Analysis and Implications of Adopting AI and Machine Learning in Marketing, Servicing, and Communications Technology

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ABSTRACT

Methods for machine learning, or ML, are becoming more accessible, and consumer-generated data is on the rise, both of which are transforming marketing strategies. Researchers and marketers still have a long way to go before they fully grasp the myriad ways in which ML applications might help businesses gain and keep an edge in the marketplace. This study systematically evaluates the academic and corporate literature to present a taxonomy of marketing use cases based on machine learning. The authors have discovered 11 common use cases that fall into four distinct groups that reflect the core areas of leverage for machine learning in marketing: shopper fundamentals, consuming experience, decisions, and financial impact. The literature highlights practical implications for researchers and marketers by discussing the taxonomy's found repeating patterns and providing an analytical structure for analyzing it and extension.

KEYWORDS

1. ANALYSIS AND IMPLICATIONS OF ADOPTING AI AND MACHINE LEARNING IN MARKETING, SERVICING, AND COMMUNICATIONS TECHNOLOGY

Enterprises face both opportunities and challenges due to the ever-increasing data volume (De Mauro et al., 2015; Sheth & Kellstadt, 2021; el., et al., 2020). Algorithms using machine learning can assist operations and enable educated judgments by utilizing such a big volume of organized and unstructured data (Agrawal et al., 2020). Improving matters further is the proliferation of the Internet of Things (IoT), which is defined as "a system of interconnected physical objects that may sense their environment and share that information with one another and other systems through the internet" (e.g., smartwatches, smartphones, home automation devices, sensors, and for a review, see Sestino et al., 2020). It is feasible to analyze large-scale collective behavior by analyzing such massive

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amounts of data, often known as "Big Data" (De Mauro et al.,, 2015), in both space and time. This allows one to utilize machine learning (AI) and Machine Intelligence (ML) techniques as a way to detect intriguing patterns and anomalies. According to Davenport et al. (2020), AI systems may learn from their mistakes and adjust their behavior based on what they have learned. They can also function autonomously and exhibit human-like thinking, learning, planning, and creative abilities. On the flip side, machine learning (ML) is a set of procedures used to build AI systems that can learn from the data they consume and so enhance their performance (Agrawal et al., 2020). Given the proliferation of equipment (Internet of Things, computers, software agents, etc.) that generate this data, the significance and value of Big Data are becoming more apparent (Bessis & Dobre, 2014; Sestino et al., 2020). In their never-ending quest for more relevant data, managers and marketers are always looking for new ways to examine and analyze existing data (Sheth & Kellstadt, 2021). According to Ma and Sun (2020), machine learning applications can help with this by providing methods to analyze data and find patterns, correlations, and prediction models. These models can then be used for intriguing marketing purposes.

By analyzing instances of behavior given by the programmer, ML approaches enable computers to carry out certain tasks, such planning and regulating elements as well as results, without explicit programming. Algorithms that can adapt their behavior in response to new input provide the engine that drives machine learning. From social studies to voice or picture recognition, these methods find usage in a wide variety of domains. The use of machine learning algorithms has opened up a world of new financial possibilities. One area where machine learning is useful is in recommendation systems for businesses: Ads are chosen by these algorithms in a flash based on user behavior and preferences as they navigate platforms, websites, or mobile apps. With no reason to alter the algorithm, this procedure takes use of consumers' preferences by automatically arranging ads based on such preferences. It can enhance its performance on its own. The range of artificial intelligence (AI) applications in business is wide, spanning from virtual assistants to chatbots, to the creation of advertisements made with the profile of a target user to deliberately achieve the highest possible level of performance and maximize the efficiency of budgeting (et al., 2020; Davenport et al., 2020; Huang & Rust, 2021; Ma & Sun, 2020; Vermeer et al., 2019). Because of its increased accuracy and ability to respond in real-time, machine learning is transforming marketing. Big digital natives like Google, Spotify, social media, and Uber are jumping on this bandwagon because they see how these advances can help build apps and platforms that can learn user preferences and tailor recommendations to them.

2. THEORETICAL BACKGROUND

2.1 Big Data and its Contribution to Machine Learning

Big Data, the deluge of data that affects every company nowadays, is constantly growing; in fact, its size doubles every 1.2 years (Shankar, 2018). As a result, conventional data processing techniques are unable to keep up with its increasing complexity (De Mauro et al., 2018). Despite this, cutting-edge innovations are opening the door to supercomputers with limitless storage capacity and lightning-fast data processing capabilities (Duan et al., 2019). To better digitalize and transition strategies for businesses, these technological advancements are necessary to manage the massive amount, diversity, and speed of big data (Sestino et al., 2020). In this light, AI is becoming increasingly significant as it can sift through mountains of data in search of actionable insights, changing the way businesses across all sectors make long-term strategic decisions (Sestino & De, 2021). One definition of artificial intelligence (AI) is "technology able of imitating the thinking processes that belong to a human mind, particularly the capacity to be able to overcome problems and learn" (Jarek & Mazurek, 2019, p. 48). Another definition is "programs, computer programs, machines, and systems that demonstrate intelligence" (Shankar, 2018, p. 7). According to Wirth (2018), artificial intelligence (AI) refers to the

study of "intelligent agents," which are devices that can sense their surroundings and operate in a way that maximizes their chances of accomplishing a goal. Artificial intelligence is also being used more and more to enhance marketing strategies by supporting various consumer-brand relations (Vlačić et al., 2021). A lot of businesses are utilizing AI and ML to figure out what customers want, how to forecast their demand, how to provide the best customer service possible, and even to train bots to answer basic customer service questions. Some examples of AI applications in automation include Amazon Prime Air's use of drones for shipping (Huang & Rust, 2021) and Lowe's use of LoweBot, a self-sufficient retail service robot, to find misplaced items in supermarkets and help customers find what they need (Davenport et al., 2020).

There has been a rise in interest in ML as an area of AI, and the field is largely acknowledged this (Ma & Sun, 2020). "A computer program is believed to learn from experience E about a few classes of tasks T and performance indicator P, if its achievement at tasks in T, as defined by P, improves with information E" (p. 114), according to Mitchell's (1997) explicit definition of Machine Learning. By analyzing fresh data points and identifying patterns, ML algorithms teach computers to learn and get better on their own. This is possible because the algorithms can detect patterns in the incoming data and produce accurate results.

2.2 Marketing Applications of ML and AI

Artificial intelligence (AI) is still a young area with many untapped research potentials, despite the growing interest in it within marketing. There have been some notable efforts to categorize marketing-related ML and AI systems since 2017. One example is a study conducted in collaboration with Deloitte, Dsm, and Ronanki (2018). The study looked at AI cognitive technology efforts that utilized AI-based systems in various business processes and intent driven functions. The results were rather fascinating. According to Davenport (year needed here), there are three main areas of AI applications. The first is technology with cognitive automation, which uses RPA to automate financial and administrative tasks in the back office. The second is cognitive insights, which uses machine learning algorithms to discover patterns in data and turn them into useful knowledge. Lastly, cognitive engagement uses chatbots, intelligent agents, and RPA to engage both employees and consumers. Other efforts to standardize marketing machine learning (ML) and artificial intelligence (AI) applications offer more common categories based on advertising strategies and actions, such as the 4Ps of marketing (product, price, place, and promotion) and STP (segmentation, targeting, and positioning).

Managers and marketers might use AI and ML to enhance segmentation, targeting, and positioning, according to a recent study (Corbo et al., 2022). Personalized advertising is one use of ML in this system. By identifying patterns that might go unnoticed by human intuition and experience, data mining can aid in segmentation. Product, price, place, and promotion make up the marketing 4Ps, sometimes known as the "marketing mix," a framework that McCarthy first put forth in 1960. An investigation of multiple instances of AI applications on advertising was carried out by Jarek and Mazurek (2019). The examples were shown to mirror the marketing mix.

3. METHODOLOGY

Through the development of a classification of applications utilized to address marketing-specific requirements, this article aims to investigate how ML and AI systems are utilized to enhance company strategies. The study started by systematically searching for and collecting a huge number of use cases and consolidated and limited collection to four specific criteria: (1) real-life instances of use coming from existing companies; (2) case references; (3) published articles in business or scholarly literature; and (4) information about ML implementations, such as the type of algorithms used. This was done considering the wide range of opportunities available. Using the bibliometric databases Scopus and Google Scholar, this review performed an extensive and methodical literature

search. Papers with the terms "Machine Learning" or "Artificial Intelligence" and "Marketing" in the title or as keywords were considered. Following the work of Kohlegger et al. (2009), The hierarchical content analysis (SCA) method was employed here to determine the most important categorization variables for every application. Aiming to arrange findings—that is, important bits of text—into meaningful categories, SCA is an iterative procedure (Mayring, 2008), as seen in Fig. 1. The most pertinent text will fall into these categories, therefore, compiling them gives an organized summary of the topic.

To determine which taxonomic categories to use, the following method was adopted. For every use case that met the four requirements mentioned earlier, this paper documented the necessary data, technology, and algorithms, as well as the value created for the company's business. This research reviewed each application's detailed description several times before deciding which of the preexisting categories best reflected its core characteristics. Following Cuccurullo et al. (2016), each application is classified into one or more groups to accommodate the complex nature of certain use cases. Our prior research and general knowledge informed the first categories used in the planning stage.

4. RESULTS AND DISCUSSION

4.1 Description of the Taxonomy

Here, 75 marketing use cases are gathered involving artificial intelligence and machine learning in May 2021 and 35 were eliminated that did not match any of the four criteria for choosing listed above. Eleven activation recipes were derived from a three-tiered taxonomy according to the SCA technique outlined in Section 3. Included research established a connection between each of the forty real-world applications reported in the literature and a recipe at the most basic level of the taxonomy, which stands for the most suitable ML application area. To symbolize the second rung

Figure 1. Process flow of a structured content analysis (SCA)
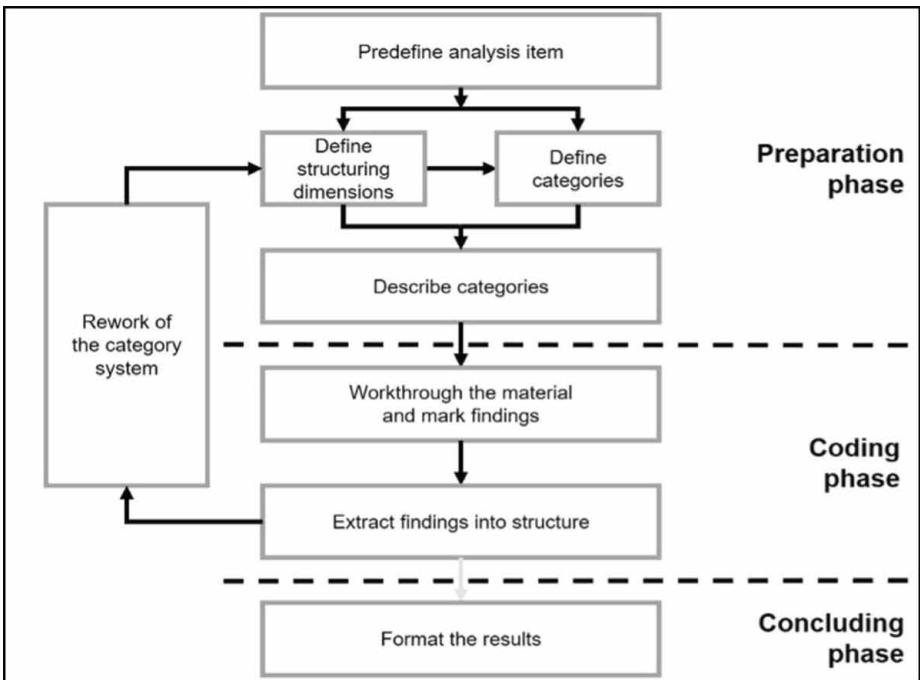
of the hierarchy, a transparent framework of artificial intelligence (AI) applications in a strategic marketing standpoint were provided, and the eleven recipes were categorized into four different categories. The recipes were divided into two groups: one for consumers, aimed at enhancing the shopping experience, and another for businesses, with the goal of enhancing decision making and financial applications. The visual representation of the taxonomy in Figure 2 is a tree, with branches representing the separation of conceptual classes and leaves representing the recipes that were identified. Here we will go over the key points of each recipe class (italicized text) and show some examples to aid in understanding them.

4.1.1 Improve Shopping Fundamentals

Whether in-store or online, the chance to improve the consumer experience at the time of purchase is at the heart of improving shopping fundamentals. Using AI to tailor the experience to each individual customer is one way to boost happiness, according to our research. One definition of personalization is the practice of creating one-of-a-kind communications for each individual customer by analyzing their demographic data and buying habits. To target specific personalized offers, businesses can use ML algorithms to forecast customer wants and identify groups of customers that are similar to those customers (Campbell et al., 2020; Murphy et al., 2015).

Figure 2. Taxonomy of machine learning use in marketing
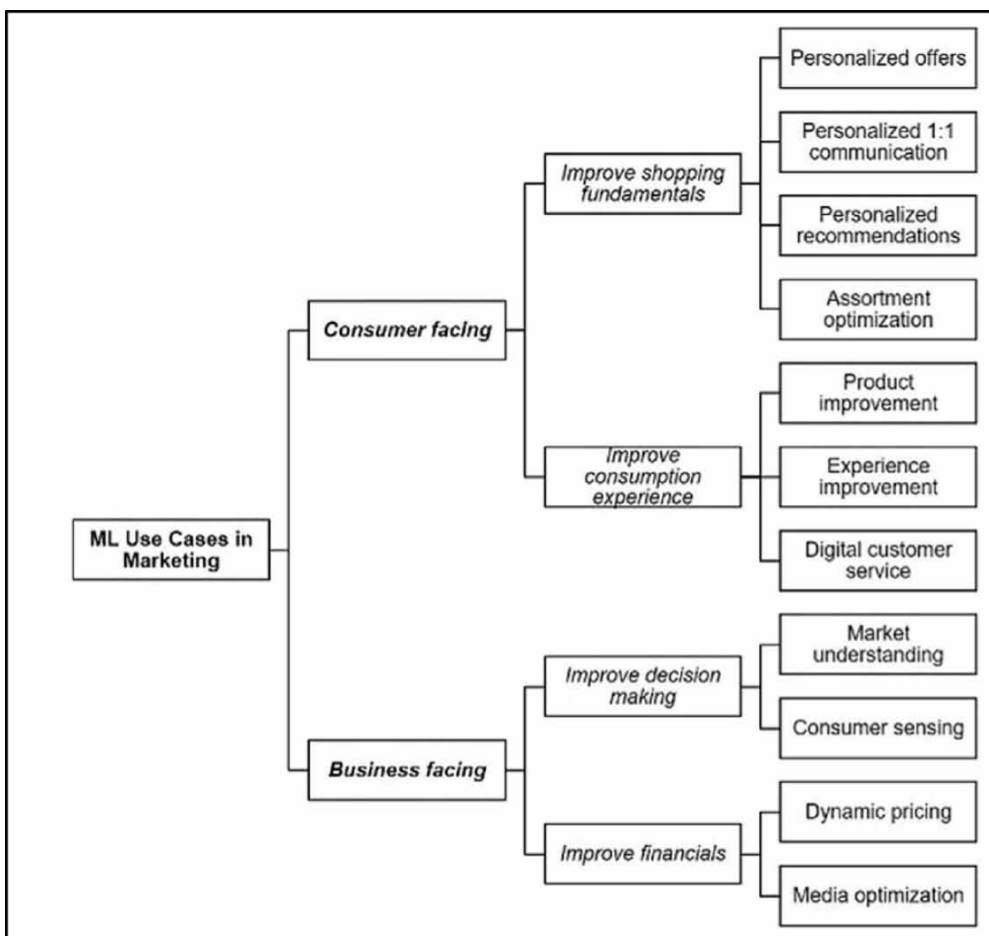
4.1.2 Improve Consumption Experience

The second group includes the items and services themselves, as well as the customers' reactions to those products and services. Digital customer service, better products, and better user experiences are all part of it. A lot of new developments are happening in this field thanks to the Internet of Things (IoT) and AI-based technologies. These innovations are particularly helpful in terms of information regarding customer relationships, developing products, and providing product support. Using internet-connected gadgets, businesses can gather detailed information about customers' product usage in real-time. Consequently, the Internet of Things permits a more thorough comprehension of consumers, which in turn permits businesses to create superior goods and enhance consumer value as a whole (Simkin, 2017). One example is a "do-it-all oven" that June, a home automation business, created. It combines seven different appliances into one. It could suggest a recipe program based on its ability to recognize food and prepare it using the combination of computer vision and machine learning capabilities by the user (T et al., 2020). Internet of Things (IoT) devices may do more than just make products better; they can also collect data about each customer, allowing businesses to tailor their offerings to meet their unique requirements and increase engagement and happiness. The 'MagicBand,' a wristband that guests wear to navigate Walt Disney World in Orlando and that gathers data on their habits, is a prime example of a product that improves the user experience. In addition to serving as a room key and attraction pass, the band also functions as an electronic wallet, enabling guests to make purchases with the tap of their wrist.

4.1.3 Improve Decision Making

According to findings during this review, the most promising avenues for enhancing decision-making include gaining a better grasp of the market and customer sensing. Companies should start by learning as much as they can about the market in which they operate, making educated guesses about its future direction and trends, and keeping tabs on how their competitors are behaving. By analyzing data using machine learning, AI can supplement more conventional approaches to market research. When it comes to online evaluations, opinions, and behaviors, text-mining is a potent tool for extracting information from any type of text, picture, audio, or video. Algorithms for deep learning allow for more complex analyses to be carried out, including computational creativity, customization, predictive analytics, and systems using natural language processing (Huang & Rust, 2021). To better understand consumer tastes and anticipate market shifts, Walmart's Social Genome Project, for instance, allows for the analysis of publicly available social media interactions (Marr, 2016). From a consumer sensing perspective, businesses use comparable technology to augment traditional interview-based information with unstructured consumer data, allowing for a more comprehensive insight of customer wants and requirements. Furthermore, automated vision and deep methods of learning can identify customers' emotions through their facial expressions, body language, voice, and their gaze when they engage with AI (e.g., speaking bots) (Campbell et al., 2020), giving businesses more detailed information about customers' preferences.

4.1.4 Improve Dynamic Pricing

Lastly, ML applications in marketing can optimize media and price tactics, which in turn can impact financial KPIs. Companies need to assess customer price sensitivity and rival pricing to establish an appropriate product or service price point. ML algorithms have the ability to predict how price-sensitive customers are and adjust prices appropriately through the use of dynamic pricing, for instance. According to Erevelles et al. (2016), Ke (2018), and Stavins (2001), AI and ML can help businesses predict customer wants and prices. According to Yang and Leung (2018) and Ye et al. (2018), enterprises can gain a significant competitive advantage by being able to dynamically modify pricing in response to market conditions and customer price sensitivity. For example, see Guda and

Subramanian (2019) for an analysis of Uber's "surge price" pricing strategy. In order to maximize earnings, the corporation uses real-time data to monitor traffic and ride requests. It then adjusts rates accordingly, which encourages drivers to be accessible only when needed (Marr, 2016). When it comes to digital marketing, "media optimization" means automating and enhancing existing techniques. A company's marketing plan is not complete without social media; with daily posts and image shares in the billions, marketers have a tremendous opportunity.

4.2 Description of the Proposed Taxonomy

A summary of the study's key results will be presented in this section. Figure 3 exhibits four-word clouds that describe the content of each use case category. These clouds represent the top 30 terms that recur in the synopsis of each conceptual class in the taxonomy. The relevance of personalization in this sector of the business is highlighted by the predominance of words like 'personalized,' 'consumers,' and 'deals' in this initial category, which improves shopping fundamentals. In this context, "consumer" appears again alongside "product," "improvement," and "experience," all of which pertain to the emphasis on product enhancement to enhance the user experience. Words like "insights," "market," and "understanding" appear frequently when discussing ways to enhance decision-making; this highlights the significance of familiarity with the market and customers to develop and execute more effective strategies. Finally, we have terms like "pricing," "strategy," and "media" for better financials, which stand for the optimization of prices and media in an effort to boost the P&L for the business.

To thoroughly examine our results, we recorded details for every recipe, including the necessary data of the implementation, the primary algorithms utilized, the key performance indicators considered, the recipe's dominance, and lastly, two or more real-world use cases. The recipe's relative frequency in the source material we obtained for our research determines its predominance (●= uncommon, ●●● = very often). The recipes covered in the prior section are summarized in Table 1.

Internet of Things (IoT) and reinforcement learning are at the heart of this field (Mcinerney et al., 2018), and decision making can benefit from NLP, which allows for social media observing, and optimization algorithms are at the heart of financial applications. With this knowledge, we can better assess the potential of artificial intelligence (AI) and machine learning (ML) to enhance many parts of businesses. Natural language processing (NLP) is one example of a pre-built AI component that is both freely available and simple to integrate. Many of the applications can be implemented

Figure 3. At the final position level of the taxonomy, word clouds depict the content in every conceptual class. Working our way clockwise from the top left corner: enhance the foundations of purchasing, the customer experience, financials, and decision making.

Table 1. Summary of recipes in marketing using machine learning as studied in this literature

Recipe	Data Requirements	Algorithms	KPIs	Marketing Mix 4Ps	Predominance*	Use Cases
Personalized Offers	Customer transactions Social and Demographic Contexual data	Supervised learning Classification Propensity score	Promotional ROI Retention rate	Promotion	**	Etsy, Harley Davidson, Target
Personalized Communic	Customer transactions Social and Demographic Contexual data	Supervised learning Classification Propensity score	Consumer Satisfaction Loyalty	Promotion	***	Sprint, Zynga, Sofinco
Personalized Recomme	Customer historical data	Supervised learning Classification Propensity score	Sales	Promotion	***	Netflix, LinkedIn, OYO
Assortment Optimization	Store specific transactions Demographics	Optimization modelling	Consumer Satisfaction Sales	Place	*	SCARA, Lowes
Product Improvement	Sensors Data	Miscellanea	Consumer Satisfaction	Product	**	BBC, QA, June, Rolls-Royce
Customer Experience	Customer transactions Social and Demographic Contexual data	Supervised learning Classification Clustering Propensity score	Consumer Satisfaction Sales	Product	*	L'Occitane, Spotify, Disney
Customer Service	Contact us FAQ Customer service history	Natural Language Processing Reinforcement Learning	Customer Satisfaction Cost per acquisition	Product	**	J-League, eBay
Market Understanding	Market research data Social media comments Customer profiles	Deep Learning Natural Language Processing	Decision Making Cost of acquisition	Product	***	Microsoft, Walmart
Consumer Sensing	Customer historical data Social media comments Customer profiles	Sentiment Analysis Natural Language Processing	Loyalty	Product	**	Apixio, Royal Bank of Scotland, Autodesk, Dickey's Barbecue
Dynamic Pricing	Historical transactions Pricing data	Optimization modelling	Profit Margin	Price	*	Major League Baseball, Hotel Tonight, EasyJet
Media Optimization	Realtime event stream digital ads content Customer profiles	Optimization modelling	Media ROI Marketing Camapign CTR	Promotion	**	Kanetix, Orange, Acxiom

*Predominance is based on the relative presence in literature according to research

using open-source data analytics platforms, languages like R or Python, or open-access libraries like TensorFlow (Wirth, 2018).

5. CONCLUSION

With a view to create a systematic taxonomy of eleven common application scenarios, the literature combed through academic and corporate publications discussing ML's marketing applications. It was discovered that several use cases will improve the purchasing and using experiences of the product's end users. Due to ML's demonstrated ability to enhance decision-making and influence financial indicators, different applications will revolve around the company and its operational model.

As they seek to comprehend the complex role of ML in advertising from the viewpoints of both customers and enterprises, marketers and managers may find our findings helpful. To be more precise, there are trends in the ways that artificial intelligence (AI) can supplement marketing plans, as shown by the organized systematic study method. From the customer's point of view, marketing should aim to do two things: enhance their entire customer journey and drive personalized activities needed by client-related idiosyncrasies. From a business standpoint, machine learning has the potential to enhance decision-making by sensing customer behavior and market trends, as well as to support media optimization methods and dynamic pricing, all of which can have an impact on financial outcomes. These findings are in line with the new paradigm of marketing known as "Marketing 5.0" (Kotler et al., 2021). This paradigm seeks to redesign both business-oriented and those centered around customers activities with a purpose to fully utilize technologies that mimic human behavior to create, communicate, offer, and rise value along the client journey. According to Kotler et al. (2021), machine learning has the potential

to make a significant impact on the marketing industry's "next-tech"—a group of sophisticated technologies that can mimic human marketers' abilities—with the goal of developing a fresh, interactive experience. To make marketing tactics more precise and adaptable in real-time, managers and marketers must comprehend the need to establish a harmonious relationship between human and artificial intelligence.

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