

THE IMPACT OF DATA SCIENCE ON CUSTOMER INTELLIGENCE, SPACE STRATEGY AND SUPPLY CHAIN OPTIMIZATION

3451°

CONTRIBUTORS:
SCOTT CRAWFORD
JOHN TUDOROVIC
RIGGS BURNETTE
MIKE PANE
EVA JORDAN

THE IMPACT OF DATA SCIENCE ON CUSTOMER INTELLIGENCE, SPACE STRATEGY AND SUPPLY CHAIN OPTIMIZATION

At its core, 84.51°'s chief offering to its customers is business advice. In its formative years, the company diligently collected millions of points of data from Kroger stores around the United States. Our data scientists analyzed these data carefully, identifying historic trends and patterns. We were able to describe shopper behavior exactly — who was buying what, when, and in what quantity. We neatly packaged this information and delivered it to business leaders, who called on deep experience and knowledge to draw insights and plot future courses of action. That was the power of descriptive analytics, and we were experts in it. But that was 15-20 years ago, and since then much has changed.

With the advent and wide adoption of smart phones and the increasing prevalence of the Internet of things, the quantity and granularity of customer data has rapidly increased. And the tools built to handle this massive influx of data have kept up in their own right, enabling deeper analysis to generate greater insight than ever before. The implications are profound for many areas of business, particularly customer intelligence, merchandising strategies and supply chain optimization.

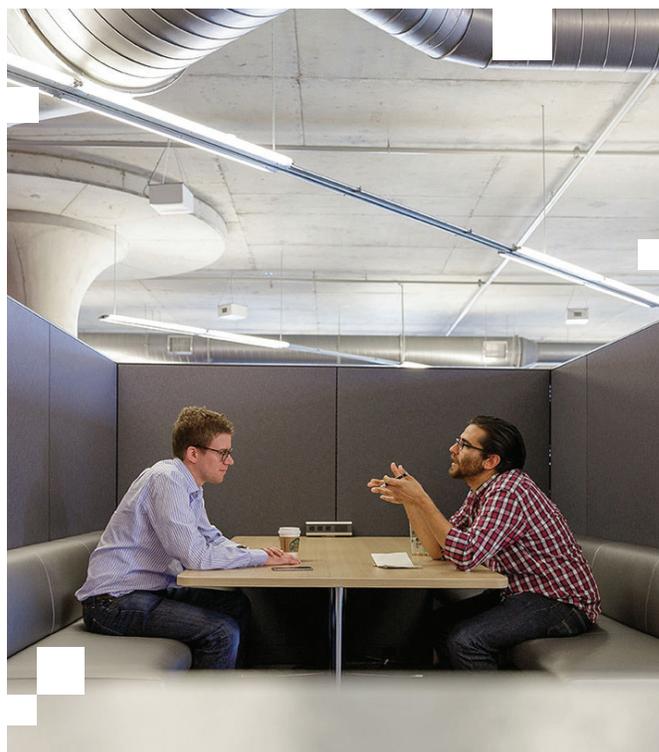


Regardless of the quantity of data or quality of analysis, descriptive analytics can only reveal what happened in the past. Using such information to form expectations about the future requires untenable assumptions and even then, such analyses are only applicable to aggregates (e.g., large groups of customers) as opposed to individuals. Forming better expectations about future customer behavior requires a different type of analysis, predictive analysis. To help equip our customers with this superior knowledge, we needed a more powerful lens into the future. That's why we evolved 84.51° from its early days as a descriptive analytics company to a powerhouse of predictive and prescriptive analytics.

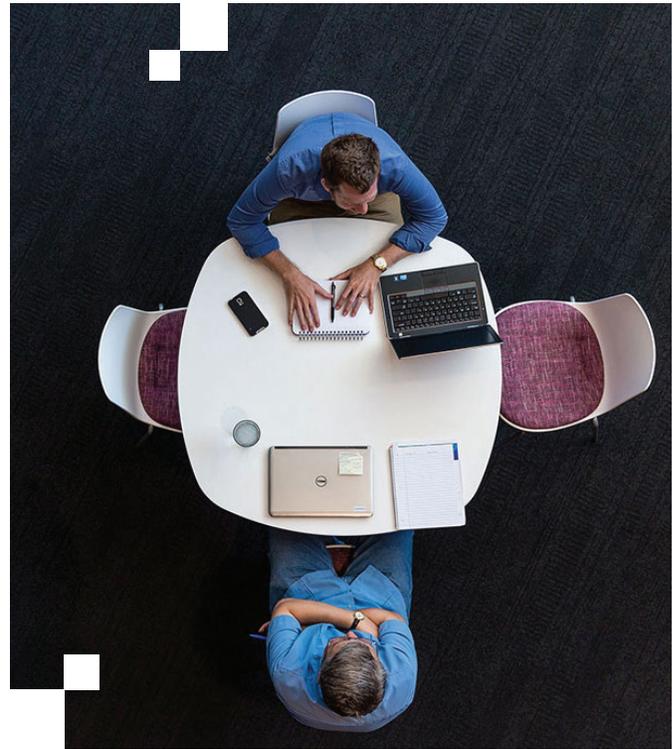
In evolving, we have endeavored to integrate data science into every aspect of our business. Doing so has come with challenges. As descriptive analysts, our modus operandi always involved applying some sort of rule to interpret the empirical evidence collected. A switch to a predictive analytics approach turns these old ways on their head and involves using machine learning to define the "rules," so to speak, to apply to our data so that we can now predict outcomes. Doing so required a group leap of faith into trusting our algorithms.

Our years of accumulated knowledge didn't go out the window to make room for this new era. Given Kroger's long and successful history, we must recognize that existing processes typically evolved over years in complex systems and include a great amount of embedded intelligence. Much of that intelligence is not easily discernable in our data. Our data scientists must always start with humility and a healthy respect for our champion processes; sometimes the benefits of a process are not easily measured. For example, having flowers near the entrance might enhance the overall shopping experience, which is not revealed by focusing on flower sales as a metric. One of the strengths of our consistent focus on customer loyalty as a key metric is that it helps us avoid "scientifically supported" mistakes such as using short term sales improvements to justify changes that negatively impact long-term loyalty.

CONSIDER - GOOD DATA SCIENCE REQUIRES A FUNDAMENTAL UNDERSTANDING OF THE BUSINESS CONTEXT AND A HUMILITY FOR THE LIMITS OF THE DATA. OPTIMAL DECISIONS IN COMPLEX SYSTEMS, SUCH AS THOSE WE ADVISE ON, OFTEN REQUIRE BLENDING ANALYTIC INSIGHTS WITH HARD-EARNED EXPERIENCE.

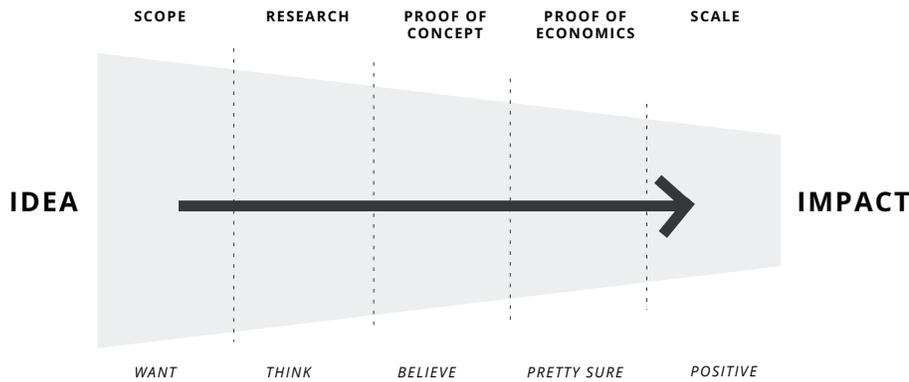


To that end, there is a framework we use when we develop a new data science product for our business. Each product launch lifecycle goes through three phrases; solution engineering, development and deployment. The objective is to ensure that we are providing solutions that deliver positive outcomes for our customers. The solution engineering phase challenges our people to investigate to deeply understand the business needs. As we improve understanding, our goal is to define the minimal viable product that will deliver value. From there, we rapidly evolve the product to improve ROI. Often, the business context and need are very complex and include many moving parts. Given such complexity, there is no way to design an elegant solution from the outside. After a well-crafted minimal viable product is launched, we learn from it, adapt it and scale it to fit.



To increase successful integration of good data science into business operations, 84.51° developed the following framework, which we call the integration funnel. This framework provides a consistent approach to advance the quality, speed and scale of science-based decisions.

84.51° INTEGRATION FUNNEL



As data science tools move through the funnel from idea to impact, they are required to pass critical tests along the way. These tests evaluate the scope, economics and scalability of the tool, and require demonstration of supporting research and success of a proof of concept. This framework provides confidence in the quality, effectiveness and usefulness of each tool before it is deployed.

Following are three examples of how different missions across 84.51° have integrated data science tools into their operations to embrace this switch from descriptive to prescriptive analytics.

STRATEGIC CUSTOMER INTELLIGENCE AND EXPERIENCE MISSION

Our strategic customer intelligence and experience mission seeks to develop and embed foundational insights about customer behaviors into business reporting and activation strategies. This mission is responsible for quantifying customer loyalty and providing the voice of the customer. The mission leverages data, both behavioral and attitudinal, to create solutions that provide an understanding of customer, store and overall organizational health.

To help store management prioritize resources, this mission developed modeling processes to identify the most influential factors driving performance for each individual store in the enterprise. This happens by collecting information about a specific store (e.g., trade area, customer base and makeup, customer perceptions, etc.), entering these factors into a model and allowing the algorithm to quantify the relationships between our target variable (sales growth/ decline) and all the independent variables (e.g., out-of-stocks, wait times, store cleanliness, etc.). Based on the quantified impact across all the variables, they surface the top controllable factors that are acting as sales depressors and message them as opportunities to improve sales.

SPACE AND ASSORTMENT MISSION

84.51°'s space and assortment mission builds data science solutions to determine the best selection of products to stock in our stores to meet our customers' needs. Additionally, this mission has developed tools to optimize the amount of space each category is given in the store to meet customers' assortment needs and to minimize out-of-stock experiences. There is a long history of applying science to address assortment and space decisions, but prior to the tools deployed by the mission, the results of the science appeared primarily at the top enterprise or at the division leadership level. The influence of those earlier attempts diminished at

the store level. The early science was also descriptive in nature and projecting the best course of action relied heavily on business leaders' knowledge and experience.

Today, 84.51° continues to infuse personalized data science into category management. However, the solutions that the space and assortment mission are able to provide are intended to better augment the knowledge and experience of the store level decision makers. They are moving the needle toward the numbers, but they are not replacing the decision makers. When designing and building space and assortment data science tools, 84.51° embeds this science in dynamic web apps in order to expose the solution to our business partners. This empowers decision makers who have extensive experience and knowledge to adjust inputs on the fly and ensure they are constantly receiving the most up-to-date and relevant recommendations when making changes to a store.



SUPPLY CHAIN OPTIMIZATION MISSION

Kroger tasked 84.51° to produce a more complete replenishment forecast than the existing system. Leveraging the integration funnel required the mission to do extensive research to understand the business context and identify opportunities to apply data science and improve supply chain operations. Rather than devising a product to quickly detect out-of-stock products, the mission determined the best course of action was to engineer a solution to prevent out-of-stocks entirely.

The mission produced a forecasting tool that takes into account the sales history of inventory items, considers promotions and other events that might affect the sales of each item over a period, learns from this information and outputs a forecast for every single item directly into an ordering system. If current stock levels of an item aren't high enough to cover projected sales, the system will order more of that item. This removes human error and frees up store employees' time by completely automating the reordering process.

CONCLUSION

Data science has become an integral part of almost all the missions currently underway at 84.51°. On our journey toward becoming a more predictive and prescriptive solutions provider, we have evolved our project management processes to increase the quality of our tools. Before they're deployed, our tools are thoroughly researched and tested. We ensure that our science is not only accurate, but also scalable to address the issues of any number of stores across the enterprise.

