventory accuracy levels as low as 60%. The use of SIM applications helps store teams reconcile higher store inventory accuracy, including in-store returns, improve sales, and reduce dead inventory or out-of-stocks.
- Modern SIM applications can directly contribute to more employee productivity and generate labor efficiencies in the store, a dynamic even more pressing in light of the historical labor challenges faced by the industry.
- Many retailers continue to struggle with scaling e-commerce order fulfillment from stores, and controlling the resulting escalation in operational costs. SIM processes, combined with the real-time intelligence from in-store IoT solutions (including item-level RFID, computer vision, smart shelves, etc.), can drastically improve in-store on-shelf availability and overall efficiency of store operations.
- Retailers continue to be under significant pressure to boost profitability and generate free cash flow, and lower inventory carrying costs is a strategic means to accomplish that.
- Even though retailers have broadly deployed SIM processes in the store, capabilities to converge inventory execution tasks with real-time store intelligence, order management, merchandising and supply chain planning systems are still emerging, leading to its post-peak position. In the future, the rise of generative AI could play an impactful role in optimized inventory management decisions and curation across a retailer's inventory locations.
- As vendor solutions continue to incorporate broad cross-channel integration capabilities leading to more widespread retailer adoption, we expect this innovation to reach the plateau within the next five to 10 years.

Obstacles

- Inventory management processes are not new, but many retailers continue to use outdated and isolated legacy systems. They lack not only the full breadth of functional capabilities required but also risk costly upgrades for unified commerce execution.
- SIM applications for in-store execution need to be complemented by the use of data-driven algorithmic planning processes in merchandising and supply chains to maximize value. However, many traditional planning functions continue to be siloed and manually intensive.
- SIM capabilities are primarily centered around manual processes involving store associates. Successfully scaling demand for store-based fulfillment requires changes in store operating models to include more automation that helps associates meet increases in velocity and volume profitably.
- The market for in-store IoT solutions is highly fragmented and still emerging. No SIM application provider in the market has yet broadly integrated with IoT-based, real-time capabilities.

User Recommendations

- Model a complex process, such as buy online, pickup in store (BOPIS), that includes pick-from-store requirements to rigorously assess cross-channel capability of your current SIM application.
- Prioritize investments in SIM applications with cloud capabilities, including for upgrade paths to support real-time data feeds from inventory locations across the enterprise.
- Work with the COO and store operations analysts to reassess major in-store key performance indicators (KPIs) monitored by your business, aligning with data and analytics capabilities offered by SIM applications.
- Identify performance gaps and evaluate opportunities from dead inventory or stock-outs in the store by undertaking root cause analysis with store operations and merchandising business leaders.

Sample Vendors

Blue Yonder; Cegid; IBM; Manhattan Associates; Microsoft; NewStore; OneView Commerce; Oracle; SAP; Symphony RetailAI

Gartner Recommended Reading

The Contemporary Guide to Retail Supply Chain Excellence: Part 1 — Inventory and Assortment

Retailers: Maximize the Profitability of Your Order Fulfillment With a Portfolio-Based Approach

Infographic: The Retail Store of Tomorrow

Smart Shelf

Analysis By: Sandeep Unni, Max Hammond

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

Definition:

A smart shelf is a connected shelf in a physical retail store, and incorporates technologies such as advanced computer vision (ACV), weight or other sensors, electronic shelf labels (ESL) or LCD displays. It is combined with AI technologies for product detection, dynamic pricing management and customer sensing. It also provides a foundation for advertising media and personalized messaging.

Why This Is Important

Smart shelf technology significantly improves execution and efficiency of in-store activities like price changes, inventory management, out of stock replenishment, online fulfillment and increases associate productivity in the store. Smart shelf continues to see increasing deployments among retailers as a technology underpinning their store digitization initiatives, notably in categories such as grocery, general merchandise, convenience, consumer electronics and home improvement.

Business Impact

Impacts of smart shelf include:

- Smart shelves can provide critical real-time visibility to in-store, on-shelf availability, increase operational efficiency, guide customers and associates to discover products and contribute inputs to Internet of Things (IoT)-based real-time store monitoring capabilities.
- Data from smart shelves can equip retailers to replicate a richer in-store experience, generating revenue uplift and delivering significant efficiency gains of store operations.

Drivers

- Smart shelf technology can address myriad use cases to generate ROI across the entire footprint of a store, within specific areas of the store (such as end caps) or in specific product categories.
- Use cases include in-store on-shelf availability; out-of-stock detection; automated pricing execution; guided order picking in store; mobile scan and go; planogram compliance; customer detection and behavior analysis (e.g., customer dwell time at a particular aisle or category); customer engagement through BLE, UWB or NFC tags; in-store advertising through shelf edge displays; contextualized promotions based on customer identification.
- Smart shelf has the potential to impact other areas of the retailers' business, including marketing, merchandising and space planning. For example, intelligent store planning solutions can be used to improve shelf-space optimization.
- Data and insights gleaned from smart shelves can help identify rich data monetization avenues with consumer packaged goods companies and manufacturers.
- Rising interest in retail media networks and in-store media placements has directly impacted availability of solutions that integrate attractive, high-definition LCD displays along the shelf edge to deliver contextualized advertising content to customers and influence conversion.
- We expect generative AI to open up a wide array of use cases in ACV enabled smart shelf, including image generation, image classification and image to text/text to image scenarios, which could significantly improve training and inference efficacy of the underlying models and further spur adoption.
- Smart shelf investments continue to garner high priority for real-time visibility and efficiency of store operations, especially due to the boost in store-based fulfillment as well as surging inflation. ESL solutions are more prominent and mature than those leveraging ACV. We have positioned the technology just past the peak in 2023, with the likelihood of reaching the plateau over the next five years.

Obstacles

Several obstacles still remain that hinder a more rapid ascent to broader adoption:

- Smart shelves that need power or network connectivity for cameras or displays require upgrades to the store infrastructure, which impacts implementation.

- Legacy cameras deployed in a store are generally not suitable to run computer vision models needed for on-shelf product recognition. Implementations with battery-powered cameras or ceiling-mounted cameras tailored to ACV specifications are being packaged into solutions.
- Solutions involving sensor fusion and weight sensors typically require custom shelving fixtures to be installed in the store.
- A majority of the ESL solutions are radio frequency-based and dependent on reliable network connectivity in the stores. The same dependency is true for smart shelf solutions that are cloud-based.
- Retailers have struggled with the capital expenses involved to deploy these solutions, although opex-based or leasing models are emerging to lower the cost barrier for adoption.

User Recommendations

- Pull together a phased plan of key store processes where smart shelves can be deployed over the next 12 months in targeted pilot stores or store formats by assessing multiple use cases.
- Accelerate implementation times and alleviate cost barriers by partnering with professional services firms or vendor solutions with a subscription-based offering.
- Quantify benefits to your workforce strategy by auditing store associate productivity and operational efficiency gains upon running a store pilot. The data gleaned will help justify increasing deployments at scale.
- Use the opportunity of smart shelf implementation to consider increasing collaboration with manufacturers and consumer goods companies to improve offers and streamline your supply chain.

Sample Vendors

AWM; Focal Systems; Pricer; SES-imagotag; Shekel Brainweigh; SOLUM; Vispera

Gartner Recommended Reading

Infographic: The Retail Store of Tomorrow

Top Unified Retail Commerce Execution Trends for CIOs 2023

Infographic: Artificial Intelligence Use-Case Prism for Short Life Cycle Retail

Infographic: Artificial Intelligence Use-Case Prism for Long Life Cycle Retail

Retail Media Technology Platforms

Analysis By: Tom Nolan, Hanna Karki

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Retail media technology platforms (RMTPs) are the foundation for retail media networks (RMNs), an advertising technology that enables retailers to offer third parties, like consumer packaged goods (CPGs) and brands, the capability to showcase relevant products at any phase of the customer shopping process. Typically leveraged in digital channels, retailers have the opportunity to extend RMTP capabilities to the physical store in line with retailers' approach to unified retail commerce execution.

Why This Is Important

Retail media technology platforms automate and optimize retailers' collaboration with brands to deliver timely and relevant shoppable ads for their customers. They enable the monetization of first-party consumer and purchase data with higher margins. This newly emerging advertising revenue stream will help them to offset margin erosion due to supply chain challenges and low margin activities associated with the sale of physical products.

Business Impact

Prebuilt retail media technology platforms provide quicker access to establish retailers' own RMNs to deliver content through online, physical store, mobile, live commerce and TV, reducing time to market for revenue gains. The more the platform is automated, the more margin advantage it offers. Leveraging store technology, for example scanners to display in-store ad inventory, capitalizes on store traffic, raises impressions and yields and offsets costs of maintaining commercial real estate.

Drivers

- Shoppers expect retailers to provide seamless, highly tailored and relevant experiences and promotions during their shopping journey in line with retailers' own unified retail commerce execution strategies.
- Estimates put RMN advertising revenue at approximately 75% margin. This makes retail media platforms a highly profitable, high margin opportunity.
- RMNs may increase conversion rates up to 30% as well as increase sales and return on ad spend (ROAS). These help boost overall profitability and generate the additional investment required for retailers' digital transformation.
- Existing in-store technology, including digital signage, smart shelf, audio systems, mobile scan and go, smart carts as well as loyalty and check-out terminals offer targeted media opportunities.
- Third-party cookie depreciation is driving brands to seek new sources of ad targeting and measurement data from channel partners closer to the point of sale. Retailers can capitalize on this shift through the RMN offerings.
- Forbes research indicates that 74% of CPGs companies have set aside a budget for RMN spending, predicted to increase through 2023. This is a lucrative opportunity for additional sources of revenue.
- Software providers are investing in developing and acquiring retail media platforms and capabilities thus increasing the number of providers and improving the diversity of capabilities available for retailers to choose from.
- Generative AI may unlock opportunities to advance RMN capabilities through better contextualized understanding and dynamic content creation delivered quickly, for example, through in-store live commerce.
- Over the last 18 months, retail media platforms have been implemented across all retail segments. Retailers include Albertsons, Carrefour, Coles, Flipkart, Home Depot, INTERSPORT, Nordstrom, and Ulta Beauty.
- The increasing global interest and adoption places this innovation at the Peak of Inflated Expectations for 2023.

Obstacles

- Unstructured, siloed or insufficient data prevents RMTPs from providing customer insights to deliver RMN performance of effective ads both on and off-site.
- Lack of investment in automation and machine learning to ensure a real-time view of inventory of advertised products that are available for purchase or delivery.
- The franchise model of brands in some markets often complicates retail media business operations, for example, in maintaining a consistent customer experience, fulfillment and inventory management.
- Lack of internal capabilities and technical know-how of successful selection, implementation and development of retail media platform technology infrastructure and RMN services.
- Evolving privacy standards and tracking capabilities limit the data that retailers can use for ad targeting and measurement.
- Without addressing data challenges and internal capabilities required to run the platform the profile will not reach the Plateau of Productivity within the next two to five years.

User Recommendations

- Map RMTP capabilities to your communication strategy to avoid underestimation of the effort required for creating or implementing RMTPs, including the impact on store associates.
- Collaborate with data and analytics teams to consolidate data sources and protect customer data in alignment with privacy standards to optimize the execution of platform capabilities while maintaining customer trust.
- Clarify with the chief marketing officer as to who will be in charge of advertising services and sales support to understand the impact of expectations for IT support.
- Partner with the head of merchandising to learn how RMTPs can improve pricing, promotion and margin optimization.
- Evaluate the impact of RMTPs on in-store tech investments by auditing current in-store technology installations to understand where gaps exist.
- Leverage machine learning capabilities to equip the business to learn from customers' response to in-store advertising to improve RMTP performance.

Sample Vendors

CitrusAd; Criteo; Doohlabs; dunnhumby; Microsoft; Particular Audience; Zitcha

Gartner Recommended Reading

Infographic: The Retail Store of Tomorrow

Top Unified Retail Commerce Execution Trends for CIOs 2023

Unified Commerce Platform

Analysis By: Max Hammond, Sandeep Unni

Benefit Rating: Transformational

Market Penetration: 20% to 50% of target audience

Maturity: Adolescent

Definition:

A unified commerce platform (UCP), includes the necessary components to support unified retail commerce, including the customer's ability to browse, transact, acquire and consume across touchpoints. It crosses every retailer touchpoint including stores, alternate physical locations such as lockers and kiosks, as well as web, mobile, social and IoT devices, regardless of the input mechanism.

Why This Is Important

Busy lifestyles and greater need for convenience have cemented customer expectations to be able to shop anytime, anywhere and through any touchpoint. Customers expect a unified experience that traverses easily between online and offline, converges with mobile, social and Internet of Things (IoT), and can serve them wherever and whenever they desire. Furthermore, as consumers move back to the physical store the requirement for retailers to provide unified retail commerce experiences is now paramount.

Business Impact

UCPs provide flexibility, continuity and consistency across all physical and digital touchpoints including web, mobile, social and order management. This allows customers to browse, transact, acquire and consume anywhere and anytime. Furthermore, a UCP can support a single view of the customer, enterprise stock visibility, product availability, contextualized pricing, promotions and recommendations, flexible fulfillment options, and greater personalization to drive loyalty and revenue.

Drivers

- The requirement for unified retail commerce has never been greater. Recent market disruption has revealed the punishing gaps within retailer ecosystems and demonstrated that many retailers are still functioning as multichannel retailers in silos rather than delivering true unified commerce.
- Over the past 12 months, the requirement for open architecture has rapidly accelerated as a high priority for retailers.
- The woeful performance of supply chains in response to high growth in online demand means that retailers must finally dissolve the operational and technical silos between their operating channels to increase flexibility in their supply chains.
- Customer expectations are changing, and they are able to switch between retailers very easily. The holistic understanding of customer shopping behavior is of prime importance if retailers are to remain relevant, instill customer confidence, and meet and even preempt their needs.
- Customer experience and business agility have become the principal competitive differentiators in modern retailing. Retailers are, therefore, urgently implementing strategies to execute the delivery of unified retail commerce to both keep pace with new and emerging customer expectations as well as to remain agile and resilient to risk in rapidly changing market conditions.
- UCPs remain near the Peak of Inflated Expectations in 2023. This is to reflect the expected acceleration in the market as retailers execute the unified retail commerce strategy, as well as the retailer's realization that they must advance their digital transformation to meet new and emerging customer expectations. Time to Plateau is expected in five years.

Obstacles

- Unified commerce solutions are predominantly cloud-based; the architecture and infrastructure changes needed will have a ripple effect on IT operations.
- The sheer amount of data to be harmonized across channels and disparate sources is a significant challenge for retailers implementing a successful URC strategy.
- Tier 2 retailers, new retailers or retailers who are moving from pure play are better positioned than larger global Tier 1 multichannel retailers to purchase a UCP from a single vendor.
- The infrastructure and internal skill set required for a UCP takes time to implement and can be a costly process.
- Unified commerce will require store associates to be equipped, trained and incentivized to serve customers in a unified manner, which requires a shift in internal culture and a high degree of training.
- New digital KPIs and metrics need to support unified commerce activity. For example, retail sales are often still measured and credited to a single channel, even though many transactions today cross channels.

User Recommendations

- Ensure the platform offers composable architecture and enables seamless integration to existing solutions or best-of-breed solutions for core components like point of sale (POS), order and inventory management, e-commerce and warehouse management systems (WMS).
- Assess the impact of Generative AI on creating and maintaining data from text, speech, images, music, and video in a consistent manner across the channels.
- Analyze your current POS functionality by comparing it with the need to deliver essential unified commerce capabilities for click and collect, store fulfillment, clienteling and smart check-out.
- Assess the architecture of the platforms for their ability to scale and grow as new capabilities are needed to support ever-changing customer demands.
- Work with other executives to build a multidisciplinary team to deliver unified retail commerce, incorporating colleagues from each retail function, including IT, operations, digital and supply chain.

Sample Vendors

Aptos; Enactor; Flooid; GK Software; NewStore; Sitoo

Gartner Recommended Reading

Top Unified Retail Commerce Execution Trends for CIOs 2023

Infographic: The Retail Store of Tomorrow

Quick Answer: What is Unified Retail Commerce, and Why Does It Matter?

Toolkit: Create a Strategic Technology Map for Unified Retail Commerce

Sliding into the Trough

Contextualized Real-Time Pricing

Analysis By: Jonathan Kutner, Robert Hetu

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

Definition:

Contextualized real-time pricing (CRTP) refers to the ability to manage and adjust item pricing for customers in real time, across all touchpoints, leveraging the customer's mobile device. Item pricing can be influenced by a wide variety of considerations including competitive pricing, promotional cadence, customer loyalty and, potentially, based on real-time supply and demand of an item.

Why This Is Important

CRTP connects physical and digital pricing for customers. Pricing in digital channels can be easily changed multiple times, and customers are increasingly aware of the different prices across touchpoints. Changing in-store pricing rapidly can cause confusion and frustration for customers and create labor issues for associates. These conflicting needs are driving large retailers to manage pricing strategies consistently across all touchpoints through customer mobile devices.

Business Impact

CRTP provides the immediate relevance that customers expect while enabling multichannel retailers to maintain the appropriate competitive stance. Moreover, by personalizing prices, retailers can target discounts toward their best customers, evaluate the market basket and effectively save margin. Further, moving payment transactions to the smart check-out process via the customer's mobile app eases the workload and complexity of execution for in-store associates.

Drivers

- Executing frequent price changes in store is complex and costly, requiring electronic shelf labels, frequent point-of-sale updates and synchronization to back-end applications.

- Using the customer's mobile device for real-time pricing is the most practical solution for ensuring they obtain the best individualized price.
- CRTP means retailers can make pricing and promotions personalized and relevant, addressing consumers' needs, such as saving money, nutrition, local products, and environmentally friendly products.
- Technology solution providers' application capabilities are maturing and can now support the functionality of CRTP down to the individual customer.
- A seismic shift within retailing means customers, not products, are at the center of merchandising processes. Retailers must now elevate the role of the customer, and this includes personalized pricing and promotions.
- Immersive in-store experiences curated for customers and delivered through a unified retail commerce ecosystem will lead to personalized products, experiences, pricing and promotions.
- Multichannel retailers must strive to entice their customers back to the store — the most profitable channel — by offering a world-class, engaging experience as well as personalized pricing and promotions.
- Product margins continue to be affected by unstable and costly supply chains. To optimize margin, CRTP can boost products and marketing messages to drive customers to the store.
- The emergence of generative artificial intelligence (AI) will further enhance the capability for personalized product offers, based on individual consumer profiles for individual shoppers, offering personalized and relevant discounts from historical data.
- CRTP is progressing into the Trough of Disillusionment, as the complexity of implementation is appreciated and the requirement to execute vital preceding stages within pricing is crucial before reaching maturity toward CRTP. Therefore, CRTP progresses on the five- to 10-year path to the plateau.

Obstacles

- The majority of retailers still have siloed processes for pricing and are not ready for implementation.
- CRTP is linked to progress of smart check-out technology, which is still in the trough.

- Difficulty in ensuring correct prices in real time across technology platforms and touchpoints will impede implementation of CRTP.
- Customers are not accepting volatile pricing on products such as groceries.
- Limitations of in-store networks and weak cellular signals hinder the ability to exploit data in real time.
- Legacy enterprise resource planning platforms and older point-of-sale systems cannot handle personalized offers for millions of customers.
- Retailers must profile the orchestration of customer data gathered from loyalty schemes or digital channels.
- Many retailers require digitalization of core AI merchandising processes such as unified price, promotion and markdown optimization (UPPMO) before any implementation of CRTP.

User Recommendations

- Analyze and profile customer behavior through orchestration of data gathered from loyalty schemes, digital channels and social media.
- Develop a unified retail commerce pricing strategy driven by customer behavior hierarchies.
- Implement a unified retail commerce platform, enabling consistent base pricing across all touchpoints.
- Link mobile applications to loyalty and check-out processes to enable pricing adjustments in real time and encourage shopper loyalty.
- Implement algorithmic retailing to ensure the retailer's entire organization is operating at peak effectiveness throughout all pricing processes.
- Integrate marketing, merchandising, supply chain and store operations processes to provide consistent cross-touchpoint execution for customers.
- Formulate a roadmap of essential UPPMO capabilities to support pricing functionality down to the individual customers, with realistic implementation time frames that will enable a successful adoption of CRTP.

Sample Vendors

DemandTec; dunnhumby; Eversight; Oliver Wyman; Oracle; Retail Express

Gartner Recommended Reading

Market Guide for Retail Unified Price, Promotion and Markdown Optimization Applications — Long Life Cycle

Market Guide for Retail Unified Price, Promotion and Markdown Optimization Applications — Short Life Cycle

Infographic: The Retail Store of Tomorrow

Infographic: Artificial Intelligence Use-Case Prism for Long Life Cycle Retail

Infographic: Artificial Intelligence Use-Case Prism for Short Life Cycle Retail

Smart Check-Out

Analysis By: Max Hammond, Sandeep Unni

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Smart check-out technology solutions are provided through the convergence of different combinations of digital technologies, including computer vision and AI. Sensor fusion, typically through the use of weighted shelves or scales, is combined in some solutions. Lidar-based solutions can also be used to replace cameras and video. Smart check-out technology solutions eliminate the need for customers to go through the traditional physical check-out lane.

Why This Is Important

Smart check-out implementations continue as retailers strive to offer customers a quick and convenient experience. Implementations are still predominantly in the small format food, grocery and convenience segments, with increasing interest in sporting arenas and travel retail. Furthermore, the tightening of labor markets and the difficulty in attracting and retaining store associates have created a new use and pressing case.

Business Impact

Smart check-out is a rising technology that can drive operational efficiency through real-time intelligence, enabling retailers to optimize their workforce through automation as well as improve their customers' journeys through ambient self-service. Retailers benefit from the data generated by tracking customers, identifying shopping behaviors and capturing individual preferences. This data can be used for greater personalization and recommendations.

Drivers

- Customer expectations for greater convenience and speed while shopping has steadily driven new smart check-out technology implementations.
- The continued tightening of the labor market and high labor costs have raised awareness for automating mundane store-based tasks and as a result, smart check-out has gained significant attention.
- New attention and investment have been given to the digitalization of store technology investments as retailers have been forced to refocus on connecting stores to their entire ecosystem and develop an immersive experience for customers and associates.
- Furthermore, retailer interest in smart check-out technology integrated within a shopping cart, basket or at the register has grown further in the last 12 months, viewed as a cheaper alternative to entire store concepts.
- The real-time insights captured through advanced computer vision and sensor fusion can help retailers improve actionable decisions in several operational areas, including merchandising, inventory management, customer service, and loss prevention. The adoption of generative AI has the potential to accelerate this over the next 12 months.
- These real-time insights will allow retailers to react more quickly and act preemptively as they have data to anticipate customer needs and preferences.
- Hybrid solutions, which have started to emerge within the market, including solutions supporting traditional registers and self-check-out terminals as a part of the smart check-out implementation, are further aiding adoption.
- Customer expectations for greater convenience and speed while shopping has steadily driven new implementations, moving smart check-out forward past the Peak of Inflated Expectations. We expect this profile to continue steadily forward over the next 12 months as retailers continue to define their approach and execute the strategy.

Obstacles

- Amazon's recent announcement of numerous Just Walk Out store closures has contributed to a slowdown in smart check-out implementations across the entire store in 2023.
- Regardless of the smart check-out model, challenges remain around scalability and high implementation costs.
- Computer vision and sensor fusion technology for smart check-out remain largely unproven in supporting large-scale formats. The typical store format size is roughly between 2,500 to 6,000 square feet or less.
- The sale of age-restricted items will require associate assistance for approval, such as alcohol, tobacco, or medicines. Additionally, associates may be needed to remove security tags.
- As a result, smart check-out has moved past the peak and is in the early stages of heading toward the trough. However, smart check-out is likely to reach the Plateau of Productivity within the next two to five years due to the rapid increase of other implementation forms, such as at the till or in the shopping cart.

User Recommendations

- Select implementations based on a thorough assessment of customer expectations, the physical store portfolio, store formats, product ranges and assortments as well as the competition.
- Leverage smart check-out to provide an enhanced ambient customer experience, making sure to offer hybrid alternatives, including the use of mixed-mode payments for check-out to meet customer expectations.
- Extract the maximum benefits from computer vision, not just for smart check-out but also for gaining greater insight at the store level. This will drive more operational efficiency as well as improve revenue.
- Reallocate and retrain cashier associates for other tasks, such as shelf replenishment, that could add incremental value to optimize human labor and improve operational efficiency.
- Evaluate the physical store communication infrastructure requirements to consider shifting self-check-out processing to the edge for uninterrupted customer experiences.

Sample Vendors

AiFi; Amazon Web Services (AWS); GK Software; Mashgin; Supersmart; Toshiba Global Commerce Solutions

Gartner Recommended Reading

Market Guide for Retail Smart Check-Out Solutions

Top Unified Retail Commerce Execution Trends for CIOs 2023

Infographic: The Retail Store of Tomorrow

Frontline Worker EXTech in Retail

Analysis By: Kelsie Marian, Max Hammond

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Frontline worker EXTech delivers distinctive employee experiences to retail frontline store workers by unifying a collection of applications that promote staff engagement and a sense of community. Applications typically include internal communications, administrative support, recognition, well-being and personal development processes. These apps are primarily designed for use via smartphones and tablets.

Why This Is Important

The need to attract, retain and communicate effectively with high-quality in-store frontline retail workers in challenging labor markets continues to drive a substantial interest in optimizing frontline EXTech. These solutions seek to increase adoption, engagement and performance via recommendations, nudges, mindfulness, wellness and connecting workers to one another. Frontline worker EXTech represents an opportunity to aggregate a multitude of different applications store associates engage with daily.

Business Impact

Frontline EXTech solutions support frontline digital workplace experiences in retail stores and drive motivation, engagement and contribute to business outcomes leading to a more agile culture fostering competitive differentiation. They help improve the employer value proposition by matching the EX with the brand characteristics and ambitions. In the near future, these solutions will include elements of generative AI that could transform store associate experiences. Hence, the benefit rating has been upgraded from “high” to “transformational.”

Drivers

- Relatively high ongoing attrition of frontline workers in retail store environments, particularly over the last 24 months in QSR.
- High churn, alongside significant operational and cultural redesign initiatives currently in flight in the majority of Tier 1 retail environments, have pushed this technology past the Peak of Inflated Expectations.
- Incorporation of Generative AI into frontline solutions could transform associate experiences through a variety of aspects, i.e., through increased and ongoing coaching, learning and selling support as these language models learn the way people interact and work on the job each day.
- This profile will reach the Plateau of Productivity within the next three years as retailers reconfigure store environments, and develop new roles and responsibilities for store associates.

Drivers of frontline EXTech also include the need to:

- Enable frontline store associates to take ownership of the execution of store-operations decisions to execute unified retail commerce, such as order picking or replenishment through store IoT solutions and mobile task management.
- Prepare store associates to support rich, immersive, in-store customer experiences by providing access to internal training solutions and/or customer-facing tools that are experienced-learning-based, for example, via virtual or mixed reality.
- Improve the well-being/experience of frontline workers: These applications track health through wearables or offer guided meditation or stress reduction for employees dealing with a high volume of customers directly.

- Increase employees' attachment to the organization by connecting them to others through real-time communication, which will also improve the customer experience.
- Provide easy access to learning: Retail and QSR workers do not find sufficient time to access the standard learning and development applications. They are increasingly leveraging dedicated frontline worker learning and/or microlearning to read job-specific, relevant learning bytes.

Obstacles

- There is currently no comprehensive EX "platform" that meets the needs of all worker types and work patterns in the major industry sectors across all employee size segments and geographies. Despite robust development efforts by many providers, one is not likely to emerge in the next five years, so organizations will need to deploy multiple EX solutions to meet their requirements.
- EX usually has multiple stakeholders, with HR, corporate communications, digital workplace leaders and operations all expecting to drive (or at least influence) solution design and deployment. This can cause difficulties in gaining consensus on the issues and outcomes.
- The market has become increasingly crowded, with digital workplaces, cloud HCM suites, HR service management, frontline communications, modern intranet and specialist vendors all positioning their offerings as "Employee Experience Platforms" for retail. This has increased market confusion in terms of which solution is the best fit for a given use case.

User Recommendations

- Assess each solution's underlying philosophy and design approach to determine its cultural and contextual fit, as no existing solution currently addresses all worker types and work patterns. For example, prioritizing solutions that offer retail-specific capabilities.
- Adopt an employee-centric culture and mindset because EXTech's success is more reliant on that than technology. Any solution, even one that applies the latest techniques, won't overcome cultural resistance.
- Structure EXTech deployments so employees can quickly see the personal, team and organizational benefits.
- Use leading design practices, such as personas and employee journey mapping, to ensure the solution actually improves interaction quality. Link this to improvements in the customer experience.
- Evaluate EXTech tools for requirements specific to frontline in-store retail workers (for example, in-store execution and immersive store needs versus corporate headquarters, warehouse, or others) to cultivate a deeper relationship between the retail organization and frontline store workers.

Sample Vendors

Beekeeper; Blink; Flip; Headspace; Perkbox; WorkJam

Gartner Recommended Reading

Market Guide for Retail Workforce Management Applications

5 Best Practices to Attract and Retain Excellent Retail Store Associates

In-Store Live Commerce

Analysis By: Hanna Karki, Kelsie Marian

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Live commerce from the physical store uses live video streaming from stores to demonstrate products and interact with remote shoppers in real time to encourage purchases. In addition to deploying live streaming through commerce platforms, online marketplaces and social networks, retailers can leverage live commerce in line with their approach to unified commerce execution.

Why This Is Important

Live commerce enables retailers to interact and connect with out-of-physical store customers, in real time, helping to grow market share and increase customer trust. It allows retailers to close the experience gap between online and offline in-person sales, support purchase decisions, promote brand awareness, feature new products, acquire new customers, and clear stock.

Business Impact

It can facilitate both one-to-one and one-to-many conversations, mimicking the in-store, in-person real-time selling experience in a convenient manner, regardless of where the consumer is located. It can also increase brand awareness and generate a large amount of traffic in a short time. Very soon, new artificial intelligence (AI) technologies such as Generative AI will enhance and complement live commerce experiences for both consumers and associates.

Drivers

- Customers and employees expect immersive and more meaningful experiences when interacting with the retailer.
- Live commerce supports customers' desire to interact with a human regardless of touchpoint.
- Live commerce is being piloted across several retail segments — both food and nonfood; however, to date, this technology has gained the most traction with specialty and apparel segments, where there is a need for consultative selling of complex products and services.
- Emergence of generative AI and ChatGPT expand live commerce capabilities by enabling more intelligent real-time product and service recommendations that help drive increased sales and more relevant customer experiences.
- Technology providers in adjacent customer interaction solution markets are continuing acquisitions, thus establishing live commerce as a key component of solving retailers' challenges in customer interactions.
- The e-commerce live streaming market in the U.S. is expected to reach $55 billion in sales by 2026 and sales in the Chinese market is estimated to be growing over $60 billion annually.
- The major push from COVID-19 pandemic is settling down and Gartner has observed fewer implementations for live commerce capabilities among Tier 1 retailers. That has pushed this innovation past the Peak of Inflated Expectations and further into the trough for 2023.
- Over the next decade, leading retailers will continue to expand and enhance their current business models in new ways as digital and physical touchpoints increasingly blur. Therefore, it's likely that live commerce will play an increasingly important role for retailers in their experimentation of metaverses and other virtualized experiences.

Obstacles

- Difficulties in identifying suitable live commerce platforms to ensure demands of target audience, use cases and technical requirements are met.
- Having resources to deliver live commerce because of labor shortages, coupled with difficulties in choosing and training the right associates for consistent and quality delivery. Labor constraints play a significant role in pushing live commerce rapidly toward the Trough of Disillusionment.
- Lack of investments in automation and machine intelligence restrict the capability of selecting products that can be offered at attractive price points, and increase visibility to real-time inventory and stock availability to fulfill demand.
- Insufficiencies in stores' network infrastructure disrupt continuity during live sessions.
- If delivery of live commerce does not meet customer expectations, it will result in decreased likelihood of purchase and negatively impact the brand image.
- Without addressing the operational support needed in the coming years, the profile will not reach the Plateau of Productivity within the next two to five years.

User Recommendations

- Collaborate with the business to identify use cases, technologies and platforms where live commerce can potentially add value. Integration of the live commerce into the retailer's overall digital and customer service strategies is of key importance.
- Work with the CMO and marketing department to determine how the execution of live commerce is conducted (through an agency, a dedicated in-house team, etc.) to agree on the level of support required from IT.
- Enable the business to master inventory for live commerce by providing tools for machine intelligence, such as assortment and price optimization applications that help meet margin and sales goals.
- Reduce the risk of project failure and cost overruns by taking into account the integration work needed to embed live streaming in the commerce platform, and integrate the check-out experience from social networks.

Sample Vendors

Alibaba Cloud; Emplifi; Firework; Immerss; Klarna; Pinterest; Salesfloor; Shopee; YouTube

Gartner Recommended Reading

Create Value Through Hyperimmersive Retail Experiences

Infographic: The Retail Store of Tomorrow

AR/VR/MR in Retail

Analysis By: Max Hammond

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Augmented reality (AR)/virtual reality (VR)/mixed reality (MR) in retail is the merging of real and virtual worlds, where physical and graphical objects appear to interact and integrate naturally. AR/VR/MR in retail is a collection of technologies encompassing the spectrum of immersive displays and interactive systems, which span from the digitization of real environments to AR/VR/MR.

Why This Is Important

Adoption of AR/VR/MR in our personal lives through gaming and entertainment is smoothing the way for adoption in our professional lives. Accelerated by customer expectations for hyperimmersive retail experiences, retailers are striving to connect with customers by enriching the customer journey. The adoption of AR/VR/MR is also increasingly providing consistent and immersive scenarios for associate training. Significantly, AR/VR/MR is becoming a foundational method for interactions in metaverses.

Business Impact

As the physical store continues to be the hub of unified retail commerce, retailers must deploy sensory-driven, intelligent in-store execution to increase operational visibility and efficiency and improve customer engagement through hyperimmersive experiences. AR/VR/MR in retail can improve collaboration and associate training, and enhance real-life situations such as customer engagement, wayfinding and store tours for new employees.

Drivers

- Use of AR/VR/MR applications has accelerated in the last 12 months as consumers gravitate further toward immersive retail experiences as well as because of the increasing hype and interest in the retail market on metaverses.
- Magic mirrors and connected fitting rooms are utilizing augmented reality and item-level RFID to demonstrate products, offer recommendations and provide highly personalized consumer interactions.
- Customer expectations for hyperimmersive store experiences dictate that retailers must develop this approach to utilize consumer devices for smart data capture, loyalty, AR and store-based capabilities to enrich the customer journey and transition the store experience from transactional to experiential.
- Mixed reality headsets and image quality are advancing at a rapid pace. Furthermore, the addition of generative AI in regard to image generation by generative diffusion models such as OpenAI's DALL·E 2 has the potential to deliver rapid and accurate immersive experiences in the retail industry.
- Store layout reconfigurations can be expensive, time-consuming and costly. Retailers are now turning toward intelligent virtual store design to avoid costly errors and prevent failed implementations.
- For consumers, use cases are growing within certain retail categories like apparel and footwear, home improvement, furniture, beauty and cosmetics, jewelry and sporting goods.
- The adoption of virtual try-on for "best fit" has grown rapidly across the fashion and beauty segments in the last 24 months.
- The demand for AR/VR/MR in retail to support digital workplaces and retail operations continues to increase, fueled by the impact of challenging labor market conditions.
- Early experimentation in metaverse and Web 3.0 technologies has the potential to uncover new use cases for AR/VR/MR in retail.
- As a result of these factors, this technology's position on the Hype Cycle continues to head toward the Trough of Disillusionment and the Plateau of Productivity is expected between five to 10 years.

Obstacles

- The AR/VR/MR market is still relatively nascent so capable vendors and partners in this space are limited.
- Although the penetration of AR has accelerated over the last 12 months, VR and MR have both seen a reduction of hype and commitment for global Tier 1 retailers.
- The considerable volume of application data retrieved from consumer interactions will require a robust AI strategy in order to accurately sanitize and present actionable metrics. Data privacy and security must also be considered.
- Mixed reality headsets can be uncomfortable for retail associates and they are not meant to be worn constantly. This has stagnated the growth in implementations in the last 12 months.
- The AR/VR/MR technology is limited to legacy smartphone devices, so it could potentially be unavailable or inaccurate for a large proportion of the customer base.
- Virtual environments such as product configurators or virtual try-on are still limited in retail. However, through the development of Web 3.0 and generative AI, consumer adoption is likely to grow further over the next two years.

User Recommendations

- Map customer processes to ensure initial use cases are joined up with other customer expectations, such as sustainability and touchless interactions.
- Collaborate with C-level counterparts to demonstrate how hyperimmersive experiences can drive growth throughout the physical store estate.
- Create a cross-functional team to consider internal use cases for AR/VR/MR in retail, including associate training, store design, and space and merchandise (visual) planning.
- Use pilot projects to test use cases and measure the benefits both for the customer and associates.
- Prioritize the development of high-value opportunities, such as reducing product return rates, increasing conversion, and enhancing the customer and associate experience.

Sample Vendors

3D Cloud by Marxent; 3DLOOK; Amazon; Matterport; Threekit

Gartner Recommended Reading

Innovation Insight for Best-Fit Technology for Fashion Retailers

Top Unified Retail Commerce Execution Trends for CIOs 2023

Infographic: The Retail Store of Tomorrow

Retail Insight: IoT Will Transform the Store for Unified Commerce Success

Distributed Order Management

Analysis By: Max Hammond, Tom Enright, Sandeep Unni

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Adolescent

Definition:

Distributed order management (DOM) orchestrates and optimizes the customer order fulfillment process to deliver targeted service levels for fill rate, ensure accuracy of orders, and provide on-time, cost-effective order fulfillment.

Why This Is Important

Consumer expectations have accelerated for free or low-cost flexible fulfillment options, and such options are now an essential competitive requirement. Retailers with complex fulfillment networks and a wide variety of fulfillment services require DOM systems to optimize fulfillment performance, reduce cost and maximize the use of all available inventory. DOM enables them to fulfill customer orders as accurately and as efficiently as possible, from wherever inventory is available.

Business Impact

DOM enables retailers to efficiently handle the complexity of unified retail commerce customer order management and fulfillment, including multiple fulfillment types in a single order as well as changes during the fulfillment process. It is used to improve order orchestration and fill rates, optimize order collection lead times, shorten cycle times, reduce buffer stock, optimize shipping on delivery and leverage new fulfillment strategies to provide a cost-optimized unified retail commerce experience.

Drivers

- To meet today's consumer shopping demands, many retailers have to increase fulfillment complexity in order to improve consumer experience.
- Physical stores are increasingly diversifying to become local fulfillment hubs. DOM can reduce the cost of fulfilling e-commerce demand.
- Retailers are expressing growing interest in DOM systems to handle order fulfillment complexity, stemming from their expansion of shopping services to consumers.
- Increased competition from pure-play digital retailers and last mile startups has heightened customers' expectations for convenient, immediate, and free or low-cost fulfillment.
- DOM continues to evolve to support more retail use cases such as managing back orders, returns, preorders, and split and partial shipments, and is increasingly being used for marketplace order fulfillment.
- Pure-play online retailers operating fulfillment from multiple network nodes are increasingly seeing benefits from the use of DOM systems. These networks can include 3PL warehouses or, often, automated DCs and microfulfillment centers that carry merchandise for a specific geographic location.
- The number of retailers with annual revenue of less than $500 million that are licensing DOM systems has grown significantly. The volume of agreements by retailers of this size is unprecedented and illustrates a significant shift away from the recent past when DOMs were considered only viable for large retailers.
- Customer expectations for fast and flexible fulfillment are driving the need to widen the ecosystem of DOM vendors on the market.
- This innovation is moving forward due to sustained levels of hype and increased implementations over the last year or so.

Obstacles

- Due to the complexity of DOM, integration presents a challenge to retailers when implementing the technology into their existing systems environment and architecture, such as inventory sources and ERP integration.
- For the DOM system to be effective, it's imperative that the inventory data is accurate across the retail network, including the physical store. This can be challenging for retailers that classify inventory into different pools across channels and don't have an efficient store inventory management process and platform. However, the adoption of generative AI has the potential to analyze demand patterns, lead times, and other factors to determine the optimal inventory levels.
- The increasing array of solutions addressing store-based fulfillment is a fragmented market representing DOM vendors, store inventory management vendors, point solutions and so on. This is adding to market confusion and adoption inertia.
- As stores diversify their operations and incorporate localized fulfillment, retailers may need to further develop or increase their labor portfolio as well as fulfillment execution costs.

User Recommendations

- Create process maps for the multiple permutations and combinations of ways a transaction can be ordered and fulfilled, considering both business and consumer processes.
- Determine your need for a DOM application by assessing the complexity of your current and planned consumer order fulfillment service portfolio against the capabilities of existing systems, such as ERP, to manage this complexity.
- Identify current integration points between DOM and other applications involved in supporting the order fulfillment process. Ensure there is no conflict between other applications or platforms that may include this capability, including POS embedded in unified commerce platforms.
- Rethink your workforce strategy for fulfillment execution, including the human workforce, third-party workers and automation.
- Evaluate adjacent technologies that can support fulfillment activities, like RFID, smart shelf, mixed reality, microfulfillment and smart robots.

Sample Vendors

Blue Yonder; Fluent Commerce; Kibo Commerce; IBM; Manhattan Associates; OneStock

Gartner Recommended Reading

Market Guide for Retail Distributed Order Management Systems

Best Practices for Selecting Retail Distributed Order Management Systems

Infographic: The Retail Store of Tomorrow

Quick Answer: What Is Unified Retail Commerce, and Why Does It Matter?

Conversational Commerce

Analysis By: Kelsie Marian, Hanna Karki

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Definition:

Conversational commerce (CC) utilizes messaging and other natural language interfaces to interact with people, brands or services, and bots. A key aspect is the enablement of the user to converse in their platform of choice — whether that is messaging platform, SMS, virtual personal assistant (VPA), social or voice. For example, for integrating commerce into messaging platforms, bots are typically used (e.g., Facebook Messenger) with APIs used for VPAs (like Amazon Alexa).

Why This Is Important

CC platforms automate activities that push information and choices to the users. Retail customers and associates can get pertinent answers — via message or voice — to simple frequently asked questions in real time and in a cost-effective manner. Messaging apps allow rich conversations that can include order selection and payments. It's important to note that this IP has been identified as obsolete as it's being displaced through incorporation into newer, natural language and generative AI technology capabilities.

Business Impact

Impacts include:

- Conversational platforms can support valuable conversations, especially when selling low-volume, high-margin or complex products and services.
- Reduced friction in the shopping process, increased efficiency and reduced customer service response time.
- Conversational commerce use has expanded rapidly in the last few years to extend faster, more convenient capabilities.
- Examples include service booking capabilities, transaction facilitation and answering inquiries, as well as postsales support such as refund issuance and order tracking.

Drivers

- Chatbots are transforming workflows in retail and are being used to ensure that both customers and associates receive the information they need on a timely basis. For example, providing store associates with real-time inventory data, the next best action within task management applications and the use of conversational AI at QSR drive-through lanes.
- The rapid emergence of generative AI and large language models, such as ChatGPT, are driving the expansion and growth of contextual conversational agents into every aspect of work and personal lives. As a result, customer expectations for what a chatbot can do will expand significantly over the next six to 12 months, likely leading to retailer investment.
- As natural language technologies rapidly improve in human understanding and context, retailers will need to advance to leverage more complex communications, such as suggested selling and contextually relevant conversations with customers.
- Conversational commerce, fueled by generative AI, will be an important aspect of the immersive retail experiences provided in metaverse environments.
- Conversational commerce, as an individual technology, will likely be absorbed into generative AI over the next 12 months, making it obsolete as a separate innovation profile on this Hype Cycle.

Obstacles

- Contextually relevant chatbots will need to be trained on individual retailer datasets in order to “learn” how to be good assistants.
- Retailers will need to investigate the security and privacy implications of virtual assistant implementations.
- AI-powered assistance through interactions on a variety of devices poses a new threat vector for identity thieves.
- Continuous risk assessment is needed to minimize the risk of fraud and maximize customer trust.

User Recommendations

- Conduct pilots and tests of conversational AI applications to help build customer trust. Timely and meaningful contextual conversations with customers increase customer engagement. The use of conversational agents support highly predictable activities like maintaining a grocery order or subscriptions, and delivering contextualized real-time pricing and personalization.
- Examine conversational applications for appointment booking, ordering assistance and Q&A as a means to meet customer demand and for saving on customer service costs.
- Human oversight will remain necessary to maintain customer trust. Escalated incidents should never be handed directly from a generative AI source to a customer.
- Assess the integration and capability needs between the virtual assistant and humans to ensure a smooth transition in the overall process and customer experiences. For example, a convenient and hassle-free experience of booking an appointment for an in-store beauty consultation through conversational commerce should be matched or exceeded with what happens when handed off to humans in the store.

Sample Vendors

[24]7.ai; Amazon; Amelia; Baidu; iAdvize; Yellow.ai

Gartner Recommended Reading

Choosing the Right Conversational AI Platform

Infographic: Artificial Intelligence Use-Case Prism for Long Life Cycle Retail

Infographic: Artificial Intelligence Use-Case Prism for Short Life Cycle Retail

Infographic: The Retail Store of Tomorrow

Algorithmic Retailing

Analysis By: Robert Hetu

Benefit Rating: Transformational

Market Penetration: More than 50% of target audience

Maturity: Early mainstream

Definition:

Algorithmic retailing is the application of complex data through advanced analytics, artificial intelligence (AI) and machine learning algorithms, and robotic and hyperautomation across an expanding, unified retail commerce structure. It provides business value by providing intellectual property, knowledge and insight in a reusable and repeatable form that allows retailers to meet customer expectations more effectively and efficiently.

Why This Is Important

Algorithmic retailing connects big data to results, helping retailers navigate from descriptive to prescriptive analytics. It includes the identification of data sources, data fabric, advanced analytics and application of mathematical algorithms that will lead to highly repeatable business processes. It uses AI to drive effective decision making and robotic and hyperautomation to drive execution.

Business Impact

Impacts include:

- Algorithms ensure that business activities optimize sales and drive customer support activities across the retailer's business.
- Algorithms also optimize cost of operations through hyperautomation of non-value-added, repetitive and complex data-driven tasks.

- Different from optimizing one process or task area, algorithmic retailing will ensure that the retailer's entire organization is operating at peak performance.

Drivers

- Inflation, threat of economic disruption and deglobalization are placing additional profitability pressures on retailers, forcing a renewed focus on managing costs and improving sales performance through more precise operational activities.
- Growing need to operate locally in diverse environments for greater efficiency, sales and profitability.
- Focus on customer-centric merchandising requirements that include complex customer behavior models in planning and management of assortments.
- With the advent of more AI use cases, greater overall AI adoption and rapid development of generative AI, the need to manage the business through automation is undeniable.
- New technologies have created opportunities to advance machine learning algorithms, incorporating many more data inputs and even decision-making capability.
- Complex algorithms were once the domain of scientists and academics, but with the advent of digital technologies and AI, retailers will be able to use algorithms to improve business results.
- In many cases, the action of algorithms on data can occur solely through the involvement of AI. At other times, humans will engage with algorithms that are acting as a support mechanism for business users.
- Presently, Gartner estimates that more than 50% of retailers have adopted some form of algorithmic optimization application, and expect algorithmic retailing should grow from its current penetration relatively quickly.
- Algorithmic retailing will close the gap with "AI in Retailing" as the close relationship will be required to fuel AI success with both innovation profiles arriving at the plateau at roughly the same time. Robust AI adoption, combined with expansion of automation interest, have quickly accelerated it deeper into the Trough of Disillusionment.

Obstacles

- Using algorithms effectively will require a new approach to organizational structure and the staffing required to support this new business practice.
- Many retailers have dedicated optimization applications in place; however, the business users may distrust or simply ignore the output. This is a chronic symptom of organizational distrust and/or lack of understanding.
- Retailers must invest in staff with skills in algorithmic retailing and AI. These skills are expensive and in high demand. In addition, their compensation levels are above the cultural norms of most retailers.
- Integrating Internet of Things, social media and other use cases significantly increases data volume, which will require not only algorithms but also a drive toward AI and hyperautomation as an organization strategy, requiring a significant change of mindset.

User Recommendations

- Determine utilization of optimization technologies and evaluate effectiveness by first identifying the current footprint of optimization applications. Business units may have built relationships with technology providers independently from IT, so it's important to take an inventory of the current optimization applications available to the users.
- Use Gartner research to grow your understanding of algorithms, AI and hyperautomation, and begin to identify initial areas of application, such as algorithmic optimization of merchandising activities or in-store task management. Work closely with business leaders to identify organizational impacts and generate a plan to manage the change.
- Closely observe generative AI developments. Very soon, interactions between business people and algorithms will likely be replaced by interactions between business people and generative AI chat interfaces like OpenAI ChatGPT.

Sample Vendors

Algonomy; Blue Yonder; Impact Analytics; Oracle; RELEX Solutions; Tata Consultancy Services (TCS)

Gartner Recommended Reading

Emerging Technologies and Trends Impact Radar: Artificial Intelligence in Retail

Infographic: Artificial Intelligence Use-Case Prism for Long Life Cycle Retail

Infographic: Artificial Intelligence Use-Case Prism for Short Life Cycle Retail

Preparing for the AI-Based Retail Nervous System

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

Advanced Space Planning With IVSD

Analysis By: Robert Hetu, Jonathan Kutner

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Intelligent virtual store design (IVSD) uses new processes, data and digital technologies to augment macrospace and microspace planning and in-store planogram (POG) execution. Advanced space planning includes recommendations to enhance the effectiveness of the macroassignment of fixtures, robotics and customer pathways, categories, and micromerchandise placement. Visualization created by augmented/virtual/mixed reality provides the ability to experience the plan from a customer perspective.

Why This Is Important

Investment in macrospace and microspace planning and POGs is reinvigorated by the need to support customer-centric, store-specific product assortments and new collaborative partnerships. This requires a significantly more advanced technology approach than the combination of tools typically used today to layout planning processes for new stores or remodels, such as Autodesk AutoCAD store design, Microsoft Excel spreadsheets and a physical layout center, along with the periodic business reviews.

Business Impact

Digital business must be integrated with physical store space and inventory. This technology will assist in testing, validation, increased execution speed and accuracy for layout changes, new store planning and remodeling. Visualization using augmented/virtual/mixed reality will yield significant savings over traditional methods of testing in-store merchandising ideas. It also enables innovation opportunities for retailers and manufacturers by offering economical alternatives to creating physical store labs.

Drivers

- New customer expectations and a resurgence of physical activity are pushing physical store design trends toward multiuse stores, more in-store services and new store formats.
- Hyperimmersive retail experiences lead to experimentation and adjustments in how physical selling space is used.
- In some cases, changes like store-based microfulfillment centers and less selling space per store will lead retailers to adopt IVSD.
- These applications will allow retailers to adjust their in-store merchandising, assortment and allocation decisions.
- The need for a higher degree of differentiation for in-store assortments and configurations across multiple store locations and formats.
- Emerging technologies including AI, algorithmic retailing, hyperautomation and computer vision provide greater precision for the placement of categories to maximize sales to customers frequenting each specific store.
- Virtual reality embedded in IVSD can approximate a near-physical experience of the plan to ensure execution that will most likely achieve the desired results. Infusing customer behavior and profiling dynamics into the consideration set, and the ability to visually consider many additional possibilities, will likely lead to significant changes in how product categories and services are deployed.
- IVSD that can be incorporated into modeling the operational behavior of things and processes, using virtual representations called “digital twins.”
- ISVD provides a tremendous new collaboration opportunity for retailers and suppliers to share information, cost-effectively test new concepts with consumers and ultimately ensure that customers are better served.
- IVSD is positioned in the Trough of Disillusionment and is expected to proceed toward the plateau in two to five years as retailers transition from traditional planogramming methods.

Obstacles

The following challenges will combine to keep IVSD on a five-year track to productivity:

- This technology is in the Trough of Disillusionment as there is a big disconnect between the recognition of the significance of this technology and actual adoption levels.
- Most retailers still execute POGs using paper rather than digital delivery.
- Too much reliance on Excel spreadsheets for much of the macrospace and microspace planning.
- As retailers and manufacturers explore alternative methods to facilitate the sell-in of new products, merchandising, category space allocation and overall store design, they are realizing the enormity of the challenge.
- Use cases are currently largely applied to pop-up stores, remodels and new store concepts. They have been much more difficult to deploy in existing formats due to the often inaccurate or missing location information.
- Generative AI will likely play a role in further development of virtual store design and development of immersive retail experiences but this will be a later use case.

User Recommendations

- Engage business leaders and champion the concept that advanced space planning through IVSD must support current and future use cases.
- Define clear business goals and expectations before vendor assessment is undertaken.
- Leverage computer vision and robotics to create virtual mapping of physical stores. The location of check-outs, stockrooms and other services must be considered to ensure the best possible experiences for customers at all times.
- Seek integration with shelf-space POG applications and other merchandising applications supporting assortment planning and category management.
- Connect digitally enabled POGs to in-store associates and service providers through mobile applications. This will improve the efficiency and accuracy of POG changes.
- Assess the frequency and quality of POG resets conducted over the past 18 months to determine the frequency of change and the opportunity cost of poor trend identification.
- Analyze data and application connectivity gaps within the next three months by comparing the current category management process to the IVSD approach.

Sample Vendors

Blue Yonder; IWD; One Door; RELEX Solutions; SymphonyAI; Tata Consultancy Services (TCS)

Gartner Recommended Reading

Retail Merchandising Propels Toward a Once-in-a-Lifetime Transformation

Market Guide for Intelligent Virtual Store Design Applications

Retailers Must Drive Customer-Centric Merchandising With an AI Core

Market Guide for Retail Assortment Management Applications: Long Life Cycle Products

Market Guide for Retail Assortment Optimization Applications in Merchandising

Advanced Computer Vision

Analysis By: Sandeep Unni

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Advanced computer vision (ACV) refers to the application of AI on real-world image or video streams for real-time inference to extract meaningful, contextual information from the physical world. The field has expanded to include machine vision, optical character recognition, image recognition, action and pattern recognition, facial recognition, edge detection, object detection, and classification.

Why This Is Important

- ACV combined with ML, IoT and edge computing in a store offers transformational potential to break down barriers between digital and physical touchpoints in retail.
- When integrated into store solutions, ACV can significantly increase store associate productivity and allow them to focus on higher-value, customer-oriented tasks, leading to a positive customer experience.
- The insights gleaned by ACV will enable associates to proactively identify and mitigate operational issues in the store.

Business Impact

ACV can process data at higher speeds and with better accuracy than humans. Use cases with wide-ranging business impact to transform operational efficiency include:

- Inventory management
- Planogram and pricing compliance
- Space planning
- Product search, identification and image-based attributing
- Product quality and allocation
- Product authentication
- Smart check-out
- Store cleaning and hazard identification
- Customer behavior analysis
- Loss prevention
- Virtual try-on, product fitting and assistance
- Visual search

Drivers

- Stores typically rely on costly and inaccurate manual processes carried out by store associates. The insights gleaned by ACV will enable associates to significantly improve productivity, accuracy and employee satisfaction by automating repetitive workflows in real time.
- ACV can enable autonomous check-out experiences in the store, thereby fulfilling customer expectations for greater convenience and speed, and reducing friction of check-out wait times, a basic and critical customer expectation that retailers must address.
- The data generated by tracking physical objects and identifying shopping behaviors in real time can drive granular insights of shopping trends in a given store or market, and serve greater personalization and recommendations that customers now expect when shopping.
- ACV enables analysis of customer traffic patterns, way-pathing and queue management, yielding monitoring and analytics of customer journeys in the store, and improving “store intelligence” in real time.
- Visual search has the potential to transform the product search and discovery process of a shopper’s journey and enhance the customer experience.
- In convergence with mobile technologies, AR/VR/MR and machine learning, ACV-enabled virtual try-on and product fitting use cases enable consumers to make better informed purchasing decisions, increasing conversions, reducing returns and fostering loyalty.
- ACV and image-recognition-based intelligence streamline product selection, attributing and catalog recommendation processes in merchandising, particularly in segments such as apparel, fashion and footwear.
- We expect the rise of generative AI to have a significant impact in the future to improve overall efficiency and accuracy on both training the models and inference, through image generation, classification, object detection and annotation at scale.
- We have positioned this technology further into the Trough of Disillusionment in 2023 as a result of continued uptick in retailer adoption since the COVID-19 pandemic, as well as the wide array of applications it can now enable. It is expected to reach the Plateau of Productivity within the next five years.

Obstacles

- Many ACV store deployments are still expensive, requiring retailers to justify capital expenses to outfit the solution.
- While ACV solutions to retrofit current store cameras are available, existing infrastructure may not meet required specifications.
- Many vendors offer proprietary technology with limited interoperability and ecosystem partnerships, leading to a fragmented landscape and deployment inertia.
- Privacy concerns over potential for customer detection and storage of PII data, including facial recognition, is a barrier for consumers that can erode retailer trust and engagement.
- There is still an education gap for retailers, as many are still unaware of the business outcomes and metrics that ACV deployments can materialize.
- There are usually multiple valid technologies available to solve a business problem that ACV can resolve (for example, bar codes, item-level RFID or weight sensors).

User Recommendations

- Conduct a full review of operational processes in your store environment to reveal gaps and identify opportunities where ACV can offer a competitive advantage.
- Identify one or two key processes that can be trialed for deployments as a starting point by commissioning a cross-functional innovation task force.
- Evaluate your current store camera infrastructure to validate if it meets needed specifications for ACV solutions available in the market.
- Seek solutions that offer architecture flexibility for integrations with existing store applications.

Sample Vendors

3DLOOK; Amazon Web Services; Dahua Technology; Deep North; Everseen; Johnson Controls (Sensormatic Solutions); Syte; ViSenze

Gartner Recommended Reading

Emerging Tech: Revenue Opportunity Projection of Computer Vision

Market Guide for Retail Smart Check-Out Solutions

Infographic: Artificial Intelligence Use-Case Prism for Long Life Cycle Retail

Infographic: Artificial Intelligence Use-Case Prism for Short Life Cycle Retail

Market Guide for Intralogistics Smart Robots in Retail

Item-Level RFID in the Store

Analysis By: Sandeep Unni

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

Item-level RFID technology in the retail store involves tagging and identifying individual inventory units through the transmission of radio waves between an RFID-tagged product and RFID reader. The tags utilized are passive (non-battery-powered) and the system typically operates in the ultrahigh frequency (UHF) spectrum in the 860 to 960 MHz band.

Why This Is Important

Item-level RFID solutions can enable better business outcomes in the retail store through inventory accuracy, cycle counts, efficient store fulfillment of online orders, faster replenishment, improved fraud/loss prevention and increased customer engagement. Effective RFID capabilities can provide easier facilitation of unified retail commerce and greater operational efficiency. Item-level RFID can also enable more immersive in-store experiences for consumers as well as the store associate.

Business Impact

Item-level RFID impacts retailer operations by:

- Significantly improving inventory accuracy, typically beyond 98%.
- Enabling real-time visibility of inventory across the supply chain.
- Increasing store associate workflow efficiency and reducing labor costs.
- Improving loss prevention as well as accurate identification of counterfeit products, thereby reducing fraud.

- Boosting loyalty and retention through increased customer engagement by bridging the online and offline offerings.

Drivers

- Item-level RFID supports optimization of a variety of tasks within the retail store, including inventory visibility and accuracy — a top area of operational efficiency that retailers must address urgently.
- For many retailers, over 50% of online orders are fulfilled from stores. Ensuring stock availability and picking those orders efficiently and accurately is critical. Item-level RFID can quickly and accurately identify the location of goods to be picked on the shelf or backroom.
- The technology improves the in-store experience of store associates by reducing time spent on laborious tasks and in turn reallocating it to more value-added, engaging activities.
- RFID-based smart check-out has seen a rise in adoption, driven by the continued need for more seamless store experiences.
- Shrinkage continues to be a major contributor to inventory loss and operational costs, estimated by the National Retail Federation to cost almost $100 billion in FY21. RFID-enabled EAS solutions can proactively monitor and deter loss through theft.
- Real-time visibility of products, understanding product performance, and adjusting assortments and allocations can be done more quickly and accurately with item-level RFID. This data is highly sought out by suppliers and manufacturers, potentially becoming a revenue opportunity.
- Recent supplier tagging mandates issued by large global retailers will require suppliers to increase their tagging penetration of manufactured goods. Over time, it may be more cost-effective to tag all items from the factory instead of doing separate runs for goods destined for specific retailers, improving economies of scale overall.
- The advent of generative AI in retail could unlock significant opportunities for combining the large amount of real-time item-level data produced by RFID with the processing power of AI for upstream inventory management across a retailer's enterprise.
- Continuing item-level RFID investments to streamline store operations have started to move this innovation out of the trough in 2023. Time to plateau is still projected for five to 10 years, though some retail segments such as apparel, footwear and fashion are well ahead of that timeline.

Obstacles

- Segments like grocery, convenience, drugs, cosmetics and beauty have had slower adoption due to tag readability challenges from metal containers, liquid products or in variable temperature environments (heat, cold, moisture or microwaves).
- Adoption in multidepartment big box stores has been largely restricted to nonfood categories such as apparel and home goods.
- Strategies for source tagging (i.e., at the point of manufacture) need to be considered to derive optimal implementation benefits across the retailers' supply chain. This poses significant operational complexities for retailers when they don't own manufacturing or are reliant on multiple production sources.
- When item-level tagging is implemented in addition to case or pallet level, the cost considerations are significant for the unit economics and business case to scale successfully.
- The organizational change management associated with item-level RFID technology onboarding and implementation is still a deterrent.
- Overall deployment cost and competing investment priorities remain challenges for widespread adoption.

User Recommendations

- Conduct a comprehensive baseline assessment of current inventory accuracy levels to determine whether item-level RFID implementation can improve inventory accuracy.
- Determine the value that implementing item-level RFID will provide to the overall business by modeling the end-to-end business process beyond store operations.
- Evaluate your key physical store processes and customer-facing interactions to understand which would most benefit from item-level RFID.

Sample Vendors

Avery Dennison; Beontag (Temera); Checkpoint Systems; Honeywell; Impinj; Johnson Controls (Sensormatic Solutions); Nedap; SimplyRFID; SML; Zebra Technologies

Gartner Recommended Reading

When and Why Enterprises Should Implement RFID to Track Critical Assets

The Contemporary Guide to Retail Supply Chain Excellence: Part 1 — Inventory and Assortment

Top Unified Retail Commerce Execution Trends for CIOs 2023

Climbing the Slope

Assortment Management Applications

Analysis By: Jonathan Kutner, Robert Hetu

Benefit Rating: High

Market Penetration: More than 50% of target audience

Maturity: Mature mainstream

Definition:

Retail assortment management applications (RAMAs) support business processes critical to meeting customers' needs by ensuring the best possible assortment of products. RAMA covers the operational functions of advanced assortment/range planning for both short- and long-life cycle product categories including preperiod and in-period planning and analysis, store clustering, assortment/financial plan reconciliation, inventory and replenishment planning, and open to buy calculations.

Why This Is Important

Gartner estimates that Microsoft Excel is the most common assortment management tool. Based on hundreds of retailer inquiries, over 50% of Tier 1 and Tier 2 grocery and specialty retailers are still assorting on spreadsheets. RAMA enables retailers to present targeted assortments to support in-store execution of unified retail commerce and insights into customer behavior to align assortments to their lifestyles. RAMA enables retailers to create a precise range of products, resolving cluttered assortments.

Business Impact

Customers' expectations of a personalized shopping experience continue to challenge retailers as they pursue digital business transformation through unified retail commerce. Without RAMA product ranges are more likely to be confusing and not in line with consumers' values. Implementing RAMA solutions will allow retailers to transition toward a more intelligent curation of precisely targeted assortments that are margin-optimized for revenue growth and will reduce waste-driven costs.

Drivers

- High return rates for seasonal and apparel products erode margin and are forcing retailers to leverage assortment optimization tools to create more tailored assortments and precise inventory demand forecasting to drive lower customer returns.
- To enable strategic listing — and regular delisting — of stock keeping units (SKUs), led by investments in artificial intelligence (AI)-led solutions to grow revenue and profit margins.
- Unprofitable discounting to clear excess inventory is costly and reduces product margins.
- Values-conscious consumers are becoming increasingly vocal about ethics and sustainability issues so expect retailers to cut down on waste.
- Customers expect retailers to edit down product choices as they are increasingly frustrated by wide assortments and stock-out gaps.
- Customers are demanding more locally-sourced goods, RAMA can help retailers implement store-specific assortments beyond the “clustering” approach.
- Physical selling footprints in stores are being reduced, leaving less space in store to display products and instead to create room for in-store experiences.
- A tectonic shift in merchandising is occurring forcing a move away from product-led hierarchy planning toward customer behavior hierarchies.
- Only by leveraging AI-driven RAMAs will merchandisers have the ability to create meaningful combinations of products for various customer segments.
- Intake margins for short life cycle products have declined due to a fundamental shift in global supply chains. Inaccurate buying leading to surplus products, will have a more severe impact on a retailers’ profitability.
- The emergence of generative AI will further enhance the capability for merchandisers to evaluate the assortments of rival retailers and feed the data into RAMAs to assess the competitiveness against their own ranges.
- RAMA is now progressing through the Slope of Enlightenment, as more retailers pursue implementations, RAMA progresses on the two- to five-year path to the Plateau of Productivity.

Obstacles

- Although this technology is progressing rapidly into the Slope of Enlightenment, there remains a disconnect between the recognition of the significance of solutions and actual adoption levels.
- Implementations have been slow and difficult to date, as retailers grapple with competing technology investment priorities across the entire organization.
- Overcoming the pervasive role of Microsoft Excel in merchandising processes remains a significant challenge for retailers, including pride of ownership among merchandising teams.
- Many organizations continue to underestimate change management to help merchandisers navigate the anticipated dramatic changes to how they work.
- For short life cycle retail, implementation of best-in-class merchandise financial planning (MFP) solutions is required to complement RAMAs and form an intertwined end-to-end planning process.
- Implementing RAMA is a complex process, it will require both merchandising and buying teams to redesign their working practices.

User Recommendations

- Invest in cloud-based RAMA solutions that have embedded advanced AI capabilities in order to enable more precise and targeted customer centric assortments.
- Provide tools to ensure that diverse fulfillment activities are considered when building assortment plans to reduce risks from safety stock or overbuying, and improve margins and limit dead inventory.
- Process map the “as is” and to-be-orchestrated category management process with RAMAs at its center to support optimized planning and execution.
- Build compliance metrics to align with customer expectations and regulatory guidelines for ethical and sustainability objectives.
- Seek out best in class RAMAs, which ensure analysis, segmentation and working practices put the customer, not products, first, to produce true customer-centric assortments.
- Analyze how implementation of MFP will impact RAMA to ensure a seamless user experience and working capability. Best practice is to operate both on the same platform and ideally from the same vendor.

Sample Vendors

Board; Dunnhumby; Impact Analytics; o9; Tata Consultancy Services; ToolsGroup

Gartner Recommended Reading

Market Guide for Retail Assortment Management Applications: Long Life Cycle Products

Market Guide for Retail Assortment Management Applications: Short Life Cycle Products

Retailers Must Drive Customer-Centric Merchandising With an AI Core

Market Guide for Retail Merchandise Financial Planning

Market Guide for Retail Assortment Optimization Applications in Merchandising

AI in Retail

Analysis By: Robert Hetu, Kelsie Marian

Benefit Rating: Transformational

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Artificial intelligence (AI) in retail includes technologies in varying degrees of hype. In current popular cases, AI refers to systems that change behaviors without being explicitly programmed based on data collected, usage analysis and other observations. These systems identify and classify input patterns, probabilistically predict and operate unsupervised. AI in retail is a key enabling technology for algorithmic retailing and is likely included within vendor-provided business applications.

Why This Is Important

AI is the driver of retail process change by enabling transition to customer centricity through increased speed and accuracy of analysis and execution. Implemented use cases include demand forecasting, marketing through personalization, social media, loyalty programs, chatbots for customer service, and fraud/threat detection. These capabilities generally come through packaged vendor solutions with embedded AI. Generative AI will increasingly become the driver of AI in retail.

Business Impact

AI capabilities will enrich merchandising, marketing and supply chain, where the associate and historical data input requirements are high by leveraging machine learning (ML), automated machine learning (AutoML), deep neural networks (DNNs) and other sophisticated modeling. Additionally, smart data discovery tools put information in the hands of business users to transform the organization by providing the ability to analyze big data and take appropriate actions to expand business opportunities.

Drivers

- New use cases are emerging, including anticipatory shipping, personalized offers, highly flexible assortments and inventory that require knowledge and prediction of customer behavior.
- Supply chain issues, global sourcing disruption, inflation and economic strain are driving margin pressures.
- Technology vendors are incorporating AI as part of intelligent retail business applications along with a growing interest in hyperautomation to improve efficiency.
- Precision is requiring more frequent changes, decisions and variation across touchpoints.
- New AI tools and capabilities are in constant development, including edge AI, advanced computer vision, large language models, generative AI, and graph technologies.
- Successful use cases and quantified benefits are existent across many unified retail commerce processes.
- Expanding data sources are fueling the belief among business users that greater levels of predictability are possible.
- A growing focus on sustainability is leading to exploration of AI solutions to reduce waste and increase process efficiencies.
- Workforce labor shortages are causing retailers to look for automation to augment and upskill workers.
- These drivers have pushed AI out of the Trough of Disillusionment from 2022. Based on responses from retail CIOs to the 2023 Gartner CIO and Technology Executive Survey, 50% will have already adopted AI by the end of 2023. We expect this technology to continue to move up the Slope of Enlightenment, reaching the Plateau of Productivity within the next five years.

Obstacles

- Organizational resistance to change that can lead to long implementation is inevitable. Business users continue to express concern about black box operations and lack of transparency.
- There are concerns about the ethical application of AI, removal of bias and privacy of customer data. This has expanded in recent months due to the quick onslaught of generative AI solutions, such as ChatGPT.
- Global legislation on data privacy and the future of AI is still evolving.
- Data management and overall challenges concerning clean data and replication of data and errors from diverse silos are issues.
- Wage inflation and high-tech competition for talent prevent many retailers from gaining skilled workers.
- Significant costs come from adding AI solutions on top of other digital transformation needs.

User Recommendations

- List AI-enabled projects planned or in progress and identify strategic importance.
- Plot projects on the strategic AI use case prisms for retail to engage with senior business leaders to discuss AI.
- Develop long-range plans for strategic AI investments and track the maturity of relevant AI technologies.
- Measure projects, including cost optimization gains and reallocation of funds for digital transformation.

Sample Vendors

Amazon Web Services (AWS); Eversight; Google; Microsoft; Peak; RELEX Solutions

Gartner Recommended Reading

Infographic: Artificial Intelligence Use-Case Prism for Short Life Cycle Retail

Infographic: Artificial Intelligence Use-Case Prism for Long Life Cycle Retail

Emerging Technologies and Trends Impact Radar: Artificial Intelligence in Retail

Preparing for the AI-Based Retail Nervous System

Retailers Must Drive Customer-Centric Merchandising With an AI Core

IoT-Based Store Monitoring

Analysis By: Sandeep Unni, Max Hammond

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Definition:

IoT-based store monitoring involves technologies to monitor, analyze and display retail store activity through real-time dashboards via signals and alerts from real-time IoT data sources within the store. These can include inputs from traffic counters, cameras, sensors, smart shelves, beacons, smart check-out, smart robots, unified commerce platforms, camera-based computer vision, loss prevention (LP) video, Wi-Fi and mobile triangulation, RFID or other connected devices.

Why This Is Important

- IoT-based store monitoring is integral to understanding the operating pulse of a store in real time, to generate continuous intelligence of store operations.
- Understanding in-store customer behavior and operational efficiency is essential as stores are the critical and essential component of overall retailer profitability.
- A cohesive data and analytics strategy leveraging physical store data and AI technologies is critical for retailers' digital transformation journeys.

Business Impact

IoT-based store monitoring helps build customer and associate behavior models based on monitoring of store traffic patterns. It offers customer service and in-store experience through analyzing shopper behavior, waypathing, check-out queues and in-aisle dwell times, and increases sales through improvements in stock availability, merchandising and space planning, real-time pricing, and upselling/cross-selling. It also reduces cost significantly by improving LP, associate productivity and store energy efficiency.

Drivers

- IoT endpoints continue to proliferate in the store. These include “things” that can enable real-time store visibility and monitor/influence customer behavior, such as smart shelf, electronic shelf labels (ESLs), item-level RFID, computer vision, 3D sensors, traffic counters, store analytics sensors (e.g., motion, temperature, sanitization sensors), indoor location sensors, connected dressing rooms and smart check-out.
- It is critical for retailers to glean insights from the store environment in real time or near real time, from the deluge of data generated from in-store IoT solutions through machine learning (ML) or advanced analytics capabilities.
- The National Retail Federation estimates that retail theft from organized retail crime (ORC) increased by 26.5% on average in 2021. Real-time monitoring and surveillance of store operations improves loss prevention and shrink, thereby significantly reducing operational costs, and improving customer and associate safety.
- Real-time monitoring and alerting offers capabilities including people counting and tracking, customer heat maps and in-aisle dwell times, and can trigger proximity marketing through shoppers’ mobile devices to enrich the store experience.
- Inputs from real-time monitoring can enable design of a “digital twin” of the store and inform creation of intelligent virtual store designs (IVSD).
- Store monitoring will become imperative for digital business as retailers move toward servicing customer lifestyles and cross over to other industries. One example is the use of computer vision technology for increased collaboration and data sharing between retailers and consumer goods companies.
- IoT-based store monitoring technologies are currently in the post-trough position. Market fragmentation and the still-emergent state of IoT solution adoption in the retail stores have prevented more rapid movement along the slope. As generative AI capabilities mature, more use cases will evolve to assimilate the vast amounts of data from these IoT solutions to generate business intelligence, provide analytics insights and unlock operational efficiency. We expect this innovation to reach the plateau within the next five years.

Obstacles

- The retail IoT landscape remains heavily fragmented, with dozens of retail-focused IoT providers with narrow presence in select use cases or technologies. Vendor collaborations and ecosystem partnerships are still emerging.
- There is no single platform or solution that integrates all the components and real-time data inputs from endpoints that retailers can buy off the shelf.
- Ability for real-time store monitoring depends on the reliability and resiliency of store infrastructure as well as available network connectivity.
- Most retailers have limited or no local IT staff, making monitoring and management of in-store applications and infrastructure a challenge.

User Recommendations

- Prioritize IoT-based store monitoring solution investments by greenlighting at least one new pilot program in alignment with your store operations stakeholder needs.
- Ensure compatibility of existing store applications with real-time data and analytics integration by directing your store's architects to undertake a review of the application architecture.
- Evaluate solutions using a best-of-breed approach through vendor ecosystem relationships and customer references from peer retailer implementations.

Sample Vendors

Johnson Controls (Sensormatic Solutions); Kepler Analytics (CountWise); Pathr.ai; RetailNext; Signatrix; Zebra Technologies

Gartner Recommended Reading

Infographic: Artificial Intelligence Use-Case Prism for Long Life Cycle Retail

Infographic: Artificial Intelligence Use-Case Prism for Short Life Cycle Retail

Magic Quadrant for Indoor Location Services

Technology Opportunity Prism: Indoor Location Services in Commercial Spaces

Workforce Analytics

Analysis By: Kelsie Marian

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Definition:

Workforce analytics combines tools, analysis and output that enables retailers to improve frontline store employee performance, measurement and decision support in retail store operations for improved employee engagement and productivity. This positively impacts business outcomes through enhanced customer experiences. Applications include optimized scheduling, labor compliance, recruiting, training, performance management, and analysis for increasing retention and reducing employee turnover.

Why This Is Important

Workforce analytics uses workforce-related data to make resource planning and business decisions. It combines data such as employee engagement (employee surveys and voice of employee data), social network data (customer review and satisfaction data), employee application data (communications and microlearning usage), IoT data (connected badges), and business performance data (revenue/sales). It then generates insights about the impact of employee performance and productivity on customer satisfaction and unified retail commerce execution.

Business Impact

- Retailers know employees are a critical asset in a competitive retail environment and have a direct impact on customer experiences.
- Combining people and touchpoint-related data with business data and data from store IoT solutions will assist in uncovering insights into where changes should be made or successes replicated strategically across the physical store estate.
- In the future, generative AI may provide new ways of analyzing work behaviors, patterns and processes as well as redefining work processes in their own right.

Drivers

- Retailers across all segments are ramping up efforts to optimize labor portfolios and scale digital workplace environments — particularly in physical stores. This includes increased investment in mobile, AI and automation, which increases the opportunity for analysis of store associate performance (e.g., productivity gains resulting from hybrid human-machine workflows both in the store and headquarters locations).
- The current tight labor market, along with rising demand for same-day pay and shared workforces, has driven retailers to further scrutinize and prioritize workforce productivity.
- While retailers have used transactional metrics such as cost per hire or turnover strategically for some time, the combination of these metrics along with, for example, the use of in-store IoT, real-time task management and communications data are now prevalent. As a result of these factors, this profile is now progressing up the Slope of Enlightenment and will likely reach the Plateau of Productivity in the next 12 to 18 months.

Obstacles

- Different business contexts require the measurement of various workforce metrics for employees and associates, particularly as retailers rethink store formats, configuration and workflows to support the execution of unified retail commerce.
- Retailers continue to grapple with process and technology changes needed to execute major unified commerce processes, such as buying online, and pickup in-store (BOPIS). As a result, many retailers are still working to efficiently calculate, track and communicate results around those metrics, despite the availability and breadth of tools to enable such insight.

User Recommendations

- Evolve your workforce and talent management applications by working closely with HR, analytics and application leaders to evaluate the analytic capabilities of their tools for breadth of functionality, flexibility to meet new business needs and ability to incorporate data from a variety of sources.
- Leverage data from multiple sources, including schedule optimization and task-related tools, to improve productivity and effectiveness. For example, measure employee engagement through the voice of the employee (VoE) analytics.
- Use findings to inform talent management strategies to fill resource gaps, such as hiring versus internal development.
- Reward store managers on increased store associate development and performance, for example, by adjusting pay for associates who may be overperforming but are yet to be acknowledged.
- Collaborate with store operations leaders to evaluate how generative AI will impact store associates regarding the redefinition of their work processes and workflows.

Sample Vendors

Ceridian; IBM; UKG; Workday

Gartner Recommended Reading

Analytics Prioritization Principles (Gap Inc.)

Infographic: The Retail Store of Tomorrow

Appendixes

See the previous Hype Cycle: Hype Cycle for Retail Technologies, 2022

Hype Cycle Phases, Benefit Ratings and Maturity Levels

Table 2: Hype Cycle Phases

(Enlarged table in Appendix)

Phase	Definition
Innovation Trigger	A breakthrough, public demonstration, product launch or other event generates significant media and industry interest.
Peak of Inflated Expectations	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.
Trough of Disillusionment	Because the innovation does not live up to its overinflated expectations, it rapidly becomes unfashionable. Media interest wanes, except for a few cautionary tales.
Slope of Enlightenment	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.
Plateau of Productivity	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.
Years to Mainstream Adoption	The time required for the innovation to reach the Plateau of Productivity.

Source: Gartner (July 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 (July 2023)

Table 4: Maturity Levels

(Enlarged table in Appendix)

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

Source: Gartner (July 2023)

Document Revision History

Hype Cycle for Retail Technologies, 2022 - 21 July 2022

Hype Cycle for Retail Technologies, 2021 - 14 July 2021

Hype Cycle for Retail Technologies, 2020 - 29 July 2020

Hype Cycle for Retail Technologies, 2019 - 31 July 2019

Hype Cycle for Retail Technologies, 2018 - 25 July 2018

Hype Cycle for Retail Technologies, 2017 - 17 July 2017

Hype Cycle for Retail Technologies, 2016 - 12 July 2016

Hype Cycle for Retail Technologies, 2015 - 17 July 2015

Hype Cycle for Retail Technologies, 2014 - 22 July 2014

Hype Cycle for Retail Technologies, 2013 - 18 July 2013

Hype Cycle for Retail Technologies, 2012 - 27 July 2012

Hype Cycle for Retail Technologies, 2011 - 21 July 2011

Hype Cycle for Retail Technologies, 2010 - 26 July 2010

Hype Cycle for Retail Technologies, 2009 - 20 July 2009

Hype Cycle for Retail Technologies, 2008 - 26 June 2008

Hype Cycle for Retail Technologies, 2007 - 3 July 2007

Hype Cycle for Retail Technologies, 2006 - 5 July 2006

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Quick Answer: What Is Unified Retail Commerce, and Why Does It Matter?

Quick Answer: What Should Retailers Know About ChatGPT?

5 Best Practices to Attract and Retain Excellent Retail Store Associates

Table 1: Priority Matrix for Retail Technologies, 2023

Benefit ↓	*Years to Mainstream Adoption*			
	Less Than 2 Years ↓	***2 - 5 Years*** ↓	***5 - 10 Years*** ↓	***More Than 10 Years*** ↓
Transformational		Advanced Computer Vision AI in Retail Algorithmic Retailing Frontline Worker EXTech in Retail Generative AI Intralogistics Smart Robots IoT-Based Store Monitoring Smart Check-Out Unified Commerce Platform	Edge Computing in Retail Non-Fungible Tokens Retail Industry Cloud Platforms Store Inventory Management	Metaverse Web3
High		Advanced Space Planning With IVSD Assortment Management Applications Distributed Order Management Retail Media Technology Platforms Smart Shelf Workforce Analytics	AR/VR/MR in Retail Contextualized Real-Time Pricing Item-Level RFID in the Store Store-Based Microfulfillment Centers	

Benefit	*Years to Mainstream Adoption*			
↓	***Less Than 2 Years*** ↓	***2 - 5 Years*** ↓	***5 - 10 Years*** ↓	***More Than 10 Years*** ↓
Moderate		In-Store Live Commerce		
Low				

Source: Gartner (July 2023)

Table 2: Hype Cycle Phases

Phase	*Definition*
Innovation Trigger	A breakthrough, public demonstration, product launch or other event generates significant media and industry interest.
Peak of Inflated Expectations	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.
Trough of Disillusionment	Because the innovation does not live up to its overinflated expectations, it rapidly becomes unfashionable. Media interest wanes, except for a few cautionary tales.
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Phase	Definition

Source: Gartner (July 2023)

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Benefit Rating	Definition
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Source: Gartner (July 2023)

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Maturity Levels ↓	*Status* ↓	*Products/Vendors* ↓
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Source: Gartner (July 2023)