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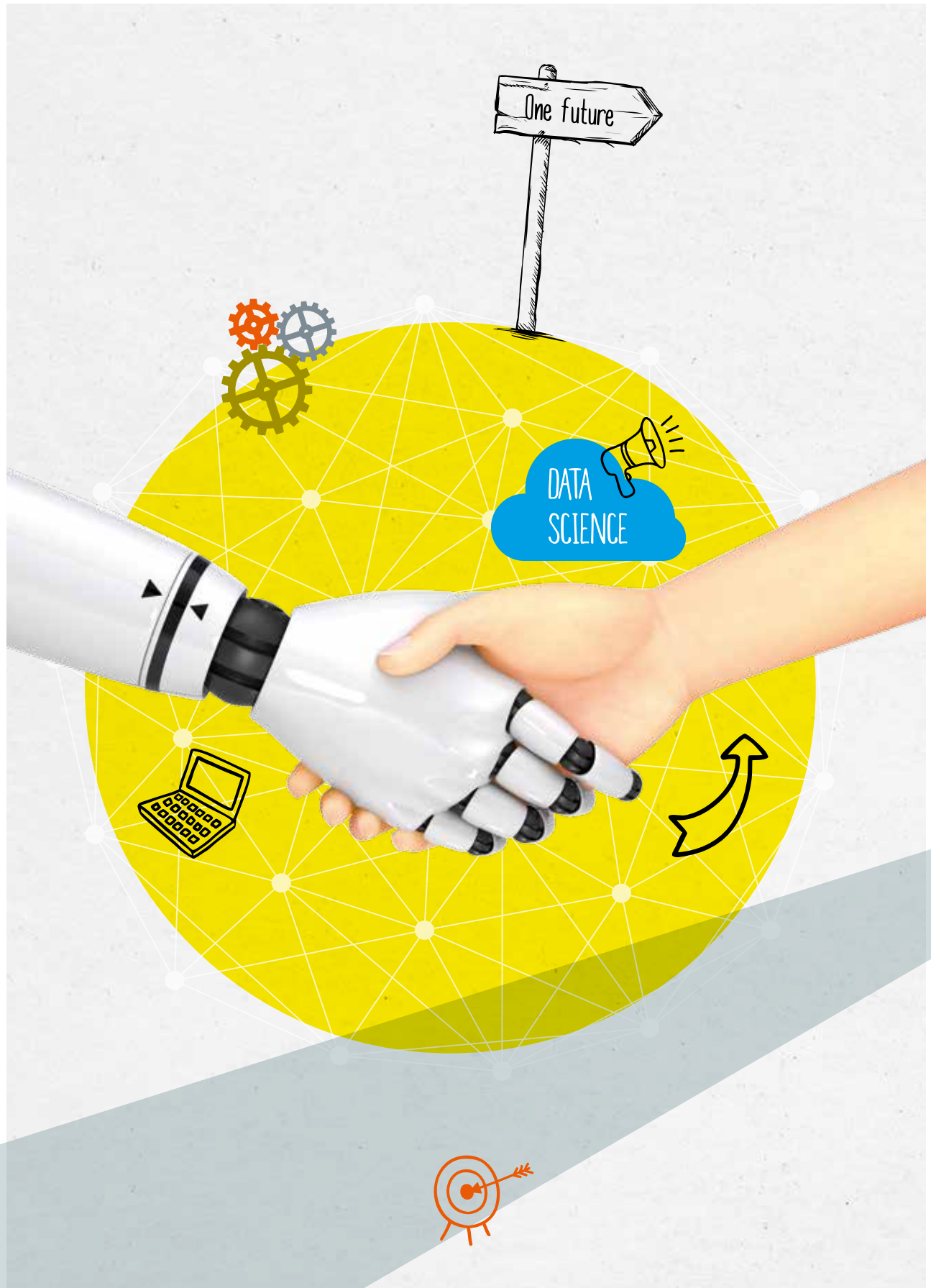
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Marketing and Data Science: Together the Future is Ours

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Computer Science, Big Data,
Quantitative Analysis, Modeling,
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THE AUTHORS

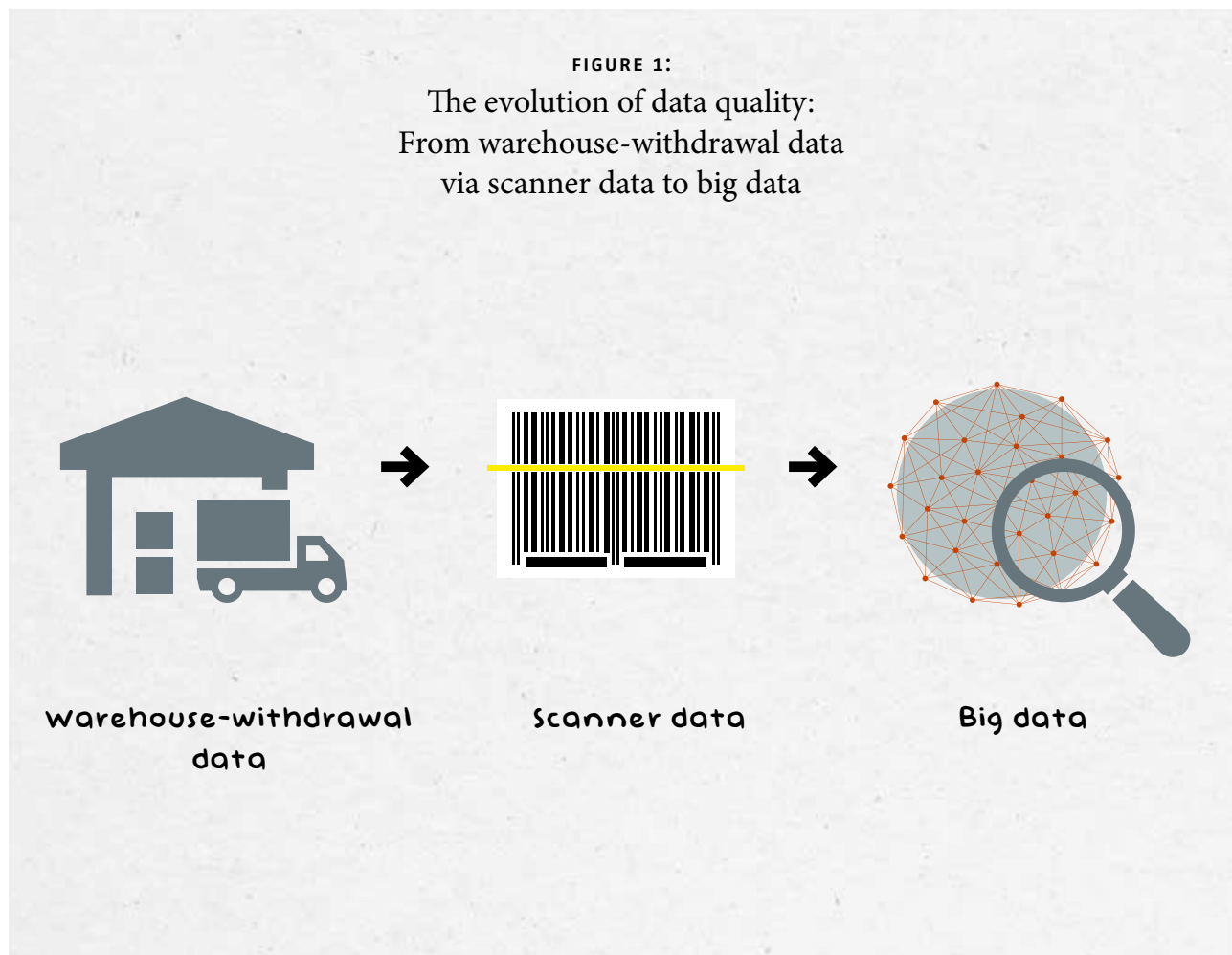
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From rules of thumb to formal knowledge /// Nearly half a century ago, young marketing faculty in business schools started to embrace sophisticated research methods, including mathematical optimization, multivariate statistics, and econometrics, to study marketing problems. At the time, the marketing discipline was considered relevant for job prospects, but teaching and practice were focused on institutional knowledge and rules of thumb. These faculty started a revolution that continues to this day to provide formal knowledge, structures for teaching and practice, and the excitement to draw the highest-caliber students to its curricula. Early efforts resulted in pioneering contributions, notably in market segmentation, media mix optimization, data-based planning, and consumer preference modeling that set in motion a new discipline, now called marketing science. New professional organizations and scholarly journals were created, specialized conferences drew progressively larger audiences, and marketing as an area of study became increasingly quantitative in nature.

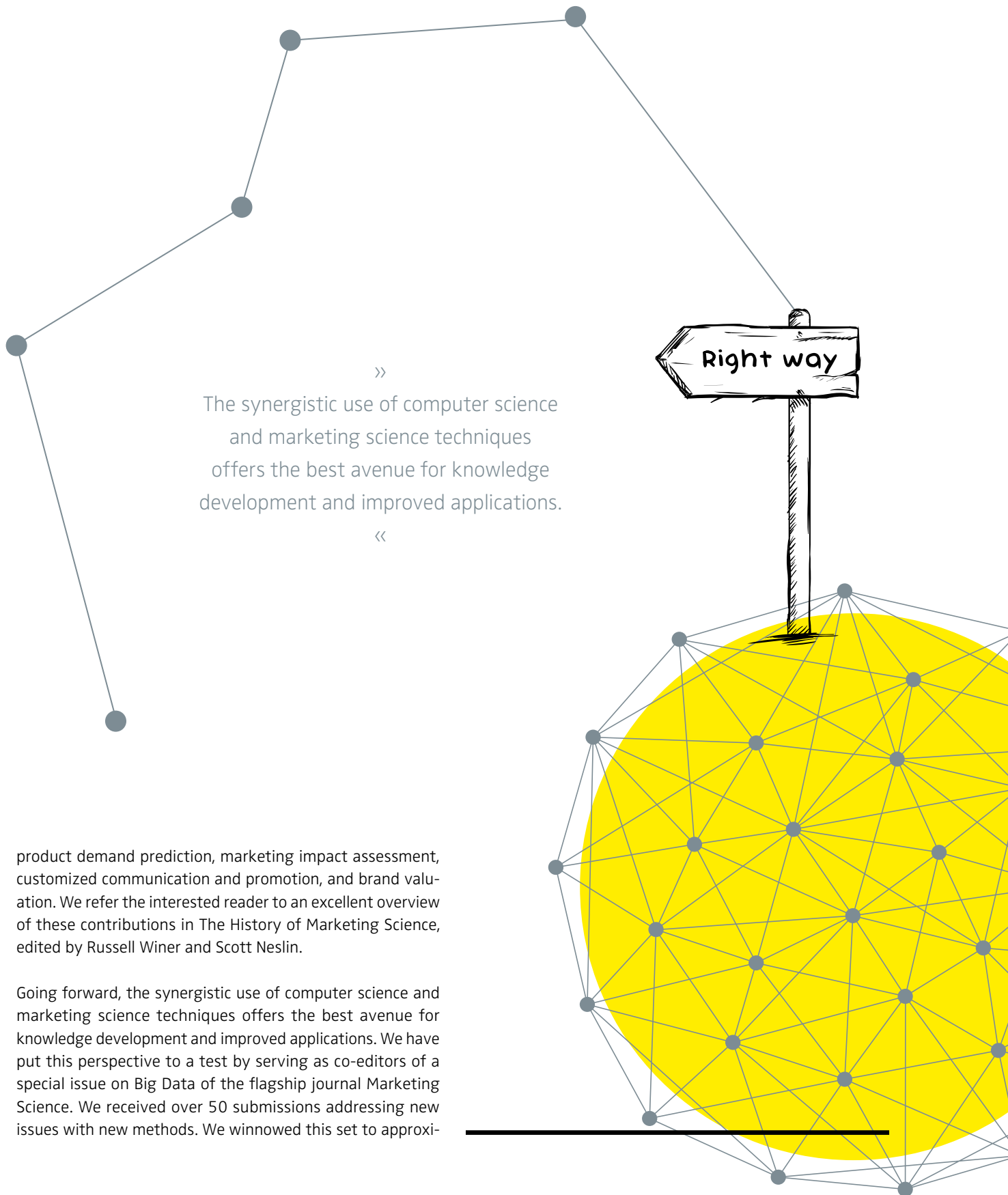
New insights from the constant flow of new data, new methods and new ideas /// The revolution was driven by new data, new methods, and new ideas. While early models relied on warehouse-withdrawal data, the 1980s brought scanner data. While simple regression was once king, advanced econometrics, discrete choice models, Bayesian methods, and improved optimization enabled researchers to tackle bigger and more relevant issues. During this development, quantitative researchers drew increasingly from insights developed in economics, engineering, psychology and sociology, but contributed back with a deep understanding of consumers and markets. Increasingly, data was collected and aggregated online, but often in focused studies. And then the Big Data revolution happened. "Big" Data is



often distinguished from regular “Data” by the three Vs, volume, velocity and variety. Indeed, with remarkable speed, companies and specialized data providers are able to assemble unprecedentedly large digital databases (volume) in real time or near-real-time (velocity) and with a large variety of data characteristics, including numerical, text, sound and video files (variety). Computer science contributed to the academic discipline by providing new methods to structure and store large data, new approaches to process large data, and new techniques for using large data. Analyses of consumers and markets that were once unthinkable because of their complexity, scale, and dynamics were now possible. Much of this development was ad hoc and focused on computation

rather than building on decades of consumer and market knowledge.

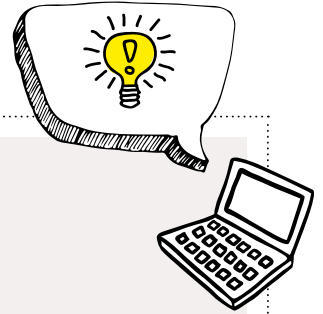
Embracing the new opportunities /// At the same time, these Big Data technological developments raised new opportunities for marketing intelligence development, and this is where marketing science comes in. Indeed, marketing science is ready for the Big Data revolution. Peer-reviewed solutions for marketing’s major challenges are already in place and can only get better with the advent of more and more varied data. In particular, marketing science had already made substantial advances in such fundamental areas as consumer choice modeling, customer lifetime value modeling, new-



product demand prediction, marketing impact assessment, customized communication and promotion, and brand valuation. We refer the interested reader to an excellent overview of these contributions in *The History of Marketing Science*, edited by Russell Winer and Scott Neslin.

Going forward, the synergistic use of computer science and marketing science techniques offers the best avenue for knowledge development and improved applications. We have put this perspective to a test by serving as co-editors of a special issue on Big Data of the flagship journal *Marketing Science*. We received over 50 submissions addressing new issues with new methods. We winnowed this set to approxi-

{ Box 1 }



GETTING A FLAVOR OF QUESTIONS THE LATEST MARKETING-DATA-SCIENCE CAN ANSWER*

Profiling the most promising customers

The internet age offers unparalleled opportunity for brands to target their advertising to consumers who are most likely to respond. But what is the best way to do this targeting, or “profiling” of potential customers? Those who are able to read the tracks can resort to web surfing behavior. Web surfing can provide reliable clues of individual consumers’ propensity to purchase. In their article “Crumbs of the Cookie: User Profiling in Customer-Base Analysis and Behavioral Targeting,” Michael Trusov, Liye Ma and Zainab Jamal develop and implement a targeting algorithm based on consumers’ online surfing data. Their approach is superior to existing methods, both in identifying the best consumers to target with digital advertising, and in avoiding wasted exposures to uninterested consumers.

Identifying relevant choice alternatives from a consumer’s perspective

Some high-technology product categories, for example television sets and digital cameras, offer a bewildering number of choice alternatives for consumers. What’s more, these offerings are subject to continuous technological innovation. How do manufacturers know which competitive products are perceived as similar – and therefore competitive – to theirs and how they should identify and target lucrative submarkets for their new offerings? In their article “Visualizing Asymmetric Competition among more than 1,000 Products Using Big Search Data,” Daniel Ringel and Bernd Skiera develop innovative mapping methods on search data at price comparison websites to obtain effective visualization of these complex market structures. Their approach offers a fast, easy to understand, yet comprehensive view of how new technological offerings compete with each other, as perceived by the buying public.

Filling individual shopping baskets through relevant product recommendations

In recommendation systems, in automated marketing and in customized targeting, practitioners would like to be able to use a consumer’s purchase history to predict the next product the consumer will buy. In their paper “Product Recommendations Based on Latent Purchase Motivations,” Bruno Jacobs, Bas Donkers and Dennis Fok apply a method that is often used in text processing to identify, from the consumer’s perspective, sets of products that tend to be purchased together. The authors’ analysis with latent Dirichlet allocation (LDA) performs better than typical collaborative filters and other model benchmarks. In doing so, it holds promise for a variety of new recommendation systems to build upon the improved predictive ability.

Knowing how consumers truly perceive your brand

Consumer perceptions of a brand are important for the management of the brand. Consumers readily express their opinions about brand attributes such as eco-friendliness, nutrition, and luxury via social media. The article “How #Green is Your Brand? Mining Cause-Related Brand Associations on Twitter,” by Arun Culotta and Jennifer Cutler provides a fully-automated method to monitor brand related messages in social media (Twitter). They track these perceptions by mining a brand’s social connections and demonstrate the method by monitoring 200 brands for these attributes. Their approach allows managers to react quickly and effectively to both opportunities and challenges in consumer perceptions of their brands.

*The details on methods and procedures are published in the original articles. They can all be found in Marketing Science, Vol. 35, 3 (May – June 2016).

mately a dozen articles by rigorous peer review. In the box on page 22 we provide high-level summaries of selected papers. These papers provide a flavor of the unique insights that are obtained from the combination of big data and marketing science.

Benefits from complementing disciplines /// One broad area of complementarity between the typical focus in statistics and computer science and the typical focus in marketing is the following. The former fields tend to focus on pattern recognition, control and prediction. Many marketing analyses embrace these directions, but also contribute by modeling structure and exploring causal relationships. Marketing has successfully combined foci from management science with foci from psychology and economics. These fields complement each other because they enable a broad spectrum of scientific approaches. Combined they provide both understanding and practical solutions to important and relevant managerial marketing problems.

We endorse, with enthusiasm, the premise that marketing should embrace data science and machine learning. We also endorse the complementarity. Data scientists and computer scientists will improve their focus and research by taking advantage of the wealth of insights provided by marketing science. Marketing managers will not only benefit from new data science flavors but will be able to choose from ever increasing sophisticated research menus. A well-balanced selection from several disciplines will be able to answer glaring questions that could not be answered before and will improve marketing decision making substantially. Together the future is ours.

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FURTHER READING

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 Analyses of consumers and markets
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 of their complexity, scale, and dynamics
 became possible.
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*Winer, Russell S.; Neslin, Scott A., (2014):
 "The History of Marketing Science,"
 World Scientific Publishing Co. Pte. Ltd.*

Marketing Science, Special Issue on "Big Data:
 Integrating Marketing, Statistics, and Computer Science,"
 Vol. 35 (3), 2016.