

Consumption-Based Forecasting and Planning

Predicting Changing Demand Patterns
in the New Digital Economy

Charles W. Chase



WILEY

Consumption-Based Forecasting and Planning

Wiley and SAS Business Series

The Wiley and SAS Business Series presents books that help senior level managers with their critical management decisions.

Titles in the Wiley and SAS Business Series include:

The Analytic Hospitality Executive: Implementing Data Analytics in Hotels and Casinos by Kelly A. McGuire

Analytics: The Agile Way by Phil Simon

The Analytics Lifecycle Toolkit: A Practical Guide for an Effective Analytics Capability by Gregory S. Nelson

Anti-Money Laundering Transaction Monitoring Systems Implementation: Finding Anomalies by Derek Chau and Maarten van Dijck Nemcsik

Artificial Intelligence for Marketing: Practical Applications by Jim Sterne

Business Analytics for Managers: Taking Business Intelligence Beyond Reporting (Second Edition) by Gert H. N. Laursen and Jesper Thorlund

Business Forecasting: The Emerging Role of Artificial Intelligence and Machine Learning by Michael Gilliland, Len Tashman, and Udo Sglavo

The Cloud-Based Demand-Driven Supply Chain by Vinit Sharma

Consumption-Based Forecasting and Planning: Predicting Changing Demand Patterns in the New Digital Economy by Charles W. Chase

Credit Risk Analytics: Measurement Techniques, Applications, and Examples in SAS by Bart Baesen, Daniel Roesch, and Harald Scheule

Demand-Driven Inventory Optimization and Replenishment: Creating a More Efficient Supply Chain (Second Edition) by Robert A. Davis

Economic Modeling in the Post Great Recession Era: Incomplete Data, Imperfect Markets by John Silvia, Azhar Iqbal, and Sarah Watt House

Enhance Oil & Gas Exploration with Data-Driven Geophysical and Petrophysical Models by Keith Holdaway and Duncan Irving

Fraud Analytics Using Descriptive, Predictive, and Social Network Techniques: A Guide to Data Science for Fraud Detection by Bart Baesens, Veronique Van Vlasselaer, and Wouter Verbeke

Intelligent Credit Scoring: Building and Implementing Better Credit Risk Scorecards (Second Edition) by Naeem Siddiqi

JMP Connections: The Art of Utilizing Connections in Your Data by John Wubbel

Leaders and Innovators: How Data-Driven Organizations Are Winning with Analytics by Tho H. Nguyen

On-Camera Coach: Tools and Techniques for Business Professionals in a Video-Driven World by Karin Reed

Next Generation Demand Management: People, Process, Analytics, and Technology by Charles W. Chase

A Practical Guide to Analytics for Governments: Using Big Data for Good by Marie Lowman

Profit from Your Forecasting Software: A Best Practice Guide for Sales Forecasters by Paul Goodwin

Project Finance for Business Development by John E. Triantis

Smart Cities, Smart Future: Showcasing Tomorrow by Mike Barlow and Cornelia Levy-Bencheton

Statistical Thinking: Improving Business Performance (Third Edition) by Roger W. Hoerl and Ronald D. Snee

Strategies in Biomedical Data Science: Driving Force for Innovation by Jay Etchings

Style and Statistic: The Art of Retail Analytics by Brittany Bullard

Text as Data: Computational Methods of Understanding Written Expression Using SAS by Barry deVillie and Gurpreet Singh Bawa

Transforming Healthcare Analytics: The Quest for Healthy Intelligence by Michael N. Lewis and Tho H. Nguyen

Visual Six Sigma: Making Data Analysis Lean (Second Edition) by Ian Cox, Marie A. Gaudard, and Mia L. Stephens

Warranty Fraud Management: Reducing Fraud and Other Excess Costs in Warranty and Service Operations by Matti Kurvinen, Ilkka Töyrylä, and D. N. Prabhakar Murthy

For more information on any of the above titles, please visit www.wiley.com.

Consumption- Based Forecasting and Planning

*Predicting Changing Demand Patterns
in the New Digital Economy*

Charles W. Chase

WILEY

Copyright © 2021 by SAS Institute Inc. All rights reserved.

Published by John Wiley & Sons, Inc., Hoboken, New Jersey.

Published simultaneously in Canada.

No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, scanning, or otherwise, except as permitted under Section 107 or 108 of the 1976 United States Copyright Act, without either the prior written permission of the Publisher, or authorization through payment of the appropriate per-copy fee to the Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, MA 01923, (978) 750-8400, fax (978) 750-4470, or on the web at www.copyright.com. Requests to the Publisher for permission should be addressed to the Permissions Department, John Wiley & Sons, Inc., 111 River Street, Hoboken, NJ 07030, (201) 748-6011, fax (201) 748-6008, or online at <http://www.wiley.com/go/permission>.

Limit of Liability/Disclaimer of Warranty: While the publisher and author have used their best efforts in preparing this book, they make no representations or warranties with respect to the accuracy or completeness of the contents of this book and specifically disclaim any implied warranties of merchantability or fitness for a particular purpose. No warranty may be created or extended by sales representatives or written sales materials. The advice and strategies contained herein may not be suitable for your situation. You should consult with a professional where appropriate. Neither the publisher nor author shall be liable for any loss of profit or any other commercial damages, including but not limited to special, incidental, consequential, or other damages.

For general information on our other products and services or for technical support, please contact our Customer Care Department within the United States at (800) 762-2974, outside the United States at (317) 572-3993 or fax (317) 572-4002.

Wiley also publishes its books in a variety of electronic formats. Some content that appears in print may not be available in electronic formats. For more information about Wiley products, visit our web site at www.wiley.com.

Library of Congress Cataloging-in-Publication Data

Names: Chase, Charles, author. | John Wiley & Sons, publisher.

Title: Consumption-based forecasting and planning : predicting changing demand patterns in the new digital economy / Charles W. Chase.

Other titles: Wiley and SAS business series

Description: Hoboken, New Jersey : John Wiley & Sons, Inc., [2021] |

Series: Wiley and SAS business series | Includes index.

Identifiers: LCCN 2021020635 (print) | LCCN 2021020636 (ebook) | ISBN 9781119809869 (cloth) | ISBN 9781119809883 (adobe pdf) | ISBN 9781119809876 (epub)

Subjects: LCSH: Business forecasting. | Business logistics. | Demand (Economic theory).

Classification: LCC HD30.27 .C473 2021 (print) | LCC HD30.27 (ebook) | DDC 658.4/0355—dc23

LC record available at <https://lcn.loc.gov/2021020635>

LC ebook record available at <https://lcn.loc.gov/2021020636>

Cover image: © Radoslav Zilinsky/Getty Images

Cover design: Wiley

Set in Meridien LT Std 10/14pt, Straive, Chennai

10 9 8 7 6 5 4 3 2 1

Contents

Foreword ix

Preface xiii

Acknowledgments xix

About the Author xxi

Chapter 1	The Digital Economy and Unexpected Disruptions	1
Chapter 2	A Wake-up Call for Demand Management	25
Chapter 3	Why Data and Analytics Are Important	55
Chapter 4	Consumption-Based Forecasting and Planning	83
Chapter 5	AI/Machine Learning Is Disrupting Demand Forecasting	135
Chapter 6	Intelligent Automation Is Disrupting Demand Planning	185
Chapter 7	The Future Is Cloud Analytics and Analytics at the Edge	207
Index	233	

CHAPTER **1**

**The Digital
Economy
and Unexpected
Disruptions**

We are experiencing unprecedented and unpredictable times where disruption has been felt globally by many companies, particularly retailers and consumer goods companies. The digital economy has had an impact on almost every aspect of our lives from banking and shopping to communication and learning. This incredible progress driven by digital technologies is affecting the world we live in by improving our lives, but also creating new challenges. The most successful organizations get ahead of an unpredictable future by being prepared for the unknown. There have been significant developments in the evolution of various disruptive technologies over the past two decades and this development brings new opportunities, both in terms of cost savings and overall value creation. The benefits of IoT, big data, advanced analytics, AI/machine learning, cloud computing, and other advanced technologies collectively can make an impact that companies can leverage to digitize their supply chains to address business challenges.

The world is changing at an accelerated pace and companies are seeing that the biggest benefits of digitization come from the ability to move faster, adapt quickly to disruptions, anticipate changes, and automatically execute information faster by managing large volumes of data more effectively—all resulting in speed of innovation and execution of those changes. As a result, companies are looking for real-time data collection across multiple media platforms that will provide actionable insights from the data to advanced analytics with easy-to-use user interfaces (UI). Additionally, these companies hope to remotely gather relevant information affecting day-to-day operations to monitor performance, make the right decisions at the right time, and improve the velocity of supply chain execution. Digital transformation will help companies establish that foundation by becoming more agile and flexible.

The consensus is that the overarching impact of digital transformation strategies and objectives will have significantly more influence than just cost savings. Companies are facing increased consumer demand for reasonably priced, high-quality products and cannot afford quality-related disruptions with their products and services. Visual depiction of a demand plan, graphical depictions of performance indicators, and better visibility of KPIs through dynamic searches and interactive dashboards and reports will enable seamless data discovery

and visualization. Users need to easily compare multiple scenarios and visualize them fully for improved performance.

DISRUPTIONS DRIVING COMPLEX CONSUMER DYNAMICS

Over the past decade, consumers have been gaining power and control over the purchasing process. Unprecedented amounts of information and new digital technologies have enabled more consumer control, and now, instead of being in control, marketers have found themselves losing control. In the past several years, however, there's been a shift. Even as consumers continue to exert unprecedented control of purchasing decisions, power is swinging back toward marketers, with the help from technology and analytics that play a new and larger role in the decision-making process.

Consumers are turning increasingly to technology to help them make decisions. This has been enabled by four key disruptions.

1. **Automated consumer engagement.** A shift from active engagement to “automated engagement” where technology takes over tasks from information gathering to actual execution.
2. **Digital technologies.** An expanding IoT which embeds sensors almost anywhere to generate smart data regarding consumer preferences triggering actions offered by marketers.
3. **Predictive analytics.** Improved predictive analytics or “anticipatory” technology driven by artificial intelligence (AI) and machine learning (ML) that can accurately anticipate what consumers want or need before they even know it—based not just on past behavior but on real-time information and availability of alternatives that could alter consumer choices.
4. **Faster, more powerful cloud computing.** The availability of faster and more powerful on-demand availability of computer system resources, especially data storage (cloud storage) and computing power, without direct active management by the user. Cloud-based demand forecasting and planning solutions that crunches petabytes of data, filters it through super-sophisticated models, and helps analysts and planners gain previously unheard-of efficiencies in creating more accurate demand plans.

Instead of merely empowering consumers, technology is making decisions and acting for them. Analytics technology will be doing more and more of the work for companies by automating activities around demand forecasting and planning in real time.

It's no longer merely about *predicting* what consumers want. It's about *anticipating*—which includes the ability to adapt marketing offers and messages to alternatives based on data from hundreds of possible sources. By anticipating, we gain a greater chance of influencing outcomes. Consumer's phones or smartwatches can deliver recommendations and offers where to go, how to get there, and what to buy based on what they are about to do, not just what they've done in the past. Anticipation is about the short-term future, or even a specific day and time. Analytics provides marketers with the ability to create contextual engagements with their customers by delivering personalized, real-time responses.

Technology is helping both marketers and customers take the next evolutionary step. Instead of merely empowering customers, it's making decisions and acting for them. Analytics technology will be doing more and more of the work for companies by automating activities around research and making actual purchases.

IMPACT OF THE DIGITAL ECONOMY

The new digital economy has affected all aspects of business, including supply chains. The Internet of Things (IoT), with its network of devices embedded with sensors, is now connecting the consumer from the point of purchase to the factory. Technologies such as RFID, GPS, event stream processing (ESP), and advanced analytics and machine learning are combining to help companies to transform their existing supply chain networks into more flexible, open, agile, and collaborative digital-driven models. Digital supply chains enable business process automation, organizational flexibility, and digital management of corporate assets.

Crossing the “Digital Divide” requires a holistic approach to digital transformation of the supply chain that includes new skills and corporate behaviors. New capabilities are also required such as digitally connected processes, predictive analytics to sense demand using

pattern recognition, and scalable technologies with the capability to process “big” data using in-memory processing and cloud computing.

WHAT DOES ALL THIS MEAN?

The gradual replacement of human judgment across the supply chain. Companies will use advanced analytics to optimize complex cross-functional trade-offs to facilitate value across the supply chain directly from the consumer back to the supplier. This new digital supply chain network allows companies to match the long tail of demand, supply, and production capabilities to create the ultimate customer/consumer fit and fulfillment.

Digitization will affect all supply chain IT systems including seamless integration across organizations, as well as real-time synchronization of data, global standardization of workflows, and rising demands of cybersecurity. This requires companies to evolve in order to best support areas such as automated data gathering, short-term tactical demand and supply planning, procurement, and execution. The challenges inherent in digital transformation are:

- **Continual connectivity.** We live in an always-on, always available world where customers/consumers expect to access information and execute any task from any device.
- **Organizational speed.** Those companies who recognize market change and opportunities will profit the most from digital transformation.
- **Deluge of information.** Information is being collected by companies from multiple channels, devices, and forms at incredible speeds with minimal latency.

Those companies who understand how to capture, store, and process this information will uncover business value and experience the most benefits.

Digital transformation crosses many facets of a company’s business including collaboration platforms, cloud, mobile, social media, big data, and most of all, predictive analytics. Digital transformation hinges on big data and advanced analytics. The analytics process needs to be tied to distinct digital architectures that include data integration and

management, robust visualization and advanced statistical models for discovery and prediction, as well as continuous delivery of insights as events unfold, which is vital to digital transformation.

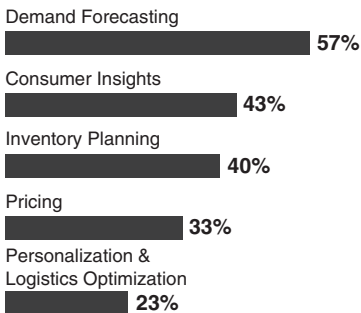
According to the 2020 Consumer Goods Technology (CGT) Retail and Consumer Goods Analytics Study, retailers and consumer goods suppliers for the first time agree on the top three areas of focus over the next year (mainly as a result of the coronavirus pandemic). Those three areas are:

1. Demand Forecasting (57% retail and 67% CG, respectively);
2. Consumer Insights (43% and 50%); and
3. Inventory Planning (40% and 30%).

In addition, roughly one-third of retailers chose pricing as a top-of-mind area of focus followed by personalization and logistics optimization. Consumer goods companies felt that assortment planning followed by marketing mix optimization completed their top areas of focus for the next year. (See Figure 1.1.)

The myriad forces affecting the relationship between demand and supply are set to expand their influence as a result of the “automated consumer engagement” and the recent disruptions. The ability to collect real-time consumer demand through digital devices will force companies to digitize their supply chains. Finding ways to be better prepared means implementing a corporate culture and structure that

TOP 5 ANALYSIS AREAS OF FOCUS FOR RETAIL



TOP 5 ANALYSIS AREAS OF FOCUS FOR CONSUMER GOODS

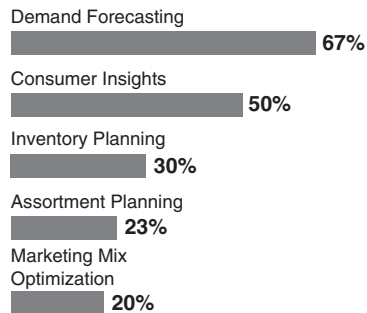


Figure 1.1 Top 5 Analysis Areas of Focus

Source: Tim Denman and Alarice Rajagopal, “Retail and Consumer Good Analytics Study 2020,” *Consumer Goods Technology*, March 2020.

brings together organizations and, most of all, data from different sources. The analytics and technology capability are now available, so organizational changes and skills must transition to the next generation demand management with a renewed focus on people, process, analytics, and technology.¹ However, it also requires ongoing change management to not only gain adoption, but to sustain the new (normal) corporate culture.

There is a more fluid distribution of goods today because customer purchase behavior has changed the way products are created and sold. The rise of omnichannel and new purchasing processes such as Amazon.com make inventory management more unpredictable. The influence of external factors, such as social media, Twitter, and mobile devices, makes it more challenging for distributors and retailers to plan deliveries and stock orders. Regardless, next-day or even same-day delivery is an expectation that consumer goods companies' supply chain processes are tasked to provide. These factors are making demand more volatile, and as a result, manufacturers can no longer operate using inventory buffer stock to protect against demand volatility, as it can too easily result in lost profit.

SHIFTING TO A CONSUMER-CENTRIC APPROACH

The definition of "fast" for consumers today is dramatically different to the "fast" of five or ten years ago. Consumers are demanding more and expect it quicker than ever before. This is being driven by millennials and other generational groups that want instant response and same-day delivery. Consumer demand is no longer driven by supply availability. A supply (push) strategy is no longer viable in today's digital world. Companies must shift their operational models by listening to demand and responding to the consumer (consumption) in order to remain successful.

Sales and marketing tactics must be more focused on automated consumer engagement. Unstructured data and social media are having a more prevalent impact than ever before on the entire purchase process, which must be factored into the demand management process. This is the result of the openness and availability of consumer feedback that social media influences and delivers. Feedback via social

media is both an asset and a liability for retailers, distributors, and consumer goods companies. Although feedback provides insight into sentiment and provides opportunity for brand exposure, it adds additional complexity to how consumption can be influenced. This also means demand can be influenced across multiple channels and often with very immediate consequences. Demand is also changing as consumers want to consume products in new ways. Subscription lifestyles and shared economies due to the on-demand world have had an impact on how companies need to plan, design, and create products for an indecisive generation of consumers. The consumer experience must remain at the forefront of retailer and consumer goods companies' priorities. Flexibility, efficiency, and a consumer-centric approach is the key to their success.

Transitioning to the digital economy requires a complete assessment of current processes, leading to a detailed road map to move from the current state to a future state. The focus must be on investment in training people to improve their analytical skills to sense demand, to understand those factors that influence the demand signals that matter, and to act on the insights. This fundamental shift is required to maintain a leading edge in our new digitized world. As a result, the birth of short- and long-term consumption-based forecasting and planning will be more anticipatory, rather than prescriptive.

As the retail and consumer goods industries continue to invest their energy and resources into the ongoing disruption (pandemic), they are emerging with a renewed focus on analytics. Both retailers and consumer goods executives have clearly allocated a large portion of their IT budgets to the pursuit of analytics. Those numbers will only continue to rise into the future. According to the Consumer Goods Technology 2020 Retail and Consumer Goods Analytics Study, 60% of consumer goods companies allocated less than 10% of their total IT spend to analytics. By 2021, however, over 52% of consumer goods executives predict more than 10% of their IT budgets will be spent on analytics. As impressive as that may be, other consumer goods leaders (nearly 7%) are even more bullish, anticipating even higher IT investment in analytics, representing as much as a quarter of total IT spend over the next three years.

The analytics marketplace continues to evolve as personalization and replenishment become ever more significant to maintain competitive advantage. Signs indicate both retailers and consumer goods companies are enthusiastically exploring these next-generation technology solutions. The focus is now on how to leverage these new tools to gain advantage over their competitors by investing in new capabilities such as artificial intelligence and machine learning, supported by cloud-ready solutions that carry the potential to supercharge analytics programs. These new machine learning algorithms not only uncover data patterns faster, but sometimes even learn how to create their own algorithms to further fine-tune the results. That makes them the perfect match for high-volume, rapid response functions that can quickly uncover changing consumer demand patterns. Signs indicate both retailers and consumer goods companies are enthusiastically exploring these next-generation solutions. The key is how to leverage these new tools to gain competitive advantage. We will explore this in more detail in the following chapters with real examples and case studies.

Worldwide challenges due to the coronavirus pandemic, however, have exposed unforeseen gaps in consumer goods companies' ability to effectively predict and plan demand, as consumers rapidly shift their buying patterns. Retailers and consumer goods companies need to be able to react seamlessly in real time to manage unanticipated demand disruptions. Although the industry has responded in a rapid frenzy to shore up supply chains and alter operations on the fly to ensure product is where it needs to be and when, doing so requires making costly changes in order to meet consumer exceptions. As the industry has entered recovery mode, more mature retailers and consumer goods companies have had to invest in their analytic capabilities with increased vigor to ensure a seamless transition from basic analytics to more consumer-centric, data-driven predictive analytics. Retailer and consumer goods leaders are now realizing the importance of investing in today to guarantee they are prepared for tomorrow.

THE ANALYTICS GAP

Although many retailers and consumer goods companies have a solid understanding of basic analytics, they are still lagging in investigative

DEMAND FORECASTING MATURITY	CG	Retail
Basic (After the Fact)	54%	28%
Investigative Analytics	18%	17%
Predictive Analytics	11%	7%

Figure 1.2 Retail and Consumer Goods Companies Analytics Maturity
Source: Tim Denman and Alarice Rajagopal, “Retail and Consumer Good Analytics Study 2020,” *Consumer Goods Technology*, March 2020.

and predictive analytics. It appears that retailers have put more emphasis on investigative analytics than have consumer goods companies. However, both will need to invest more aggressively in both investigative and predictive analytics to meet today’s consumer expectations. (See Figure 1.2.)

The ability to understand, predict, and ideally shape consumer behavior lies at the heart of today’s heightened interest in analytics. Consumer goods companies have been working at the limits of the data analytics opportunity for a long time, leveraging point-of-sale (POS) and syndicated scanner data to convince retail partners to collaborate on analysis influenced by consumer programs to drive sales for their shared benefit. Some retailers have slowly warmed up to this approach, but a large number have remained resistant to share their data, or have charged fees to do so, hindering progress. This is not surprising given the decades of experience and maturity gained by consumer goods companies, who are now forcing retailers to play catch-up with their analytics capabilities.

You can’t do analytics correctly if your data is not at an expected level of quality, making it difficult to integrate with all the new omnichannel customer engagement options (mobile, social, and online) that are available to consumers. Data management is the core foundation of getting things right.

WHY PREDICTIVE AND ANTICIPATORY ANALYTICS?

Today, vast amounts of structured and unstructured data are being collected on a minute-by-minute basis through devices embedded almost everywhere as a result of IoT. That information could be

integrated together to form some highly accurate conclusions about your business. Therefore, providing the ability to predict shifting consumer demand patterns using predictive analytics, which leverages data mining, statistical algorithms, advanced modeling, and machine learning techniques. Using predictive analytics, companies can identify the likelihood of future outcomes based on historical data, as well as causal factors like price, sales promotions, in-store merchandising, Google trends, economic information, stringency index, and COVID-19 epidemiological data. While the practice of using predictive analytics is getting more attention among retail and consumer goods companies, especially for demand forecasting and planning, its use is still lagging in comparison to the other industries. Although predictive analytics was not designed to definitively predict the future, it is far more advanced than current basic (after the fact) analytics that only models patterns associated with trend and seasonality.

What if trend and seasonality have been disrupted by an unanticipated event like a global pandemic? Your historical trend and seasonality patterns are now no longer good predictors of the future. You must find real-time leading indicators other than trend and seasonality that can explain the changing consumer behavioral patterns affecting demand for your products. This requires more advanced analytics that can take advantage of such additional data as daily POS data, weekly syndicated scanner data (Nielsen; Information Resources Inc. IRI), Google trends, stringency indices, epidemiological data, economic data, and others.

As an alternative, predictive analytics can tell you what might happen given the same set of circumstances if all things hold true. Although predictive analytic models are still probabilistic in nature, they are generally very good at predicting future demand, as compared to basic trend and seasonal methods that only utilize past historical demand. It's easy to find a model that fits the past demand history well, but a challenge to find a model that correctly identifies those demand patterns that will continue into the future. In other words, you can't always rely on past historical trends and seasonality alone. You must account for factors that may arise due to unforeseen disruptions to truly make accurate predictions. A common criticism of predictive analytics is that markets and people are always changing,

so static historical trends are too simplistic to describe how something will or will not happen with any level of certainty.

As technology continues to improve, so does our ability to collect and process data at an exponential rate, making it possible to perform “anticipatory” analytics. While still a new concept, anticipatory analytics is gaining awareness as a viable methodology across many disciplines. Anticipatory analytics is enabling companies to forecast future behaviors quicker than traditional predictive analytics by identifying changes in demand acceleration and deceleration. It addresses business challenges and places the burden on the decision makers to take action to reach a discrete outcome.

DIFFERENCE BETWEEN PREDICTIVE AND ANTICIPATORY ANALYTICS

Predictive analytic models range from a simple linear model to more complex algorithms affiliated with traditional causal models, such as ARIMA, ARIMAX, dynamic regression, and machine learning models (Neural Networks, Gradient Boosting, Random Forest, and others). Predictive models tend to be very accurate when past patterns continue in the future. They tend not to be as accurate in identifying inflection points, or a real-time disruption that may alter the future outcome. Anticipatory models build on the foundation of predictive models that allow you to identify and adjust predictions based on inflection points, business turning points, or an abrupt change in direction due to a real-time disruption.

Predictive models based on Artificial Intelligence (AI) are enabling more accurate forecasting by analyzing patterns not only of historical data, but also those factors that influence consumer demand. AI uses data mining, statistical modeling, and machine learning (ML) to uncover patterns in large data sets to predict future outcomes. For example, a retailer or consumer goods company can use machine learning to determine the likelihood that specific items will be out of stock and when, or the likelihood that a consumer will buy an alternative brand of paper towels if the production of a national brand suddenly halts due to a disruption. It also could analyze consumer goods suppliers to determine which ones will prove most reliable in an emergency.

Anticipatory analytics helps to identify the future needs of a business before the obvious signals occur. The goal of anticipatory analytics is to understand all the potential outcomes that could occur in the future in addition to those that occurred in the past. Anticipatory models are more advanced machine learning models, such as cognitive learning, that can learn and process information in real time.

Utilizing the right mixture of data, processing tools, and technology like “event stream processing” and cloud computing, anticipating alternative future outcomes can be achieved in real time. Key enablers of anticipatory analytics are faster data management and the ability to process vast amounts of information in real time. Another enabler is the ability to merge the past and present by seamlessly combining data and behavioral trends such as real-time data inquiries, purchase behavior, social media, and economic data to provide a holistic view of future consumer demand patterns.² Anticipatory analytics evaluates real-time data signals at the edge of the network to predict the future faster than traditional predictive analytics.

Anticipatory analytics is certainly an appealing opportunity for demand forecasting, but it is not meant to replace predictive analytics, which has not been fully utilized by most companies over the past 30 years. The one thing we have learned from the current COVID-19 crisis is that traditional (basic) analytics using simple methods that can only model trend and seasonality no longer work in the digital economy, particularly when the trends and seasonality have been disrupted. Predictive models that incorporate other factors, such as POS, price, sales promotions, in-store merchandising, epidemiological, stringency indices, economic and other data sources need to be utilized before attempting more sophisticated methods like anticipatory models. Both approaches are valuable and can work individually and/or together.

It is important to evaluate each business situation where predictive analytics can be best applied and where anticipatory analytics may be a more appropriate approach to solve the business problem. One approach is not necessarily superior to the other; it is about which methodology can be best utilized to solve each specific business problem. Traditional response modeling and other predictive analytic practices will always be important options, as more companies focus

on analytics to facilitate growth. Also, companies will have to invest in data scientists in order to successfully leverage both predictive and anticipatory analytics to gain competitive advantage.

THE DATA GAP

It's no secret that retailers and consumer goods companies historically have not agreed when it comes to data sharing. According to the Consumer Goods 2020 Retailer and Consumer Goods Analytics Study, 36% of retail partners are sharing POS transaction data on a weekly basis, and 25% report promotions performance on a weekly basis with no set cadence. However, many retailers openly admit that they don't share much data at all. The highest among the data that they are not sharing includes online customer behavior data (80% of retailers) followed by loyalty or other related customer data.

What's even more interesting, for the data that is being shared, consumer goods companies say that 35% of retailers are charging for it. However, 73% of retailers indicate that they are not charging consumer goods companies for the data because they are not sharing enough data to justify it. That said, retailers and consumer goods companies are in alignment that they are still working in silos, but are making progress toward a shared data model, which is well known to be the ideal scenario for both industries. Since internal cooperation is still a work in process, many consumer goods companies have outsourced work to vendors to address their need for additional information, while retailers are not addressing this need. Most consumer goods companies have been depending on syndicated scanner data from Nielsen and Information Resources Inc. (IRI) to supplement their data needs to better understand changing consumer demand patterns for their products by geography, retail channel, key account, category, product group, product, SKU, and UPC. The latency of syndicated scanner data has been significantly reduced from 4–6 weeks to 1–2 weeks (or less), as a result of improved Nielsen or IRI syndicated scanner data services.

Syndicated scanner (POS) data from brick-and-mortar stores is the data most frequently purchased from Nielsen or IRI. This data covers a large portion of brick-and-mortar sales for 12 different channels. The data is available to any consumer goods and other manufacturers

on both a subscription and ad hoc basis. Although somewhat costly, it's easy to work with coverage of anywhere between 60% and 70% of a company's product portfolio; in most cases, there is 100% coverage of a consumer goods company's key products (20% of their product portfolio), representing 80% or more of their annual volume and revenue. The following six channels would be of interest to most consumer goods companies.

1. Grocery/Food
2. Mass Merchandisers (Walmart, Target, and others)
3. Drug
4. Dollar Stores
5. Warehouse Club
6. Military

There are three more channels covered by Nielsen/IRI which are relevant to many but not all consumer goods companies, depending on their product assortment.

- Gas and Convenience
- Pet
- Liquor

Nielsen and IRI provide very similar information for these channels, offer account-level detail for most key retailers, and include them in their multichannel markets. They essentially collect electronic POS data from stores through checkout scanners across key retailers. In addition, they work very closely with their consumer goods customers to make sure that the syndicated scanner data is standardized, normalized, and aligns with each consumer goods customer's internal corporate product hierarchies.

In emerging markets where POS information is unavailable, field auditors collect sales data through in-store inventory and price checks. Their stringent quality control systems validate the data before it's made available to consumer goods companies. Understanding e-commerce sales has also become increasingly important for retailers and consumer goods companies, thus e-commerce measurement data has become a priority for Nielsen, which now offers a global e-commerce

measurement service to help retailers and their consumer goods companies access online sales performance to better understand how their online sales contribute to total sales.

Amazon also provides companies with access to the sales history for their products. Up until the recent COVID-19 crisis, roughly 2–10% of a consumer goods company's products were being sold through Amazon. Most companies forecast demand for products sold on Amazon, but pay little attention given the size of those sales. The e-commerce giant accounts for about half of online sales in the United States, but since the COVID-19 crisis has experienced a significant ramp up in delivery of essential items like food, cleaning supplies, and medicine during the stay-at-home orders to prevent the spread of the coronavirus. According to several financial sources, Amazon sold, shipped, and streamed more food products and video content during the first three months of 2020 (an average increase in revenue of roughly 26% or \$75.5 billion) as it became an essential provider for consumers staying at home. So, Amazon is no longer ignored by many consumer goods companies, particularly those companies who sell essential products.

The COVID-19 pandemic has transformed how people shop and how retailers sell. In response, retailers and consumer goods companies are looking to build new analytics capabilities to support the need to change in order to be more effective. Business executives are looking to data, analytics, and technology for answers on how to predict and plan for the surge and, ultimately, the decline in consumer demand. It is significantly easier to shut down facilities than it is to quickly boost production and capacity. The biggest unknown is whether there will be a delayed economic recovery or a prolonged contraction. Regardless of the outcome, retailers and their consumer products suppliers will need to think ahead and be prepared to act quickly.

THE IMPACT OF THE COVID-19 CRISIS ON DEMAND PLANNING

Companies are experiencing unprecedented complexity as they look for growth and market opportunities. Their product portfolios are growing with new product introductions, new approaches for existing products,

and new sales channels. The emerging endless aisles of the Internet and mobile shopping channels are expanding product offerings, adding unparalleled supply chain complexity, and making it difficult to manage inventory effectively. Sales and trade promotion spending, designed to grow sales revenue, continues at a staggering pace.

The goal is to grow demand, but it comes at a high cost: the cost of demand complexity. This complexity makes it hard to forecast demand accurately when faced with expanding new items, new channels, new consumer engagement preferences, and global disruptions. Companies are quickly realizing that traditional demand forecasting techniques in this ever-changing complex environment have reached their limitations and are no longer capable of hitting their sales targets. To address these new challenges, companies are striving to become more analytics driven. They are embracing analytics capabilities, which requires emphasis on new data streams as an opportunity to measure the effectiveness of marketing campaigns, sales promotions, product assortment, and merchandising.

The goal is to improve decisions regarding product distribution, and operations across all channels of their business. As direct customer relationships are influenced by mobile devices and in-store IoT, these new data streams are introducing new sources of insights. However, it's taking time to transition from a limited analytics role to a more expansive role. Companies are quickly realizing that their enterprise effort requires a completely different culture that includes different skills, processes, and technology. Although many companies have already started to collect data across all their distribution channels to gain more customer/consumer information, the race to apply analytics to optimize sales and inventory across all channels has taken much more effort than anticipated.

Predicting demand and managing inventory across every channel is hard work. Shorter product life cycles, expanding assortments, frequent price changes, and sales promotions compound the challenges companies are experiencing due to the disruptions created by digital commerce and the current COVID-19 crisis. It's enough to make you wish you had an "easy button" to figure out today's savvy shoppers, and navigate through the four pandemic stages and demand shifts. Figure 1.3 illustrates the four pandemic stages: preliminary,

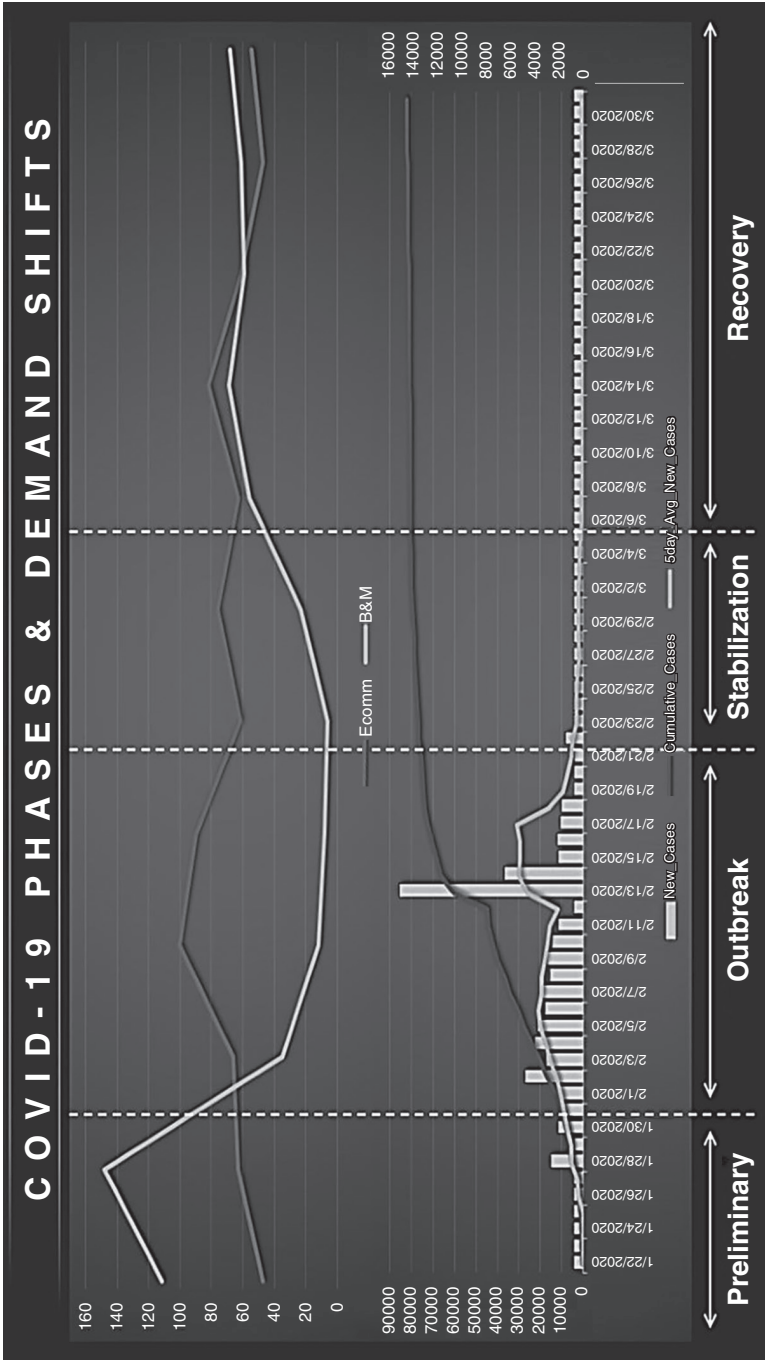


Figure 1.3 Pandemic Four Phases and Demand Shifts
Source: Brittany Bullard, Jessica Curtis, and Adam Hillman, "Retail Forecasting Through a Pandemic," SAS Voices Blogs, May 4, 2020. Graphic created by Jessica Curtis and Adam Hillman, SAS Institute Inc.

outbreak, stabilization, and recovery. With the right demand forecasting and planning process, analytics, and technology, you can simplify your demand planning process and create an integrated planning framework that supports multiple forecasting methods with one synchronized view of demand for every type of customer/consumer ship-to combination.

The COVID-19 crisis is transforming how consumers shop, forcing retailers to change how they sell. In response, retailers and consumer goods companies are being forced to build new capabilities and change how they engage with consumers. As a result, the relationship between retailers and consumer goods companies is being strained, with each fighting to stay ahead of the ever-changing digital economy and the COVID-19 crisis. For consumer goods companies, there are additional pressures from niche and private label brands, which are squeezing margins as a result of selling more goods through higher-cost channels. Meanwhile, retailers are trying to increase their online and mobile capabilities while dealing with pressure from discounters and e-commerce giants like Amazon and Alibaba, as well as price-driven consumers.

Because of the disruption caused by the COVID-19 global pandemic, everything has changed. As an unforeseen disruption, COVID-19 is augmenting many trends that have been disrupting the industry for more than a decade. The move to mobile and online shopping is now accelerating at warp speed, with US grocery's penetration into e-commerce doubling and, in some cases, tripling by the end of the initial outbreak stage of the pandemic. As consumers stayed home self-isolating to stop the spread of the coronavirus, they used mobile apps and websites to purchase essential products, and then over time, they added a mix of products that looked very different from what they had previously purchased in brick-and-mortar stores, with a focus on pantry items and products for at-home occasions. Those who did venture into stores found the experience transformed by new rules on physical distancing, hygiene, and the use of masks. In fact, a recent consumer-sentiment survey³ found that more than 75% of Americans had tried new brands from different retail formats, or otherwise changed how they shop as a result of the COVID-19 crisis. Consumer packaged goods companies bore the brunt of that shift, with their profits falling, while retailers still managed to make some gains.⁴

The pandemic has created more urgency for retailers and consumer goods companies to partner to leverage new technology, data streams, and consumer insights regarding shoppers across all trade channels. With the sudden shift to new forms of buying, the need to coordinate and collaborate has never been greater. As a result, three shifts have surfaced regarding changes in how retailers and consumer goods companies work together—changing consumer preferences, accelerating omnichannel demands, and the need for increased speed and responsiveness, according to McKinsey analytics.⁵

- **Changing consumer preferences.** With the unprecedented size and scope of the lockdowns, consumers have naturally developed a craving for products and services centered on at-home occasions.
- **Accelerating omnichannel demands.** As consumers move more seamlessly between online retailers and brick-and-mortar stores they expect the brands that serve them to do the same. The need for retailers and consumer goods companies to deliver omnichannel excellence has become more critical as the pandemic gives rise to a hybrid model that combines digital commerce with products and services delivered by a neighborhood store.
- **Increased speed and responsiveness.** The continued outbreaks, stabilization, and recovery stages of the pandemic are likely to remain difficult to predict until everyone is vaccinated. Rising infection rates can quickly result in renewed restrictions, which means retailers and consumer goods suppliers will need to adopt a more fluid and dynamic approach to getting goods into the hands of consumers. This will require more accurate demand forecasts that can model the four phases of the shifts in demand as a result of the changing pandemic restrictions.

The question is whether consumer preferences will revert to pre-pandemic norms once the restrictions are lifted. It is likely that consumers will continue spending large amounts of time at home due to the risk of infection, and as restrictions are lifted, they will revert back to some previous norm. Based on research, it is believed that it could take anywhere from three to ten years for brick-and-mortar channels to fully recover. Within many retail channels, the longer-term shift away from

physical stores and higher-priced retail brands has accelerated due to the pandemic. It is estimated that the grocery and convenience channels are likely to lose up to seven points of market share to discounters, hypermarkets, and online sales. This is becoming the new norm. For consumer goods companies, it's time to shift from crisis mode to a more fundamental realignment of their product portfolio and path-to-market strategy to respond to these new consumer purchasing dynamics.

The longer-term effects of failing to predict and anticipate changing consumer demand patterns will result in lost sales, wasted inventory, unproductive marketing investment and promotional spend, inability to effectively plan inventory for key products, and reduced revenue and profit margins. Those companies who embrace predictive and anticipatory analytics and adopt new technology to boost their forecasting and planning capabilities will unlock short- and long-term business benefits. Those same companies will see uplifts in margins as a result of fewer markdowns, and see improved consumer value, accelerated inventory turns, and significant increases in revenue as a result of fewer out-of-stocks.

Selling in the age of the consumer will require foresight, not reaction, to changing consumer demand patterns. Retailers and consumer goods companies will need to establish a pipeline of predictive leading indicators that will allow them to anticipate and predict changes in consumer demand with enough time at the right level of granularity to take corrective actions. In order to maintain their competitive edge, retailers and consumer goods companies must outpace their peers by selecting and implementing new technologies that drive actionable insights critical to adapting to the new digital economy and unforeseen disruptions. Finally, they must drive process and organizational change by hiring data scientists and retraining their people to rely on data and analytically derived consumption-based models to create a more efficient end-to-end supply chain—from consumer to the supplier.

CLOSING THOUGHTS

As digital technologies become more widespread, retailer and consumer goods companies' supply chains will need to evolve, which will require a renewed focus on predicting changing consumer demand patterns.

Transformation will not simply be about new technical capabilities or deployment and use of digital technologies; it will require more transparency. In other words, digital transformation requires extensive changes to the way people in the organization interact and collaborate across processes and corresponding business models. Leadership and workforce talent/skill sets, their attitudes, and ways of working will need to adapt to the new normal. Delivering real benefits for the future will require focus on integration of technologies that are better aligned with the business needs, followed by effective management of those new digital technologies. Those changes will help manage a digitally transformed, consumer analytics-driven organization for the future. Overall, collaboration, new organizational changes, and cultural change must be driven by a champion who reports to an executive sponsor from the C-level suite.

Companies are rapidly transitioning from the hierarchical organizational structure to one that is far more collaborative. Not just because they need to work together to do things faster and reduce delays between organizational silos, but also because now they can share information to create a common view of what needs to be done, end-to-end, within the supply chain. Cross-pollination of understanding among various divisions maximizes the overall business value. Fundamentally, a collaborative culture results in a single source of the truth. Such a culture facilitates connectivity among the various islands of information from downstream consumer strategies and tactics to upstream supply planning, manufacturing, and distribution.

Business executives are looking to data, analytics, and technology for answers on how to predict and plan for the surge, and ultimately, the decline in consumer demand. It is significantly easier to shut down facilities than it is to quickly boost production and capacity. The biggest unknown is whether there will be a delayed economic recovery or a prolonged contraction. Regardless of the outcome, retailers and their consumer goods suppliers will need to think ahead and be prepared to act quickly. Retailers and consumer goods companies are the backbone of the consumer goods supply chain and a lifeline to their customers. Their ability to operate efficiently is determined by the weakest link in the end-to-end supply chain. That link has now been exposed as the result of the digital economy and the coronavirus pandemic—the inability to effectively predict shifting consumer demand patterns.

To make matters worse, the current crisis has changed the makeup of the average grocery basket, making it difficult to predict rapidly shifting consumer demand patterns. As a result, the current supply chain is struggling to keep up. Restoring balance will require changes in the way demand forecasting and planning are conducted by both retailers and consumer goods companies. Navigating the current climate will require new intelligence, resilience, and more dependence on advanced analytics and machine learning.

NOTES

1. Charles Chase, *Next Generation Demand Management: People, Process, Analytics and Technology*, Wiley, 2016: 1–252.
2. Dun & Bradstreet, “Predictive vs. Anticipatory: Understanding the Best Analytics Approach to Address Your Business Goals,” 2016: 1–5.
3. Brandon Brown, Lindsay Hirsch, René Schmutzler, Jasper van Wamelen, and Matteo Zanin, “What Consumer-Goods Sales Leaders Must Do to Emerge Stronger from the Pandemic,” McKinsey & Company, August 2020: 1–10.
4. Ibid.
5. Ibid.

