ARTIFICIAL INTELLIGENCE IN MARKETING

Editor-in-Chief Naresh K. Malhotra
Edited by K. Sudhir and Olivier Toubia

REVIEW OF MARKETING RESEARCH

VOLUME 20

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Editor-in-Chief: Naresh K. Malhotra

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ARTIFICIAL INTELLIGENCE IN MARKETING

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Howard House, Wagon Lane, Bingley BD16 1WA, UK

First edition 2023

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British Library Cataloguing in Publication Data
A catalogue record for this book is available from the British Library

ISBN: 978-1-80262-876-0 (Print)
ISBN: 978-1-80262-875-3 (Online)
ISBN: 978-1-80262-877-7 (Epub)

ISSN: 1548-6435 (Series)

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INTRODUCTION

OVERVIEW

Review of Marketing Research, now in its 20th volume, is a publication covering the important areas of marketing research with a more comprehensive state-of-the-art orientation. The chapters in this publication review the literature in a particular area, offer a critical commentary, develop an innovative framework, and discuss future developments, as well as present specific empirical studies. The first 19 volumes have featured some of the top researchers and scholars in our discipline who have reviewed an array of important topics. The response to the first 19 volumes has been truly gratifying and we look forward to the impact of the 20th volume with great anticipation.

PUBLICATION MISSION

The purpose of this series is to provide current, comprehensive, state-of-the-art articles in review of marketing research. Wide-ranging paradigmatic or theoretical, or substantive agendas are appropriate for this publication. This includes a wide range of theoretical perspectives, paradigms, data (qualitative, survey, experimental, ethnographic, secondary, etc.), and topics related to the study and explanation of marketing-related phenomenon. We reflect an eclectic mixture of theory, data, and research methods that is indicative of a publication driven by important theoretical and substantive problems. We seek studies that make important theoretical, substantive, empirical, methodological, measurement, and modeling contributions. Any topic that fits under the broad area of "marketing research" is relevant. In short, our mission is to publish the best reviews in the discipline.

Thus, this publication bridges the gap left by current marketing research publications. Current marketing research publications such as the *Journal of Marketing Research* (USA), *International Journal of Market Research* (UK), and *International Journal of Research in Marketing* (Europe) publish academic articles with a major constraint on the length. In contrast, *Review of Marketing Research* can publish much longer articles that are not only theoretically rigorous but also more expository, with a focus on implementing new marketing research concepts and procedures.

Articles in *Review of Marketing Research* should address the following issues.

- Critically review the existing literature
- Summarize what we know about the subject – key findings
- Present the main theories and frameworks
- Review and give an exposition of key methodologies
- Identify the gaps in literature
- Present empirical studies (for empirical papers only)
- Discuss emerging trends and issues
- Focus on international developments
- Suggest directions for future theory development and testing
- Recommend guidelines for implementing new procedures and concepts

A FOCUS ON SPECIAL ISSUES

Since volume 8 published in 2011, *Review of Marketing Research* has a focus on special issues realizing that this is one of best ways to impact marketing scholarship in a specific area. The volume editors of all of the special issues have been top scholars. These special issues have focused on the following topics.

Volume, Year	Topic	Volume Editors
8, 2011	Marketing Legends	Naresh K. Malhotra
9, 2012	Toward a Better Understanding of the Role of Value in Markets and Marketing	Stephen L. Vargo and Robert F. Lusch
10, 2013	Regular Volume	Naresh K. Malhotra
11, 2014	Shopper Marketing and the Role of In-Store Marketing	Dhruv Grewal, Anne L. Roggeveen, and Jens NordfÄlt
12, 2015	Brand Meaning Management	Deborah J. Macinnis and C. Whan Park
13, 2016	Marketing in and for a Sustainable Society	Naresh K. Malhotra
14, 2017	Qualitative Consumer Research	Russell W. Belk
15, 2018	Innovation and Strategy	Rajan Varadarajan and Satish Jayachandran
16, 2019	Marketing in a Digital World	Aric Rindfleisch and Alan J. Malter

(Continued)

Volume, Year	Topic	Volume Editors
17, 2020	Continuing to Broaden the Marketing Concept: Making the World a Better Place	Dawn Iacobucci
18, 2021	Marketing Accountability for Marketing and Non-marketing Outcomes	V. Kumar and David W. Stewart
19, 2022	Measurement in Marketing	Hans Baumgartner and Bert Weijters

THIS VOLUME

This special issue focuses on the current state of the art of the literature on Artificial Intelligence (AI) that is relevant to marketing, and thus provides a roadmap and agenda for future research in the field. Together the chapters in this volume lead to new insights, approaches, and directions for research on various aspects of AI. It is hoped that collectively these chapters will substantially aid our efforts to theoretically conceptualize the constructs, collect data to empirically examine the measures, and formulate appropriate models to provide a broader arsenal of research methods as well as fertile areas for future research. I thank K. Sudhir and Olivier Toubia for such an outstanding volume. The *Review of Marketing Research* continues its mission of systematically analyzing and presenting accumulated knowledge in the field of marketing as well as influencing future research by identifying areas that merit the attention of researchers.

Naresh K. Malhotra, *Editor-in-Chief*

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THE STATE OF AI RESEARCH IN MARKETING: ACTIVE, FERTILE, AND READY FOR EXPLOSIVE GROWTH

K. Sudhir and Olivier Toubia

1. INTRODUCTION

Almost every aspect of consumers are subject to digitization and storage – physical movement, product and media consumption, online search and shopping habits, body metrics, and social interactions. Using cookies, offline beacons, and data trading, these so-called "digital exhaust" of individual behavior are collated to obtain "360 degree," real-time view of consumers. Advances in computer science in the subfields of natural language processing and computer vision allow for sensemaking of qualitative unstructured data involving text, images, video, and various forms of multimodal data from consumers and the marketplace. Collectively, these advances in real time and varied data collection, algorithmic methods that make sense of data, and cheap computational power have led to significant advances in data-driven artificial intelligence (AI). For quantitative marketers, these advances in AI have led to exciting opportunities to improve marketing – through real-time and contextualized personalization of all elements of the marketing mix (the 4Ps), automation of many marketing actions, learning about customer needs and consumer feedback to products and services in the marketplace. AI can improve marketing activities (e.g., market research) and decisions by making them faster, cheaper, or better.

Marketers and marketing scholars have mostly taken a firm-centric profit maximizing perspective in the application of AI. But as AI has made greater inroads in the marketplace and society, considerable debate has risen about the terms of that trade underlying the sharing of individual and societal data with firms. This debate has become especially strong when it raises concerns about data privacy, bias, and fairness. To the extent that consumer and societal data are

Artificial Intelligence in Marketing
Review of Marketing Research, Volume 20, 1–12

ISSN: 1548-6435/doi:10.1108/S1548-643520230000020001

the raw material of ongoing AI-based innovation, marketers have to address these issues in a balanced manner to ensure the long-term sustainability in the use of AI for marketing – as these have implications for consumer data-sharing with firms and societal regulations governing the use of data and AI.

The purpose of this volume is to provide a deep and expansive overview of the state of the art of AI research in marketing. The next 10 chapters in this volume cover managerially relevant applications of AI in marketing, while also describing relevant methods. The chapters also point scholars to exciting new areas of research at the interface of AI and marketing. In this introductory chapter, we seek to provide an organizing structure for AI scholarship and use it to situate the research described in the handbook chapters. We also hope the structure will aid scholars in identifying gaps in the literature to make new contributions.

2. THE MARKETING–AI ECOSYSTEM

In Fig. 1, we depict a schematic diagram of the Marketing–AI ecosystem, which can provide an organizing structure for AI research in marketing, and clarify potential opportunities to make new research contributions. In the figure, AI is represented in terms of the data and algorithms used to predict any relevant variable of interest that can be then used as input into desired applications. At a high level, it recognizes three key stakeholders: (1) firms (marketers) who deploy AI to aid decision-making (and as such have control of both the data and the algorithms that go into the AI); (2) individuals (consumers) impacted by firm's deployment of AI, who provide consent and opt in for their own data to be used

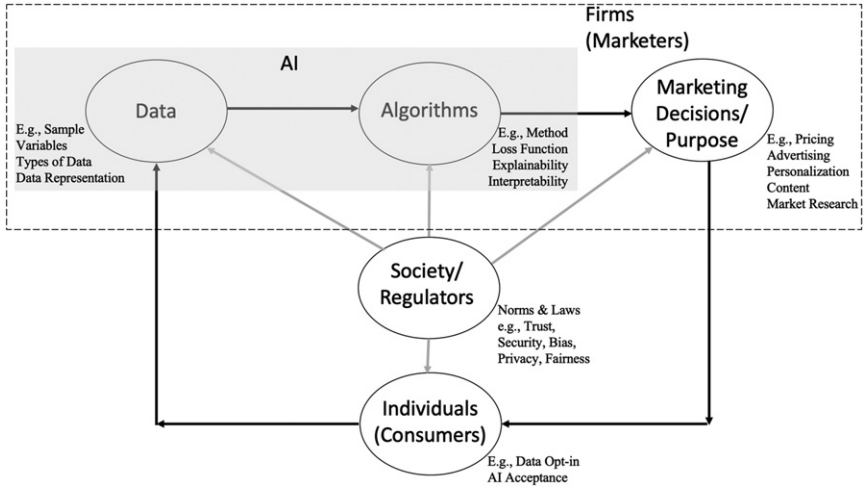

Fig. 1. A Schematic Diagram of the Marketing–AI Ecosystem.

in AI systems; and (3) society as a whole, whose norms and laws impact AI deployment, adoption, and effectiveness. We next use this figure to organize and discuss existing AI research in marketing. After discussing the handbook chapters in Section 3, in Section 4 we illustrate how to use the schematic diagram (Fig. 1) to identify new AI research opportunities in marketing.

2.1 Organizing Existing Research on AI in Marketing

As mentioned, Fig. 1 represents AI in terms of data and algorithms. At its core, modern AI involves prediction/forecasting of various variables through machine learning algorithms from data and using these to aid various decisions (in our case, marketing decisions). Thus data and algorithms are the technical core of AI and focuses on how big data (often characterized by the 3Vs of greater volume, velocity, variety) and novel algorithms (e.g., traditional machine learning, natural language processing [NLP], vision methods) can be used/improved to predict outcome variables. Many chapters in the book discuss these technical elements.

At the next level (within the dashed line box), we represent what marketers use the AI for, that is, to help aid making marketing decisions faster, cheaper, and better. This boxed area represents most of the discussion in the chapters of this handbook. In some settings, the use of AI can be automated into marketing actions; in others, it serves as a decision aid with human managers in the loop. But AI's overall large-scale adoption by management requires it to be more than a prediction black box. AI models need to have greater interpretability, explainability and transparency for managers to be comfortable with its adoption. Further it is important that the advised marketing action indeed have the desired causal impact. Hence there is also a strong agenda of "technical" research that seeks to go beyond prediction to aid interpretability, explainability, transparency and causality in AI in order to enhance adoption by marketers.

Much of this AI research takes a firm-centric perspective focusing primarily on improvements in decision-making, with AI algorithms seeking to maximize profits (or related objectives such as increasing customer acquisition, retention or sales). They typically treat customer actions and consent for data collection and use as given, while treating societal norms and regulations as exogenous. Fig. 1 therefore expands this firm-centric perspective to include the two other stakeholders: individuals (consumers) and society as a whole.

Firms offer products and services in the market to consumers. Consumer demographic and behavioral data (search, purchase, usage, and social media behaviors) provide the data used in AI for marketing. Firms obtain access to these data through direct consent from consumers, trade with firms, or simply recording behaviors when there are no regulations on such data use and control. Firms can use a variety of algorithms on the data in their control or possession to maximize chosen objectives to aid them in efficient marketing decisions. While firms (and most marketing research) typically use the data and algorithms to maximize their own objectives (e.g., profits), they may also increase/reduce consumer welfare, in the aggregate or for specific individuals or groups. The extent to which firms ensure that data is protected and secure, and their privacy

policies impact how the data can be used for marketing choices, but also how consumers feel about sharing the data.

Regulators evaluate the overall benefits and costs for society (consumers and firms), but because data are from individuals, they also consider the impact on individuals or groups in regulating the use of data. For instance, regulators may set standards for data security, enshrine privacy rights, and can require that algorithms be unbiased, fair, and transparent. All of these stakeholders exist within a broader context of societal norms around privacy, trust, etc., which impact acceptance and adoption of AI. These societal norms may vary significantly across countries.

3. THE CHAPTERS

The chapters in the handbook are organized around (1) marketing purpose of AI; (2) data types used in AI; and (3) relevant algorithms. We describe the chapters in the book building of their primary dimension of organization. We note while chapters organize around primary dimensions, they summarize research that varies among other dimensions. For instance, a chapter on the personalization dimension may use various types of data, algorithms, and multiple types of marketing decisions. Finally, beyond the firm-centric perspective, we discuss the impact of consumers and society on AI development and adoption.

3.1 Marketing Purpose of AI

3.1.1 Aiding Marketing Decisions

Ding and Goldfarb (2023) organize the current AI-related research in marketing by categorizing them in terms of their marketing (and/or broader economic) applications: prediction, decision, tool, strategy, and society. Their key premise is that AI is essentially a technology that uses data and new machine learning algorithm to reduce the cost, time, and error in prediction, and as such can be increasingly used in applications requiring cheap, fast, and accurate predictions. One of the most common types of predictions that marketers value is individual consumer response to changes in various elements of marketing mix. The predictions can help marketers by becoming further input into marketing mix decisions (e.g., pricing, advertising, selling, product design), or automated marketing tools (automated pricing, ad bidding) to improve marketing efficiency within a given business model. Finally, the cheaper, faster, and more accurate predictions may even impact business strategy and business models (e.g., the author highlights the potential for Amazon to move from the current "shop, then ship" model to a "ship, then shop model" when prediction accuracy becomes cost-effective for Amazon to first ship to consumers and then let them decide whether to return). The authors conclude with a brief discussion on societal issues such as privacy, biases, fairness, etc.

The next three chapters provide a deep dive into specific AI applications in marketing: personalization, pricing, and content generation for marketing.

Personalization: Rafieian and Yoganarasimhan (2023) provide a deep dive into the topic of AI for personalization of various marketing decisions (e.g., coupon, pricing, promotion, advertising, content promotion, and recommendations), based on a set of observable individual characteristics and past behaviors. While the benefits of personalization have been well known to marketers, AI offers the ability to deliver personalization at a large scale (e.g., many consumers, many features, many potential treatments), in a way that is robust (i.e., not based on spurious correlation, and externally valid), adaptive in real time, and forward-looking (i.e., internalizing the future consequences of short-term marketing actions). The authors provide methodological structure on the algorithms in terms of their scalability and generalizability, and the ability to do online/interactive and dynamically optimal personalization. It also discusses the strengths and tradeoffs of various methods to evaluate personalization strategies. Finally, the paper concludes with some of the societal issues around personalization. Beyond the societal issues involving consumer welfare, privacy, and fairness due to personalization of marketing actions, they discuss the challenges of polarization due to personalization in content delivery.

Pricing: Aparicio and Misra (2023) focus on AI applications around pricing, with a strong focus around high frequency price changes. This chapter goes beyond personalization in pricing for price discrimination in two important ways. First, it goes into detail into the pricing literature on dynamic real-time price response to demand and supply shocks, which are particularly relevant for platforms like Uber and Airbnb. Second, it addresses the challenges of learning about demand response through cheap and fast price experimentation especially for new or frequently changing (e.g., fashion) products, specifically within an "earning while learning" experimentation framework, mostly typified by multi-armed bandit (MAB) models. They highlight the need for more research on how experimentation itself changes underlying demand and how one can estimate the true demand primitives. The paper also addresses the literature around pricing in the face of (dynamic) competitive reactions. Finally, the paper discusses recent literature around how algorithmic pricing can lead to collusion when competitors are all simultaneously seeking to learn underlying market characteristics and its implications for regulation.

Automated Content Generation for Marketing: Schweidel, Reisenbichler, Reutterer, and Zhang (2023) focus on the issue of automated content generation. The content generated could be textual (e.g., promotional email, advertising content, webpage descriptions for Search Engine Optimization as in Reisenbichler, Reutterer, David, Schweidel, & Dan, 2022) or visual (e.g., personalized images in marketing communications, social media posts or webpages, video trailers). Clearly, marketing content generation requires customization by customer needs and journey stages. The authors use the lens of the customer equity framework (Rust, Lemon, & Zeithaml, 2004) to identify opportunities for leveraging AI-based content generation in customer acquisition, relationship development, and customer retention. Not only do authors recognize the overall impact on acquisition, churn, profitability, and life-time value, but they also recognize customer differences in expectations for the human touch in the

relationship development and retention stages (relative to acquisition stages), and how these differences can impact AI adoption in these different stages. They also discuss issues of potential abuse (e.g., deepfakes) and problems (e.g., due to biases in foundational language and vision technologies), suggesting possibilities for future work.

3.1.2 Market Research

The next two chapters focus on how AI can aid learning about customers faster, cheaper, and better. While one focuses more on learning about customer needs, the other focuses on obtaining customer feedback.

Learning About Customers: Hauser, Li, and Mao (2023) discuss how AI is transforming the way firms collect the Voice of the Customer (VOC), an essential aspect of the new product development process (Griffin & Hauser, 1993). While collecting VOC has historically been a major endeavor requiring considerable numbers of qualitative interviews with consumers, which are then analyzed by experts (Griffin & Hauser, 1993), AI has been shown to drastically reduce the time and cost necessary to extract relevant consumer needs (Timoshenko & Hauser, 2019). When it comes to research opportunities leveraging AI, Hauser et al. (2022) make a useful distinction between research where constructs are identified a priori based on extant theories and knowledge, versus a posteriori based on the analysis of large amounts of data (which may in turn lead to new theories). These authors also highlight challenges related to the construct validity, the external validity, and the causal validity of constructs extracted by AI.

Customer Feedback: In a complementary chapter, Lee, Chakraborty, and Banerjee (2023) review the collection and analysis of customer feedback, which may come in the form of customer reviews, complaints, product ratings, images or videos posted by consumers, etc. They identify and discuss three main research themes: effect of online reputation (e.g., online ratings) on demand, informativeness and dynamics of customer feedback, and the analysis of consumer feedback in the form of text and images. They stress the need to combine machine learning and deep learning models with economic and behavioral models to address issues such as selection and endogeneity that arise when generating insights from consumer-generated data. They also warn against potential limitations and biases of customer feedback data, arising from concerns such as self-selection, herding effects, and fake reviews. They close by discussing the two-sided nature of consumer–firm interactions, contemplating the impact of management response to user-generated reviews, and the trend toward automating these responses using chatbots. This raises the question of the role of AI anthropomorphism in AI-mediated consumer–firm interactions, which is the topic of a later chapter (Uysal, Alavi, & Bezençon, 2023).

3.2 Data

Many of the standard AI applications involving machine learning described in previous chapters use structured quantitative data. But advances in NLP and

computer vision have expanded the range of marketing applications by converting unstructured data involving text (e.g., online reviews), images, and video into structured data. Further generative models as in content generation applications generate text and visual content for marketing purposes. Two chapters in the handbook focus on methods and applications involving text and visual data.

Text Data: In terms of data, textual data have been the most common type of unstructured data analyzed in AI applications to marketing. The literature leveraging text and NLP in marketing is now mature, and there have been several surveys of the literature discussing applications (e.g., Berger et al., 2020; Humphreys & Wang, 2018). Hartmann and Netzer (2023) discuss applications where text can serve as independent variables, dependent variables, or in tandem with some other quasiexperimental or natural experimental variation can be used to establish causality. They also discuss applications such as concept and topic extraction, relationship extraction, and sentiment and writing style extraction.

Visual Data: There is also a growing literature studying images. Zhang, Feng, and Srinivasan (2023) devote a chapter of this volume to the application of computer vision techniques to the systematic, large-scale analysis of images and videos for marketing purposes. Their extensive review covers both images and videos, both feature-level and pixel-level models, and applications aimed both at increasing firm profit and consumer utility. Video analytics is discussed in several other chapters of this volume (e.g., Hauser et al., 2023; Lee et al., 2023; Schweidel et al., 2023; Zhang et al., 2023). As a potential next frontier for the field, Hauser et al. (2023) highlight the challenge of modeling abstract constructs such as story arcs and metaphors, portrayed in videos and other media. There are also new applications involving hiring using video interviews, etc. More broadly, there is huge potential for video-based AI that involves human interactions and movement in the context of the emerging interest in augmented and virtual reality (AR and VR).

3.3 Algorithms and Methods

Natural Language Processing: Hartmann and Netzer (2023) describe the various text analysis methods that have been used in the literature to address different types of applications involving concept and topic extraction (e.g., LDA), and sentiment analysis (e.g., lexicons). They then discuss newer methods involving word embeddings (static and contextual). These methods not only address text classification tasks but also new applications such as text generation, summarization, and question-answering.

Computer Vision: Zhang et al. (2023) discuss various types of vision models (feature and pixel-level models). While the feature-level models are more easily interpretable, they are not as flexible as the deep learning–based pixel-level models. They then discuss how to address methods to address issues of explainability, interpretability, and transparency in vision models. They note that there is limited work still in the areas of modeling human movement, poses, and interactions between humans. Recently, Chakraborty, Chiong, Howard, and Sudhir (2022) modeled human poses and movement from interview videos for

salesforce hiring. However, much work remaining as modeling human movement and poses, etc. to understand consumer behavior will gain importance in the context of the metaverse, where data on human movement in AR and VR settings become widely available.

Deep Learning: Liu (2023) focuses on deep learning methods, which can be used for NLP, vision, and learning applications. Beyond providing a high-level overview of the value of deep learning in extracting hierarchical concepts, the chapter describes six types of deep learning models that are useful in marketing applications involving unstructured data (language and vision) and structured data. Deep learning models fall into three categories: (1) discriminative models that are particularly useful for classification and prediction (CNN, RNN, and Transformers); (2) generative models such as generative adversarial networks (GANs) and variational autoencoders (VAEs) that can generate text, image, or video marketing content (GAN and VAE); and (3) deep reinforcement learning models, which are used to learn about effectiveness and payoffs of marketing strategies, where actions are taken over time (e.g., a customer retention strategy in customer relationship management [CRM]).

3.4 AI's Impact on Consumers and Society and Vice Versa

In the last chapter of this handbook, Uysal et al. (2023) specifically focus on the issue of Anthropomorphism in AI with an extensive, interdisciplinary review of the benefits and harms of AI anthropomorphism for consumers as well as firms. They document what appear as inconsistent results across domains (e.g., robotics, computer science, marketing), with some studies arguing and showing that automorphism facilitates trust between humans and machines, and others, for example, documenting the existence of an "uncanny valley" whereby we dislike machines that look too much like us (without looking exactly like us). To resolve these inconsistencies in the literature, the authors propose to take into account the role of context and individual differences in the study of the impact of anthropomorphism. In other words, they posit that anthropomorphism has ambivalent effects, which depend on the context of application (e.g., type of tasks performed by AI) and the individual characteristics of the user (e.g., demographics, personality traits, emotional state).

Many other chapters address issues of how consumers and society impact AI development and adoption. We highlight some topics and the chapters that address these issues.

Algorithmic Aversion: It has been shown that humans tend to exhibit algorithm aversion, for example, they tend to avoid algorithms (Dietvorst, Simmons, & Massey, 2015). Relatedly, Uysal et al. (2023) discuss a literature that has documented negative reactions to andromorphic AI. Schweidel et al. (2023) bring up the possibility that consumers may not react favorably when they become aware of the fact they are interacting with AI-generated content. More research is needed to understand consumer acceptance of AI.

Polarization: When content is personalized, there is a risk of creating echo chambers where consumers only see information that confirms their beliefs,