Market Guide for Unified Price, Promotion and Markdown Optimization Applications, 2018

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Aggressive, comprehensive and brand-right pricing strategies supporting unified commerce are a capability gap for many retailers. Retail CIOs can use this research for insight into the UPMMO technology market and associated vendors to deploy algorithmically driven, real-time, cross-channel pricing.

Key Findings

- Retailers operate in a dynamic marketplace where online price changes happen in real time, effectively leaving them unable to compete using traditional approaches for pricing in store.

- In highly competitive categories, the moment a traditional price optimization cycle is completed, the results are no longer accurate.

- Indications of a growing bifurcation between preperiod price planning and in-period price execution are now evident.

- The vigorous nature of consumer pricing will express itself as contextualized pricing in real time.

- Unified price, promotion and markdown optimization (UPPMO) will move into the Plateau of Productivity in the next two years without resolving the dilemma of real-time pricing.

Recommendations

Retail CIOs seeking to implement customer-centric merchandising and marketing technologies, such as UPPMO, should:

- Define a unified commerce pricing strategy focused on a consistent customer experience by proactively collaborating with the business leaders.

- Evaluate how mobile and loyalty strategies can be leveraged to offer consumers visibility for real-time, personalized pricing.

- Use caution when evaluating vendor offerings for contextualized real-time pricing, as only a handful currently offer the capability.

- Focus on both analytics and execution as they consider adopting real-time pricing.

Market Definition

UPPMO is technology that uses predictive analytics and optimization capabilities to plan and manage every aspect of pricing (i.e., initial, regular, promotion and markdown). This technology can provide improved pricing and promotion planning and management throughout the entire life cycle of the merchandise. Individual price, promotion and markdown optimization solutions are being combined to form a unified solution to better align with the way that price is managed during the product's life, whether short-seasonal products or multiyear basic replenishment items.

Market Description

Major software players offer all optimization types; however, there are still best-of-breed providers of individual optimization applications. Table 1 shows how vendor support aligns with various retail segments.

Table 1. Vendor Solution Support by Retail Industry Segment

Vendor	Apparel/ Footwear	Consumer Electronics	Consumer Goods	Convenience	Grocery	Drug Store	General Merchandise	Home Improvement	Ware Clubs
Advanced Pricing Logic									
dunnhumby (Aptaris)	√	√	√	√	√	√	√	√	√
Blue Yonder	√	√	√	√	√	√	√	√	√
Clear Demand	√	√	√	√	√	√	√	√	
Daisy Intelligence					√	√	√		
dunnhumby			√		√	√	√		
Engage3	√	√	√	√	√	√	√	√	
First Insight	√		√				√	√	√
IBM	√	√	√	√	√	√	√	√	√
JDA	√	√	√	√	√	√	√	√	√
NTT DATA	√	√	√		√	√			
Opalytics	√	√	√				√	√	
Oracle	√	√	√	√	√	√	√	√	√
McKinsey & Co. (Periscope)	√	√	√	√	√	√	√		
Retail Express				√	√	√	√		
Revionics	√	√		√	√	√	√	√	√
Rubikloud			√	√	√	√	√		
SAP	√		√		√	√	√	√	√
SAS	√	√	√	√	√	√	√	√	√

Vendor	Apparel/ Footwear	Consumer Electronics	Consumer Goods	Convenience	Grocery	Drug Store	General Merchandise	Home Improvement	Ware Clubs
SO1					√	√			

Source: Gartner (June 2018)

Within each industry segment, capabilities and types of optimization prioritized vary. While the goal is a unified approach, as Table 2 shows, not every vendor supports all types of price optimization.

Table 2. Vendor Solution Support by Type of Optimization

Vendor	Competitive and Market Analysis	Initial Price Optimization	Regular Price Optimization	Promotional Price Optimization	Markdown Price Optimization
Advanced Pricing Logic	√		√	√	√
dunnhumby (Aptaris)				√	
Blue Yonder	√		√		√
Clear Demand	√	√	√	√	√
Daisy Intelligence		√	√	√	√
dunnhumby	√		√	√	
Engage3	√		√		
First Insight	√	√	√	√	√
IBM	√		√	√	√
JDA	√	√	√	√	√
NTT DATA	√	√	√		√
Opalytics		√	√	√	
Oracle	√	√	√	√	√
McKinsey & Co. (Periscope)	√	√	√	√	√
Retail Express	√	√	√	√	√
Revionics	√	√	√	√	√
Rubikloud	√		√	√	√
SAP	√			√	
SAS	√	√	√	√	√
SO1				√	

Source: Gartner (June 2018)

Common requirements that Gartner has identified and researched for the UPPMO market are shown in Tables 3 and 4.

Table 3. Critical Capabilities by Optimization Type

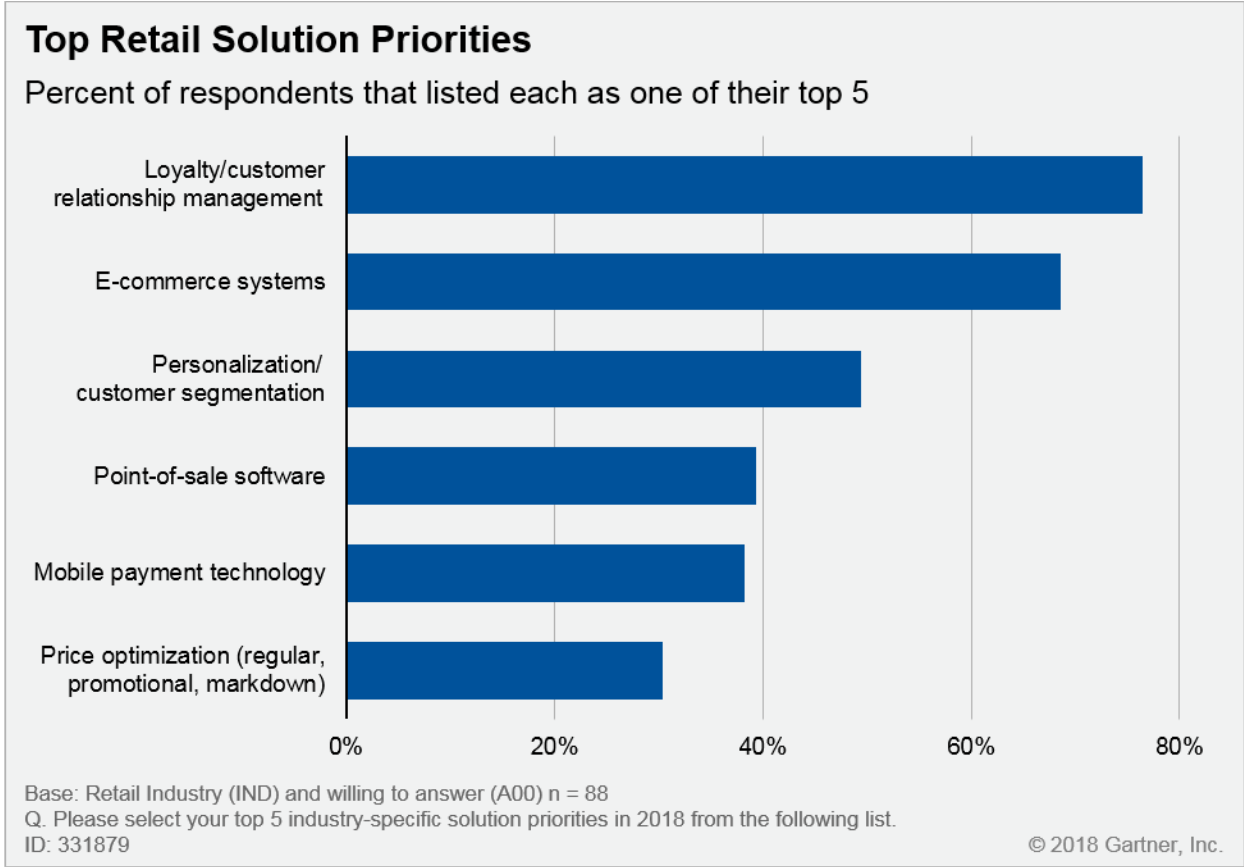| Common Requirements	Competitive or Market Intelligence	Initial Price Optimization
- Support what-if scenarios - Support pricing zones - Support cluster and store-specific pricing - Support e-commerce channel pricing - Export pricing to third-party execution systems - Import data from merchandise financial planning application	- Gather brick and mortar competitive/market data - Gather online competitive/market data - Monitor MAP pricing compliance - Support advanced matching of similar items based on attributes - Support advanced matching of similar items based on image analysis - Support strategic competitive pricing analysis - Use historical item/style data to suggest initial price	- Forecast sales based on initial pricing model - Use customer/employee socialization to suggest initial price - Use gamification technologies to suggest initial price

Source: Gartner (June 2018)

Table 4. Critical Capabilities by Optimization Type

Regular Price Optimization	Promotional Price Optimization	Markdown Price Optimization
■ Integrated with promotional and markdown price optimization ■ Support key item pricing ■ Support personalized customer pricing ■ Support use of sourced competitive pricing and market data ■ Utilize customer data from loyalty and other third-party data sources ■ Optimize supplier trade promotion funding ■ Utilize inventory availability, cannibalization and suitability	■ Integrated with regular and markdown price optimization ■ Manage promotional planning workflows ■ Model flyer layout and product placement ■ Model layout for digital advertising, including social media, email, text and application support ■ Optimize supplier trade promotion funding ■ Provide promotional planning calendars and applications for planning and management of promotions ■ Select from supplier-funded options for promotions ■ Support advertising zones ■ Support competitive pricing and market data ■ Support personalized customer promotional pricing	■ Import historical data including sales, inventory and margins ■ Integrated with regular and promotional price optimization ■ Support markdowns at the store/style/color level ■ Use planned out-of-stock date to calculate anticipated markdown ■ Utilize external application data, such as weather or other trend data

Source: Gartner (June 2018)

Price optimization is largely accepted as a required technology for doing business and identified by 30% of retailers surveyed in Gartner's 2018 CIO Survey as one of their top five technology priorities. Yet, it is dwarfed by loyalty/CRM, personalization/segmentation and mobile payments (see Figure 1).

Top Retail Solution Priorities

Percent of respondents that listed each as one of their top 5

Base: Retail Industry (IND) and willing to answer (A00) n = 88
Q. Please select your top 5 industry-specific solution priorities in 2018 from the following list.
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Source: Gartner (June 2018)

The opportunity and challenge for retailers will be combining the use of these technologies as part of their execution of a contextualized, real-time pricing strategy. Gartner has found that most large retailers are struggling to reach the fourth stage of maturity for UPPMO. Key indicators include a consistently high inquiry volume by Gartner clients, although there are variations by retail segment. For example, regular price optimization is more advanced in large grocery operations. As Figure 2 shows, maturity is hovering around Level 3, resulting in failure to achieve the significant business benefits derived from more complete adoption.

Figure 2. UPPMO Maturity Curve

Figure 2. UPPMO Maturity Curve
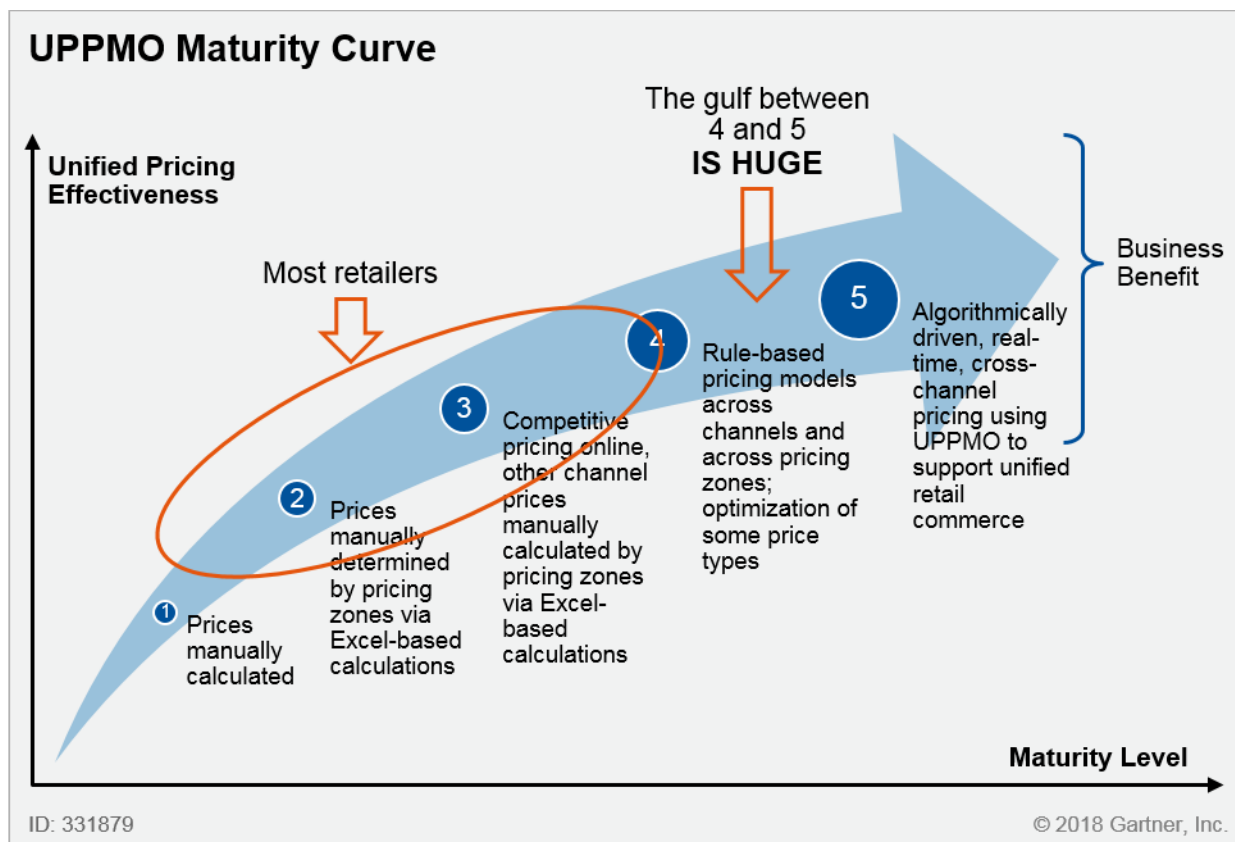
Source: Gartner (June 2018)

Ultimately, the distance between Levels 4 and 5 is more of a chasm that must be crossed. As such, it's imperative that retailers continue to invest in UPPMO technologies to support preperiod planning, develop more consistent and comprehensive pricing policies, and prepare for real-time pricing.

Market Direction

Two vendors lead the market with the highest share of retail implementations — IBM and Revionics. However, there are more than 20 active vendors, with many of the new entrants coming from the artificial intelligence domain. Major factors driving differentiation among vendors include:

- Use of artificial intelligence (AI) throughout the UPPMO process

- High-quality visualizations that help business users understand recommended prices

- Integrated processes across all pricing types and channels

- Integration with campaign management

- Provision of promotion planning/calendars/layout capabilities

- Tighter integration with pricing-execution systems

- Use of customer data for personalization

Market Analysis

Indications of a growing bifurcation between preperiod price planning and in-period price execution are evident. As Figure 3 illustrates, Gartner expects that Levels 1 through 4 will comprise the sum of all UPPMO activities and that a new discipline of contextualized real-time pricing to support unified retail commerce will emerge.

Figure 3. Bifurcation of the UPPMO Process Creates a Split Between Planning and Execution

Bifurcation of the UPPMO Process

In-Period Execution

Preperiod Planning

Real-Time Pricing Across Channels

Initial Price Optimization

Online Competitive Price Optimization

Promotion Price Optimization

Markdown Price Optimization

Regular Price Optimization

+ Cross-Channel CRM, Loyalty, Behavior

+ Consumer Social Collaboration

+ Competitor Identification, Data, Positioning & Strategy

+ Ad Calendar, Promotional History, Vendor Funds, Advertising Media History

+ Product Life Cycle Plan; Weather; Inventory On Hand, On Order and In Transit by Location

POS Transactions, Sales History, Merchandise Financial Plan, MAP, MSRP, Location, Zone, Planogram, Climate

1   2   3   4   5

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Source: Gartner (June 2018)

For retailers, contextualized pricing in real-time pricing is defined as the retailer's ability to manage and adjust prices for customers in real time, across all channels, based on a wide variety of considerations. These include competitive pricing, promotional cadence, customer loyalty and availability.

Representative Vendors

The vendors listed in this Market Guide do not imply an exhaustive list. This section is intended to provide more understanding of the market and its offerings.

Table 5. Representative Vendors in UPPMO

Vendor	Product, Service or Solution Name
Advanced Pricing Logic	PRICEXPERT
dunnhumby (Aptaris)	Aptaris powered by dunnhumby
Blue Yonder	Blue Yonder Price Optimization
Clear Demand	OmniChannel Demand Management
Daisy Intelligence	Daisy Price Optimization
dunnhumby	PriceStrat: Price Optimisation, Enterprise Promotions Management
Engage3	MissionControl competitive intelligence platform (CIP) and competitive price response (CPR)
First Insight	InsightPricing, ElastiCast
IBM	IBM Price Management, IBM Price Optimization, IBM Promotion Planning, IBM Promotion Optimization
JDA	JDA Strategic Pricing, JDA Pricer, JDA Promotions Management & Optimization
McKinsey & Co. (Periscope)	Periscope Price Advisor, Personalization Advisor, Promotion Advisor
NTT DATA	4Price
Opalytics	Predictive Analytics for price optimization, Opalytics Price Optimization, Opalytics Promotion Optimization
Oracle	Assortment Planning & Optimization (APO), Oracle Retail Regular Price Optimization (RPO), Oracle Retail Offer Optimization (OO), Oracle Retail Promotion Planning
Retail Express	RE 2.0 merchandising
Revionics	Revionics Price Suite, Revionics Dynamic Pricing, Revionics Promotion Suite
Rubikloud	Promotion Manager and Customer LifeCycle Manager
SAP	Promotional Management for Retail (PMR)
SAS	Retail Omnichannel Analytics, Revenue Optimization Suite
SO1	SO1 Optimized Discounts

Source: Gartner (June 2018)

Vendor Profiles

Advanced Pricing Logic

PRICEXPERT from Advanced Pricing Logic is a SaaS solution that uses analysis of specific sales drivers to calculate the value of an individual item from a customer and a retailer perspective. The solution allows users to create as many pricing scenarios as needed to optimize pricing through intelligent automation to enable future prescriptive pricing strategies. It groups items with similar value drivers, and continuously monitors these values and groupings for accuracy. PRICEXPERT then uses a pricing optimization process that:

- Applies business strategy to each group of items

- Applies business rules based on condition and price range

- Calculates the impact on financial metrics (such as sales, revenue, cost and margin)

- Models a forecast with elasticity, competitive sensitivity, cannibalization and seasonality effects

- Optimizes prices for multiple business objectives

- Compares with the market as the final step and closes the loop

Managing by value groups enables the retailer to begin to focus more on customer behavior. This is a major impetus for automation through optimization to provide a much more measured and intelligent approach to pricing optimization, making the solution best-placed for advanced users. At the time of this research, Advanced Pricing Logic implementations include small to midsize multichannel, specialty retailers in North America.

Blue Yonder

Blue Yonder is a data science and machine learning company with roots in particle physics at the European Organization for Nuclear Research (CERN). It promotes its ability to help retailers realize how machine learning is the technology that will keep them ahead of trends and enable them to maintain a competitive advantage in the market. Artificial intelligence and machine learning are core concepts that Blue Yonder leverages to optimize pricing within its offerings.

Blue Yonder offers regular and markdown pricing solutions for e-commerce and brick-and-mortar retailers, and supports multichannel pricing. Rather than starting with a rule-based approach, it states that dynamic pricing and strategic key performance indicator (KPI)-optimization, based on statistical modeling and machine learning for price-demand relations, will provide more actionable insights to rapid changes in the marketplace.

Blue Yonder is predominantly in the European market, but it is expanding to North America as well as Asia/Pacific and Latin America. It has been implemented in Tier 1 through Tier 4 retailers in a variety of segments, including apparel, grocery and general merchandise. Cloud deployment is currently offered via Microsoft Azure.

Clear Demand

Clear Demand's OmniChannel Demand Management solution provides unified pricing and demand management through innovations in forecast accuracy, business strategy and life cycle pricing. Its focus is on delivering value and driving adoption for retail and CPG.

Clear Demand products include:

- Regular Pricing — enables retailers to easily see the range of opportunities to maximize profit and revenue

- Promotion Pricing — recommends the best items to promote with a location daily demand forecast

- Markdown Pricing — designed to maximize profit and revenue at end of season or during clearance

All are supported by demand forecasting that uses Bayesian, nonlinear regression models that account for more than 20 factors. Clear Demand's unified retail pricing solutions address the complete life cycle of pricing from regular pricing through promotion pricing and markdown pricing, and utilize innovations specifically designed for competitive and rule-based pricing across mobile, online and in-store. The solution's machine learning capabilities support ad hoc "what if" scenarios, calculate proposed new prices and forecast nightly in order to support real-time pricing strategies.

Clear Demand is predominantly in the U.S. with retail, CPG and e-commerce clients. However, the company has implemented solutions in a variety of Tier 1 retail segments, including specialty, home improvement, mass merchant, apparel and drugstores. In December 2017, Clear Demand announced an expansion of its integration with Tableau Software's Server product to provide additional data visualization and analysis capabilities to its customers currently leveraging the Clear Demand Pricing, Promotion and Markdown solutions. The move brings new visualization and dashboard capabilities for retailers' pricing optimization and merchandising strategies. Clear Demand has implementations in North America, Latin America, EMEA and Asia/Pacific. Cloud delivery options include private, Amazon Web Services (AWS), Google Cloud and Microsoft Azure.

Daisy Intelligence

Daisy's A.I Simulation SaaS platform for retail leverages transaction log data into specific promotion, pricing and inventory forecasting decisions. Daisy's portfolio for UPPMO consists of promotional product selection, price optimization, and inventory forecasting and promotional targeting. Its solutions provide recommendations to improve retailers' organizations' promotional effectiveness, logistics, stock-outs, transaction size, revenue and margin.

The platform relies on advanced reinforcement and machine learning techniques to simulate outcomes. By analyzing extremely large datasets, the Daisy Intelligence model finds relationships among variables such as cross-category cannibalization, promotional cadence, associated product affinities, price sensitivity and seasonality. This allows the retailer to optimize pricing and promotions dynamically, in near real time tied to long-term profit and loss changes rather than short-term, promotion-specific outcomes. The model delivers the end decision (i.e., product, price and

inventory quantity) either directly to client users with planning workflow software or the final price to clients' operational systems directly without human intervention. In fully autonomous mode, the service includes automated price quality control, fault tolerance and high-availability options.

Currently, over 16 retailers of various market size in North America use Daisy's Artificial Intelligence technology for their promotion planning, pricing optimization and inventory forecasting. Completed retail implementations include grocery, mass merchandise, and specialty and drugstore segments.

Dunnhumby

Dunnhumby's PriceStrat suite of products uses customer transactional data to first identify customer segments, then model and execute pricing and promotional scenarios in real time to target and grow loyal customers. The Promotions Analytics module identifies how to cut the "long tail" of underperforming promotions and optimize the remaining strong performers by identifying the right combination of tactics to deploy. The Market Analytics Solution, Rapid Reviewer sends the results of dynamic pricing rules directly to merchants with modeled price change proposals, and their corresponding financial and customer segment impacts. At the time this research was conducted, dunnhumby did not support markdown capability.

Dunnhumby recently acquired Aptaris, following a strategic partnership to enable retailers to increase the relevance of promotional offers to their customers. The dunnhumby Enterprise Promotions Management platform combines dunnhumby's customer-data-science-driven forecasting with Aptaris' promotions planning workflow, vendor management portal and design capabilities. The platform delivers customer impact analysis at each stage of promotion management, including providing information needed to plan, deliver and measure promotions within merchant and vendor teams.

Dunnhumby serves retailers and manufacturers in grocery, convenience, consumer goods, health, beauty, personal care, food service, apparel and advertising in 80 countries worldwide. Completed implementations include Tier 1 through Tier 4 retailers. Dunnhumby operates as a wholly owned subsidiary of Tesco Stores. It is a global leader in customer data science and has more than 2,000 employees, 25% of which are data scientists, in 50 offices in more than 30 countries throughout Europe, Asia, Africa and the Americas.

Dunnhumby (Aptaris)

Aptaris provides an enterprise marketing and promotions management software solution that focuses primarily on the promotional space, connecting marketing and promotions management processes for seamless customer communications. The solution is centered on the workflow end of promotional decision making, from deal initiation through implementation to settlement of postpromotion analysis. Aptaris operates on the belief that the largest opportunity in the marketplace is finding intuitive and simple ways of ingraining science into the everyday processes retailers use today.

Dunnhumby recently acquired Aptaris, following a strategic partnership, to enable retailers to increase the relevance of promotional offers to their customers, resulting in improved sales and margins, while boosting the efficiency of their merchandising and marketing operations. The

dunnhumby Enterprise Promotions Management platform combines dunnhumby's leading customer-data-science-driven forecasting with Aptaris' innovative promotions planning workflow and vendor management portal. The easy-to-use, one-stop platform delivers better efficiencies at every stage of promotion management, including providing all the information needed to plan, deliver and measure every promotion within merchant and vendor teams.

Available options for cloud deployment include private cloud as well as AWS, Google Cloud and Microsoft Azure. Aptaris and dunnhumby serve a variety of national retailers, grocers, distributors and consumer goods vendors in the Tier 1 through Tier 4 marketplaces. With a predominant presence in the U.S. today, Aptaris is beginning to expand its footprint in EMEA, Asia/Pacific and Latin America as part of the larger dunnhumby family.

Engage3

Engage3 takes a three-pronged approach to its pricing solutions by providing competitive visibility, segmentation and predictive analytics to retailer pricing strategies. The MissionControl competitive intelligence platform (CIP) is an end-to-end solution that uses data science to ensure data quality, and allows retailers to optimize the design and automate the management of their competitive shop programs. CIP also uses demand-side product attributes to link "like" competitor items with machine learning applications as well as reverse-engineer competitors' strategies.

Engage3's segmentation capability allows for optimization of price zones and the management of store-level key value indicators. It also provides personalized offers. Proprietary predictive algorithms leverage shopper behavioral data, loyalty data and local competitive pricing data to inform purchase optimization as well as personalized and trade fund selection and optimization models.

Its competitive price response solution consists of a base price optimization engine that allows retailers to optimize across categories with various scenario models and provides dynamic pricing capability. CPR includes psychological models that determine the relative price image of each retailer and identify optimal strategies to shift perception in both the short and long run.

Engage3 plans to augment its base price optimization capability with initial, markdown and promotion optimization modules in 4Q18. Present in the U.S. Tier 1 through Tier 4 retail markets, Engage3 works with retail segments including apparel, grocery, drug, general merchandise and home improvement. Cloud solutions are deployed via AWS. Engage3 was founded by the creators of SAP (KhiMetrics), who are credited with creating the retail price optimization space. Engage3's leadership team is composed of former SAP (KhiMetrics), dunnhumby, KSS Retail and IBM (DemandTec) executives.

First Insight

First Insight provides cloud-based predictive analytic consumer product testing solutions for department stores; mass merchant and specialty retailers; manufacturers; wholesalers; and footwear, sporting goods, home goods, jewelry and e-commerce companies.

For retailers and brands, it offers the InsightSuite solution, which consists of InsightSelection, InsightPricing, and InsightTargeting. InsightPricing helps determine optimal entry price points to maximize gross margin. This enables retailers and brands to quickly quantify market demand, forecast average unit retail and identify margin movers — products that can bear a higher market price than originally planned.

ElastiCast is the latest enhancement to the InsightPricing solution. Launched in early 2018, ElastiCast enables merchants, planners and marketers to analyze various pricing scenarios and predict how consumers will react to different price points throughout the product's life cycle — from initial pricing to markdowns to clearance. Results allow retailers to see the distribution of demand, before they go to market, so they can set prices more intelligently.

First Insight works with a variety of retailer segments worldwide in North America, EMEA, Asia/Pacific and Latin America, from Tier 1 through Tier 4 market size.

IBM

IBM provides IT infrastructure, applications, consulting and system integration services worldwide. For retailers, its offerings range from the shopping experience to identify customers and grow market share, to merchandising and supply networks to improve inventory turnover, to operations-specific tools to streamline back-office processes. IBMs' Price Optimization and Promotion Optimization software allow retailers to coordinate pricing across channels, ensure compliance with pricing strategies and optimize prices for products by automating time-consuming pricing tasks. IBM's capabilities automatically assimilate new data and improve pricing recommendations without requiring human intervention.

IBM uses several modules to provide for retailers' specific pricing needs:

- IBM Price Management helps retailers simplify and streamline the pricing process with rule-based pricing.

- IBM Price Optimization helps improve retail pricing strategy to optimize base prices for everyday items, and achieve sales, volume, profit and price image objectives.

- IBM Markdown Optimization helps retailers design optimal plans to set markdown timing and depth to optimize profitability and achieve inventory on-hand objectives for virtually every clearance item in their physical and online stores.

- IBM Dynamic Pricing is a SaaS offering that automatically recommends an online retailer's best response to changes in competitive prices, product demand and market conditions.

- IBM Promotion Planning offers a planning environment for merchants to plan and manage the details of their promotional activities.

- IBM Promotion Optimization uses advanced consumer demand management science to help retailers develop promotional offers and ad placements that increase the total store impact across categories.

The above solutions are provided under the umbrella of Watson Customer Engagement and can be enabled with Watson to provide augmented intelligence and insights to the practitioner utilizing the solution. IBM offers these products to retailers globally in North America, Latin America, EMEA and Asia/Pacific across a variety of segments and retailer sizes, including apparel, grocery, general merchandise and home improvement. Private cloud delivery is offered at this time.

JDA

JDA develops enterprise software that enables planning, optimization and execution of supply chain, merchandising, and pricing processes for organizations across industries. JDA's life cycle pricing solutions are part of the JDA platform of integrated planning and optimization solutions. They rely on the JDA demand forecasting solution, which maintains that a centralized, multichannel, single view of demand enables retailers to be demand-driven. JDA emphasizes decomposing and cleansing the historical sales data, normalizing for the effects of pricing, promotions, seasonality and moving holidays. This results in an accurate baseline forecast and makes those adjustments visible to the core forecasting algorithms. JDA's offerings consist of:

- Store and SKU forecast capabilities, and consumer price response with localized merchandising and competitive strategies to define prices via JDA Strategic Pricing

- Multichannel, multicustomer price management and execution tool via JDA Pricer

- Promotional planning and execution via JDA Promotions Management & Optimization

- Markdown price optimization via JDA Markdown Optimization

JDA's life cycle pricing solutions are built on the JDA grid technology that the company claims enables performance and scalability. JDA offers self-learning market response models that retailers own and can refresh on their own, claiming this reduces the total cost of ownership and allows refreshes to occur much more frequently, improving predictability and accuracy. The JDA pricing and promotion suite includes calendar campaign and event planning, as well as advertising desktop publishing capabilities, helping to support execution and workflows associated with promotions. JDA also offers price execution capabilities via JDA Pricer and can be integrated with other JDA pricing suite products. Private cloud delivery option is available.

JDA operates a global installation footprint across North America, Latin America, EMEA and Asia/ Pacific in a variety of retail segments and sizes. These include apparel, grocery, general merchandise and home improvement.

McKinsey & Co. (Periscope)

McKinsey & Co.'s Periscope platform provides price optimization solutions as part of an integrated suite of retail analytics solutions. Periscope's solutions as a service include ongoing refreshed insights, data enrichment and quality management, software solutions, and ongoing expert capability-building support. The company asserts that the price optimization solution is designed to enable retailers to execute their pricing strategy across channels and price zones with human- and

analytics-driven algorithms to define guardrails and a management-by-exception philosophy. The suite of pricing solutions includes:

- Price Advisor for regular price optimization and dynamic pricing

- Markdown Advisor to drive markdown effectiveness (currently being replatformed)

- Market Vision for competitive online price intelligence

- Promotion Offer Innovation to "micro test" never-tried promotions

- Promotion Advisor to evaluate vendor trade funds and promotional opportunities

- Personalization Advisor for personalized offer creation and execution across channels

These solutions are tightly integrated with the company's category management process to allow category managers to easily perform pricing as part of their category management function.

Periscope offers these products to retailers globally, with a focus on the apparel and fashion, home furnishing, consumer electronics, grocery, and consumer packaged goods segments. Cloud delivery options include AWS and private cloud.

NTT DATA

NTT DATA 4Price consists of four modules that cover initial, regular, markdown, and competitive price optimization and analysis:

- Sales price management offers an engine to calculate the proposed sales prices, and margin calculation at product level and each level of merchandise structure.

- Competitive positioning analysis and simulations provides analysis of pricing position and simulated pricing effects.

- Sales price optimization provides demand modeling, price elasticity calculations and markdown optimization to manage and plan stock cleansing campaigns, optimizing sales price based on demand modeling and a what-if decision support tool.

- Promotion checks enable the acquisition of promotional planning and promotional sales prices to check overlapping on permanent sales price management.

4Price's rule-based engine +4Price Optimizer design starts from NTT's prescribed best practices on price management and price optimization, and provides a solution that includes all the functionalities necessary for a pricing process that is easy to implement. Additionally, through high flexibility, it can be quickly introduced. 4Price has a rule-based decision support engine that makes it easy to use. Rules are expressed through a simple user interface in familiar retail terms, so the initial setup of price determination becomes a natural task, and changing the constraints and drivers or performing what-if simulations becomes fast and easy. The functions provided for managing the rule priorities support system usability and may lower maintenance costs. The product allows for testing pricing strategies and dynamic pricing that incorporate key business rules and objectives, such as profit, price limits, volume goals, gross margin changes, product-brand relationships and response to competition. This is made possible by a proprietary demand model and constraint-

based planning with nonlinear optimization. Recently, NTT introduced a scheduling capability for limiting diffusions of price variations per chosen period (e.g., day, month) to limit impact on store operations.

NTT DATA provides consulting, system development and business IT outsourcing services worldwide. The majority of pricing implementations for retail are in the Tier 4 market space in apparel, general merchandise and grocery/hypermarket segments. A private cloud delivery option is available.

Opalytics

Opalytics' Predictive Analytics for Price Optimization SaaS solutions help retailers solve complex price and promotion optimization challenges. Opalytics uses machine learning to define pricing curves and optimization to take into account business rules such as promotion budgets, timing constraints and cannibalization. Opalytics offers the following capabilities:

- Initial price optimization via Opalytics Predictive Analytics for Price Optimization

- Regular price optimization via Opalytics Price Optimization

- Promotional price optimization via Opalytics Promotion Optimization

At the time of this research, it has implementations in Brazil and South Africa through a North American parent company. Delivery options include private cloud and via AWS. The Opalytics Cloud Platform (OCP) provides a means to deploy analytics in a dynamic cloud infrastructure, including both custom and off-the-shelf applications.

Oracle

Oracle Retail's enterprise pricing solutions include:

- Oracle Retail Promotion Planning and Oracle Retail Offer Optimization (OO) for the entire product life cycle of promotions, targeted offers and clearance markdowns

- Oracle Retail Regular Price Optimization that focuses on long-life-cycle items

- Assortment Planning & Optimization and Oracle Retail Regular Price Optimization, where optimal initial pricing recommendations are embedded within core assortment planning processes and support for dynamic pricing

Oracle Retail's solutions are presented across a common user experience. The solutions combine AI, machine learning and decisions sciences with data captured from Oracle Retail applications and third-party data to predict outcomes under a unified view of pricing and promotions. Oracle Retail's enterprise pricing solutions are integrated across the planning, merchandising, supply chain and omnichannel solutions, and can be integrated with third-party solutions.

Market analysis is a driver to the overall category strategies that drive detailed pricing objectives (e.g., maximize margin or volume). It also provides decision support at an item level when market item information is available. Oracle's price planning and optimization solutions use a single

baseline forecast from Oracle Retail Demand Forecasting (RDF). The RDF baseline forecast is updated with direct and adjacent (that is, halo and cannibalization) impacts of price changes to create a common composite forecast.

Oracle Retail's Advanced Clustering and Customer Segmentation uses machine learning to recommend location clusters and customer segments that optimize how pricing and promotion decisions are presented to customers. RDF provides users with what-if promotion impact assessment capabilities to support promotion planning, and item planning capabilities to consolidate regular, promotion and clearance decisions into a common life cycle pricing and promotion plan.

Oracle Retail delivers SaaS solutions exclusively through Oracle Global Business Unit Cloud Services. Delivery options include AWS, Microsoft Azure and Google Cloud. Oracle Retail's enterprise pricing solutions are implemented worldwide across a variety of retail segments and market sizes.

Retail Express

Retail Express delivers cloud-based and on-premises retail operating software for major grocery and general merchandise retailers. The company provides analytics-based optimization coverage of most areas of merchandising in a multichannel environment using a common analytics engine for forecasting, simulation, optimization, segmentation and targeting. This provides its price and promotion optimization with visibility into what happened over previous years, and details of the forward marketing and merchandising plan. Dynamic pricing is also supported. Predictive outcomes are designed for different users to ensure they are fit for purpose, and support the operation and execution processes. Recently, the technology employed in RE 2.0 merchandising application was upgraded to leverage machine learning. This upgrade was designed to handle more casual factors and improve the accuracy of the forecasts provided, to model at more granular levels, more frequently, and to drive insights more effectively.

In many of its implementations, Retail Express is the place of record for marketing and merchandising plans and assortments. Furthermore, Retail Express asserts that forecast accuracy is dependent on the quality of variables employed and that the best source of variables are the operational planning tools of the functional teams that support those variables. Thus, managed services are an important part of Retail Express's overall offering to support day-to-day operations.

Optimization reviews promotional vehicles, ranked based on goals and objectives, and then recommends an optimal set of promotions. It includes use of incentive mechanics and an understanding of their net impact on the category or department for any market or format. It takes into account common effects, such as cannibalization and cross-category impacts. Retail Express has implementations in North America, Europe and Asia/Pacific, and cloud deployment options include private and via AWS.

Revionics

Revionics uses sophisticated, user-friendly AI-based science that rapidly and automatically provides price and promotion recommendations at the scale and frequency required, without teams of

consultants or scientists. It uses machine learning science built on a SaaS architecture that updates at various intervals to adjust to current or emerging trends. Through a predictive and prescriptive platform, Revionics asserts that it takes into account all known demand-influencing factors across the pricing life cycle for all channels. It relies on easy-to-understand insight into the "why" behind recommendations, rather than a black-box approach, believing that transparency creates understanding, builds trust, increases user adoption and drives value.

Revionics offers the following pricing-related products: Price Suite, Promotion Suite, Markdown Suite, Dynamic Pricing and Competitive Insights. If desired, Revionics can dynamically optimize prices in an automated fashion to deliver high-frequency pricing to adjust for upcoming business environment changes and ensure retailers' pricing strategies are optimal. Its on-demand simulation enables retailers to predict the outcomes of various situations, allowing adjustments of strategies, rules and constraints to ensure that they can prepare for and achieve their objectives.

Revionics uses a self-funding "crawl, walk, run" approach, where retailers can start with management and analytics as a crawl approach and then move into optimization as they walk and run. It claims the fastest speed to value, with initial project ROI achieved in as little as one month. It offers analytics services to help retailers increase their return on investment for price, promotion and markdown.

Revionics' customer base includes retailers of all sizes who have subscribed to Revionics' optimization for more than 10 years, plus a robust and growing global footprint in North America, EMEA, Asia/Pacific and Latin America. Cloud delivery options include AWS, Google Cloud and private.

Rubikloud

Rubikloud provides practical adoption and application of AI for global, Tier 1 retailers to help them understand and intelligently execute a unified pricing strategy. Rubikloud's cloud native machine learning platform, alongside its Promotion Manager and Customer LifeCycle Manager products, automates and improves mass promotional planning through "intelligent decision automation." Rubikloud's product offerings include:

- Regular price optimization

- Promotional price optimization

- Markdown price optimization

Rubikloud's products help retailers reduce the complexities of promotional planning and store allocations to yield more accurate forecasting, and better predict their customers' intentions and behaviors throughout their retail life cycle. The products also offer dynamic pricing capabilities. Underpinning Rubikloud's products is a SaaS platform that enables retailers to take in data from a variety of operational sources. It uses both structured data (e.g., point of service [POS], loyalty, CRM and ERP) and unstructured data (e.g., web log, social media and Internet of Things [IoT]) — to perform focused machine learning.

Rubikloud's platform and products enable connection and integration to a variety of source data systems, and are compatible with AWS, Google Cloud Platform and Microsoft Azure. Rubikloud has implemented with general merchandise and drugstore retailers in North America and Asia/Pacific.

SAP

SAP's next-generation offering is being planned for SAP's roadmap. However, no dates have been released at the time of this research. The new offering will be based upon the existing Customer Activity Repository (CAR) platform data sources and Hana Predictive Library solution offerings. This direction aligns with SAP's overall strategy for S/4 to automate current business processes and augment with newer machine learning techniques based upon the Leonardo platform. Since the 2017 UPPMO Market Guide, SAP has discontinued its traditional initial price/regular price and markdown applications, previously referred to as DM6.4.

SAP asserts that the integration of marketing-led digital campaigns with the traditional merchandising promotion process is a big theme as retailers move into the digital advertising and communication space. Promotions are undergoing a digitalization process across several new areas, and traditional planning and optimization processes will need to be changed over the coming years. This includes the need to manage collisions that may occur over the new digital channels and physical channels. SAP expects HANA and SAP CAR to enable this as retailers extend their pricing and promotional campaigns across these channels.

SAP offers promotion optimization to retailers globally continues to build upon the success from its promotion application Promotional Management for retail in the market with over 70 Enterprise customers and greater than half of these live or in implementation. Cloud delivery options include AWS, Google Cloud and private cloud.

SAS

SAS provides Retail Omnichannel Analytics for merchandising and marketing intelligence, supply and demand planning, customer experience and insight, cybersecurity, data management, visualization, and revenue management solutions. SAS asserts that its Revenue Optimization Suite provides a comprehensive view of consumer demand, enabling retailers to optimize life cycle pricing strategies and corporate profitability. Regular price, promotional price and markdown price optimization are offered on a high-performance platform to speed time to insight.

By using predictive analytics and machine learning, SAS is capable of delivering accurate demand forecasts at the store- and SKU-level. This enables targeted, localized strategies, and delivery of analytics and forecasts to support pricing decisions down to the product/store level. Localized demand sensing and robust modeling are supported by SAS's shared analytical platform that leverages a common data model with a flexible design to support variations in business process. Integration enables consistent execution across related business processes, such as marketing, merchandising, fulfillment and store operations. Its flexible implementation strategy supports cloud deployments, on-premises behind the firewall, and results as a service.

The solution provides in-memory analytics, support for "phased implementation, integrated BI and advanced data visualization capabilities, and an optimization engine for integration with retailer

systems via APIs. Releases in 2019 and beyond will provide capabilities to support unified price, promotion and markdown pricing, and integration with financial and assortment planning solutions. Additionally, Unified Life Cycle Price Optimization offers initial, promotional and markdown pricing solved simultaneously across the product life span. The solution can be operated to solve for life cycle pricing or individual price types (i.e., regular, promotion and markdown), if desired.

SAS' Revenue Optimization Suite has been implemented for Tier 1 through Tier 3 retailers in apparel, grocery, general merchandise and home improvement worldwide. Cloud delivery options include AWS, Google Cloud, Microsoft Azure and private cloud.

SO1

SO1 leverages machine learning algorithms to analyze customers' purchase histories, and calculate the right combination of product, discount and time to maximize retailers' pricing strategies. SO1 offers the following capabilities for promotion optimization:

- Smart recommendations: Ranks product-related information, such as offers from circulars, coupons, product launches and recipes, according to a customer's individual preferences and the retailer's goals.

- Optimized discounts: Selects, ranks and adjusts these offers to match a customer's willingness to pay and to increase his or her purchase likelihood in alignment with the retailer's goals.

- Programmatic promotions: Provides retailers with a white-label, self-service platform for manufacturer brands to launch, manage and track AI-powered campaigns in real time and according to their specific needs, like generating trial sales and brand switching.

The core of SO1 is its proprietary engine. It observes patterns within baskets, as patterns disclose preferences and latent product properties. The SO1 Engine identifies substitutes (e.g., similar tasting products from different brands), complements (e.g., products used for a special recipe) and consumer categories (e.g., products for children), without human interaction, product master data or manual labeling of products. Customer and product positions are updated in real time, and adjusted to changing preferences and external influences, such as weather and other offers.

The SO1 system detects algorithmically out-of-stock situations per product and store. Therefore, SO1's system is able to detect individual product availabilities and uses that information when creating a promotion feed. To drive and maintain constant user engagement, the SO1 system can anticipate promotion fatigue of individual users and, if necessary, automatically select teaser or reward offers to be included on the personalized promotion feed. SO1 is currently working with Tier 1 retailers in grocery and drugstore segments in North America and EMEA. Cloud delivery options include Microsoft Azure.

Market Recommendations

Retail CIOs seeking to implement customer-centric merchandising and marketing technologies should:

- Define a unified commerce pricing strategy focused on a consistent customer experience by proactively collaborating with the business leaders.

- Evaluate how mobile and loyalty strategies can be leveraged to offer consumers visibility for real-time, personalized pricing.

- Use caution when evaluating vendor offerings for contextualized real-time pricing, as only a handful currently offer the capability.

- Focus on both analytics and execution as they consider adopting real-time pricing.

Acronym Key and Glossary Terms

Contextualized pricing in real-time	This is defined as the retailer's ability to manage and adjust prices for customers in real time, across all channels, based on a wide variety of considerations, including competitive pricing, promotional cadence, customer loyalty and availability.

Gartner Recommended Reading

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

"Implementing Customer-Centric Merchandising and Marketing in Retail Primer for 2018"

"Cool Vendors in Retail Merchandising and Marketing"

"Prioritize 14 Best Practices for Successful Price Optimization Implementations"

"10 Best Practices for Using Customer Data to Drive Loyalty for Unified Retail Commerce"

"Market Guide for CRM in Tier 1 Retail"

"Transforming From Multichannel to Unified Retail Commerce Primer for 2018"

Evidence

"Clear Demand Incorporates Tableau's Server Product to Enhance Pricing and Promotions Solutions," Clear Demand.

"Daisy Intelligence Named a Cool Vendor in AI for Retail by Gartner," Daisy Intelligence.

"Modern Analytics," Opalytics.

"Cutting-EDGE Solutions to Achieve Your Goals," SO1.

Note 1 Representative Vendor Selection

Vendors included in this research represent a sample of possible solution providers. Selection was made in part based on interactions with Gartner's retail client interactions on the topic of UPPMO.

Most vendors service the Tier 1 retail market, but some smaller, innovative providers are included for an enhanced perspective.

Note 2 Gartner's Initial Market Coverage

This Market Guide provides Gartner's initial coverage of the market, and focuses on the market definition and rationale for the market and market dynamics.