

EBOOK

Top Trends and Opportunities in AI for Retail and CPG



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INTRODUCTION

If you judged by the number of times the phrase “artificial intelligence” was used at NRF 2019 - Retail’s Big Show and Expo, you would think that advanced solutions are being rolled out across every retail enterprise. Yet aside from huge strides being made by behemoth pure digital players in the space (like Amazon or Alibaba), the reality is that the AI maturity level in this industry is still relatively low.

Implementing AI solutions in brick-and-mortar retail is naturally more challenging than online retail; yet taking a step back¹, both are still surprisingly only in early stages. According to a 2018 study by Capgemini², over a quarter of the top 250 global retailers are integrating AI into their organizations (a sharp increase from 2016, when it was only a small minority of 4 percent). However, the study also found that only 1 percent of AI initiatives reach full-scale deployment.

Research from the McKinsey Global Institute has shown that the retail industry could reap global benefits from AI worth \$400 billion to \$800 billion—more than any other industry.

Notes from the AI Frontier. Insights from Hundreds of Use Cases³, McKinsey Global Institute

This is about to change. According to McKinsey Global Institute, investments by retail and CPG in artificial intelligence are expected to exceed \$8 billion by 2024. What’s more, another report from McKinsey shows that AI has the potential to create more annual value for retail⁴ than any other industry (see graph below). As more and more players successfully venture into new applications of machine learning, predictive analytics, and more, the AI disruption in the retail space is bound to happen quickly.

¹ <https://nrffbigshow.nrf.com/recap>

² <https://www.capgemini.com/wp-content/uploads/2018/12/Report---Building-the-Retail-Superstar-Digital1.pdf>

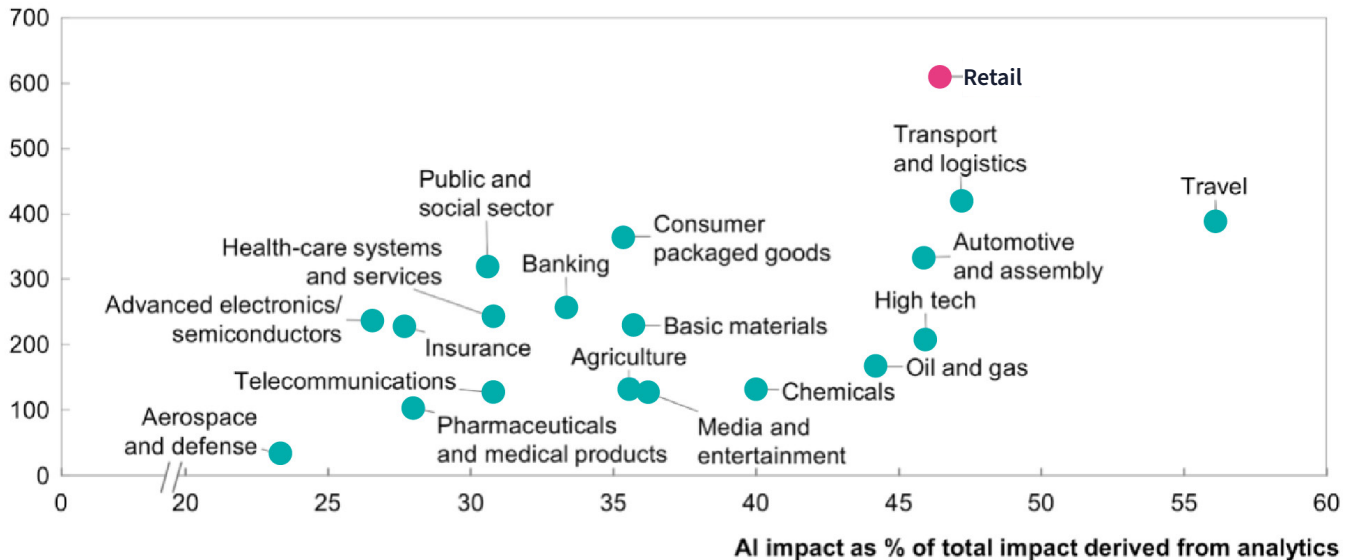
³ <https://www.mckinsey.com/~media/mckinsey/featured%20insights/artificial%20intelligence/notes%20from%20the%20ai%20frontier%20applications%20and%20value%20of%20deep%20learning/notes-from-the-ai-frontier-insights-from-hundreds-of-use-cases-discussion-paper.ashx>

⁴ <https://mck.co/2WHYJjU>



AI has the potential to create annual value across sectors totaling \$3.5 trillion to \$5.8 trillion, or 40 percent of the overall potential impact from all analytics techniques

AI impact
\$ billion



Source: McKinsey⁵

But what does “AI” really mean in terms of businesses’ opportunities for growth and capabilities, and in particular, for real-world retail applications? And how do you, as a retailer or CPG company, regardless of size, shift the paradigm and transform your data into actionable insights and real business value?

With Enterprise AI, machine learning (ML) and data science solutions becoming a benchmark for business practices, retailers today have the unprecedented opportunity to shift the paradigm and leverage their data to elevate the customer experience in new, more meaningful ways. This white paper will delve into:

- **An in-depth look at some of the highest-value use cases to consider when getting started (or continuing) an AI journey.**
- **An overview of frequently used retail AI techniques illustrated with more advanced use cases.**
- **Up-and-coming trends on the horizon of AI in retail and CPG.**
- **Challenges and suggested frameworks for transforming technology, people, and processes around AI in today’s enterprise.**

⁵ <https://www.mckinsey.com/~media/mckinsey/featured%20insights/artificial%20intelligence/notes%20from%20the%20ai%20frontier%20applications%20and%20value%20of%20deep%20learning/notes-from-the-ai-frontier-insights-from-hundreds-of-use-cases-discussion-paper.ashx>

I. CORE USE CASES FOR RETAIL AND CPG

From hyper-targeted marketing campaigns and customer journey optimization to transforming warehouse and store management, AI is empowering brands and retailers to understand their customers and their businesses better in order to deliver unique, differentiated, one-on-one experiences. Marketing, sales, and supply-chain management together constitute some of the biggest areas of opportunity. And of course, AI is a powerful tool for personalizing product recommendations, including through analyzing aggregated user data to understand individual customer preferences.

Consumer industries such as retail and e-commerce will tend to see more potential from marketing and sales AI applications because frequent and digital interactions between business and customers generate larger datasets for AI techniques to tap into. E-commerce platforms, in particular, stand to benefit. This is because of the ease with which these platforms collect customer information, such as click data or time spent on a web page, and can then customize promotions, prices, and products for each customer dynamically and in real time.

For their part, brick-and-mortar retailers and CPG companies can implement AI applications to improve product assortment and inventory management per store and to optimize their supply chains end-to-end.

Brick-and-mortar and online retailers alike can take advantage of the Internet of Things (IoT) to generate data usable by AI techniques to both improve the performance of their supply chains and apply some of the top-line innovations from the online world to the offline world, for example, by viewing dwell time in front of a physical display as analogous to spending more time viewing web or mobile content.

Here are some of the most common high-value use cases for real-world AI applications in the retail, e-commerce, and CPG space.



MARKETING AND SALES USE CASES

PERSONALIZED RECOMMENDATION ENGINES

Leading analysts predict that smart personalization engines used to recognize customer intent will enable digital businesses to increase their profits by up to 15 percent by 2020. Needless to say, personalization has thus become table stakes for retailers today, who are faced with fierce competition from e-commerce giants and an increasingly demanding customer base.

For example, one retailer that's synonymous with personalization and relevance is Amazon. Its recommendation engine analyzes users' past purchases, items already in their carts, products they have rated, and more to figure out the most relevant items to serve shoppers. It has been reported that Amazon drives 35 percent of its sales through its product recommendations engine.

In fact, AI is the only way to deliver hyper-personalization: its ability to absorb and sort through a lot of unstructured data and use that information to gain more relevance among customers is a critical asset for retailers. Companies who aren't Amazon and don't have their seemingly endless resources can still use machine learning to analyze a variety of data sources for the basis of AI-based personalization, including:

- Browser history
- Page clicks
- Social interactions (likes, shares, etc.)
- Past purchases
- The duration for which a page was viewed
- Location
- ...and so much more

All of this data (too much for humans to comb through) when combined gauges customer interests and preferences in a more complex and exhaustive way than previously possible.

For example, AI can:

- Help deliver product recommendations based on frequently bought items or related products.
- Customize web pages and elements to suit a customer's needs. For instance, Netflix does intense behavior analysis based on behavior and demographic data to determine the content that will resonate with their customers.
- Analyze similarities between users based on correlations in their attributes (shopping and browsing history, demographic factors, location, etc.), in order to identify look-alike profiles and base recommendations such as "users like you have also bought..."

Creating such recommendation engines is much more than training machine learning algorithms - which is in fact just a fairly small amount of work in the entire process. Data preparation, features engineering, preprocessing, deploying, and maintaining the workflow and models in production: these are just some of the many things to do in order to create powerful recommendation engines and deliver highly personalized online and offline experiences.

Luckily, AI, ML, and data science platforms (such as Dataiku) offer retail data teams the immense benefit to be able to create the entire data science workflow in an integrated environment with no need to go back and forth between several tools, and thus completely internalize data initiatives. AI platforms can also offer smaller retailers and CPG brands a competitive edge through automation and self-service analytics features, especially for smaller personalization projects.

PRICE AND LOYALTY PROGRAMS OPTIMIZATION

One of the most common, as well as one of the most high-impact areas of AI in retail is in price, promotion, and markdown optimization.

Price optimization involves, on the one hand, tailoring prices to customers in a way that they view them as attractive, fair, and non-arbitrary for the products they care most about, and on the other, predicting when it is (or isn't) necessary to offer discounts.

Research from Forrester shows that using AI and ML for price optimization is a win-win for both retailers - due to its proven impact on bottom lines - and for customers, who largely view it as a positive and fair practice as long as the prices presented are within their budget.

More and more, retailers are finding ways for customers to provide data, often in exchange for incentive schemes, such as loyalty programs. The more information that customers voluntarily provide, the easier it is for retailers to drive loyalty through personalized marketing.

Moreover, retailers are trying to make it as easy as possible for customers to join their loyalty programs, notably by removing traditional requirements that they acquire store-branded credit cards. Major outlets, such as Macy's, J. Crew, and Nordstrom dropped their card requirements in 2018 in an attempt to boost loyalty program participation.

AI offers a powerful set of applications for retailers to enhance and personalize their loyalty programs. With capabilities like natural language processing, image analysis and semantic reasoning, marketers can benefit from having an adaptive and evolving understanding of the customer-to-brand engagement.

FURTHER READING



Today, loyalty means more than enrolling in a program and passively collecting points or occasionally cashing in for a benefit, and AI can help make that a reality. Inactive memberships and failed promotions are costly and result in a relationship breach. Customers want to feel like they are being treated uniquely, and when the customer experience meets this expectation, brands benefit.

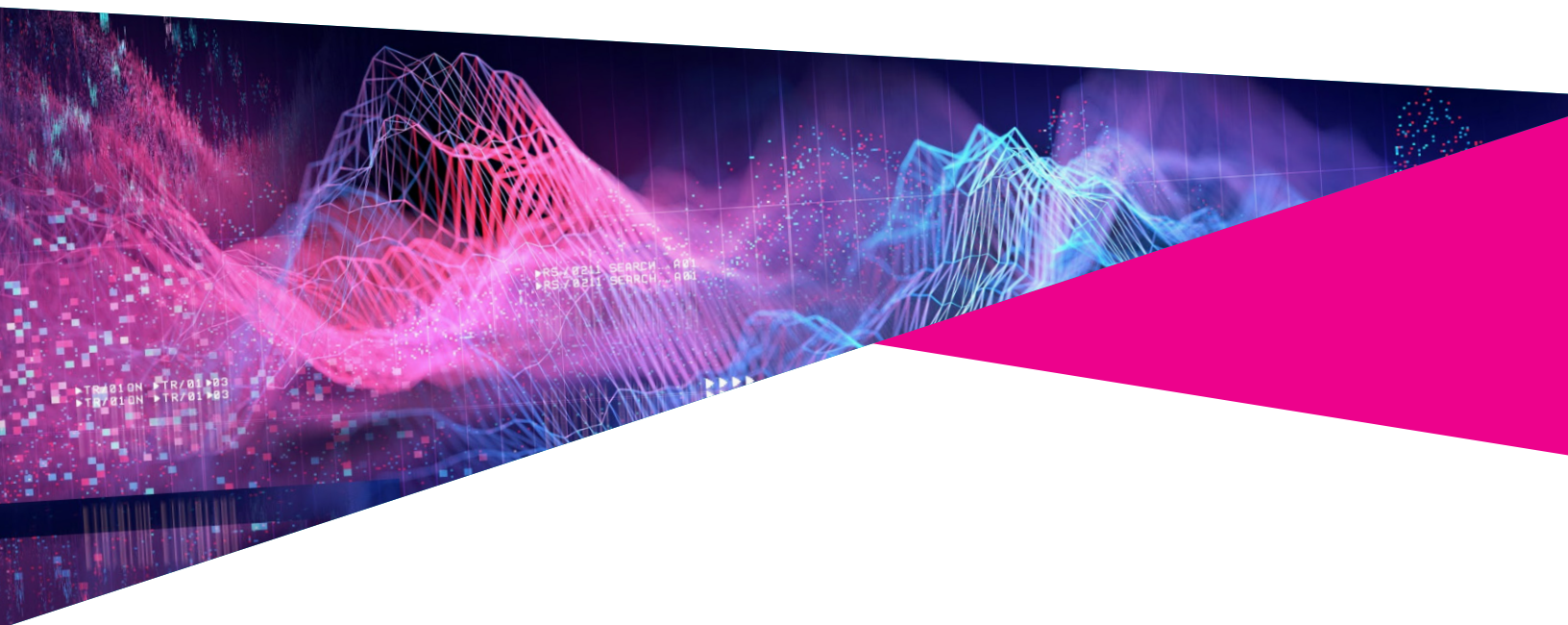
BEHAVIORAL AND GEOSPATIAL ANALYSIS

A McKinsey⁶ analysis projected that more than three-quarters of retail sales would take place in-store in 2025, but many of those sales will be driven by a retailer's online presence. Similarly, many online sales can be attributed to an experience that customers had in-store. Geospatial analysis is helping retailers to better understand the interplay between their brick-and-mortar and online operations.

With opt-in e-receipt programs and anonymized cell phone data, retailers can use AI systems to analyze how a consumer behaves across its multiple channels. It can track the path that a customer takes preceding a purchase and pinpoint those parts of its operation that are leading to conversions. Such analysis is particularly valuable for global retailers seeking to understand how to drive online sales in different parts of the world.

Brick-and-mortar retailers could also benefit from geospatial analytics by using open data sources to analyze the interplay between demographic factors of a certain location and the success of their operations in that area.

One global retailer was able to attribute particularly strong online sales in certain areas to a variety of features in its brick-and-mortar operations. A team of data scientists pinpointed the following characteristics as driving a higher-than-average e-commerce halo: a large store in the area, a high proportion of young professionals, and the store being located in a high-quality retail environment. Understanding those factors can guide the retailer as it plans its future brick-and-mortar operations.



⁶ <https://www.mckinsey.com/industries/retail/our-insights/how-retailers-can-keep-up-with-consumers>

SUPPLY CHAIN USE CASES

Supply chain management plays a behind-the-scenes, albeit strategic, role in how consumers receive or purchase products. As inventory becomes an increasingly important differentiator, stores need to leverage intelligent supply chain strategies to ensure the availability of the right products at the right time to every customer.

Retailers are always looking for an edge to gain efficiencies and greater precision in their supply chain. The more accurately retailers can forecast demand, manage inventory and manage relationships with their suppliers, the more easily they can prevent waste, cut costs and more effectively invest their capital in profit-generating activities.

CHATBOTS

Increasingly, companies are turning to AI and automation to deal with frontline issues with suppliers. Companies are able to reduce their supplier relationship workforce by using chatbots that can take care of a large percentage of the common issues and transactions.

More and more, retailers will no longer have to rely on employees to place purchase orders, process invoices or find suppliers. Chatbots will be able to do that work, often by corresponding with other bots on the supplier end. The automated technology will significantly reduce labor costs as well as perform much of that work more quickly than humans could. While humans can be tough negotiators, automated supply chain processes will be able to quickly research and identify the best deals possible.

When combined with deep-learning and advanced analytics, chatbot technology can help deliver important information to retailers about disruptions in the supply chain they need to respond to. For instance, a chatbot might inform a procurer of a natural disaster that has impacted typical supply routes and recommend alternative means of procurement.

In the 24/7 world of supply chain management, chatbots significantly reduce the need for dedicated customer relationship staff, particularly during non-traditional work hours. When retailers are dealing with suppliers in different time zones, it's critical that they be able to deliver rapid responses to inquiries, but AI and automation techniques are increasingly enabling them to do so without incurring a substantial labor cost.



INVENTORY MANAGEMENT AND STORE OPTIMIZATION

Predictive modeling will continue to optimize inventory for retailers large and small. Large companies are already pioneering technology that more precisely aligns inventory with customer demand.

Inventory management is particularly salient in the grocery sector, where the ability to forecast demand reduces food waste and ensures that there is adequate supply of the items that customers want at a given time.

Traditionally, savvy retailers might stock certain items based on what they know about how customers behave based on the time of year or weather. They know to stock up on hot dogs during BBQ season or champagne around New Year's. Predictive models, based on years of data and a variety of different data sources, offer retailers the chance to do this with exponentially greater precision, detecting nuances in consumer behavior that would escape the notice of even the most perceptive store manager.

For example, Walmart has found success in predicting consumption patterns based on weather. The model detected a spike in demand for hamburgers on hot days with clear skies, while demand for steaks rises on cloudy, windy days.

Retailers are increasingly deploying smart storage devices, from refrigerators to shelves, to keep track of inventory in real-time. Smart shelf apps have proliferated, offering store salespeople the ability to more quickly find products for customers or to identify products that need to be restocked. Whether or not the store is busy, being able to free employees of the obligation of constantly checking inventory allows the store to more effectively deploy its workforce to focus on other duties, such as customer service.

SPACE PLANNING AND STORE DESIGN WITH IOT

The proliferation of connected devices has major implications for the retail industry, and industry leaders know it. A survey of global retail decision makers from the 2017 Zebra Retail Vision Study found that 70 percent said they were ready to integrate the Internet of Things (IoT) into their stores. A similar study by Zebra the following year found that 52 percent of retailers were already delivering their frontline employees data from IoT devices in real time in order to enhance customer service⁷.

IoT technology presents the opportunity for retailers to understand how the layout of their stores is shaping customer behavior. The more connected devices that are able to track and analyze customer movement throughout a facility, the better retailers will be able to design their stores to maximize impact. In the past, design decisions were shaped by anecdote or (at best) focus groups. Now, however, retailers can rely on data science to optimize the customer experience.

Stores are also using connected devices to deliver the highest level of personalization and customization to marketing and promotions. While geofence technology has enabled retailers to detect the presence of customers in their stores, connected devices offer even greater precision, so that retailers can ping customers with promotions specific to the section of the store they're in or the specific product they're looking at.

⁷ https://www.zebra.com/us/en/about-zebra/newsroom/press-releases/2018/zebra-study-finds-number-of-intelligent-enterprises-doubles-since-2017.html?tactic_type=PRP&tactic_detail=RT_TotalRetailIE_TotalRetailIE_NA_None

II. ADVANCED RETAIL AI TECHNIQUES AND USE CASES

THE 3 TYPES OF AI IN RETAIL

McKinsey identifies three types of AI⁸:

- 1. Classification types:** Classification generally focuses on Natural Language Processing (NLP) or computer vision. AI in this context identifies words or images and - you guessed it - classifies them. Using NLP, tweets by customers and target audiences can be grouped according to the expressed attitude, for example, and be used for customer sentiment analysis to evaluate satisfaction levels, emerging demands and trends, etc.

Computer vision can be used with product images to identify attributes, sometimes as simple as “short sleeved” or as complex as “floral print.” The value of AI in this context lies in providing details about unstructured information. But to really get value out of it, those details have to be used in order to make new decisions – and that requires human supervision and foresight to transform those details into actionable insights.

- 2. Prediction types:** Prediction is about forecasting – trying to anticipate the most likely next action that the customer is going to take, or predicting the quantity of products and the delay in which they will need to be restocked, etc. Prediction in retail can entail everything from hyper-targeted advertising and personalization to logistics and stock optimization.
- 3. Generation types:** The last type of AI is generation. Chatbots are the most recognizable retail application of generation AI. Chatbots range in sophistication, from common ones that can be set up by anyone in a matter of minutes, to highly-customized bots with a range of capabilities.



⁸ <https://www.mckinsey.com/~/media/McKinsey/Business%20Functions/McKinsey%20Analytics/Our%20Insights/The%20age%20of%20analytics%20Competing%20in%20a%20data%20driven%20world/MGI-The-Age-of-Analytics-Full-report.ashx>



According to an analysis in Forbes⁹, presently, prediction is by far the most valuable type of AI that can be applied to a retail business problem. However, most of the activity in AI in retail is focused on NLP and computer vision – not on the much harder (and more valuable) problem of forecasting. And most of the NLP and computer vision work is focused on classification, rather than generation.

That's not to say that NLP and computer vision aren't valuable, just that their value is limited. NLP and computer vision are used today moreso to make the most out of the decisions that have already been made and trying to get consumers to buy from there. With forecasting, retailers have an opportunity to decide what to buy, how much to buy, where to put it, and how to price it, according to the customers they're targeting.

ADVANCED TECHNIQUES AND USE CASES

Uplift Modeling

Uplift modeling in retail is mostly used for up-selling, cross-selling, churn prevention and retention activities. The objective is not to predict the likelihood of a customer buying, but what can be done to increase the likelihood of customers making a purchase. The models aims at predicting the outcome of a marketing campaign by selecting individuals for whom the action will be most profitable.

Uplift modeling is frequently applied in the marketing domain in retail. Success of uplift modeling lies in high model performance of ensembling techniques due to the ensemble diversity arising from the predictor variables that are very weakly correlated with customer behavior.

Clustering

Store clustering is a technique with growing popularity in the retail domain. It is employed to build relevant consumer segments that are homogenous in certain behavioral aspects and can be targeted using the same marketing strategy.

Retail store segmentation can help to group together stores which have a similar customer-base and location. It helps in differentiated marketing strategies for each store segment, targeted to specific customers. Category-based clustering strategy zooms in on specifics and helps to group items and products of a certain category in a specific group.

Dynamic Pricing

For any company selling products or services, whether online or in brick-and- mortar stores, setting the optimal price is everything. And it's a fine balance to find the equilibrium between what customers are willing to pay and what the business's profit margins can withstand. The big players have continually proved price optimization as a strategy critical to their success - Walmart reportedly changes its pricing more than 50,000 times per month, and they have the growth rate to show for it.

⁹ <https://www.forbes.com/sites/nikkibaird/2019/02/14/snapshot-2019-the-state-of-ai-in-retail/#5954d599773b>



Dynamic pricing, a highly flexible approach to setting the cost for a product or service, is one way to find this optimal balance. Using AI and advanced analytics, retailers can check and continuously monitor the prices of competitors. This enables them to automatically match them or even offer a lower price, so the customers get the best possible deal and stay with the same brand. But so far, dynamic pricing has only been used widely by major players in e-commerce and has unfortunately not spread far beyond that market. See below how one company broke away from the norm of dynamic pricing and was able to bring this revolutionary predictive analytics technique to any business, whether offline or online.



FEATURE



SMART GENERATION OF OPTIMAL PRICES FOR OFFLINE AND ONLINE BUSINESSES

THE CHALLENGE

Long, Arduous Data Prep Caused Stale Pricing Recommendations

Pricemoov is a service that delivers optimal pricing suggestions and solutions to its customers by weighing the intrinsic value of the item, its seasonality, and the attributes of the customer himself through detailed segmentation. To do so, Pricemoov collects datasets from its customers that are updated daily through partitioning.

Pricemoov's challenge was that data originating from old SI systems, Oracle, or MySQL was dirty and required a full-time developer to perform long ETL steps in PHP for cleaning. Once cleaned, the datasets were painfully entered into a model, as they were custom-built pipelines. And once finished, the replication and deployment process for the next customer was taking weeks.

THE SOLUTION

Scaling Through Reproducible and Replicable Workflows

Pricemoov discovered Dataiku, which has transformed their business by not only allowing them to run proof-

of-concepts for potential customers on short notice thanks to significantly faster data cleaning processes and the ability to quickly replicate existing work, but also ultimately by enabling them to provide better pricing options overall.

The data department at Pricemoov now uses Dataiku to:

- Replicate existing workflows to get proof-of-concepts for potential customers up and running quickly.
- Significantly speed up data cleaning and exporting, leveraging the Dataiku's visual point-and-click interface to enable less experienced staff to assist with this process and leaving tenured data scientists to focus on modeling rather than data prep and plumbing.
- Non-technical teams (like marketing) can build their skills and scale their efforts thanks to an intuitive, visual point-and-click interface. Longer term, the goal is to have them efficiently and independently leveraging website clickstreams and HDFS datasets.





- Better define a specific price per customer that evolves over time by melding data indicating demand with customers' willingness to pay. Deliver specific insight for local branches by quickly applying geo clustering.
- Quickly submit pricing options to local branches of brick-and-mortar stores, who can then choose to accept the options or not and can seamlessly share feedback to improve the model.

THE RESULTS

Delivery of 10x More Models

After implementing Dataiku to scale their pricing optimization system and its surrounding processes, Pricemoov saw:

- A two week improvement in the speed at which they could produce pricing and forecast models.
- The creation of 10 times more scenarios.
- An improvement in staff performance and development, allowing new hires to prototype code in Jupyter notebooks and sales teams better sell the product.

“Dataiku has been pivotal in accelerating our growth by allowing us to scale our operations. With the success of this initial project, we’re looking forward to enhancing the work we’ve already done by going real time with API requests. This will further expand our customers’ opportunities when it comes to robust pricing options.”





III. MAIN AI CHALLENGES IN RETAIL & CPG

GETTING MODELS INTO PRODUCTION

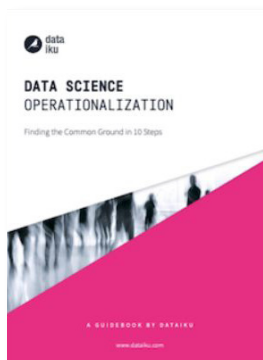
Studies show that 86 percent of predictive and machine learning prototypes never make it to production. Because of a number of reasons (both technical- and people-related), it has historically been very difficult to industrialize and get actual value from AI projects.

The reason for that? Deployment of data science and machine learning projects is hard. It consists of taking the data scientists' work from prototype to production stage. That means from a draft on someone's laptop to a data product that performs heavy computation every day, be it to make predictions (recommender systems, churn, etc.) or for more standard applications like data processing.

Indeed, deployment of AI solutions is a common issue faced by organizations worldwide that want to get started (or even move past getting started and into scalability). And it's not the most trivial issue either, even for industries with a higher overall level of AI maturity. The difficulty and cost of putting models into production - plus the uncertainty in terms of revenue generation - is part of the reason why the extremely cost- and price-sensitive retail industry has lagged behind in applying technology like AI, ML, and predictive analytics to their business operations.

The key to delivering business value from data lies in aligning AI projects with actual business value (and getting those projects out of the lab and into a production environment where there is real, business impact) - also known as operationalization (o16n). Operationalization simply means deploying a machine learning model for use across the organization. O16n is vital for the business to realize the full benefits of their data science efforts.

FURTHER READING



THE CHALLENGE OF MIDSIZE AND SMALLER RETAILERS

E-commerce giants and large incumbent tech firms have multiple advantages over smaller enterprises. From acquiring a deeper understanding of their customers to optimizing their supply chain and store operations, large retailers use sophisticated analytics in every area of their business to gain a competitive edge over their rivals.

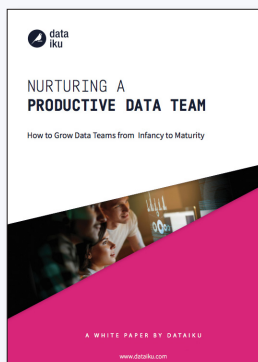
Important investments in machine learning and AI technology and training have helped many larger corporations gain market share through more sophisticated targeting, more personalized promotions, and a better ability to identify and exploit strategic opportunities. However, for the majority of midsize or smaller retailers and CPG brands, leveraging AI and transforming their data into dollars hasn't been as easy.

And it's not because they don't understand the value of data or AI; it's simply because they do not have the large stacks of resources and expertise that large organizations have access to. In addition, midsize brands and retailers are likely to face the inevitable challenges of all growing businesses:

- Various outdated legacy systems;
- Siloed data and teams;
- Budget constraints;
- Data culture change - the necessary gradual transformations in organization, processes, and most importantly, people - is often the biggest challenge of all.

This all may sound overwhelming, but it shouldn't stop midsize and smaller retailers from embarking on their Enterprise AI journey. You don't need to hire hundreds of people on your data team to start, you just need a few of the right people equipped with the right tools, working on high-value use cases.

FURTHER READING



DATA COLLECTION AND MANAGEMENT

In brick-and-mortar retail and CPG, the largest hurdle to AI is, unfortunately, data collection. Sure, there's transaction and loyalty card data that can be used for marketing initiatives (like churn prediction and prevention). But to implement machine learning - particularly deep learning - projects in the stores themselves, there's a chunk of missing data related to the in-store experience. Yet obtaining this data via complex systems is a huge cost hurdle, and given that today, only 1 percent of retail AI initiatives reach full-scale deployment, implementation is still (understandably) considered a risk.

While large online retailers have the undeniable upper hand when it comes to data collection, CPG companies can increasingly keep up though a growing access to vast amounts of information, from traditional enterprise data (via their finance and operations departments) to consumer data (especially online behavior) to partner data (typically by way of panels, retailers, insight partners, and others), and recently, even data generated from sensors and Internet of Things (IoT) applications.

Despite this, many CPG and brick-and-mortar retail companies are lagging behind in their data initiatives and, with the exception of large retail chain players, haven't managed to meaningfully implement and scale AI solutions, or extract actionable business value from their AI activities.

A study by BCG¹⁰ identified multiple organizational roadblocks as explanation for CPG companies' difficulties with getting their AI and ML models to production, from timid support on the part of senior executives to poor data governance and a lack of taxonomy (that is, an agreed-upon data framework), as well as fragmented teams and a failure to anticipate fully the impact on jobs and ways of working that AI and advanced analytics will have.

That's where data platforms come in to help. To successfully operationalize and scale, data teams need far more than just good data - they also need staff, structure, efficiency, automation, and a deployment strategy; data science tools facilitate these requirements (and much more). They can also help by bridging the gaps in technical skills required through tools like visual machine learning or deep learning plugins that facilitate simpler data initiatives.

FURTHER READING



“CPG companies can use AI and advanced analytics to translate consumer-related data into insights and then disperse those insights throughout the organization—from product design to supply chain to marketing and sales.

To achieve that goal, investments in AI and advanced analytics will not be enough. It will require significant changes to ways of working throughout the organization, from board-level decision making to shop floor operations.”

BCG, Unlocking Growth in CPG with AI and Advanced Analytics¹¹

¹⁰ <https://www.bcg.com/fr-fr/publications/2018/unlocking-growth-cpg-ai-advanced-analytics.aspx>

¹¹ <https://www.bcg.com/fr-fr/publications/2018/unlocking-growth-cpg-ai-advanced-analytics.aspx>

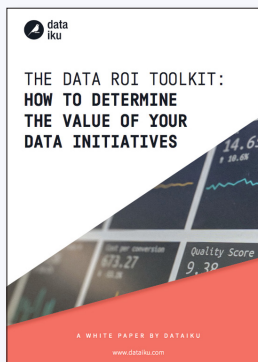
ESTIMATING ROI

Retail as an industry operates on relatively thin margins. There are exceptions – luxury, for example – but for the most part, it makes the industry very risk averse and conservative. The ROI has to be solid and well-defined in order to get a retailer to move.

With AI use cases in retail, the ROI so far has been pretty good – due to an aggregated sales lift that comes from encouraging incremental purchases through personalization, some cost savings that come from using chatbots instead of relying on call center personnel for routine inquiries, and revenue and inventory turn benefits that come from AI-driven replenishment forecasting use-cases.

But AI blurs the lines between micro- and macro-level use cases. A macro use case in retail, like something that applies to long-term forecasting in merchandise planning, may actually be built on a use case that is an aggregation of better sales, fewer stockouts, and less inventory at individual stores over time. Even when long-term forecasting might answer the question of what should be the aggregated levels of merchandise purchases in order to match forecasted demand, the AI may be arriving at these aggregations by making localized predictions and rolling them up. And those localized predictions come about from identifying patterns of activity from the past, and using what AI can extract from those patterns of activity to predict what will happen next.

FURTHER READING



DATA GOVERNANCE, ETHICS & RESPONSIBILITY

In a recent Deloitte survey, about a third of respondents named ethical risks as one of the top three concerns about the technology. State of AI in the enterprise¹², 2nd edition Deloitte Insights, October 22, 2018.

The tremendous benefits of AI to the retail economy are invariably accompanied by serious challenges. Concerns about the displacement of workers by technology is hardly unique to the era of AI, but many analysts believe that the next wave of innovation may force unprecedented consideration about the future of human labor. Businesses and political leaders will have to be sensitive to the disruption that new tools cause and identify ways to reorient displaced workers for jobs of the future.

¹² <https://www2.deloitte.com/us/en/insights/focus/cognitive-technologies/state-of-ai-and-intelligent-automation-in-business-survey.html>



Regulators will also face pressure from different constituencies as they make decisions about approving disruptive technology. Excitement about the opportunities offered by autonomous vehicles and drone technology will compete with serious concerns about safety and liability.

Most likely the greatest concern will relate to privacy. What can regulators do to ensure that retailers can harness the power of personal data and share its benefits with consumers without infringing on individuals' rights to privacy? These are questions with which every political jurisdiction and population will wrestle.

Retail has a special blind spot when it comes to managing the ethics of a technology, as we have seen over and over again with consumer privacy. Let's just take mobile phone tracking as one example. As retailers first tried to roll out consumer in-store tracking using things like mobile phone sniffers, there was a lot of finger-pointing between retailers, who said "we rely on technology vendors to manage the privacy impacts" and vendors who said "we rely on retailers to implement the technology in a way that meets their customers' expectations for privacy." We're easily headed down this road again with AI.

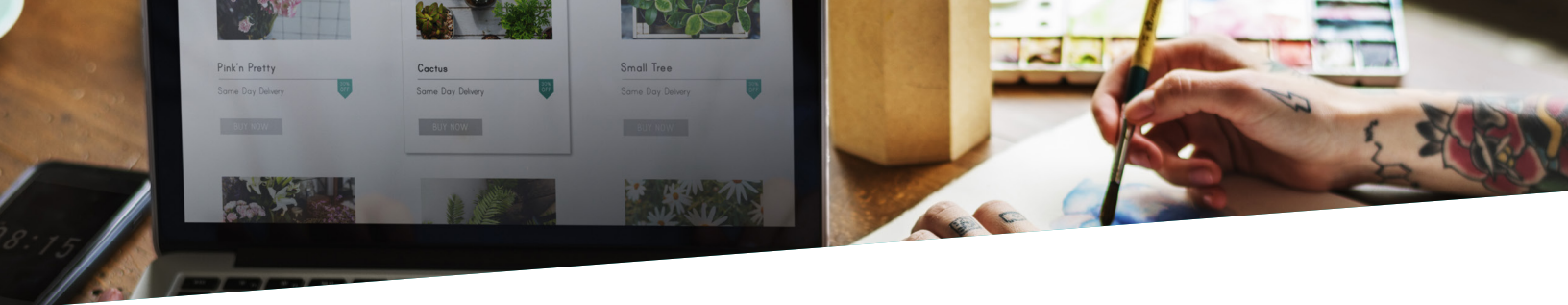
But it doesn't have to be this way. With some relevant expertise and education of people, careful governance processes, and the right tools (for example, choosing an AI platform that facilitates privacy compliant data projects and allows for complete model interpretability), the ethical and regulatory challenge is not impossible to surmount.

DATA PRIVACY MATTERS

When dealing with personal and/or potentially sensitive data, organizations should take it upon themselves to review any relevant regulations in their region(s) of operation and be prepared to comply with those regulations. The most important step in working with personal data is ensuring that the way consent is obtained for collecting that personal data is in line with regulations.

FURTHER READING





IV. TOP TRENDS THAT WILL TRANSFORM THE RETAIL & CPG INDUSTRIES

1. NEW DATA, MORE DATA, & JOINED UP INSIGHTS

Companies that have captured the full customer journey by integrating multiple sources of data are generating up to 8.5x higher organization value. *“Marketing in the Driver’s Seat: Using Analytics to Create Customer Value”¹³, Harvard Business Review.*

Brands and retailers are engaged in collecting as much data as possible on customers to more effectively communicate with them and retain their loyalty. At the most basic level, online retailers are harnessing consumer data to present customers with the products they are most likely to value. Every day, the algorithms underpinning these processes become more sophisticated, accounting not just for a customer’s own purchases but myriad other data points, including subtle behavior cues, both online and in real life, to better understand a customer’s personality.

In some ways, the shopping experience is more impersonal than ever, simply because people are increasingly making their purchases through a computer screen, rather than across the counter from a store clerk. And yet it’s imperative in the increasingly digital world of retail for businesses to personalize the shopping experience as much as possible. Much of that depends on AI.

Retailers could derive ever greater value from the analysis of online activity, and much of this opportunity lies in moving outside of traditional data sources. Both traditional and newer online retailers are now leveraging a multitude of behaviors that consumers exhibit while they’re browsing on their websites, such as:

- Purchases
- Time spent on site
- Pages/items clicked on
- Search terms

As deep learning capabilities advance, retailers will be able to get even more mileage out of the information that customers voluntarily provide when they sign up for loyalty programs or store credit cards. Such information includes:

- Date of birth
- Gender
- Address
- Purchasing history

¹³ <https://hbr.org/resources/pdfs/comm/google/19688GoogleFeb2016.pdf>



Those four data-points will continuously deliver richer and richer insights to retailers as deep-learning capabilities increase. Programs will likely be able to use them to predict a person's income, marital status, household size, education level and other key demographic details.

Many of those insights can be gleaned simply by comparing the customer's data to publicly-available databases, from census records to social media profiles. Algorithms can then use that information to create a profile of each shopper and to predict their consumer preferences.

But when it comes to datasets, bigger is not always better. Amazon has found that the accuracy of its predictions in e-commerce does not continue to improve by simply adding more products. In other words, the competitive advantage is not the amount of data, but how the company uses it. Thus, retailers using AI can compete with larger companies even without enormous datasets.

2. RETAILERS ARE REALIZING THE IMPORTANCE OF CROSS-FUNCTIONAL COLLABORATION AND ORGANIZATIONAL CHANGE MANAGEMENT

"86 percent of retail executives claim they plan to increase their investments in big data tools over the coming year alone.

Voice of the Category Manager Survey 2019¹⁴, JDA Software Group & PwC."

Retailers need to create change on an organizational level, supporting often hundreds or even thousands of individuals affected by the transformation (it is here where the advantage often falls to smaller, more agile retailers who can better foster this change). In any case, a flexible, powerful, step-by-step program ensures that impacted personnel receive the awareness, coaching, and training they need.

It is not enough to just equip your data team with a cutting-edge data science and AI platform. It's crucial to understand how to transform the entire enterprise, creating a core competency that differentiates your stores in the ever-evolving world of digital transformation.

Based on consistent and effective change management processes applied across roles, structures, processes, and projects, leaders can guide their teams through every kind of change, while also helping employees know what to ask for in order to be successful.

3. THE REVOLUTION IS ON FOR THE RETAIL INDUSTRY

The rapid digitization of communication, shopping and almost every other aspect of daily life has entirely up-ended consumers' habits and expectations. Now more than ever, brands and retailers need to re-appraise every aspect of what they do: how they develop products, how they interact with consumers, and how they operate their stores. And retailers need to do this quickly or risk being left in the dust.

At the same time, though, we've reached an inflection point in the development of AI, machine learning, and data science platforms that is a windfall to brands and retailers. So, while business is more challenging than ever, it's also possible to do things that just a few years ago would have been either unthinkable or prohibitively expensive

¹⁴ <https://jda.com/knowledge-center/collateral/2019-jda-voice-of-the-category-manager-survey-presentation>

The current retail landscape is defined by disruption. Legacy retailers are competing for market and mindshare with direct-to-consumer startups and brands and ecommerce marketplaces. Consumers now have more choices than ever to fulfill every need, which is accelerating their expectations around the shopping experience.

In this face of this rapid change, every retail business must excel in a number of core areas to keep pace - personalization, staffing, supply chain and cross-channel experience, among others. Foundational to each of these is the ability to leverage data-rich intelligence and ensure these insights are distributed across all levels of the organization.

Every aspect of retail operations has the potential to make or break the customer experience. Luckily with data-powered intelligence at their disposal, organizations can optimize four key pillars crucial to delivering a next-level retail experience— the ability to understand their customers, deliver an intelligent supply chain, empower employees and create a new retail model that centers around the products and services their customers crave. Retailers can transform data into dollars by using customer information to determine better marketing, service and product opportunities.

4. EQUIPPING DATA TEAMS WITH THE RIGHT TOOLS IS KEY TO RETAINING THEM

Data teams and data scientists by nature are curious, driven by a desire to make a difference in the organization and to have impact. And yet despite this, when it comes to employee productivity - namely data team productivity - employers are hesitant to make any investments at all (or they fail to consider the ROI in this area completely).

Despite an estimated \$6,000 to \$8,000 investment per employee per year in the form of employee benefits, talent is still leaving. So compare that to an investment in data team productivity - tools that make it easy to collaborate (lifting much of the data preparation burden off of data scientists) and easy to put models in production.

These tools bring both a business and HR impact - companies that want to get ahead and retain the best talent in the competitive data science space will take the time in what remains of 2019 to calculate the ROI of data team productivity.

5. THE ROLE OF DATA AND DATA ANALYSTS IS CHANGING

Data scientists are awesome but they are expensive, scarce, and they can't be expected to provide subject matter expertise for every line of business. Team up one data scientist to every three to five analysts, and watch collaboration, productivity, and business value increase exponentially.

When thinking about the shifting role of the business analyst, one must consider AutoML. At its core, AutoML is about using machine learning techniques to automate the process of applying machine learning; e.g., a fraud detector for credit card payment. Overall, AutoML projects would augment or replace a rule-based system so that data science is about replacing hard-coded rules by a model.

But is it all just hype? Does one really need machine learning/AI to train machine learning/AI? Often times, people will only focus on the automatic tuning or selection of the best-performing algorithms for a given task. And today, most products that build models incorporate some capabilities to boost the productivity of data scientists, including feature engineering, optimization of model parameters, or model selection and blending.

However, AutoML has a broader scope, and it can be applied to the whole pipeline of machine learning, from cleaning the data to tuning



algorithms through feature selection and feature creation. As such, AutoML has big implications for how data teams might work in the long term. Data science projects would be led by data scientists, who can then leverage data analysts that have been around and know the ins and outs of the data (or even of the underlying models) in order to guide the feature engineering process.

This is an exciting time for retail automation; if smart systems can help leverage analytics at every step of the chain, business insights will help retailers understand local trends and better tailor their marketing campaigns.

6. COMPANIES NEED TO BE ABLE TO INTERPRET AND EXPLAIN THEIR PREDICTIVE MODELS

If you already have predictive models in production, congratulations; but how do you explain to colleagues, management, internal and external audit teams how the model came to the decision it did?

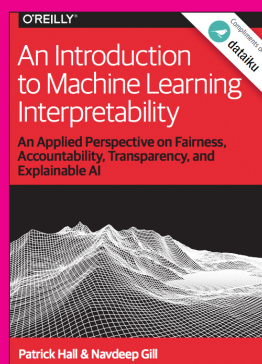
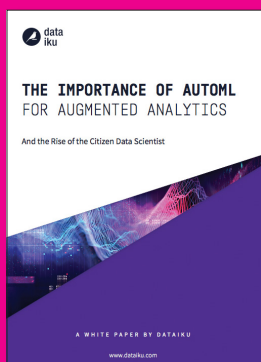
As machine learning advances and becomes more complex (and especially when employing deep learning), outputs become increasingly more difficult for humans to explain. So interpretable machine learning is the idea that humans can - and should - understand, at some level, the decisions being made by algorithms.

For retailers and CPG companies alike, access to large amounts of customer data and the ability to use it to enhance consumer insights and build recommendation engines is crucial, but for this, customers and employees who provide their data and/or use the recommendations that come out of an AI-driven analysis need to be able to trust the data processing and the results.

The principle of fairness in interpretability is even more fundamental: how do you keep the AI from learning things it should not? Apparently, AI can learn to collude and discriminate fairly easily, and without someone monitoring the conclusions, a retailer relying on an algorithm that has learned the wrong thing could find itself in hot water with regulators very quickly.

It's a common and crucial mistake to assume that only very highly regulated industries should have to be concerned with ML interpretability. Yet in fact, everyone should care about it, because at the end of the day, it builds better models - understanding and trusting models and their results is a hallmark of good science and good business in general.

FURTHER READING



CONCLUSION

Making the transition into the age of AI isn't easy for the retail and CPG space, but it also isn't insurmountable. Retailers and brands that take a step-by-step approach and set themselves up with the right infrastructure for people, processes, and tools can thrive.

Those that don't adapt will find themselves slowly falling behind, losing business to rivals who favor newer technology and struggling to stay relevant in this rapidly changing consumer insight-driven industry. To conclude, here are the three key overarching themes and takeaways from this white paper:

1. Brick-and-mortar retailers and CPG companies naturally encounter bigger and different challenges on their journey to implementing Enterprise AI than e-commerce and online retailers, but both are still at the early stages of development. Studies identified different organizational roadblocks causing retail AI to lag behind, but also unprecedented opportunities for companies in this sector to reap actionable business value from upscaling their AI and machine learning initiatives.
2. The tremendous benefits of AI to the retail economy are invariably accompanied by serious challenges in terms of governance, ethics, and responsibility, but with some relevant expertise and education of people, careful governance processes, and the right tools, the ethical and regulatory challenge is not impossible to surmount.
3. Data science, machine learning, and AI platforms are a clear win for retail and CPG: they can provide a platform for organizations to optimize four key pillars crucial to delivering a next-level retail experience - the ability to understand their customers, deliver an intelligent supply chain, empower employees and create a new retail model that centers around the products and services their customers crave. By choosing the right platform, retailers and brands can transform their business model and embark on the path to Enterprise AI to understand their customers and their businesses better, in order to deliver unique, differentiated, one-on-one experiences.

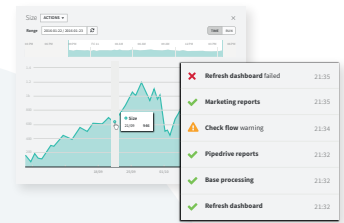


Your Path to Enterprise AI

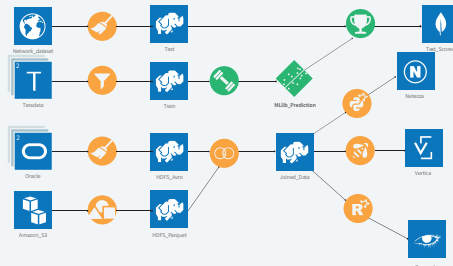
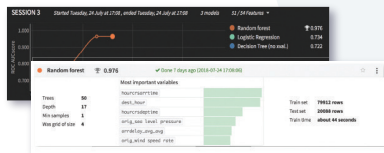
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Moran, Mr. James	male	35
Heikkinen, Miss. Katri	female	26
Salvador, Mr. Miguel	male	35
Aliot, Mr. Yusef	male	35
McCarty, Mr. Thomas	male	35
Hewlett, Mr. Rowley	male	29

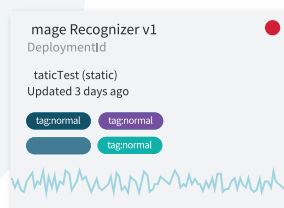
Monitor & Adjust



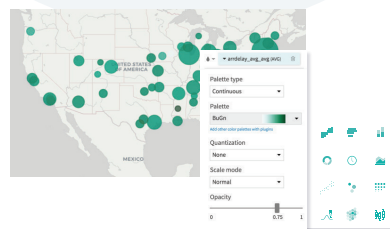
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