Transforming food, drug, and mass merchant retail with AI

Google Cloud

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Executive summary

The $15T global retail industry has been rocked with significant waves over the past decade, but the most recent disruption and global health crisis, COVID-19, has caused the biggest shock of all. Within several months, the global pandemic not only amplified differences between retail leaders and laggards, but seriously condensed the timeline available to play ‘catch up’ in digital transformation and e-commerce.

As the longer-term impacts of COVID-19 reshape the retail landscape, hundreds of operational decisions will need to be made even more rapidly across the value chain, and retailers will have to take advantage of new tools and business models to become ever more efficient and less exposed to future shock. In other words, the next ‘normal’ in retail will undoubtedly be digital, and it will increasingly be shaped by adoption of the best tools for such complex decisions: artificial intelligence and machine learning technologies (AI/ML).

Over the last decade, we’ve witnessed AI/ML grow dramatically, with its potential for wider commercial use made possible by falling sensor costs, increasing data management capabilities, and exponential strides in computing power. Retailers who choose to leverage AI/ML to solve critical business problems sooner rather than later will reap the benefits, as investments in AI yield more value as they mature.

At Google Cloud, we recently commissioned a survey of 100 global retail executives to better understand which AI/ML applications across the retail value chain drive the highest value and excitement in retail, and what retailers need to keep in mind when going after these opportunities. We took a look at two specific sectors—Food, Drug, and Mass merchants (FDM) and Specialty retailers. The researchers assessed value at stake based on the anticipated impact of using AI/ML approaches for the use cases vs traditional approaches used to optimize and applied that value to the relevant line items in the P&L.

Our research[1] identified the top AI/ML use cases[2] for investment by Food, Drug, Mass Merchant (FDM) retailers. Together, these potential application areas have the potential to drive between ~$280-650B in value as adoption accelerates. In an industry where profit margins are in the single digits, AI is poised to significantly unlock value. In fact, ten use cases by our estimation make up just over 75% of the value at stake for FDM retailers (~$210-490B), and fall primarily within three parts of the value chain: merchandising and assortment, store operations, and logistics and fulfilment.

To take advantage of this value potential, retailers must act decisively: they need to earn the support of the C-suite and ensure their leadership truly champions adoption of AI; they should establish cross-functional working teams and well-defined KPIs for use cases; and they must nurture technical capabilities and a data-driven culture. This chain of actions, when taken together, can enable ~60% of the value capture we project, and could drive up to double the operating cash flow of a typical food / drug / mass retail business if fully implemented by 2023.[3]

This accelerated adoption of AI/ML will have wide-ranging effects. For retailers who move fast, the outcome will be more resilience in operations despite the uncertainties in the world—and the opportunity to focus on serving their consumers in the emerging new 'normal' environment. For those with the vision and the capacity to shape their futures, there are real opportunities today to position their business for innovation and success, and we at Google, with our suite of AI/ML technologies and cloud platform capabilities, can help retailers get there.

1. Google commissioned online survey across North America, Asia Pacific, Europe, Middle East, Africa and Latin America of 98 global retail executives from July 3-July 17, 2020 with a direct or indirect involvement in AI/ML implementation on the business or technical side within a company of at least $300 million in annual revenue. The data is not weighted, and therefore only representative of the individuals surveyed.
2. Top AI/ML use cases were identified based on the survey as well as expert interviews inside and outside Google. The researchers sized the relevant retail sectors from industry reports and revenue projections (adjusted appropriately for the impact of COVID-19) and assessed value at stake based on the impact of AI/ML based use cases vs traditional approaches on line items in the P&L. Value was tempered down to take into account market dynamics, including competition, and the impact of other use cases on the same P&L line items.
3. Notes from the AI Frontier: Modeling the Impact of AI on the World Economy, McKinsey & Company, September 2018.

Why are we focused on AI/ML in retail?

Artificial intelligence and machine learning (AI/ML) present us with novel and efficient ways to solve challenging and persistent problems, particularly when it comes to predictions. Retail, due to its fast moving, trend powered, and fluid nature coupled to an extended logistics chain, relies heavily on making smart predictions. As improvements in AI/ML over the last several years have proliferated, not only in performance advances but also in deployability, there are exciting openings for experimentation in many domains of the retail value chain.

Taking a step back, artificial intelligence (AI) is the theory and development of systems that are able to perform human-like tasks such as visual perception, speech recognition, and decision-making. Machine learning (ML) is an effective way of building AI systems that automatically find useful patterns in data that can vary greatly: voice, video, images, text, sensor outputs, etc. The resulting predictions can be small ("What is the product in front of this checkout camera?"), larger ("How many team members should I have in the distribution center Thursday morning?"), or more complex and forward-looking ("How many of this dress should I have in Store X in October next next?"). In each case, AI/ML can yield more accurate answers and those answers will improve over time. Greater amounts of data and "training" of a system's logic, yields progressively detailed and effective predictions, thus making investments in AI yield more value as they mature—rather than deteriorating as seen with many depreciable capital investments.

Returning to retail, there's an exciting range of opportunities across functions and roles, since retailers are regularly making predictions in hopes of serving customers in better, more sustainable, and profitable ways. Falling sensor costs, growing data management capabilities, and increasing computing power, are all making AI/ML predictions better, faster, and cheaper—leading towards an anticipated rise in its use across all customer interactions and business processes within the retail sector.[4]

Google is at the forefront of technology changes, constantly pushing the frontier of possibilities in applying AI/ML, and has the ability to help enable our retail customers across the world to solve their hardest problems and capture their most compelling opportunities in new ways.

4. Prediction Machines: The Simple Economics of Artificial Intelligence, Ajay Agarwal, Joshua Gans, Avi Goldfarb, (2018)

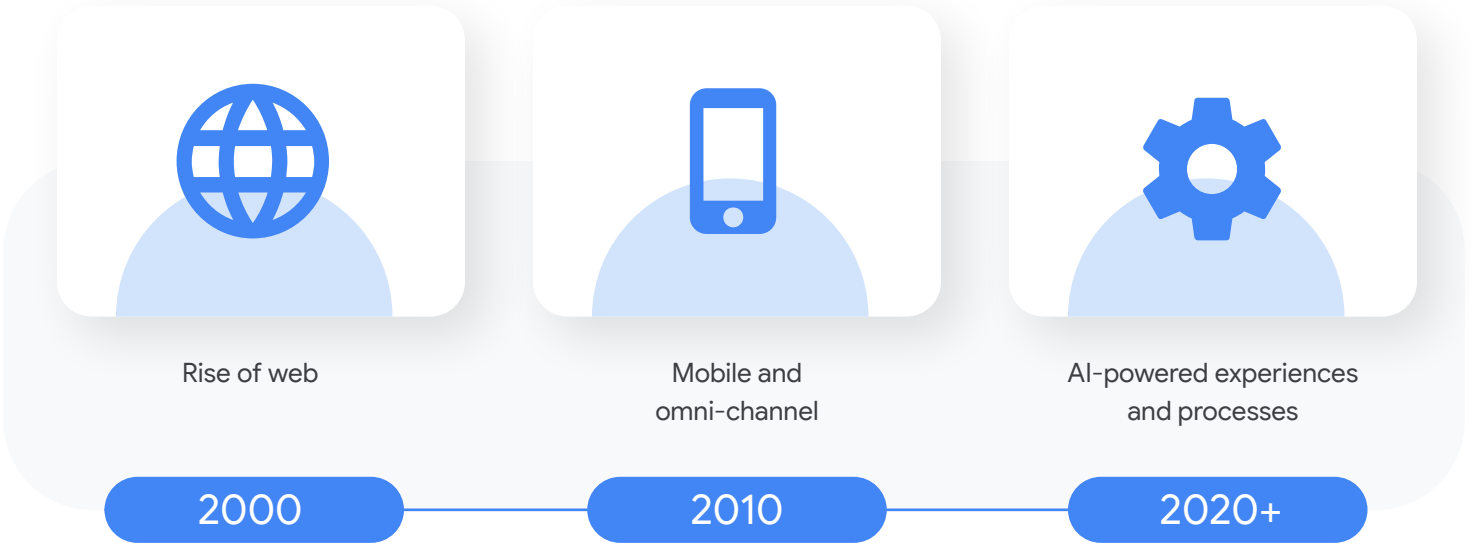
Chapter 1

The state of retail

Waves of change in retail

While retail is a diverse and fluid sector, over the past decade the world has experienced significant waves of change: the rise of web commerce, the shift to mobile, the disruption of categories by digital natives. All of these changes have meant that shaping strategy and action plans based on technology has shifted from the sole role of CIOs and CTOs to the entire leadership team.

Presently, both the world and the retail sector are coping with an even newer wave of change and disruption sparked by the COVID-19 pandemic—which is first and foremost a global health crisis and a massive economic disruption affecting the lives of all people around the world. This disruption is reshaping the industry in many ways. The sheer scale of the retail sector means that changes can unexpectedly compound and create large and even permanent swings in previously stable parts of the industry (e.g. the center aisles of the grocery store), accelerate some already fast-moving changes (e.g. omni-channel commerce), and create changes that will ultimately result in the next 'normal' of retail.



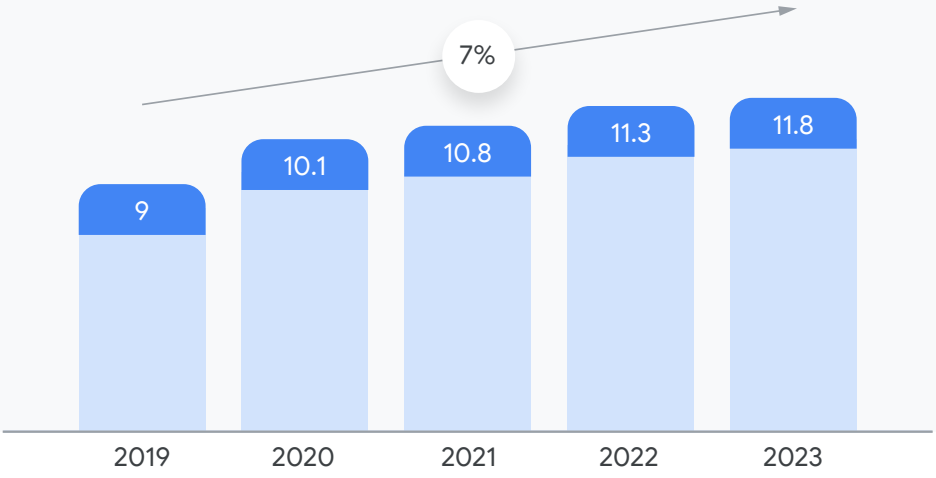
Thus far, shifts in consumer behavior have impacted many parts of retail, as have the public health orders limiting physical presence and economic activity. These changes have spurred swings in demand in many categories and a increased adoption of digital purchase channels. Revenue has risen in the Food, Drug, and Mass Merchant (FDM) markets, especially in core grocery segments as meals at home became substitutes for food on-the-go or in restaurants. However, as consumer behavior, business practices, and government regulations stabilize and reset, demand is expected to as well. Digital acceleration however is here to stay and FDM retailers are increasingly investing in improving online shopping experiences that for many consumers fell short of expectations at the peak of the pandemic.

While there is intention to continue to buy online, **25% of online shoppers** globally find the online shopping experience less satisfying than visiting a physical store.

Source: Kantar, COVID-19 Barometer Global Report, Wave 1-4, 17 markets spanning all regions, March 14 - April 27 2020

It is also important to note just how large a segment of the global economy retail is. In 2019, the FDM market had ~$9T in revenues, and by 2023 that is expected to grow by 30% to about $11.8T, COVID-19 impact projections included[5]. Within FDM, the grocery sector makes up ~60% of the market's volume, yet, as the sector grows in emerging markets, this could increase even further.

Global FDM revenues ($T)



Source: Euromonitor/ "The next normal in retail: Charting a path forward," McKinsey & Company, July 17, 2020

This acceleration of change will obviously have wide-ranging effects. More resilient operating models and leadership teams will not just survive, but thrive in this new environment. Others will be at risk, and some—especially those in a more fragile state entering the crisis—will not be able to sustain their businesses. For those with the vision and the capacity to shape their futures, there are real opportunities to position themselves through innovation for success. Google, with its AI/ML technologies and cloud infrastructure and solutions capabilities, is equipped to provide the platforms these businesses need for innovation.

5. Source: Euromonitor / "The next normal in retail: Charting a path forward," McKinsey & Company, July 17, 2020

Shifting consumer behavior and impact on retail

Rise of home delivery

In many markets lockdowns and stay-at-home orders shifted consumption to private residences reducing demand for eating out and entertainment, elevating the “domestic arts”—baking, grilling, cooking, cleaning, even home improvement—and shifting spending toward grocers and category killers, like Lowe’s and The Home Depot. This change in consumer behaviour also accelerated trends like omni-channel and personalized commerce, putting pressures on FDM retailers to meet new demands.

As consumers’ food consumption shifted, expectations from grocers and mass merchants grew. Hours of operation, customer service, and improperly stocked shelves—which were once more easily forgiven—became ‘front and center’ for customers. Navigating more quickly through a store became even more important than sheer convenience, not only for store pickers, who filled exploding omni-channel orders via apps like Instacart, but also for consumers, who sought to reduce time spent in-store due to viral transmission concerns.

Shift to e-commerce

The inability to visit stores grew online consumption overall. In grocery, the rapid, seemingly overnight shift took many by surprise. At Google we saw searches for “best grocery delivery” grow 700%[6] globally YoY and searches for "curbside pick up" grow globally by over 3000% YoY. [7] Similar trends shifted e-commerce revenues for grocers globally from ~3% to ~10%, where it wasn’t anticipated to settle till 2023. The number of consumers who now use digital channels has also increased by an average of about 20-25% globally.[8]

These tectonic shifts put stress on retailers, particularly on margins. With the lowest average across the sub-sectors[9], grocers now face increasing operational costs on omni-channel orders and management of all back-end processes from demand planning to warehousing and distribution.

Store employees were on double-duty, preparing orders for BOPIS[10] pick ups and managing ad-hoc tasks like store hygiene throughout the day. Those retailers without direct-to-consumer or digital set up missed out on the growth in digital demand.

Searches for "curbside pick up" have grown globally by over 3000% YoY[7]

6. Google Data, Global English, Mar 11 - May 9, 2020 vs Mar 11 - May 9, 2019
7. Google Data, Global English, Mar 18 - May 16, 2020 vs Mar 18 - May 16, 2019
8. “Survey: US consumer sentiment during the coronavirus crisis,” McKinsey & Company, July 18, 2020
9. ~2.5% profit margin compared to ~9% (for mass merchants) and ~5% (for category killers)
10. Buy online, pick-up in store

Refocus on convenience

Limited access and availability in stores also challenged brand loyalty, as customers drastically changed their shopping. 40 to 50% of consumers tried new stores, websites, or brands, with 20% switching their primary choices[11]. Long lines and out-of-stock products eased switching as consumers had to adjust for availability, and value. As one digital leader in a US retailer noted:

> We have to hustle to **be there for our shopper across all the channels** she is trying...otherwise someone else will get her business."

Retailers continue to struggle to maintain customer loyalty in the face of a renewed focus on availability and value. Grocers and merchants without loyalty programs suffered, as shoppers—now pressed for time, safety, and value—scrambled to source immediate needs from different retailers. The irregular demand constrained retailers without the right products or the right levels of inventory, resulting in stock-outs and missed opportunities. One retail CIO noted:

> We saw numbers that were **3-4x** what we see in holiday peak...but this time we had no warning."

11. "Survey: US consumer sentiment during the coronavirus crisis," McKinsey & Company, July 18, 2020

Digital transformation and the power of AI/ML

COVID-19 has not only amplified differences between retail leaders and laggards, but seriously condensed the timeline available to play 'catch up' in digital transformation and e-commerce. The result has been a digital divide across retailers, partitioning them into likely to thrive, simply survive or struggle. So far implementation of AI/ML use cases has been key. Retailers who invested in cloud capabilities even one year ago have benefited.

But the story of AI/ML implementation is not straightforward since retailers often decommission a project before they can reap the expected value. (See 'Barriers to value' on page 52).

As the longer-term impact of COVID-19 reshapes the retail landscape, business models will need to be adapted to become more efficient and less exposed to shock. In other words, the recovery will be digital. As such, across the value chain, hundreds of operational decisions will need to be made more rapidly and AI, cloud and data applications will have a disproportionate impact, because many of the needed tasks are hard for humans to do repetitively or at speed. Utilization will continue to separate those that thrive from those that struggle. The ability to leverage AI/ML will drive success, as companies that use AI/ML can drive 2x more data-driven decisions, 5x faster decision making, and 3x faster execution[12].

12. Machine Learning: The New Proving Ground for Competitive Advantage by MIT in partnership with Google Cloud

By 2030, companies that fully absorb AI could double their cash flow.[13] The next 'normal' in retail will undoubtedly be digital, and it will distinctly be marked by the adoption of AI/ML.

The following chapters explore AI/ML in a practical way, reviewing the highest impact use cases for food, drug, and mass merchants across the value chain, as well as the barriers to implementation and how to ensure success.

Companies that use AI/ML can drive

2x

more data-driven decisions

5x

faster decision-making

3x

faster execution

Source: Machine Learning: The New Proving Ground for Competitive Advantage

13. Notes from the AI frontier: Modeling the impact of AI on the world economy, McKinsey & Company, September 2018

Chapter 2

The value of AI/ML

Overview of value chain and use cases

The retail value chain consists of eight parts, and ranges from 'top-of-funnel' activities like customer acquisition and retention, to 'back office' activities like real estate and corporate functions. Across these eight value chain domains, we have identified 75 use cases where AI/ML can help retailers unlock value by solving old problems in new ways (in much the same way self-checkout increased staff efficiency and customer experience) and new problems (like compliance to health standards).

Example AI/ML use cases across the retail value chain[14]

Customer acquisition & retention

- Personalized promotions (redeemed in-store/offline)
- Personalized promotions (redeemed online)
- Auto-populated and personalized online cart
- Loyalty program management

Omni-channel commerce

- Customer care chatbots
- Fraud detection
- Personalized product recommendations

Store operations

- Picker routing
- Frictionless check-out
- Shelf-checking
- Automated task dispatch and in-store execution

Product lifecycle management

- Design to value
- Trends analysis
- Optimizing sourcing, manufacturing, and quality

Merchandising & assortment

- Demand planning
- Assortment optimization
- Inventory optimization
- Pricing optimization

Logistics fulfilment & delivery

- Demand prediction to optimize fresh value chain
- Omni-channel fulfillment optimization
- Warehousing operations optimization
- AI-enabled last mile (e.g. drone delivery)

Real estate

- Store footprint optimization

Corporate functions

- Cash forecasting
- Automation of finance

14. Use cases are not listed in any particular order

High value use cases

Across this subset of use cases, 10 opportunities make up just over 75% of the value at stake (~$210-490B) and primarily fall within three parts of the value chain: merchandising and assortment, store operations, and logistics and fulfillment.

While these areas of the value chain are the key value drivers today and in the near future (6-24 months), other pockets of value may also become important in the future, such as within corporate functions and real estate, where AI/ML can also have impact. Today, more than 30% of retailers are testing at least one high value use case with proof of concept implementations, and more are sure to come.

Value at stake

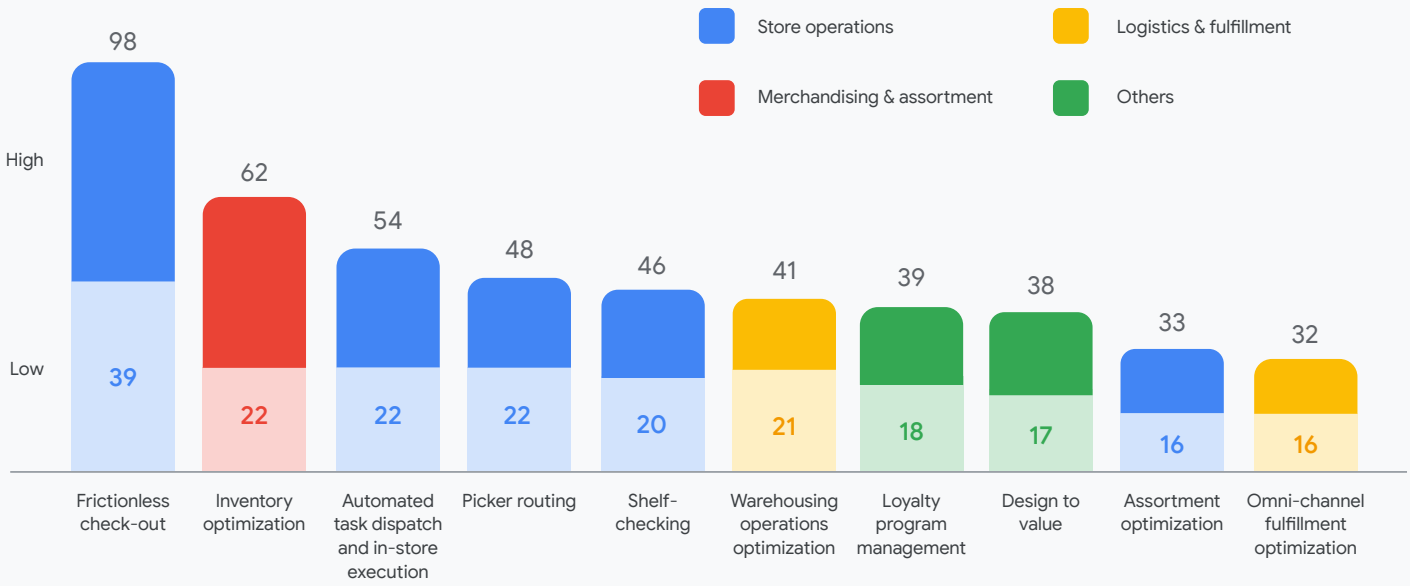
Among a wide range of food, drug, and mass merchant retailers, we observed use cases that stood out based on value potential, implementation difficulty and cost, and retailers' excitement to implement them. This subset of 18 use cases—identified through a survey of global retail executives in operational, commercial and technical roles, and via interviews of experts—could be a large value driver for the global FDM retail industry. To arrive at the value at stake, the researchers sized the relevant retail segments from industry reports and revenue projections (adjusted appropriately for the impact of COVID-19) and assessed value at stake based on the anticipated impact of using AI/ML approaches for the use cases vs traditional approaches to optimize and applied that value to the relevant line items in that P&L. Value was tempered down to take into account market dynamics, including competition, and the impact of other use cases on the same P&L line items. Together, these use cases have the potential to drive between ~$280-650B in value by 2023. In an industry where profit margins are in the low single digits, AI can make a significant difference.

$280B-650B

In value at stake through AI/ML in retail

Top 10 use cases by value

$B, 2023F



10 use cases make up over 75% of the value at stake

Use cases within store operations make up 4 out of the top 10 use cases by value.

Retailers can gain productivity and directly improve the bottom line through improvements in workforce management and in enabling a better customer experience by ensuring stores are properly navigable, shelves are properly stocked, and checkout is a breeze. By leveraging the rich data set that retailers are able to obtain from their day-to-day operations, these use cases can drive up to ~40% of the value at stake in the FDM sector.

4 of the top 10

use cases by value are in store operations

Implementation across retailers, today and in the future

When we look across the different types of FDM retailers, we see a similar appetite for AI/ML implementation. Over 70% of retailers we surveyed have more than 20 AI/ML use cases in pilot. On average, retailers are testing out 27 use cases at a time, while fully implementing an average of 16. Larger retailers (over $5B in annual revenues), however, are implementing more than double the average, with over 30 use cases in full implementation.

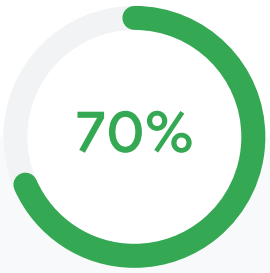
Who is motivating this use of AI/ML? In over 70% of the cases, business units initiated a use case for implementation, with 50% coming from commercial teams and the remainder being motivated by operational teams. Interestingly, technical teams initiated fewer than 30% of the use cases retailers have in pilot or full implementation—despite the heads of technology (e.g. CTO and CIO) being key sponsors for use cases and key decision-makers for the technology that underpin these opportunities.

of retailers have more than 20 AI/ML use cases in pilot

However, when we take a broader look at the portfolio of use cases—whether inspired by the business or technology side—over one third of the use cases are not high-value use cases. While there are other considerations in selecting what AI/ML applications to pursue (see 'How retailers are achieving impact' on page 48) there is a clear opportunity for FDM retailers to optimize their portfolio of AI/ML initiatives for higher impact and drive value creation.

In the near future (6-24 months), retailers intend to prioritize top-of-funnel use cases: loyalty management with smart CRM to drive customer lifetime value, and personalized product recommendations and auto-populated and personalized carts to drive top-line growth. 50% of FDM retailers are experimenting with these three use cases today. They continue to show high intent to fully implement in the future, with 50-75% of retailers declaring these use cases are high priority for implementation within the next 6-24 months.

Let's take a closer look at each of the 18 high potential use cases across the value chain in more detail, up next.



of use cases are motivated by business teams

of use cases being implemented today are not high value

High-value use cases for FDM retailers

Use case profiles

For each of the high-priority use cases identified in the research we have built a simple profile in the form shown in the example on the right side of this page.

See below for definitions of the dimensions in each profile.

Value at stake

The value potential created by the AI/ML use case across the global FDM industry based on operating profit impact on the P&L of a typical retailer in this market if full potential is captured by 2023.

Stars indicate use cases that drive top line growth while gears indicate those that create significant value from productivity. Note: some use cases earn both badges.

Full implementation effort required

Assesses effort required across data, technology, talent, investment and other organizational requirements (such as change management, business process updates, or cultural aspects) to realize use case.

Momentum

The desirability of the use case based on retailers' excitement today and for the next 6-24[15] months; ranges from 0-10.

15. Calculated as the difference between high priority intention to implement use case in future (6-24 months) and reported full implementation of use case today

Customer acquisition & retention

Personalized promotions redeemed online

Online personalized promotions are designed to provide individual customers with the relevant offers to help drive conversion and sales (including cross-sales and up-sales).

Digital economics, as well as AI/ML models, have taken this use case a step further by enabling the deployment of even more effective personalization tactics such as individualized electronic product coupons.

Such solutions rely on pooling a range of customer data including past purchases and relevant online behavior in ways compliant with user policies and preferences. AI models enhance the accuracy of pattern finding and pattern-driven offer triggers enabling more relevant offers to be delivered at just the right time. They also allow for accurate matching of personalized offers to consumers needs increasing the likelihood consumers take action.

Typical implementation requires a cross-functional marketing and analytics team as small as 5 to 10 members and is reported to have one of the shortest times to value. 52% of FDM retailers have realized the full expected value in fewer than 6 months. One of the most important success enablers for this use case is having a clear set of well-defined KPIs (e.g. daily conversions, daily sales), with over a quarter of FDM respondents citing the lack of such consistent metrics as a major obstacle.

Case study

Bringing real, up-to-the-minute data into everyday decisions

Metro is one of the largest B2B wholesalers and food specialists in the world, supporting small and large businesses from the Atlantic coast of Portugal to the Pacific shores of Japan. Metro wanted to democratize data analysis, collecting more semi-structured and detailed data from tills, customer databases, and marketing campaigns, and making it available inside the company. To make that happen, Metro built a data lake and analytics solution, mainly based on BigQuery and other Google BI services together with the data-science and machine learning experts from freiheit.com technologies. With one API for data ingestion and another for integrating with other products, the solution enables real-time reporting on data streamed direct from stores and applications. By connecting data points, Metro can offer advice like hygiene laws for certain foods, or information on provenance to their customers and can even integrate their local weather forecast so a store doesn't run out of ice cream on a sunny day.

Metro AG

> We ran extensive workshops with people from all around the organization to find where AI could add most value. We picked out key subjects to focus on, from improving customer analytics, to optimizing pricing, reviewing our assortment, and making our supply chain more efficient. This isn't abstract for us. We have a clear roadmap to make gains from machine learning."
>
> **Dr. Ehler Lange,** METRONOM Domain Owner, Metro AG

Source: Google Cloud

Customer acquisition & retention

Personalized promotions (redeemed offline/in-store)

In-store or offline personalized promotions help provide individual customers with the most relevant offers in a specific time and place within or around a physical store.

Such promotions are traditionally more difficult to implement than their online counterparts given the challenge of collecting and integrating consumers "behavior stream" in-store relative to analyzing their click-stream online. A sales team at headquarters cannot pull up numbers on how many shoppers actually picked up a given product and put it back on the shelf last month, though they can check how often it was clicked on or put on a wish list online. Getting offline promo targeting right also requires more change to execute—with changes needed in store to train employees on how to handle offers at the POS and education of consumers themselves.

More than 50% of FDM retailers noted they expect training and change management requirements to be high to fully apply this promotion model in their daily operations.

Given the challenge in contributions to incremental sales, as well as the change in business processes and checkout systems requiring updating for implementation, offline promotions are more difficult to execute relative to their online counterparts. Despite this, most FDM retailers are able to fully realize impact and capture value in less than 24 months. Across the global FDM market, this value can reach up to ~$30B, with 40%+ of retailers we surveyed piloting this solution today and seeking to capture a portion of this value.

Customer acquisition & retention

Loyalty program management[16]

Loyalty program management utilizes AI/ML to identify and capitalize on the factors that drive recurring engagement with a brand to increase customer lifetime value.

By using information about customer preferences and needs (e.g. channel of engagement, types of communication) and matching other information about audience targeting, AI/ML technology opens the door to targeted loyalty program management systems. Today, more than 40% of retailers are experimenting with modernization of loyalty using AI/ML capabilities and over 50% intend to implement it within the next 6-24 months.

To capture the potential in next generation loyalty program management and to best cater to customers' needs, retailers need many kinds of data, e.g. transaction data, 'look-alike' data, CRM data, channel preferences, and other consumer profile information making this dependent on bringing a wide range of input streams into a retailer's data platform.

To take action based on a better view on loyalty and customer value, downstream processes need to change. For example, employees may need to be trained to input and use data from the CRM system. Category killers, especially relative to grocers and mass merchants, historically have less mature loyalty programs, and therefore likely require additional lead time for ramping such programs. Other retailers may face significant legacy modernization work. But the prize for success here is larger and the payoff continues and improves over time.

16. Includes smart CRM

Customer acquisition & retention

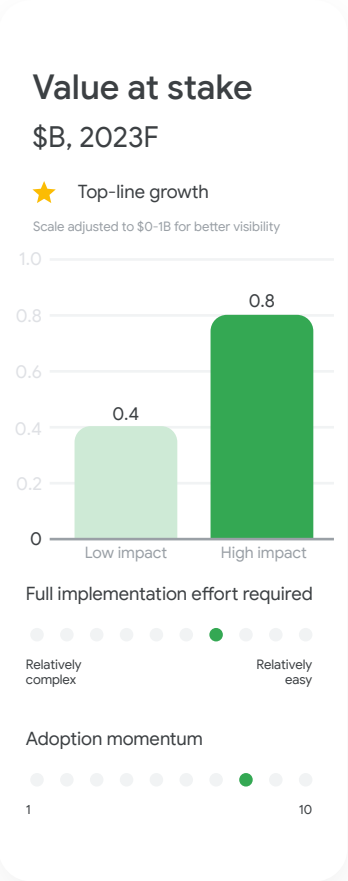
Auto-populated and personalized online cart

While many use cases are being tested at scale today, this use case represents an emerging opportunity for innovation that can pay off for FDM retailers given frequent trips and deep shopping histories that they have the opportunity to aggregate.

Based on the historical purchasing and browsing data, an auto-populated and personalized online cart can predict customer interest and help an online shopper pre-fill a shopping cart to drive direct top-line impact.

Collecting, annotating and analyzing the historical shopping data is core to implementation as the accuracy of the AI/ML models, and hence the value captured, will be driven by the quality and variety of the data. As a result, the implementation might be complex in the short-term, but the growth opportunity still remains high in the long-term.

Today, 50% of retailers are testing out auto-populated carts, and, while only 20% have fully implemented the use case, that number is expected to grow by 2.5x in the next 6-24 months.



Omni-channel commerce

Customer care chatbots[17]

AI/ML has enabled retailers to implement advanced chatbots for personalized assistance, product recommendations, and customer service queries (e.g. first level support, FAQs, etc.).

The goal is to increase customer satisfaction and operational efficiency, while simultaneously reducing handling costs. This takes advantage of the rapid improvements in natural language understanding and generation—both speech and text—that AI models have enabled. Google is a leader in application of these technologies across our business and brings them to our retail customers as well.

Chatbots start with pre-trained models but that training needs to be enhanced with further training for responses on category and context specific topics for each retailer. Deployment requires data such as anonymized call center records and customer service conversational histories, which feed NLP (natural language processing) models. Customer workflows are also necessary inputs for designing an automated customer care experience. Thus, while >70% of chatbot applications are driven by business teams, cross-functional collaboration between business, operations and tech colleagues is a key driver of success.

Time to impact can relatively be short. Shifting customer care towards an automated, tech-based solution with a consistent customer experience (especially for first level support queries), can take as little as 7-12 months with a team of 5-10 members. The longer-term benefit of implementing such a solution comes as the AL/ML system continues to learn from agents on how to solve the toughest problems. This can enable enhanced service availability and quality at lower cost. Today, 50% of FDM retailers have not implemented a chatbot solution, but almost half are expecting to act in next 2 years.

17. Includes customer care automation/call routing

Case study

Responding quickly to customers with Rapid Response Virtual Agent

Retailers like Albertsons faced call volume to their stores that increased five times the norm during COVID-19. To get customers faster responses, Albertsons enlisted Google Cloud's Rapid Response Virtual Agent to manage inbound call volumes and address customers' more basic questions, such as hours of operation, pick and delivery options, and order status. The Rapid Response Virtual Agent solution allows retailers to stand up new chatbot-based services within two weeks to help respond to their customers more quickly and efficiently, especially as it relates to critical information around COVID-19. This new chatbot can help with store hours inquiries, inventory questions, pick-up options, and more, offloading an immense amount of calls going to human agents, so they can focus on more complex service needs.

Albertsons

"The pandemic sparked a number of inquiries from our customers, causing a rush of calls, and impossibly long wait times. With the Rapid Response Virtual Agent program we were able to quickly set up our virtual agent, answering questions and directing traffic at the first inquiry level. Saving us time and money, while better servicing our customer's needs."

Cameron Craig, Vice President Digital Product, Design & Experience, Albertsons

Source: Google Cloud, quote

Omni-channel commerce

Personalized product recommendations

AI/ML can improve customer omni-channel experiences by providing individualized product suggestions and other communications (e.g. online and in-store messaging)—not only to a given customer but also to specific moments in her shopping journey.

Highly relevant recommendations can be powerful drivers of basket expansion and can lead to an enhanced customer experience as well as increasing likelihood of return trips and shopper loyalty.

Aggregating the data needed to enhance accuracy and the pipelines needed to bring both on- and offline data together is an important step in fueling models for predicting intent of purchase. Capturing value through recommendations requires relatively little change management, but some business process changes will still be required to deliver the full potential over time. While fewer than 4 in 10 retailers have full implementation today, within 24 months, that number is expected to jump to 7 in 10 indicating that food, drug, and mass merchants really see the potential for business impact.

Case study

Analysing customer commerce data to support business growth

With more than 260 million people, Indonesia represents a considerable opportunity for ecommerce companies. Blibli.com aims to become a leader in Indonesia's ecommerce sector. Founded in 2010 and launched in 2011, Blibli.com plans to be a one-stop shop for consumers seeking products and services in mobile and tablet devices, sports and outdoor activities, home and living, men's and women's fashion, tickets and vouchers, and other categories. The business also provides bill payment and hotel and airline booking services. Blibli.com relies on an ecommerce engine and a data platform to run its business. The data platform captures clickstream data as well as data from its backend systems. The business uses the clickstream data to capture intelligence about customer behavior on its website, including trending products and services, while backend system data is used to measure performance against business metrics and key performance indicators. Blibli.com is now running its data platform in a Google Cloud Platform environment designed to optimize performance and availability.

Blibli

> Machine learning services could improve our product combinations as well as help us automate and streamline inventory planning, customer segmentation, and events classification. We now have more time to consider our options in this area because Google Cloud Platform has allowed us to spend less time managing our infrastructure."
>
> **Welly Dwi Putra,** Principal Data Engineer, Blibli.com

Source: Google Cloud

Store operations

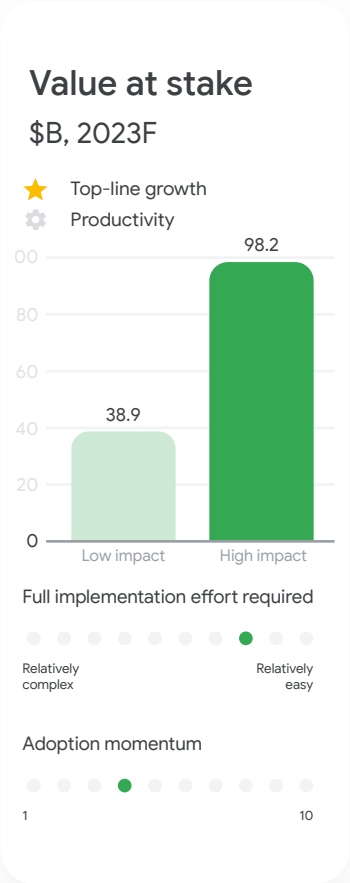
Frictionless checkout

Speeding checkout and cutting down line wait times has always been a goal for food, drug, and mass merchants. The integration of in-store technologies and AI is bringing the new possibilities for solutions to this age old problem.

Frictionless checkout is a group of applications of computer vision and data analytics tools that help retailers reduce or eliminate store labor needed for check-out and store monitoring and which increase shopping convenience for customers via a eliminating the traditional checkout process. This goes beyond the typical self checkout model that shifts work to the consumer and offers the freedom to collect your basket and "just walk out."

AI models capture both the action of the consumer and the products they are collecting in the store. Significant image and video data such as packaging images and customer behavior patterns is required to train such algorithms. Furthermore, extensive hardware, including on-premise video processing, cameras, and on-shelf sensors, are required. These complexities illustrate why having well-defined KPIs is the key enabler while minimizing risk of high-cost investments, and modeling the cost trajectories of the hardware needed to bring this to reality. Significant change management and consumer education is required for adoption, of course.

While frictionless checkout is technically complex, it also holds high value potential—and if the full value is captured, it could represent could represent as much as 15% of the total value at stake. Thus, it is easy to see why many retailers are beginning to test and experiment with the technology despite the challenges.



Store operations

Shelf-checking

Checking to make sure stock is in the right place and replenished throughout the day is a problem as old as the store itself. But it remains a critical value lever for food, drug, and mass merchants.

AI-enabled video analytics employed in shelf-checking systems identify and prevent operational friction points like stockouts, pricing errors, missing labels, and planogram inconsistencies.

Store operations teams are the biggest proponents of such systems, but success hinges on the data scientists, ML specialists, and translators needed to run and maintain the solution. This is because for shelf-checking to be established, a significant image dataset is required to train algorithms (e.g. packaging images, shelf images over time) along with investments in hardware and software since typical implementation relies on video-enabled robots roaming aisles to collect the necessary information.

Despite utilizing robots in some cases for data capture, shelf-checking training cannot be ignored: 75% of FDM retailers note that they need significant focus on training—especially given the impact on store operations. Given this, the path to impact is longer than most AI implementations we assessed. 50% of FDM retailers surveyed take more than 12 months with a cross-functional core team of up to 10 members to fully see the impact.

Store operations

Automated task dispatch and in-store execution

An AI/ML Automated task dispatch helps prioritize and dispatch tasks for in-store execution by determining work that can be most efficiently allocated to in-store or warehouse teams. Such approaches are used by retailers to assist in providing better in-store experiences for customers by getting the right work done, at the right time, by the right employee.

The key requirement for implementing is a solid understanding of the real-time labor requirements of all tasks, employee productivity history, access to inventory data, and customer service information. Given that semi real-time or even fully real-time collection and analysis of such data is necessary to make sufficiently fast decisions, 50% of FDM retailers mention increasing technical capabilities as their top enabler for this use case.

While the user interface of a task management system offering a feed of work to employees on a mobile device is easy to use, significant change management and adoption training would be needed for both employees and store managers. As a result most FDM retailers see expected valuable impact in 7-12 months, on both labor productivity and other store operations KPIs as well as on the consumer experience.

Today, less than 10% of retailers have fully implemented automated dispatch as a solution, but excitement for this solution is high: within the next 24 months, the number of retailers that plan to pilot it could increase by 1.5x. With more than $50B at stake, it's no wonder it has momentum.

Store operations

Picker routing

As more digital orders arrive for in-store pickup or ship to home delivery, retailers are moving fast to enhance the productivity of those “pickers” who must prepare the orders. The essential goal of picker routing is to determine the most efficient sequence for collection of required items with the least travel time possible. Use of AI/ML technology for such tasks is especially relevant for omni-channel retail grocers and mass merchants given wider assortments and changing SKU mix.

Overall physical layout and inventory SKU data across the entire location is essential for such systems to function. Investments in employee location tracking (e.g. via BLE[18] mesh networks and indoor location sensor hardware), as well as specialized software, are required to get a picker solution up and running. With such data, software, hardware, and operational requirements, increasing cross-functional team usage is one of the most important drivers of success: integrating the operations and analytics teams plays a key role in the early and successful implementation of such systems.

Picker routing however does not need an unwieldy team in order to function: 50% of FDM retailers are able to implement this use case with a cross-functional team of fewer than 10 people. The training effort is moderate if attention is given to the user interface and simplicity of the employee experience. Relative to others, such technology has a shorter time to change realization and given the sharp increase in e-commerce and “drive up and go” demand we expect momentum to build quickly for these solutions.

18. Bluetooth Low Energy

Case study

Remote maintenance of bot swarms to pick customer orders in lockdown.

Grocery retailers across the globe have seen huge spikes in demand for online delivery due to lockdown conditions in spring-summer of 2020. Ocado Technology supported its UK retail partners in delivering 40% more groceries than pre-lockdown, while also launching new ecommerce deployments for retail clients in France, Canada, and Sweden, to assist them in serving more customers during this time. Google Cloud helped Ocado Technology keep moving during lockdown, supporting human operators to remotely oversee maintenance of the company's unique bot swarm that picks customer grocery orders.

Ocado Technology

> I'm incredibly pleased at the rate we've adapted. Ultimately, it has led us to appreciate even more how our investments in technology can make us more efficient."
>
> **James Matthews,** CEO at Ocado Technology

Source: Google Cloud

Product lifecycle management

Design to value

AI/ML-enabled design-to-value (DTV) processes rely on techniques like sentiment analysis, trend modeling, and social media listening to predict which products are likely to succeed. They also can help quickly assess packaging design choices and associated costs and thus contribute to early modeling of the full economics of a new product launch. This helps ensure the correct private label products are produced in the most efficient ways, with the least amount of waste for a given customer base.

Perhaps the biggest challenge to this approach is collecting sufficient catalogues of images, text, reviews, sentiment analysis, and transaction/sales data to help inform the AI/ML analyses. Additionally, significant work, data collection and model training are also required to develop R&D and supply chain models for all-in assessment of new product launches as well as for cost reductions to existing SKUs.

With nearly 70% of FDM retailers citing the need to train a moderate number of employees for DTV, plus additional investments in change management, and supply chain and R&D process updates, DTV becomes one of the more complex use cases to fully implement. As such, fewer than 15% of retailers have fully deployed AI in this domain today, despite the potential lift in sales and top-line impact. We expect momentum to build, however, as more players recognize the potential for impact.

Merchandising & assortment

Assortment optimization

Assortment optimization leverages AI/ML to enhance product selection based on data (e.g. customer reactions to products on shelves, customer 'walk' rates, space sensitivity, duplication) to maximize potential revenue, yet the technology can be leveraged both online and offline.

Assortment optimization requires an established base of data on both customer behavior (e.g. shopping, macro search trends, geographic location) and retailer information (e.g. historical sales, category assortment and performance, and marketing data), and as such, requires advanced analytics to balance the breadth, depth, and variety of SKUs optimally.

There is still a mindset component that needs to be overcome for value to be captured, namely the shift toward data-driven assortment optimization where merchants adjust based on recommended mix instead of fully merchant-driven choices. Workflows and roles of people within the process will also shift creating a need for thoughtful integration of analytics, training, and process design to capture the potential value.

Case study

Assortment recommendation for personalised selection at store level

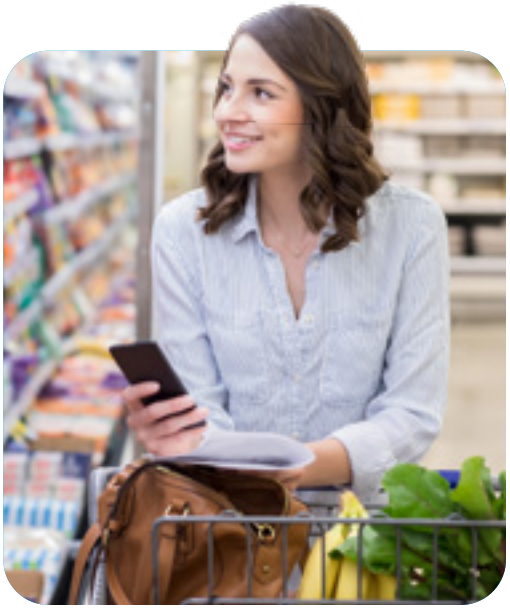
Carrefour is one of the largest grocery retailers in France. Carrefour needed to ensure it had the right products, in front of the right shoppers, at the right store location. With Google Cloud, Carrefour developed an assortment recommendation tool that helped the chain support a more personalized selection at the store level, giving store directors the autonomy to influence inventory needs. The tool also gives Carrefour headquarters visibility into the merchandising decisions by each of their franchise stores.

Carrefour

“

Thanks to Google Cloud Platform technology we are redefining the ways of doing shopping, developing a truly omnichannel value proposition for our customers and across the continents there is value creation in our core business."

Amélie Oudéa-Castéra, Executive Director, E-commerce, Data and Digital Transformation, Carrefour



Source: Google Cloud, quote

Merchandising & assortment

Pricing optimization

Price optimization allows a company to assess how customers will respond to different prices for its products and services. AI/ML can assist with increasing the speed and complexity of the algorithms used. Given how versatile such techniques are, it can be applied to meet various objectives of a particular retailer (e.g. profitability on each unit sold, overall market share, access to a new market, spoilage).

Retailers need access to a wide variety of pricing data (e.g. by competitor, item, store, and location) as well as transaction information. However, pricing optimization is a high leverage opportunity where a small team can deliver high impact quickly with 40% of FDM retailers citing the ability to implement pricing optimization solutions with a team of fewer than 5.

Overall, relatively low levels of change management and limited training is required. As a result, the time for FDM retailers to capture the value of pricing optimization is 7-12 months. It is thus no surprise that nearly 50% of retailers have already fully implemented solutions in this domain, and only fewer than 5% do not intend to act.

Merchandising & assortment

Demand planning

Demand planning employs AI/ML to better understand and predict customer demands of retailers in order to best optimize supply. Because demand planning impacts so many parts of a retailer's P&L (e.g. revenue, cost of goods sold, inventory holding costs, spoilage and markdowns), it is a critical use case for FDM retailers and can deliver impressive level of impact.

Retailer data (e.g. sales history, category data, and marketing data), data on consumer behavior (e.g. shopping, search trends, geographic location), and public information data (e.g. seasonal events, weather) all need to be analyzed together for effective implementation. Given the wide range of information that needs to be combined, platforms and "data pipelines" to organize and manage those resources are key enablers of the AI solution set.

Nearly 50% of retailers have already implemented AI-driven demand planning solutions in some way, but many still require changes in behavior processes and workflows to reach full adoption. Similar to assortment optimization, the most critical change is the shift of mindsets from historical forecasts adjusted by human merchants to data-driven merchandising recommendations that allow merchants to plan and act in more granular and specific ways. The planning team enabled by AI can deliver better outcomes far faster and with greater agility.

Merchandising & assortment

Inventory optimization[19]

Getting the right inventory in the right place in the face of fast-changing demand is one of the most critical challenges in retail.

Almost all retailers use models of some kind to help them set stock levels. However, AI-powered inventory optimization is able to increase accuracy and granularity of SKU and store-level stock planning; results which enable companies to minimize lost sales, inventory waste and shrink, and therefore increase profitability and working capital efficiency.

As with many AI/ML techniques mentioned, a wealth of data is required, including product SKUs, (near-) real-time demand, expiration dates, and (near-) real-time inventory. Collaboration with vendors and logistics partners to enable supply chain visibility of inbound orders and to adapt to any supply disruptions is key. Faster data paths enabled by cloud-based event stream processing can enable better visibility from store to DC to in-transit stock. Cloud data platforms can bring together these fast-moving streams to allow machine learning algorithms to set and reset stocks and replenishment triggers more dynamically than ever. These platforms and third-party tools can enable even small cross-functional teams to deliver significant improvements vs. older modeling approaches and more importantly drive faster more accurate actions.

FDM retailers are acting quickly. 50% of those surveyed have implemented some solution, and adoption is expected to grow to nearly 70% in 2 years. Because inventory optimization improves both top-line and productivity drivers of financial performance, it creates a disproportionate impact: roughly $60B at stake across the world, making it the second most valuable use case for food, drug, and mass merchants.

19. Includes advanced replenishment

Logistics fulfillment & delivery

Omni-channel fulfillment optimization

Omni-channel retailing has required retailers to offer a fully-integrated shopping experience, uniting brick-and-mortar to mobile commerce and everything in between. The corresponding increase in consumer touch-points also provides opportunities for AI/ML to enable retailers to optimize multiple aspects of logistics. At its heart it requires retailers to communicate, with accuracy, what time a customer can expect an order to make their experience seamless, while driving the highest margin for the retailers.

Omni-channel fulfilment optimization demands a high accuracy level for inventory data across all channels, as well as integration of systems for consistently real-time views of inventory across the store/distribution center network.

Cloud data platforms bring new capabilities to aggregate this fast-moving data and AI algorithms offer enhanced capabilities to act on it quickly. Targeting KPIs for customer service, margin, and stock levels and optimizing across them simultaneously is only made possible on data in this volume and velocity by cloud-based AI.

Today, about 1 in 4 retailers have fully implemented omni-channel fulfillment solutions powered by AI, and 1 in 2 are experimenting. The typical timeline to achieve expected impact is after 12-24 months given the need to integrate up and down the value chain, but the impact potential is high with opportunity to unlock nearly $32B in estimated value.

Case study

Cross-channel problem solving, efficiently

Customer-first service means shipping direct, having the right tool in store, teaching new skills, and anticipating customer needs, everywhere. The Home Depot (THD) empowers its associates with Google Cloud's BigQuery by providing timely data to help keep 50,000+ items stocked at over 2,000 locations, to ensure website availability, and provide relevant information through the call center. How? By giving visibility to the things each customer needs, like item location within a local store, despite unique store layouts. No two Home Depots are alike, and the stock in each has to be managed at maximum efficiency. Migrating to Google Cloud, THD's engineers built one of the industry's most efficient replenishment systems—then figured out how to get more done, using BigQuery for streaming application performance monitoring. When THD associates need to locate goods they turn to their mobile apps for in-store navigation. AI sorts out what's needed. AI/ML is also helping THD prevent shelf outs in store by predicting which items are likely to need restocking.

The Home Depot

"Our query performance is down from hours and days to seconds and minutes."

David Narayan, Distinguished Engineer, Infrastructure Team, The Home Depot

Source: Google Cloud, video

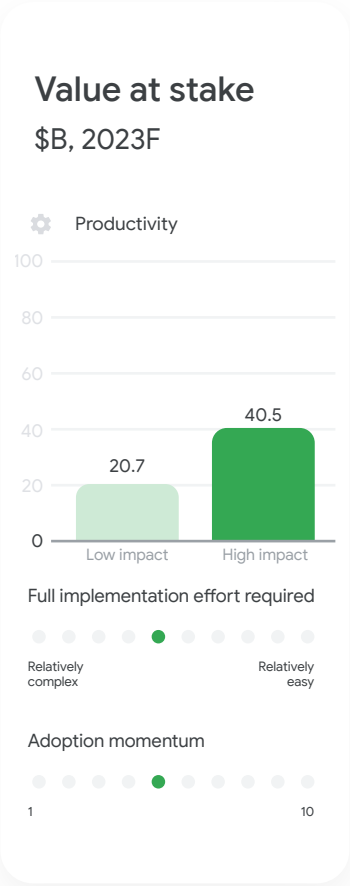
Logistics fulfillment & delivery

Warehousing operations optimization

Warehousing optimization can employ AI/ML to make the best use of time, space, assets, and other resources within a warehouse through automation, ensuring there continues to be an accurate view of inventory and that it can be easily located at any given time. Impact for this use case is driven primarily through productivity levers, including operations labor, occupancy, and general and administrative costs.

Warehousing operations optimization requires real-time warehouse inventory and operational data in order to be realized completely, an effort necessitating corresponding software and hardware (e.g. connected devices) for full implementation (though these investments may be limited if leveraging a 3rd party platform). Having well-defined KPIs is the most important driver for FDM retailers to achieve their growth goals here.

As demand has gradually shifted toward requirements for rapid delivery and high velocity replenishment, organizational appetite has increased for this use case, 20% of experimenting retailers expect to move from proof-of-concept solutions to full implementation within the next 2 years.



Logistics fulfillment & delivery

AI-enabled last mile logistics

“Last mile” refers to the final step in the fulfilment process where a parcel is moved to its final destination, and is typically the most expensive leg for retailers. This last mile has become more complex as omni-channel retail has increased the number of shipping ‘nodes’ through which an order can pass, and as consumer demand has increased for quicker shipping and real time updates. AI/ML enables last-mile optimization by helping arrange delivery efficiently and accurately (e.g. cheapest path, fastest path) through dynamic routing and other methodologies.

AI-enabled last-mile requires real-time data on logistics, pricing information, shipping conditions and disruptions as well as software to integrate a retailers’ disparate order preparation and outbound delivery systems.

Relative to other use cases, it is quick to capture value, given low change management and business process change needed. 75% of FDM retailers captured value for AI/ML applications in this domain in less than 12 months.

4 in 10 retailers have either experimented or implemented some form of AI solution today. Looking ahead, we found that within 24 months, the number of FDM players that expect to fully realize the solution could triple, given the increased attention to this age-old puzzle of optimized routing that is driven by accelerating e-commerce order flow.

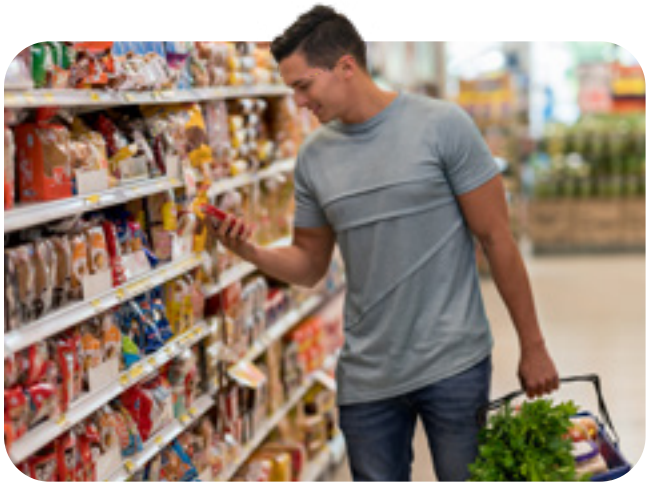
Chapter 3

Accelerating delivery of AI/ML

Achieved impact

Across full implementation and proof of concept, FDM retailers across different types and sizes can achieve impact with AI/ML, and often have more impact than expected.

In 9 out of 10 cases, FDM retailers realized the expected or more than expected value from the portfolio of AI/ML use cases they had implemented, including proof-of-concept use cases. 60% of retailers saw the anticipated impact from AI/ML applications, and 30% saw 25-50% more impact than expected. Fewer than 10% of FDM retailers realized less impact than anticipated across their portfolios of use cases.



9 out of 10

FDM retailers realized expected value, or 25-50% more than expected value, from the AI/ML use cases they implemented

CEOs sponsor and support the implementation of 20% of use cases across the FDM value chain. Other C-suite leaders sponsor, with the Chief Merchant, CIO/CTO and Chief Marketing Officer at ~15% or lower.

However, CTO/CIOs and their technical teams choose the technology provider, which needs to provide value articulation support in addition to implementation services. The fact that technical leaders are expected to step forward for future value capture might indicate a movement of AI/ML into the "mainstream" of enterprise technology in retail.

After the implementation, in general, 80% of AI/ML use cases in FDM deliver the value expected in fewer than 12 months, with 15% of them being able to realize expected value in fewer than 3 months. However, the training and change leadership is perhaps an underappreciated aspect as FDM retailers need to retrain a moderate number of end users in 75% of the use cases.

CEO is the key sponsor for use case implementation.

CTO/CIO, is the key decision maker of technology and cloud provider to use.

use cases realized value in fewer than 12 months

use cases are motivated by business teams

Enablers of value

What makes a retailer more likely to succeed in capturing value from AI/ML. Based on our research, there are 5 key factors that retailers have identified as the top enablers for success. Together, these factors enabled ~60% of the value capture for the 9 out of 10 retailers that saw expected or more than expected value from use case implementations.

Top 5

Enablers of value for FDM retailers

- C-suite championing and understanding of the value of AI
- Data is available
- Cross-functional teams working together
- Well-defined KPIs for use cases
- Presence of technical capabilities

C-suite championing and understanding of the value of AI

To implement successful AI/ML applications, C-suite need not only provide sufficient support and motivation, but also good understanding of the short-term value, and more importantly, the long-term value of those applications across multiple perspectives.

Data availability

Rich data sets, such as customer transactions, location, and even images, provide the fundamentals for FDM retailers to build up cutting-edge AI/ML applications to achieve growth goals (see 'AI/ML myths debunked' in page 54). Data also needs to be prepared - mapped, cleansed and combined from multiple sources to be usable.

Cross-functional teams working together

Collaboration across business, operational, technical, R&D, and other teams is critical for FDM retailers, especially as the deployment of more complex AI/ML applications may touch multiple parts of the organization, thus requiring multiple cohesive and integrated efforts.

Well-defined KPIs for use cases

KPIs help retailers maintain a North Star for the success of their use cases portfolio. With clearly defined measurements for each use case, retailers can maintain a pulse on progress and more easily and actively evaluate the impact of their AI/ML applications to make the right decision for next steps. Well-defined KPIs for use cases is the top enabler for use cases such as pricing optimization (see 'Pricing optimization' on page 40) and online personalized promotions (see 'Personalized promotion (redeemed online)' on page 23).

Organization understanding of the changes needed to take advantage of AI

Technical capabilities, including technical talent, are a key differentiating factor. For example, data scientists provide the technical capabilities of uncovering insights from millions of records and observations, while the ML specialists translate those insights into machine learning models that continuously generate revenue or reduce cost in the future. Presence of technical capabilities is the top enabler for use cases such as shelf-checking (see 'Shelf-checking' on page 33). For retailers who lack in house talent, partners can play a key role in helping bridge the gap.

Barriers to value

What makes a retailer less likely to succeed in capturing value from the portfolio of use cases? Based on our research, there are also 5 key barriers that retailers, who have captured less than the expected value from the implementation of AI/ML use cases, have identified as drivers for potential failure. When looking back at initiatives where full value potential was not delivered, FDM retailers cited these barriers ~80% of the time.

Top 5

Anticipated barriers to value for FDM retailers

- Data limitations
- Cultural and mindset challenges
- Technical talent limitations
- Financial constraints
- Lack of understanding of the changes needed to take advantage of AI

Barriers in the future

When asked about the use cases they intended to implement in the near future (6-24 months) FDM retailers identified 5 barriers they believed would continue to block or begin to block the realization of value. Together, these made up ~50% of the blockers to value.

Top 5

Barriers to value for FDM retailers

- Lack of well-defined KPIs for use cases
- Data limitations
- Models or tools limitations
- Cultural and mindset challenges
- Organizational politics

Chapter 4

AI/ML myths and how Google Cloud can help

AI/ML myths debunked

AI/ML is a complicated and sophisticated set of tools, but there are certain perceptions about it that we want to debunk.

Myth #1 Data needs to be perfect

No! There is neither perfect data nor perfect models. While most data needs to be cleaned, annotated, aggregated and grouped to feed AI/ML models, the data does not need to be perfect as long as it carries the key signals and factors that can indicate further insights and action items. Data pipelines and data quality tools need to be configured to enhance quality and remove bias, but also to be robust against some noise in the data or disruptions in gathering. Even if a business did invest in "perfect" data at a point in time, without being continuously collected and updated, even "perfect" data loses power and value. However, it's important to note that while data does not need to be "perfect," ML models should be trained on data that is similar to that which will be used in production. This requires upfront effort, usually in the form of data gathering, normalization, cleansing, and processing, so it's important not to get discouraged at the process, as this will lead to better quality outputs for the AI models overall.

Myth #2 AI/ML models only work with transactional data

No, again! Machine learning is an effective way of building AI systems that automatically find useful patterns in data that can vary greatly. Beyond traditional transactional data, there are video, voice, text, images, sensor outputs, and other data that can be consumed and employed by models to build predictions. In fact, machine learning provides unique capabilities when applied to these varied data sources and unique "multimodal" approaches to combining signals from diverse types of data.

Thus an effective AI strategy should assure a wider range of digital information—with appropriate privacy and security controls applied—are used to extract valuable insights and to drive actions that enhance customer experiences and business processes.

Myth #3 Data cannot be missing

AI/ML models actually do not need a complete set of data to be able to 'learn' and provide predictions. One of the key benefits of AI is that it can work better on "sparse" data sets (i.e., those with missing or not fully populated values) than other analytics approaches. This enables models to be more robust against the "real world" disruptions in data flows and to deliver predictions that are valuable early on, as well as even better as data volume and quality improve. This makes investments in AI / ML based-systems less "fragile" than other kinds of enterprise IT systems. For example, AutoML Tables is a Google solution that can handle data as its found in the wild. AutoML Tables automates feature engineering on a wide range of tabular data primitives (such as numbers, classes, strings, timestamps, and lists) and also helps you detect and take care of missing values, outliers, and other common data issues.

Myth #4 Data can only tell us about the past

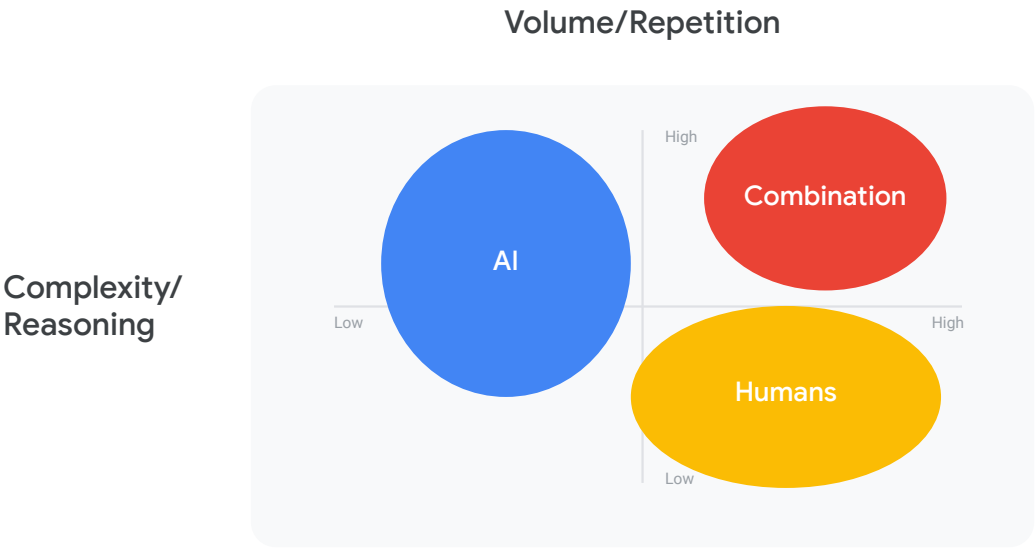
One of the key benefits of AI is that it can help move retailers from using their data in a "rear view mirror " capacity (e.g. a historical understanding of their performance) toward using data as the "headlights" of a fast moving enterprise navigating uncertain terrain (e.g. a view on demand and sales in 12 months). AI's power comes in handling data exceptions well enough to enable retailers to identify when the business is starting to falter, and to continually update forecasts based on new data that is coming in. These 'predictions' and constant learning are what make AI/ML applications so compelling.

Myth #5 AI startup costs are high

No! It's more affordable than you think. Nowadays, with the cloud and AI infrastructure providers such as Google, retailers only need to focus on their core business logic and the best use cases of AI technology. Additionally, you can tackle projects incrementally. Therefore, the costs of AI startup, such as keeping clean and organized data, have been decreasing and have become more controllable in recent years.

Myth #6 AI can only solve esoteric problems

Actually, AI/ML is very effective in solving seemingly simple problems. Within retail, hundreds of operational decisions will need to be made on a more rapid daily, weekly, and monthly basis. This is an area where AI cloud and data applications will have a disproportionate impact for retailers who deploy them, particularly because many of the needed tasks are hard for humans to do at repetitively or at speed, but relatively easy for AI to perform. Other examples areas where AI can help in a practical way is in helping users search better and find the products they need.



How Google Cloud can help

Food, drug, and mass merchant retailers around the world are boldly reshaping their strategies to delight increasingly digital consumers and to deliver even more compelling and personalized experiences.

Google Cloud can be your trusted technology partner, creatively leveraging all of our consumer innovation and broader offerings to help you deliver on new, unique journeys for your brand. Benefit from the same AI technology Google uses to build products and features, our commitment to AI principles, responsible AI and investments in explainable AI that help you better interpret predictions made by ML models. Our objective is to help make AI/ML accessible with products and solutions built for Retail and we approach this in three key ways to ensure we meet the needs of retailers across the AI/ML capability spectrum:

Pre-built solutions

We are bringing industry specific solutions to market across the retail value chain to solve for specific retail use cases. For instance, with Recommendations AI you can deliver highly personalized product recommendations at scale.

Building Blocks

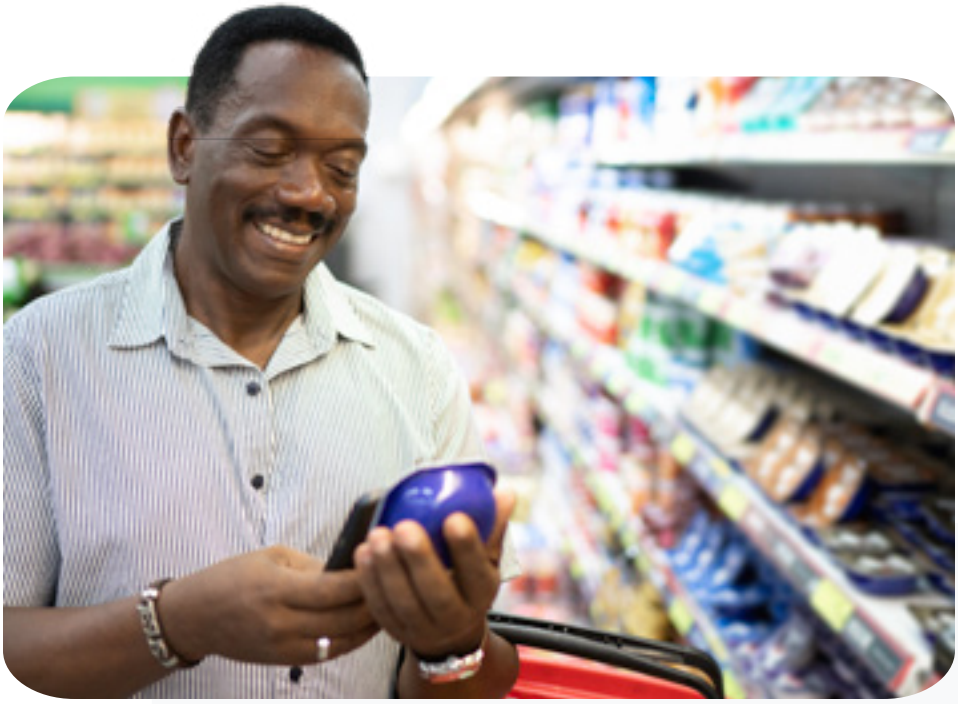
Our Cloud AI Building Blocks enable your developers to easily infuse AI into your existing applications or build entirely new intelligent applications across a broad spectrum of use cases with or without prior ML expertise. There are two types of building blocks: AutoML for custom models and APIs for pre-trained models. You can use them individually or in combination depending on your use case.

AI platform

And finally, if you have the data science and machine learning skillset and the desire, you can leverage our robust AI platform to build your own applications to meet the unique needs of your business.

We are also growing our ecosystem of partners who have deep expertise in enterprise retail and can help you get faster results with integrated or out of the box SaaS solutions.

Ultimately our goal is to help retailers capture digital and omnichannel growth and become customer centric and data driven, while driving operational excellence across the organization.



We hope you found the findings shared in this ebook useful. For a conversation on how we can support your unique needs as you work on a transformation agenda for your business, reach out to your Google Cloud account team or contact us online.