



# Revenue Growth Management

*powered by Google*

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*Special thanks to Ashish Narasimham, and KC Rakam for contributing to this whitepaper.*

## Introduction

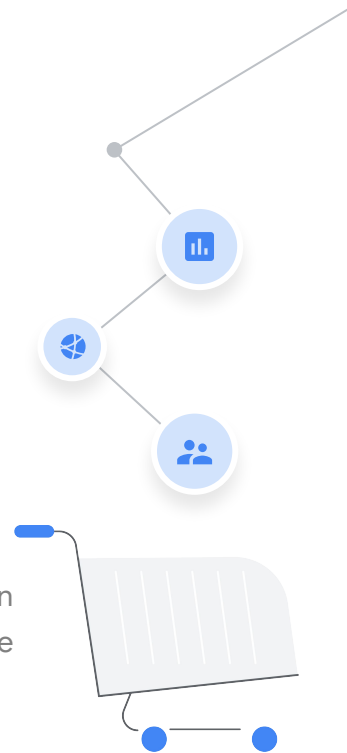
Inventory distortion is forcing companies in the Consumer Packaged Products (CPG) industries to rethink demand sensing; traditional forecasting methods overlook vital factors, but **evaluating all business variables in a single view is problematic**. The evaluation of investment scenarios often considers limited views (by region, brand, and client), leaving aside more profitable or optimal opportunities.

Revenue Growth Management is the practice that many organizations have implemented to achieve full financial value for what they offer, with a big eye on the long-term business strategy, applying Go-To-Market (GTM) strategies taking into consideration the view of the Product, the Market, and the Customer to improve business KPIs such as revenue, cost, and margin, among others.

During my more than 20 years of experience working with some of the world's leading retail and consumer products companies, I have seen that many Revenue Growth Management initiatives remain incomplete; many of them are driven by advanced analytics, nevertheless, most cases are isolated efforts with particular objectives; such as improving the accuracy of demand forecasting or finding the right level of inventory per store, among a wide variety of use cases. Even so, many organizations continue to base their business decisions on traditional models that use only a few data points, often just historical data, seasonality, and sales information. But don't get me wrong, those use cases are significant. They are helping many organizations to increase their revenue, reduce overstock or avoid out-of-stock, which is great for business.

The value of Artificial Intelligence (AI) and Machine Learning (ML) in the Consumer Industry is more evident now than ever. The process of actually implementing AI & ML use cases that can scale, however, continues to remain elusive. In addition to improved results, AI & ML can save valuable time and resources. The most advanced AI solutions can not only help identify the best scenarios, but they can also find the optimal answer without or less human guidance.

In this whitepaper, you'll discover not only the technology behind Google Cloud Platform, but also innovative approaches to accelerate implementation of a transformative revenue growth management solution that evolves from short-term benefits driven by annual planning to a longer term vision.



# What we are solving for?

Companies in the consumer industry need to construct a basis for collaboration, so they can find the best business scenarios and have actionable insights to increase revenue and profitability without neglecting the improvement in the percentage of assertiveness in their decisions.

## How would you answer the following questions?

- Are promotion optimization and demand forecasting enough to grow the business?
- Are you getting full value from Revenue Growth Management?
- Do you have the right inventory mix at the right time and deliver a quality customer experience while increasing revenue, improving profits, reducing supply chain costs, or increasing market share? In a sustainable way.



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Consumer Packaged Goods companies invest up to 20 % of their gross revenues on promotions, making it one of the largest items on the profit and loss (P&L)<sup>1</sup>

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10% to 20% improvement in demand forecasting accuracy can directly produce a 5% reduction in inventory costs and a 2% to 3% increase in revenue<sup>2</sup>

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<sup>1</sup> [Use Trade Promotion Management To Boost Return on Promotions](#), Forrester, Sep. 2019

<sup>2</sup> [Improve demand forecasting accuracy](#), IHL Group

## Challenge one - data

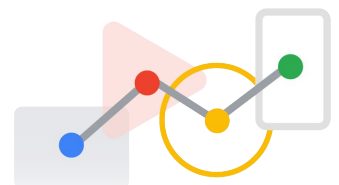
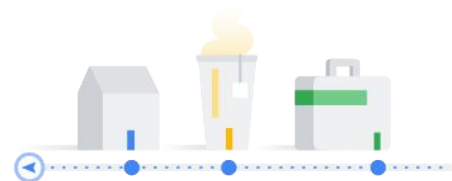
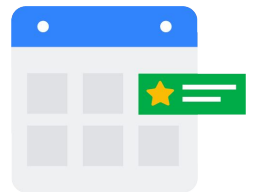
A comprehensive Revenue Growth Management effort should take into account the following data sources:

- *Sales*
  - Sale-In, dispatches and orders.
  - Sale-Out, in collaboration with your customers (Retailers).
  - Sales team data - visit frequency, coverage.
- *Price*
- *Trade & Promotions*
- *Inventory, distribution, and stock.*
- *Supply chain*
- *Categories / assortment, including competitive analysis by category*
- *Client Segments and channels.*
- *Marketing analytics activation data* from your marketing activities to discover consumer interest through content interaction and Ads.

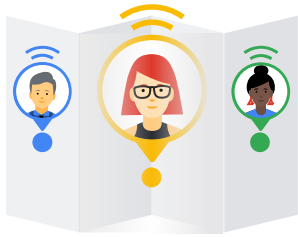
For companies that engage in direct-to-consumer (D2C) channels, consumer interaction data can be a great source of insights to understand the consumer and improve demand models. Data sources like:

- Last-mile retailer
  - *Store/brand/product loyalty.*
  - *Purchase frequency.*
- D2C
  - *Clickstream/digital shopping.*
  - *User web actions, to evaluate purchase intent, or cart abandonment.*

All of these data, if used correctly, can add tremendous value to your revenue growth management efforts, and if you think about it, I'm sure you'll have the data from most of the above sources. Many companies have this data for their products and channels at the store/SKU level, filling the Data Lakes or Data Warehouses with transactions that happen daily in different sales channels (digital or traditional)—known as **internal data!**



We can also talk about **external data**. In this case, we will find a wide variety of data sources, such as:



- *Weather*. We've been told that weather data can help understand consumer behavior and demand beyond seasonality.
- *Consumer Insights*. Research companies have made great strides in understanding consumer behavior and defining market segments, among other variables.
  - Understand the interests and affinities of consumers in relation to geography.
- *Syndicated data from research companies*.
- *Product Reviews* from online retailers.
- *External disruptions* (COVID, Supply Chain, great resignation...you name it)
- *Location Intelligence*, to understand how people move and interact at the Point of Sale.
- *Trends*. The consumer industry has seen significant changes in the last 18 months, from the evolution of shopper preferences to the rise of conscious consumers and the launch of new products and technologies, all of which have created significant challenges and opportunities. Capturing these trends early represents an excellent opportunity to feed our predictive models and anticipate customer needs.

Great, we can use **internal** and **external data** in our models in different levels and ways, but the data is there. I like to refer to the external data as Multimodal Signals. According to [Oxford Academics](#): “Multimodal Signals comprise components that are presented to the same receiver across two or more sensory modalities”.

The other data consideration to keep top of mind is the structure of the data. Internal datasets are often scoped not at the global level but somewhere smaller such as at the region or city level. As those datasets organically came to life, different teams structured them differently. E.g., The internal data granularity may be at the country level in one region versus at the city level in another region. If used as is, this necessitates rolling data up to the lowest common denominator, with the risk of losing valuable information in the process. In another case, the product join key for your sales order table in LATAM may not be compatible with the products defined for APAC. For these and other issues, you'll need to be mindful of how to rationalize these differences and come to a unified data model that you can draw from. In some cases, you may roll up the data. In others, you may want to go back to the source and adjust the data creation to give you the results you're looking for.

## Challenge two - the time

Time is another big challenge when it comes to decision-making in the Consumer Industry, either when we are planning or, more importantly, executing; the time to make a decision is critical. We need our Revenue Growth Management solution to deliver insights fast; low latency predictions are vital. ML & AI often requires hours to run a prediction and consume a lot of computing resources.

## And, challenge three - connecting the dots

From my experience, this is the main challenge, how can we connect the dots? We can write an MBA class simply discussing how to select which KPI we want to improve and how to leverage the available internal and external data relevant to our business and have the data and capabilities to explain to decision-makers what is driving the demand.

Read on. I'll share a proven approach that helps make it easy to connect the dots and implement a successful revenue growth management solution in your business.



# Getting started

In my experience, there are two options to address this problem:

## 1 Tactical Thinking

Following a tactical thinking approach, such as improving inventory or forecast accuracy, starts with an initial problem statement with the appropriate solution and builds on it each time by adding the best solution for the problem. **Doing things right!**

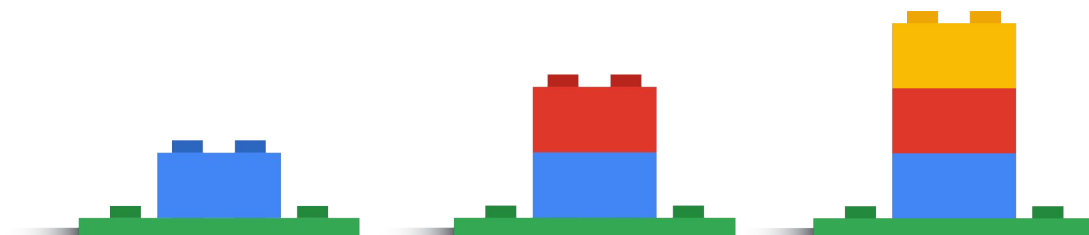
## 2 Transformational Thinking

Build with the future in mind and think about the whole picture when deciding. Existing data is transparently shared. New data is collected and analyzed. Predictive and prescriptive analytics are applied. Your people and processes are being transformed. Revenue Growth Management is no longer focused on single variables but has become a differentiator for your business.

Difficult to do and can take a lot of work if some big-picture pieces are already in place, but it will have more benefits. **Doing the right things.**



*Are you doing things right or doing the right things?*

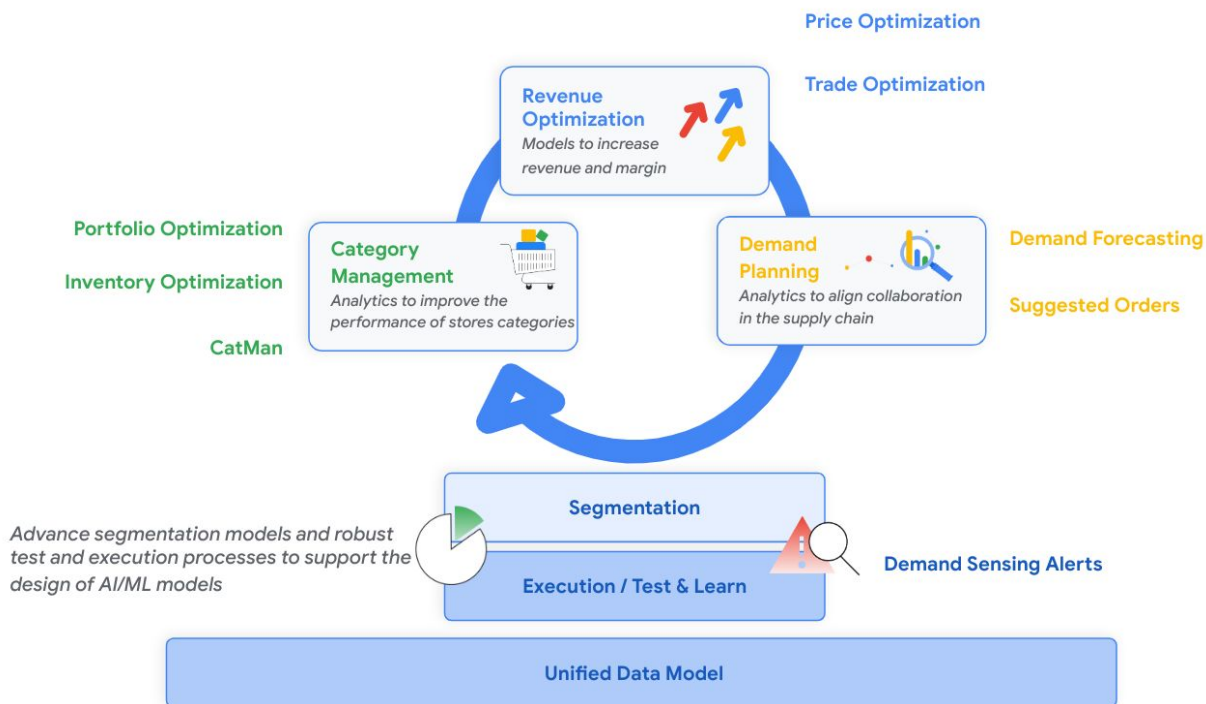




## Doing the right things

It would be best if you implemented a transformational Revenue Growth Management solution connecting all the dots to **do the right things**. The main idea is to find the right balance to deliver different advanced analytical tracks that will depend on each other to evolve toward a comprehensive solution.

As illustrated in the following diagram, you will enable levers in concert to translate your clients' net income management strategy into actions that can improve performance and unlock new value.



*Integrated Revenue Growth Management approach*

Your company will evolve and mature from developing Go-To-Market (GTM) strategies in functional silos to developing GTM in alignment across all functions, moving from focusing on volumes to concentrating on value, to finally transitioning from short-term trade-offs driven by seasonal planning to a long-term strategic view.



## Why use Machine Learning?

Revenue Growth Management is an example of an area where AI-based techniques can help. Why? Because AI & ML based forecasting models can digest large sets of disparate data, drive analytics and automatically adjust when provided with new information. Machine learning models can not only incorporate historical sales data but also rely on real-time data regarding variables such as marketing campaigns, web actions like a customer clicking the “add to cart” button on a website, local weather forecasts, etc., many of the internal and external data discussed above.

According to a McKinsey study that looked at areas where AI can have the highest impact on various industries, AI & ML techniques can reduce forecasting errors by 30-50% compared to conventional approaches. Another McKinsey report talks about how improving forecast accuracy by 10% translates to a potential 5% reduction in inventory cost and a revenue increase of 2-3% for retailers.<sup>3</sup>

Beyond improving the bottom line, this strategic approach will bring some underlying benefits:

- End-to-end demand visibility
- Improve supply chain, partner, and marketing collaboration
- Enable real-time insights and, most importantly, make more informed decisions quickly
- Efficiency (reduction of planning time and focus on execution)

## Sustainability in the Supply Chain

Sustainability is a critical topic in the Consumer Industry. 82% of consumers now say that Sustainability is top of their minds, and they prioritize it in their purchasing behaviors<sup>4</sup>. One of the top issues when it comes to Sustainability is sustainable sourcing. Many consumer companies are reducing their impact on climate change by lowering their emissions and becoming more resilient to inevitable climate impacts. Sustainability is a critical issue, and Revenue Growth Management can also bring sustainability benefits into the company, for example:

- Improved demand forecasting will enable your business to enhance its production and inventory. Helping to reduce excess waste across the value chain.
- Enterprises can reduce their carbon footprint with demand sensing integrated supply chain logistics and even reduced shrinkage as fewer products risk expiring on the shelf.
- In mass consumption, production is based on actual demand; therefore, a more accurate forecast can eliminate unnecessary product production and unsold stocks. An optimized product portfolio can facilitate minimizing wasteful resource consumption and excess production, reducing the environmental burden.

<sup>3</sup> [Notes from the AI frontier: Applications and value of deep learning](#), McKinsey, April 2018

<sup>4</sup> [Kim McNamee, Jenny Fernandez, "3 surprising ways people prioritize sustainability in the wake of the pandemic," Think with Google, October 2021](#)

# Where can Google Cloud Help?

The technology world contains a variety of challenges to overcome before realizing value; analytics doesn't have to be one of them. Google Cloud is a leader in the data & analytics space, working with many of the largest CPG & Retail organizations globally and helping them focus on their insights rather than their infrastructure.

Building your Revenue Growth Management solution on Google Cloud means having technology that takes the value of all the data and provides insights to drive focus to the innovation that you need to be doing.

- 1 Unique approach & Industry Experience
- 2 Data Ecosystems
- 3 Sustainability
- 4 Cutting-edge technology

## Our Mission

Accelerate every organization's ability to

digitally transform its business

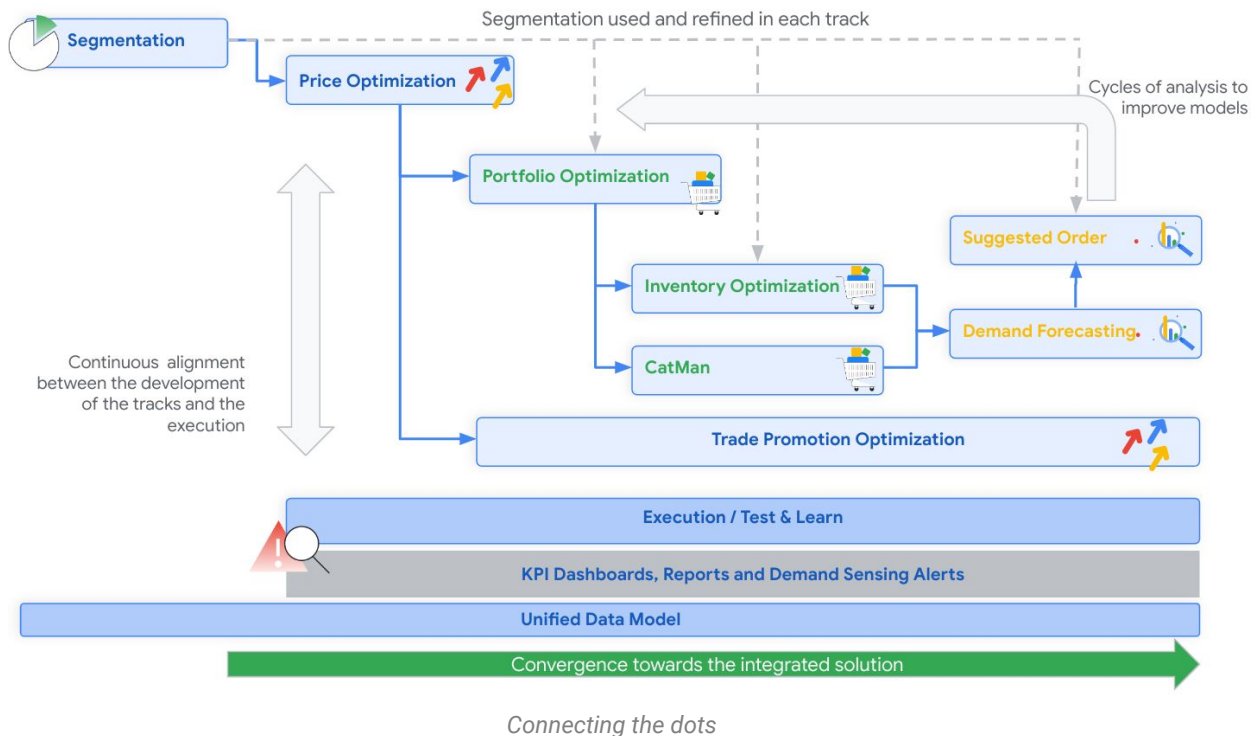
# 1 Unique approach & Industry Experience

Google has been supporting the CPG industry to connect and understand their consumer across the path to purchase for over 20 years, including revenue growth management, demand planning, and other advanced analytics use cases.

57% of consumers use Google search during their purchase journey, 3x more than TV, social media and, brand.coms<sup>5</sup>

Each company will have its unique approach to implementing a Revenue Growth Management solution; however, below, I will present an approach that can help you understand how to connect all the dots. The main idea of this approach is to incorporate analysis cycles to refine and strengthen models based on the results and learn from other models.

Beyond the analytical models, a base track is continuously aligned between the development of the tracks and the execution of pilots to enrich the models from the learning and testing new processes and hypotheses.



Let's discuss the different tracks.

<sup>5</sup> Numerator P2P Study, N = 7,080. 9: Google search:Did you use any of the following to find information about [url("Brand")] [url("Category")] or similar products? Numerator, May 2020

## Unified Data Model

As described above, one of the main challenges with Data is building a unified data model to unleash all the value of our internal and external Data. This Unified Data Model becomes the foundation of your Revenue Growth Management efforts and grows exponentially in value. It allows you to relate more datasets from different organizations within your company, your customers, and all the external data that will contribute to the analytical models.

Before running any segmentation efforts, I recommend spending enough time preparing the data. Machine learning helps us find patterns in data—patterns we then use to make predictions about new data points. To get those predictions right, we must construct the data set and transform the Data correctly. When it comes to Data preparation, using a Future Engineering approach can be a good practice. You can think of feature engineering as helping the model understand the data set the same way you do. Users often focus their machine learning efforts on building models but end up spending much more time on data. Applied machine learning is basically feature engineering.<sup>6</sup>

Finally, we will start building a Unified Data Model. It would be best if you implemented this model at different organizational levels. To have successful Revenue Growth Management results is optional to have a global unified data model from the beginning. Instead, you can build unified data models at the regional or brand level, aligned with your market execution strategy, reducing the effort to rationalize all the data differences and come to an executable unified data model. The global Unified Data Model will become a reality as the initiative evolves.



## Segmentation

It would be best if you don't execute a mature Revenue Growth Management effort at the company level; it would be so challenging to implement and adopt by the organization; a recommended approach is to start with an advanced segmentation exercise that helps to understand customers and to prioritize which are the best points of sale to place products. The segmentation model will be used and refined in each analytical track.

Using a data-driven segmentation will reveal new insight you might miss otherwise to gain additional insights and create more competent targets/scenarios to evaluate large amounts of data to make actionable segments finally.

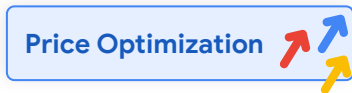


## Key Action

Building a global unified data model is a big challenge; consider reducing the effort by having data models at the regional or brand level.

<sup>6</sup> Ng, Andrew. "Machine Learning and AI via Brain simulations." Stanford University, March 2013

We have other models that will be "special" as they help to find scenarios for the optimal use of resources.



Price Optimization aims to find the most optimal price point for a product or service, looking to attract customers, maximize sales, and increase profits.

Product prices often change based on the observed market response, sell-through rates, supply disruptions, and other factors. Rule-based or manual price management in spreadsheets doesn't scale well to large catalogs with thousands of items. These slow and error-prone methods can often lead to inventory build-up or substantial revenue losses. Machine Learning methods are both faster and provide more formal optimality guarantees. These models can significantly improve the productivity of human experts by allowing them to automate large parts of their decision-making process.

You will find a blog with an example of a [Price optimization notebook for apparel retail using Google Vertex AI](#), from one of our partners.



## Key Action 1

Discover consumer interest through ads data and leverage it as a leading indicator to influence pricing optimization, inventory, and more.

## Key Action 2

Always include an advanced segmentation exercise, any client or client is unique, but the data will help us find similar segments, facilitating the execution of the strategies.

## Trade Promotion Optimization

Trade Promotion Optimization aims to maximize promotion performance and improve revenue and profit KPIs. I recommend starting “playing” with this model after running some Price Optimization exercises and having the optimal price point for the product; this will help save capital investment by finding the best promotion for a category or even at the product level. As we mentioned, CPG companies invest around 20% of their gross revenues in promotions, so the idea is to find the best ROI. Some of the best practices I have seen when it comes to optimizing promotion are:

1. Narrow the audience/market - segmentation.
2. Don't run the same promotion for too long
3. Include external influencing factors that can affect customer habits and segmentation.
4. Be aware of the cannibalization impact of promotions within the same category.
5. Analyze Multi-category cross and upsell in your promotion definitions and execution.

With our feedback loop, you will implement a more holistic insight-driven approach to minimize overall trade spend waste and maximize effectiveness. This track will be improved in every cycle by the other tracks, e.g., you may find an optimal promotion for a certain product, but when the Portfolio Optimization track is running, the promotion would be different.

## Portfolio Optimization


## Inventory Optimization

Once we have a price strategy, Portfolio Optimization will be the next step. The idea is to define the product portfolio/assortment that maximizes revenue or margin within the specified segments. Then this model will help to determine the optimal inventory levels at SKU/Store level to minimize cost and availability. With an optimized portfolio, you'll be able to align inventory, assortment, and planograms to improve product category performance. Identifying and dismantling underperforming portfolios presents a clear opportunity to reduce capital and other resource costs.



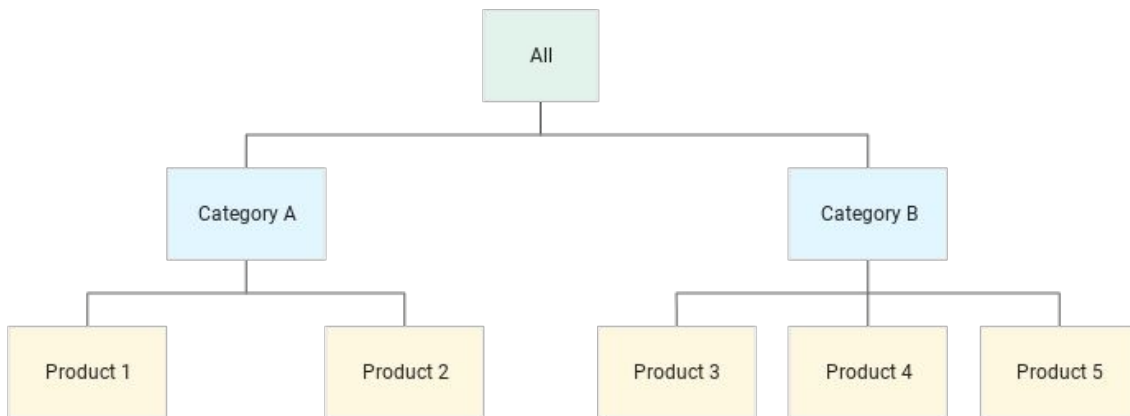
### Key Action

The Trade Promotion Optimization track will be one of the most challenging ones, but it will mature with the feedback and actual results from all the other tracks.

**Demand Forecasting.** 

Finally, after running all the tracks, we can build a more accurate demand forecast and even provide real-time information to field sales associates through automatically generated Suggested Orders..

Forecasting models predict a sequence of values. For example, a CPG company should forecast daily demand for your products for the next three months to adjust stock inventory appropriately in advance. Some initiatives also start with Demand Forecasting, which can be one of the first steps, but there are other recommended ways to start, as a current forecast can have a bias. To solve this bias, we can use hierarchical aggregation. Time series are often structured in a nested hierarchy. For example, the entire inventory of products that a client (retailer) sells can be divided into categories. The categories can be further divided into individual products. When forecasting future sales, the forecasts for the products of a category should add up to the forecast for the category itself and so forth up the hierarchy.



*Category hierarchy*

E.g., if the hierarchical group is a "category", the predictions at the "category" level are the sum of predictions for all "products" in the category. If the objective of the model is mean absolute error (MAE), the loss would include the MAE for predictions at both the "product" and "category" levels. This helps to improve the consistency of forecasts at different levels of the hierarchy and, in some cases, may even improve metrics at the lowest level.

 **Key Action**

Build the Demand Forecast after playing at least with Price and Portfolio optimization to achieve better forecast accuracy.



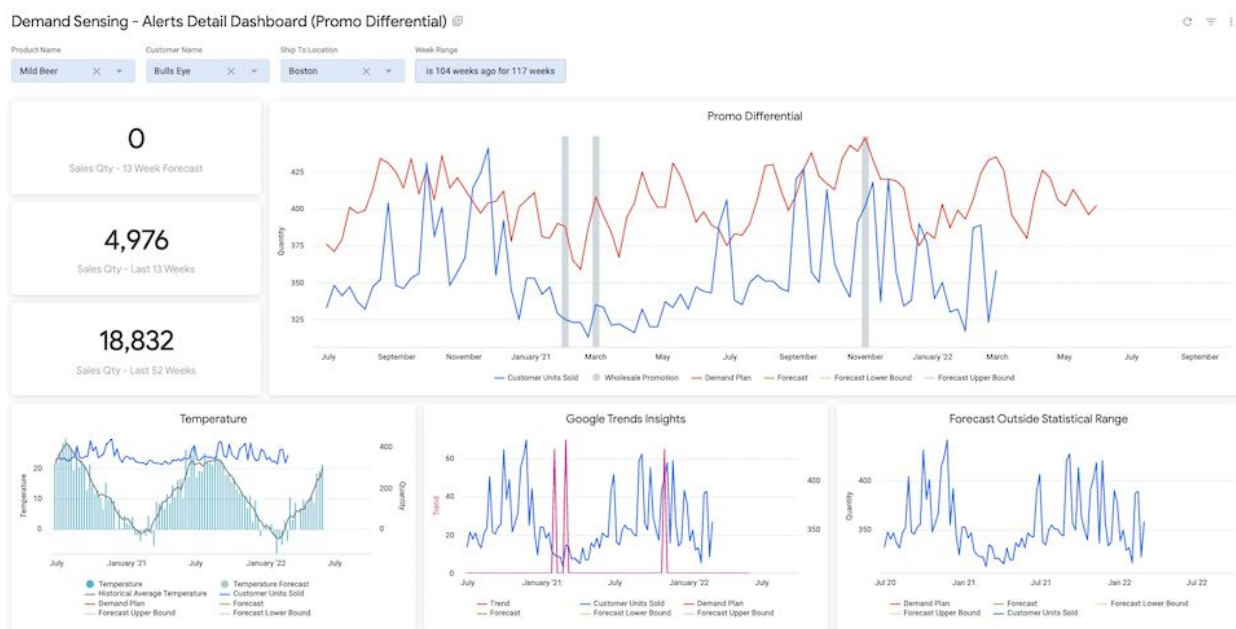
Execution / Test & Learn

KPI Dashboards, Reports and Demand Sensing Alerts

So far, we've talked about planning and optimization. Planning is an essential part of the model, but having a continuous alignment between the development of the analytical tracks and the execution of the pilots will help to enrich the models from learning, test new processes and hypotheses, and, most importantly, accelerate decision-making.

Before deploying the models, a best practice is to test them in real-world scenarios (controlled pilot tests), choosing a specific customer segment, product category, and region, making it easier to incorporate feedback to improve the models.

Having alerts when marketing/commerce efforts create demand spikes or dips will make it easier to track promotion differentials, combining many of the available multimodal signals, such as Google Trends, temperature, and more, into a single view.



Example: Demand Sensing - Alerts Detail Dashboard (Promo Differential)

Key Action

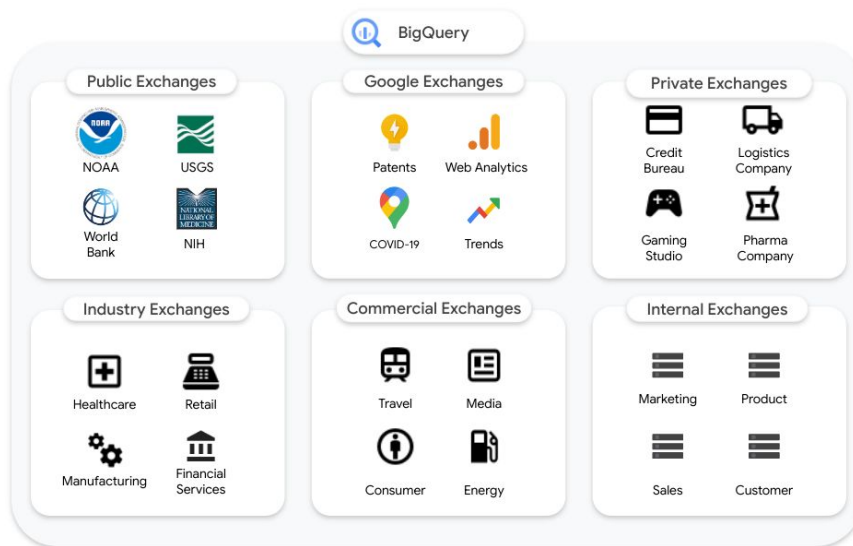
Even if they do not materially affect the demand plan, capturing new signals is crucial. Identifying short-term changes in demand is mission-critical to better match demand with supply.

## 2 Data ecosystems

Google has **nine** consumer applications with over **1bn** users each<sup>7</sup>, **90%** of internet users are reached via Google's Video, Display, Search, Shopping, and Apps<sup>8</sup>. Google's unique datasets allow you to enrich data and spot new trends, opening up more opportunities.



BigQuery, our leading data warehousing solution, will enable these data sets in your company, bringing internal and external signals into a single data repository.



Google Data Ecosystem

Sharing and exchanging data is critical to your revenue growth management strategy. BigQuery customers already share data using our existing infrastructure, with over 4,500 customers swapping data across organizational boundaries. Creating seamless access to analytics workflows and insights has become that much easier with the introduction of [Analytics Hub](#) and surfacing datasets unique to Google.

Your users can explore the revamped search experience to browse and quickly find relevant datasets. In addition to easily finding and leveraging your organization's internal datasets in Analytics Hub, this also includes Google datasets like [Google trends](#) and [Earth Engine](#), commercial datasets from our partners, and public [datasets](#) available in Google Cloud Marketplace, like [COVID-19 Open Data](#) or [American Community Survey \(ACS\)](#), and the more of 50,000 public data sets available at [Kaggle](#).

We can even help to analyze the Point of Sale, adding Location Intelligence from Google Maps - "[Location intelligence: the new frontier of Data Driven success.](#)"

<sup>7</sup> [Google Products with over 1 Billion Users](#) *Business Insider*, August 2018

<sup>8</sup> [Meet the Google Display Network](#) *Think with Google*, April 2013



## 3 Sustainability

At Google, we strive to build sustainability into everything we do. For everyone: every Googler, every user, every product, every partner, every customer, and every community.

Sustainability has been a core value since Google was founded two decades ago. We were the first major company to become carbon neutral in 2007. We were the first major company to match our energy use with 100 percent renewable energy in 2017. We operate the cleanest global cloud in the industry and are the world's largest annual corporate purchaser of renewable energy.

Our strategy is going beyond just carbon neutrality. Yes, we bring you smarter, more efficient data centers built on the cleanest cloud, but we also are partnering with industries to help them solve their most demanding environmental challenges. A Google data center is twice as energy efficient as a typical enterprise data center. We now deliver six times as much computing power for the same amount of electrical power as five years ago.

We are solving for healthier supply chains that increase with our leading AI & ML while reducing waste by partnering with brands to improve climate and conservation efforts, including restoring our oceans, forests, and wildlife with our unique geospatial technology.

From product design to manufacturing and supply chain operations, Google is working to deliver the tools and technologies that provide the data and insights for more sustainable decision-making so together we can address environmental and social impact at every step of the journey.

- [Google Cloud's Carbon Sense suite](#) is a collection of tools to help you accurately report the carbon emissions associated with your Google Cloud usage enabling you to take data-driven action to reduce your carbon footprint.
- At Google, we support large and small enterprises to create a safer, cleaner, fairer, and more equitable supply and value chain. Solutions like [TraceMark](#) are advancing first-mile sustainable sourcing partnerships.
- With increased customer demands, climate concerns, and consumer delivery expectations, many industries are turning to Google Cloud to help them stay competitive in this environment. Google's [Cloud Fleet Routing API](#) and [Last Mile Fleet](#) solutions help enterprises improve execution to serve customers and address the onslaught of logistical and environmental factors that go into delivery.

## 4 Cutting-edge Technology

Google Cloud has three offerings to help you enhance or implement your Revenue Growth Management solution.

1

### Build Your Own solution

**Custom-build** using pre-provided ML models in BigQuery, our enterprise data warehouse along with our Vertex AI platform. Requires in-house data science engineering

2

### Build with an SI Partner

**Leverage an SI partner** to building your own Revenue Growth Management capabilities without the in-house engineering

3

### Choose an “Out of the Box” ISV Solution

An **integrated demand planning system** that offers planning functionality as a packaged solution

Using any of these three approaches, you can infuse machine learning into your current Revenue Growth Management solution to achieve high results, leveraging the [Google Smart Analytics Platform](#).

As we efficiently, ML & AL are fundamental pieces of the solution. [Google Vertex AI](#) is one of the latest innovations born of [Google Brain](#) researchers and is being made available to enterprises within an accelerated time. Vertex AI can ingest large volumes of structured and unstructured data, allowing planners to include relevant demand drivers such as weather, product reviews, macroeconomic indicators, competitor actions, commodity prices, freight charges, ocean shipping carrier costs, and more.

To easily run advanced forecasting and planning models, [Vertex AI Forecast](#) can ingest up to 100 million rows covering years of historical data for thousands of product lines. The powerful modeling engine would automatically process the data and evaluate hundreds of different model architectures and package the most recommended ones into one model, which is easy to manage, even without advanced data science expertise. [Vertex AI Forecast explainability](#) features can show how each of these drivers contributes to the forecast and help the decision-makers understand what drives the demand to take corrective actions early.

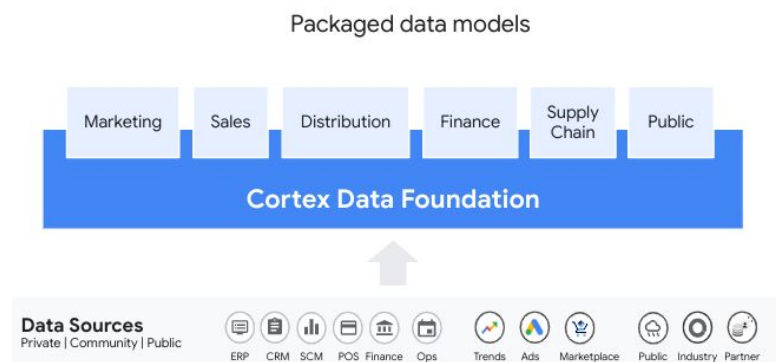
Revenue Growth Management is about **connecting the dots**, which means the models will need to manage many variables; this is called hyperparameter tuning in the Machine Learning jargon. Hyperparameter tuning takes advantage of the processing infrastructure of Google Cloud to test different hyperparameter configurations when training your model. It can give you optimized values for hyperparameters, which maximizes your model's predictive accuracy.

As discussed, another essential piece of the solution is Data. With [Cortex Foundation Framework](#), you can kickstart insights and reduce the time to value using their reference architectures, packaged services, deployment templates, and accelerators to guide you from planning to delivery and getting set up quickly.

Google Cloud Cortex Framework takes our experience working with SAP and other enterprises across the industry and our leading technologies to provide a new approach to make innovation repeatable and scalable. We provide scenario-driven reference architectures, solution accelerators, and content to help customers get started quickly with our Cloud, which helps reduce risk, complexity, and cost of deployment and accelerate business outcomes all on a data cloud built for innovation.

The *Cortex Data Foundation* help accelerates analytics use cases by using:

- **Predefined data models** for BigQuery
- **Data processing templates** for Change Data Capture (CDC) & hierarchies
- **Example machine learning code** with Vertex AI
- **Sample business dashboards** for Looker, our Business Intelligence & Analytics platform.
- **Curated sample data** for quick start discovery



*Cortex Reference Architecture - Data Foundation*

Cortex has pre-defined data models for Marketing (*Google Ads, Search, and Trends*), Sales, Distribution, Inventory and Stock, Finance, Supply Chain, and Public data sets, including Maps and Weather. By connecting your enterprise applications such as SAP and Salesforce into their Cortex pre-defined data and analytics models in BigQuery, you can unlock insights across these data sets and combine them with other data from Google and 3rd Parties. The Data Foundation accelerates your ability to onramp your data and start to enable analytics and insights across a variety of use cases.

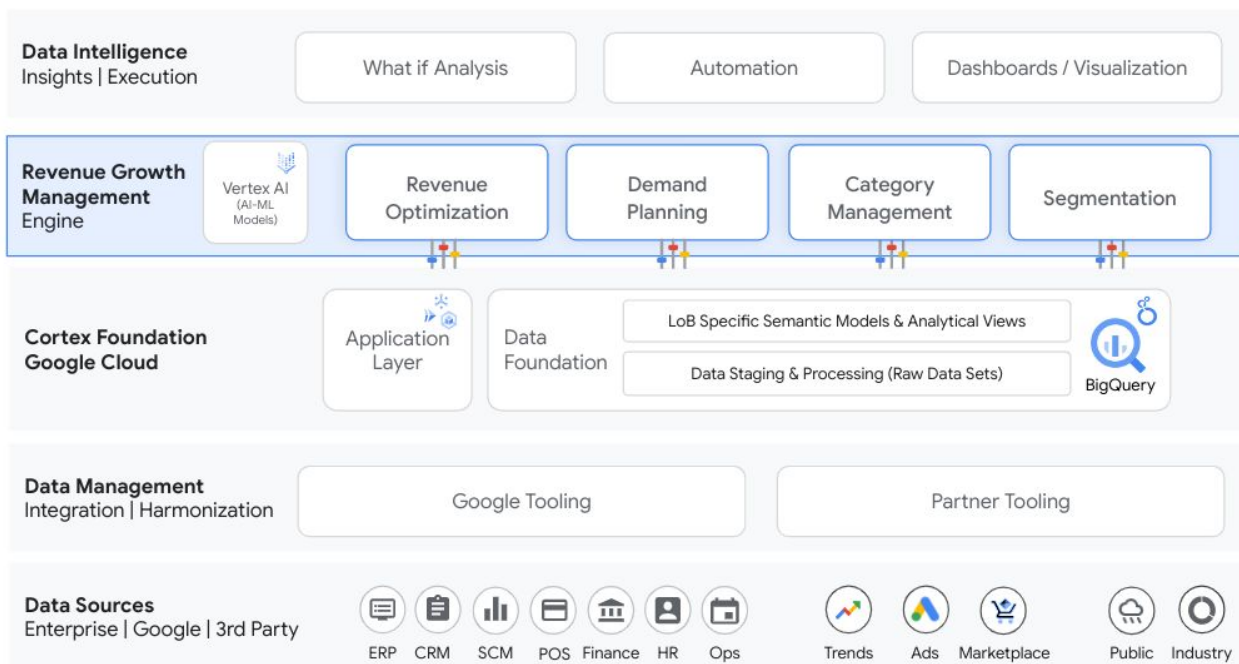
Cortex also provides an [Application Layer](#) for cloud-native applications Integration.



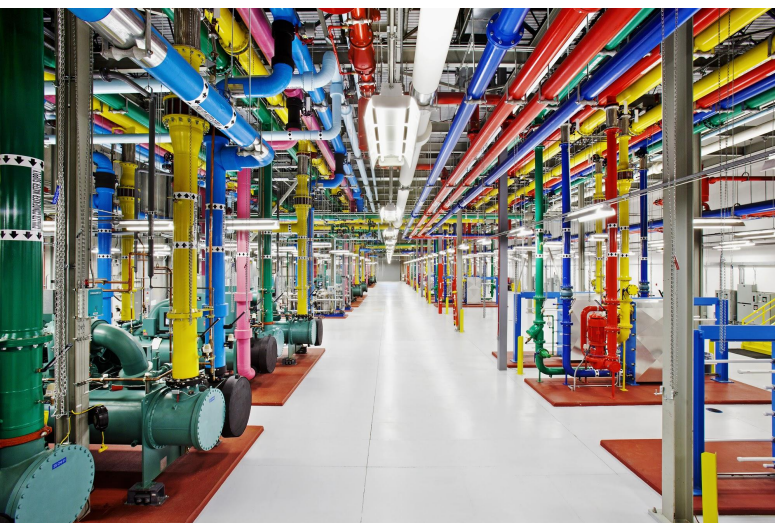
## The Revenue Growth Management - powered by Google

You must be wondering, what do all those pieces look like together?

The following image illustrates an overview of the Revenue Growth Management solution powered by Google. This solution will be the foundation of the process, synthesizing insights from AI and ML models running on Vertex AI and leveraging the Cortex Foundation Framework, making it easy and convenient to integrate with your technology and business stack.



Revenue Growth Management Reference Architecture



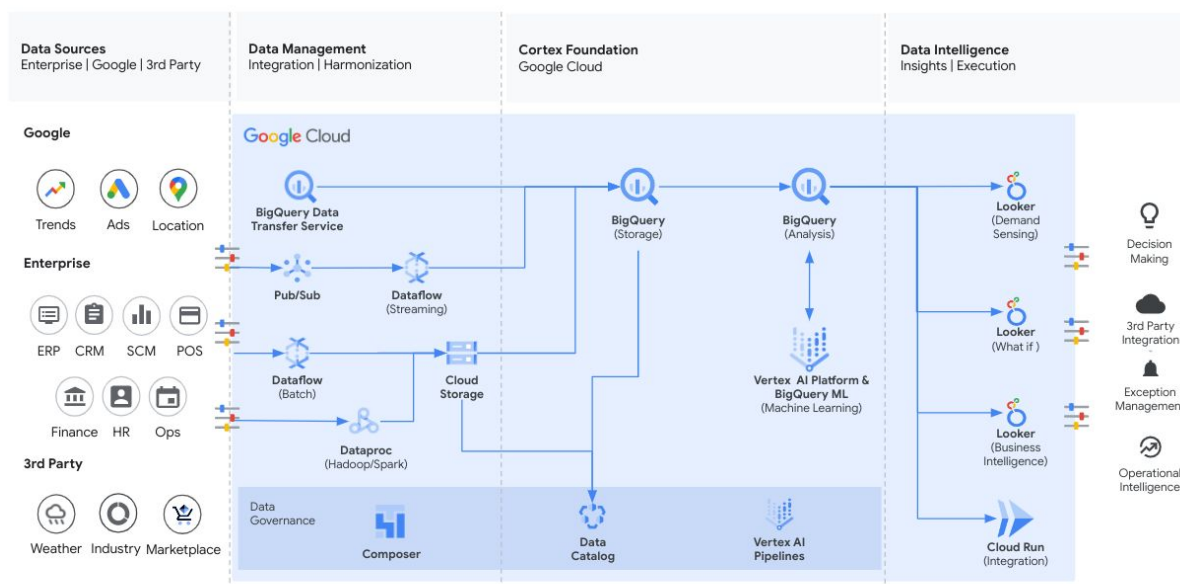
*Our open cloud approach enables you to develop software faster, innovate more easily, and scale more efficiently—while reducing technology risk. Google Cloud embraces open source and our Partner solutions.*

## Working with our partners

Google Cloud has partnered with various Systems Integrators and Independent Software Vendors to bring our customers our industry-leading technology customized to their needs. Some examples of Systems Integrators:

- Global Systems Integrators
  - Accenture
  - Deloitte
  - Capgemini
- Regional Systems Integrators
  - Pluto7
  - GridDynamics
  - Quantiphi

The following is an overview of the solution architecture if you prefer either of these two approaches, **1) Build your own solution** or **2) Leverage a system integrator partner**:



*Solution Architecture - Google Cloud*

Each of our System Integrator partners will add their specific tools or accelerators to the project at any solution’s layers.

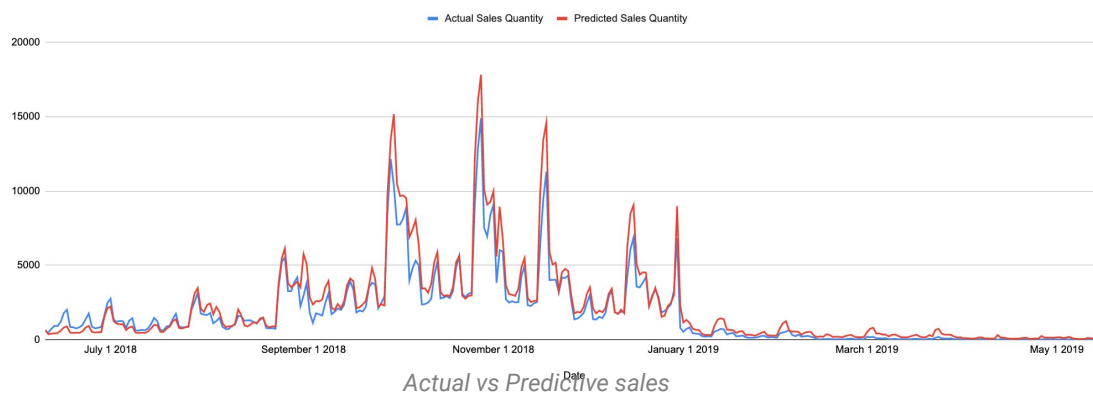
In the case of **3) choosing an “Out of the Box” Partner**, they can leverage Vertex AI and the Cortex Framework capabilities to infuse Google’s AI & ML capabilities and deploy and run their solutions on Google Cloud. Some of our Independent Software Vendors partners in this space:

- o9 Solutions
- Project44
- Manhattan Associates
- Anaplan
- c3.ai



## Case Study

Let me walk you through a case study. This was an actual implementation in the apparel sector. While the case study is based on work for a global fashion retailer, the use case is very generic and has applicability to broad retail. The use case here was for buy order planning, where the customer wanted to predict the sales for an entire season three months before the season began. The goal for this forecast was to decide how much inventory to buy/order for the entire season. One of the challenges was that all items in our consideration set were new (these items had never been sold previously). Typically for these scenarios, what their planners were doing was using past sales data with some manual linkages to similar products they had sold, which was again based on human judgment. Planners would then tweak these forecasts based on their knowledge of the market, their experience of dealing with similar products previously, intuition, etc.



*With Google's demand forecasting models, we could generate a very accurate forecast to predict sales for the season even though all these items had zero sales history, so traditional statistical models would not be able to give results.*

In addition to the predictive power, we incorporated rich metadata around products, promotions, and pricing in our forecast. The impact we saw for this one set of products for one season was 14M USD on margins. This was based on both increases in planned inventory based on the model's prediction and reduction in stock that would have resulted in markdowns.

What we also found was that accuracy is not sufficient -it was equally important to be able to explain and provide insights to planners with visualization of the forecast over the entire season and factors influencing the forecast, which items the model takes into consideration as similar to items we were generating forecasts for. We also gave them an idea of what additional factors influence demand so they knew what levers to pull e.g., knowing how much a product is influenced by marketing allows planners to make adjustments like promotion decisions that can help them hit their targets.

Planners especially valued the ability to compare our forecasts with their manually created forecasts, dive deeper where there were discrepancies, and understand why the model was forecasting in a certain way.

## Conclusion

Revenue Growth Management is a powerful asset for any organization in the consumer industry; however, it remains an opportunity due to the complexity of its implementation and operation; it has enormous potential and proven benefits, and the technology is ready to infuse AI & ML models to realize the full value of what your company offers to consumers.

The framework discussed can help your organization to implement a transformational Revenue Growth Management solution, focusing on getting all the benefits of this practice and taking advantage of Google's advanced AI & ML technology.

