

# Technology Driven Marketing Research in a Digital World: Implications for the Role and Scope of Marketing Research

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Manuscript received October 30, 2023; revised November 30, 2023; accepted February 2, 2024; published May 10, 2024.

**Abstract**—This article reviewing typical technology enabled various marketing research types, including Online Research, which leverages the widespread internet to enhance data collection. Online Research involves the use of secondary data from the internet and online primary data to support decision-making. Real-time Research is another prevalent method that analyzes consumer behaviors on digital platforms for immediate decision-making. Real-time Research, also known as Real-time Experience Tracking (RET), is extensively used to provide marketing decision support from digital data platform. Neuroscience Research employs neuroscience tools to study consumer behavior and marketing decision processes. VR/AR Research utilizes Virtual Reality (VR) and Augmented Reality (AR) to enhance research efficiency, making it more immersive and quicker to gather data. AI Research harnesses artificial intelligence for in-depth and rapid data analysis, providing valuable insights for informed decision-making. Additionally, Other Technology-driven Research explores various technologies like chatbot, blockchain and voice assistance for data collection efficiency and analysis. In the realm of market research, these modern technological approaches offer diversified tools and methodologies, contributing to more effective data collection, analysis, and decision-making processes.

**Keywords**—technology-driven research, market research, digital market research

## I. INTRODUCTION

In this era of digitization, the contemporary landscape of marketing research is undergoing a profound transformation, catalyzed by the digital revolution. The integration of technology and marketing research is not merely an enhancement; it is an imperative for understanding the intricacies of consumer behavior and the dynamic market environment (Cluley *et al.*, 2020). This article aims to delve into the intricate interplay between technology and marketing research, while simultaneously scrutinizing the far-reaching consequences for the role and scope of the discipline within our digitized world.

The advent of the digital age, characterized by pervasive connectivity, the proliferation of digital platforms, and the ceaseless generation of data, has redefined the fundamentals of marketing research. This redefinition is fueled by technology's unparalleled capacity to collect, process, and analyze data, allowing for a deeper and more nuanced comprehension of consumers, markets, and the mechanisms of influence. Moreover, the omnipresence of technology has necessitated a shift from traditional, static research methodologies to dynamic, data-driven strategies that can adapt to the fluid nature of the digital landscape.

The implications of this profound transformation are manifold. First and foremost, technology-driven marketing

research expands the horizons of data collection and analysis. It provides researchers with unprecedented access to diverse and voluminous data sources, such as social media, e-commerce platforms, and the Internet of Things (IoT), ushering in an era where consumer insights are derived from real-time, multi-faceted data. Second, the integration of artificial intelligence and machine learning algorithms revolutionizes research by automating tasks such as sentiment analysis, customer segmentation, and predictive modeling. This, in turn, leads to more efficient research processes and the generation of more precise, actionable insights.

Furthermore, technology has facilitated the delivery of highly personalized experiences to consumers, heralding a new age of marketing where tailoring is not just an aspiration, but an attainable reality (Chandra *et al.*, 2022). As consumers expect individualized interactions with brands, marketing research has assumed a critical role in constructing customer personas and understanding their preferences and behavior.

In addition to personalization, technology-enabled marketing research empowers businesses with real-time decision support. The speed at which data can be collected and analyzed enables organizations to respond nimbly to shifting market dynamics, customer feedback, and emerging trends. This real-time responsiveness enhances the strategic agility of businesses, equipping them to make informed decisions promptly. However, this integration of technology into marketing research does not occur without its ethical considerations. As data privacy, informed consent, and responsible data usage come to the forefront, marketing researchers and practitioners must navigate these ethical challenges with diligence and integrity.

Considering these developments, it is imperative that both academics and industry practitioners grasp the implications of technology-driven marketing research on the role and scope of their discipline. The digital revolution compels a reevaluation of traditional research paradigms and requires a reconfiguration of methodologies and strategies. Thus, this article will critically examine the multifaceted relationship between technology and marketing research, elucidating its transformative effects and ethical considerations. Ultimately, it underscores the necessity for both academia and industry to adapt to this dynamic and data-rich environment, shaping the future of marketing research in a digitized world.

## II. DRIVERS FOR TECHNOLOGY-DRIVEN MARKETING RESEARCH

In today's rapidly evolving landscape, research driven by technology holds significant importance across multiple

dimensions of market research according to following drivers.

#### *A. Consumer Digital Behavior*

Consumer behavior in the modern era is profoundly influenced by advanced technologies, reshaping the landscape of marketing research. This impact encompasses three pivotal aspects of consumer behavior. Firstly, the ubiquity of smartphones, driven by global internet connectivity, revolutionizes data collection by making information constantly accessible online, expediting market research processes. Secondly, the vast amount of content shared on social media platforms, such as YouTube and Instagram, makes these platforms indispensable for researchers, enabling the collection of authentic customer data while respecting privacy. Finally, the integration of technologies like Artificial Intelligence, Virtual Assistants, Chatbots, and Blockchain into consumers' daily lives is altering how businesses interact with their customers. AI and machine learning offer personalized product recommendations, Virtual Assistants provide voice-controlled services, Chatbots facilitate real-time communication, and Blockchain offers secure and transparent data-sharing possibilities in research (Karanci, 2018). These technological shifts highlight the evolving role and scope of marketing research in the digital age.

#### *B. Limitation of Traditional Research*

Research with modern technology has significantly alleviated the limitations associated with traditional research methods that relied on human labor for data collection, such as surveys or interviews, and subsequent analysis. These traditional methods posed several challenges, including the potential for researcher bias in sample selection and research questions, constraints related to the quantity and quality of questions due to time limitations, uncertainty regarding the quality and authenticity of respondents, high time and budget requirements for data collection, and limitations in the applicability of research findings for future decision-making (Karanci, 2018).

In contrast, modern technology-driven research helps alleviate the limitations of traditional research methods that rely on human labor for data collection through surveys or interviews, which often encounter various constraints. These constraints include:

(1) **Researcher Bias:** Conventional research often involves the selection of a sample group by researchers themselves or the use of hypothetical research questions, leading to potential researcher bias.

(2) **Question Quantity and Quality:** Traditional research heavily depends on the number and quality of questions asked. Researchers may be limited in the number of questions they can ask due to time constraints, and the quality of questions can impact the accuracy of responses.

(3) **Participant Quality:** Conventional research cannot guarantee that survey respondents are representative of the actual customer base, nor can it ensure the quality of their responses. This uncertainty affects the reliability of the data collected.

(4) **Time and Budget Constraints:** Traditional research methods are time-consuming and costly, as they require human resources for data collection, often involving

extensive travel. This results in a resource-intensive research approach.

(5) **Limited Future Applicability:** The constraints associated with traditional research can hinder the usefulness of the obtained data for future decision-making, potentially compromising the objectivity and the efficiency of data collection and analysis.

The integration of modern technology in research methods addresses many of these issues, making research more efficient, cost-effective, and ensuring higher data quality. This shift enables researchers to obtain more accurate and objective data, which can be of greater value in guiding future decision-making processes.

### III. BENEFITS OF TECHNOLOGY-DRIVEN MARKETING RESEARCH

Research conducted using modern technology holds significant benefits for market research in various aspects (Srinivasan, 2023) as following:

#### *A. Forecasting Market Trends*

Leveraging technology to observe changing customer preferences, purchasing behaviors, and decision-making patterns is crucial for businesses to adapt and thrive. For example, the clothing brand H&M recognized the growing trend of environmental conservation, inspiring them to incentivize customers through loyalty cards for recycling clothing. This resulted in the collection of approximately 19,000 tons of clothing in 2020 through the "Let's close the loop" program, earning praise from consumers. Technology-driven market research enables businesses to gain a competitive edge by adjusting marketing strategies, developing new products, and delivering market value that aligns with evolving customer needs. It efficiently captures not only observable behaviors but also the subtle shifts in consumer sentiments.

#### *B. Analyzing Market Competition*

In highly competitive markets, businesses must analyze their competition to refine their business strategies, such as pricing, product characteristics, and customer service, to enhance their market share. Technology-driven market research can help businesses understand customer behaviors, enabling them to determine why customers may switch to competitors. Effective research tools provide insights into deeper emotions and facial expressions, thereby collecting richer data. For instance, eye-tracking technology can be used to compare the effectiveness of brand advertising against competitors. Businesses can compare their marketing strategies with those of competitors in the industry. For example, healthcare company GSK established the Shopper Science Lab to simulate stores stocking GSK's health products and used sensory data to understand customer behavior in their lab.

#### *C. Testing New Products*

Modern technology-driven research conducts tests on innovations and product concepts before making substantial investments in product development and launch. By collecting and analyzing customer feedback in advance, businesses can make informed decisions and avoid costly mistakes. For example, Coca-Cola's commitment to

sustainability led them to experiment with paper bottles for all their products. Research involving customers' reactions and preferences helps to assess the viability of new product offerings. Technology-driven research allows businesses to create heat maps and comparative scoring to test brand (advertising) messages against competitors. Businesses can compare their marketing strategies with those of competitors in the industry.

#### *D. Enhancing Efficiency and Reducing Marketing Costs*

Businesses employ technology-driven research to analyze customer data and optimize their marketing strategies by identifying the most effective marketing channels and content. Businesses can determine which marketing campaigns provide the highest Return On Investment (ROI) and adjust strategies accordingly. Presently, numerous technology-driven research tools are available, offering comprehensive platforms that collect both quantitative and qualitative data about brands in one place, providing a consolidated view of all data and presenting it visually, thereby facilitating quick decision-making.

### IV. TECHNOLOGY-DRIVEN MARKET RESEARCH

Technology-driven research categorized based on the core technologies employed, but each type of research is interconnected, and their integration is essential to enhance research efficiency and address issues arising from traditional research methods, thereby saving labor, time, and yielding bias-free results.

#### *A. Online Market Research*

Online research refers to the use of fundamental technology, primarily the internet, for data collection to enhance research efficiency. It includes techniques such as web searching, online surveys via email, and in-depth video interviews. Online research has gained popularity due to its numerous advantages, including global reach, enabling research across countries without the need for physical presence. Additionally, it offers multiple target platforms, helping researchers to reach and segment diverse target groups across various online media. For instance, online surveys can be distributed through websites, emails, and social media platforms, with results easily differentiable.

Furthermore, online research offers flexibility for both researchers and participants. Data collection can take various forms, including email surveys and social media advertising, making it easier to reach respondents on platforms they are comfortable with. Additionally, online surveys can be easily modified, facilitating adjustments without data loss. Online research is also timesaving, as it significantly speeds up the research process compared to traditional methods. Traditional market research often requires extensive time for tasks such as identifying the target population, selecting appropriate sample groups, and preparing data collection tools. In contrast, online research can rapidly develop data collection tools and conduct immediate analysis, reducing the overall research timeline. Therefore, online research is cost-effective, as it allows access to various target groups and customers across multiple media with minimal resource allocation. Smaller and medium-sized businesses can benefit from online research without requiring substantial research

budgets, providing equal access to information and competitive advantages in the industry.

Online research can be categorized into two main types (Klaus, 2013):

1) **Online Secondary Research:** This involves collecting and analyzing data from online sources to study research topics. It is often referred to as "desk research" or "online secondary research". This type of online research is generally quicker and more cost-effective than primary research. However, it offers limited control over data, as it relies on data that is already available online. Sources of online secondary research include professional associations, competitors' websites, business operation guidelines, reports from various organizations, database platforms, online libraries, digital media, and competitor websites.

2) **Online Primary Research:** Online primary research entails gathering and analyzing data according to specific business objectives. It offers the highest level of control over research and research outcomes. Online technology supports various methods, such as online interviews through video conferencing, online surveys, online in-depth interviews via video calls, and more. These are all widely accepted formats for online primary research which comes in various forms:

- **Online Interviews:** Researchers conduct interviews with data providers via smartphones or computers using online video call software, such as Zoom or Google Meet, without the need for physical presence.
- **Online Group Discussions:** Researchers facilitate conversations among multiple data providers on defined research topics using online video conferencing or online interview software. As with online interviews, both researchers and participants can be geographically dispersed.
- **Online Observations:** This approach involves observing data or events on the internet without the need for physical presence. For example, researchers may observe discussions about brands on social media platforms and various online forums.
- **Online Product Concept Testing:** Researchers test new product concepts via the internet, presenting ideas to sample groups for evaluation. This can involve presenting product concepts through video and gathering opinions via online interviews or surveys.
- **Online Product Trials and Surveys:** Research participants are allowed to try out products and provide feedback through online surveys.
- **Online Diary Studies:** Participants record their daily lives and experiences online, creating long-term data collection.

Online research, whether secondary or primary, offers substantial advantages, including speed, cost-efficiency, and accessibility to diverse sources of information, making it a valuable tool for research and business decision-making.

Dove, a beauty brand promoting self-esteem among women, initiated the #SpeakBeautiful campaign during the 2015 Oscars. This campaign aimed to shed light on the prevalence of negative self-talk among women on Twitter and subsequently promote more positive self-image discussions. Collaborating with Twitter, they conducted market research to analyze communication on Twitter

related to women's self-esteem. The research found that personal body confidence was at its lowest on Monday mornings and weekends. As a result, Dove strategically designed and promoted the campaign on Twitter during these crucial times to reach women when they were most vulnerable, ultimately leading to changes in behavior. Surprisingly, the campaign's effectiveness surpassed expectations, with a 36.8% reduction in negative beauty-related tweets in 2015 compared to 2014. Additionally, discussions related to the Oscars and VMA awards witnessed a 30% decrease in negative tweets and a 69% increase in positive self-related tweets. This comprehensive shift contributed to a 14-point increase, reaching 76% positivity in beauty-related discussions in 2015. #SpeakBeautiful even became a top trending Twitter hashtag in the United States throughout the year, inspiring women over 168,000 times and driving over 800 million social media campaign impressions (Unilever USA, 2006).

### *B. Real-time Market Research*

Real-time research, the most extensively employed research methodology, bears a resemblance to online research, as it involves the examination of consumer behaviors on digital platforms to bolster decision-making processes. It is also known as "Real-time Experience Tracking" (RET) or "real-time experience monitoring". Real-time data plays a crucial role in market research by providing businesses with more current information, enabling them to respond swiftly to ever-evolving market dynamics. This form of research offers numerous advantages to businesses. Firstly, it aids in developing highly targeted customer profiles by using real-time data in conjunction with Customer Data Platforms. Companies can amass in-depth information to refine service delivery and identify prospective customers based on observed consumer behaviors. Secondly, real-time research enhances the efficiency of marketing campaigns by allowing businesses to promptly adjust their strategies in response to real-time consumer behaviors, circumventing the need to wait for the collection and analysis of potentially outdated data. Moreover, businesses can gauge the effectiveness of these adjustments and apply these insights to future marketing endeavors. Thirdly, real-time research expedites data management and furnishes readily analyzable insights that expedite immediate decision-making. This not only conserves time but also resources that would otherwise be expended on traditional data collection and analysis techniques. Additionally, real-time research platforms often offer customizable dashboards accessible to team members, streamlining decision-making processes further. Lastly, it enables businesses to closely monitor and respond to their competitors' strategies in real time, including pricing changes and promotions. Real-time research is a cornerstone of business agility and adaptability, essential for thriving in dynamic market landscapes.

In 2014, Disney faced concerns regarding declining visitor satisfaction at Disney World due to issues like long lines and high ticket prices, potentially leading to a loss of visitors. To address this, Disney initiated the "Next Generation Experience" project, collaborating with researchers from Carnegie Mellon University to develop cost-effective,

battery-free RFID tags, known as "Rapid," capable of real-time motion tracking within 200 milliseconds. Disney implemented RFID wristbands linked to the "My Magic+" guest management system, allowing visitors to make payments, book activities, and access their hotel rooms, creating a new Omni-channel customer experience (Hollander, 2022). These wristbands facilitated in-depth data collection on guest behavior, enabling Disney to customize marketing strategies and enhance the park layout, ultimately improving the overall guest experience. The key takeaways include data-driven analysis, tailored experiences, and responsive product and service development based on visitor behavior, leading to an efficient and personalized approach to marketing and visitor satisfaction. Disney's use of RFID technology and data-driven insights significantly enhanced the guest experience.

### *C. Neuroscience Market Research*

Neuroscience research entails the study of how an individual's nervous system responds to marketing activities by measuring the neural activities and biological responses outside the nervous system (Lutkevich, 2022). The research can be broadly categorized into two main types based on measurement techniques (Indeed Editorial Team, 2023):

#### *1) Measuring brain function (Neurological brain activity)*

Electroencephalogram (EEG): EEG is a technique that measures the electrical activity of the brain by placing small metal discs and wire electrodes called electrodes on the scalp. It records electrical brain activity for a duration of 45 to 180 minutes. This method is used in neuroscientific research to measure brain responses to marketing stimuli and memory recall related to products or brands.

Functional Magnetic Resonance Imaging (fMRI): Functional magnetic resonance imaging is a technique that creates maps of brain activity. It offers precise insights into brain function. Neuroscientists use fMRI to examine brain activity in response to marketing strategies.

Steady-State Topography (SST): SST is a technology that directly measures brain activity using EEG while participants view marketing stimuli or engage in specific tasks. This method provides fundamental neuroscientific information by capturing oscillatory brain activity associated with the visual response known as Steady State Visually Evoked Potential (SSVEP).

#### *2) Measuring biological responses to the nervous system (Neurological responses)*

Facial Coding: Facial coding is a tool used to measure emotional responses by analyzing facial expressions through computer algorithms and the Facial Action Coding System (FACS). This method provides deep insights into emotional responses to marketing-related stimuli, supporting traditional market research.

Eye Tracking: Eye tracking technology measures the gaze and emotional responses of individuals when exposed to various stimuli. It helps in determining what attracts the most attention and is a valuable tool for marketers in collecting evidence of consumer behavior without the need for expensive neuroimaging technologies.

Galvanic Skin Response (GSR): GSR measures the

electrical conductance of the skin. It is used to detect emotional responses to marketing stimuli. Researchers sometimes combine eye tracking with GSR to learn about the quantity of emotional response as well as the corresponding emotional components.

**Heart Rate Monitoring:** Monitoring heart rate can provide insights into emotional responses to marketing stimuli using instruments like an electrocardiogram (ECG). Similar to other psychophysiological methods, the concept is to study these psychophysiological responses, which may not be consciously perceived by humans, and correlate them with emotional responses.

In 2003, Dr. Read Montague, the director of the Human Neuroimaging Lab, conducted a new iteration of the “Pepsi Challenge” using Functional Magnetic Resonance Imaging (fMRI) to study the neurological response of individuals participating in a blind taste test of cola beverages. The results mirrored the original Pepsi Challenge from 1980, with most participants preferring Pepsi, and the fMRI measurements exhibiting a similar trend. Notably, the ventral putamen region of the brain, associated with reward processing, showed increased activity when people consumed their preferred beverage. In a second experiment, participants were informed of the brands, Coca-Cola and Pepsi, they were tasting. Interestingly, almost everyone claimed a preference for Coca-Cola in a 3:1 ratio. However, the study revealed a different pattern of brain activity, particularly in the medial prefrontal cortex, a region associated with complex cognitive and emotional processes. Dr. Montague concluded that the brain’s response to the Coca-Cola brand was influenced by advertising and emotional attachment, suggesting that it was the brand identity and emotional associations rather than the actual product quality that played a pivotal role. This research, published in 2004, generated significant public interest in the neuroscience of decision-making and emotions related to brand perception (NeuroSensum, 2018).

Today, major consumer brands have long been employing neuroscience research to enhance their marketing efforts. For instance, Coca-Cola has employed neuroscientific methods to measure the effectiveness of their advertising campaigns. Agencies like Millward Brown have incorporated technology like Affectiva’s facial coding, which utilizes webcams to automatically analyze consumers’ emotions, replacing traditional methods that required human experts to interpret facial expressions from video footage. This shift has not only reduced costs but also accelerated the analysis process. These are just a few examples of how neuroscientific research has significantly advanced in the contemporary era, impacting various aspects of consumer-oriented brand strategies.

#### *D. VR/AR Market Research*

VR/AR research, or Virtual Reality/Augmented Reality research, encompasses the utilization of virtual reality and augmented reality technologies to improve research efficiency (Wedel *et al.*, 2020). The term “Virtual Reality” (VR) pertains to the deployment of a simulated three-dimensional environment, enabling users to explore and engage with a virtual world closely mirroring real-life experiences as perceived through their sensory faculties. The creation of this virtual environment relies on computer

hardware and software. While VR offers the advantage of a fully immersive three-dimensional experience, it necessitates users to wear headsets for interaction.

Conversely, “Augmented Reality” (AR) is an interactive technology that superimposes or integrates digital elements onto the user’s real-world surroundings in real time. The advantage of AR lies in its accessibility through users’ smartphones without the need for additional hardware. However, it falls short in providing a complete three-dimensional immersive environment and depends on the user’s physical surroundings.

Virtual Reality (VR) and Augmented Reality (AR) research plays a pivotal role in both the realms of academia and marketing for several compelling reasons (Arvtech, 2017). First, these technologies offer users a rich and immersive experience. VR immerses users in lifelike environments, while AR overlays digital elements onto the real world, facilitating the measurement of emotional responses and brand perceptions. Second, VR and AR provide the capability to swiftly customize content to meet specific user needs. Research using these technologies can create personalized experiences and drive targeted marketing efforts by incorporating insights from VR/AR research findings. Third, VR and AR can enhance physical spaces and offer additional interactive experiences, such as how brands like TOMS shoes use AR to demonstrate the positive impact of customers’ purchases. Furthermore, these technologies reduce in-person and travel barriers by enabling remote interactions and collaborations, potentially reducing the need for face-to-face meetings. This is complemented by VR and AR’s ability to boost conversion rates in e-commerce, as products enriched with VR/AR content tend to have significantly higher conversion rates. Finally, VR and AR research provides built-in data analytics capabilities, allowing for real-time data collection and the analysis of user engagement and responses. VR’s advanced analytics can even track user gaze, providing deeper insights into consumer behavior, making them invaluable tools in both research and marketing endeavors.

Sephora cosmetic retail has simplified the makeup selection experience with the introduction of Sephora Virtual Artist, powered by Augmented Reality (AR). This tool allows Sephora customers to virtually try a wide range of beauty products, including eyeshadow, lipstick, blush, and even false eyelashes. The virtual assistant works by using AR to scan users’ faces, enabling them to experiment with different makeup looks. In 2015, the company established an innovation lab in San Francisco’s Dogpatch area, bringing together a diverse team of researchers and stakeholders from various departments, including technology, marketing, and product development. This innovation team played a crucial role in sourcing and testing products, as well as developing new innovative technologies to enhance the customer experience both online and in Sephora stores. Leveraging research findings and artificial intelligence, features like the virtual makeup trial have greatly boosted online sales and improved the overall online shopping experience for Sephora customers, leading to a 25% increase in online sales and a 35% improvement in conversion rates (Trackmind).

### *E. Artificial Intelligence Market Research*

Artificial Intelligence research, also known as AI research, focuses on the application of artificial intelligence in the field of market research. Artificial Intelligence's capacity to analyze extensive datasets rapidly and accurately is a central feature, enabling researchers to uncover elusive patterns and relationships that traditional research methods may miss. In market research, AI plays a multifaceted role:

Firstly, AI facilitates intelligent data collection and analysis using Machine Learning, allowing for the autonomous aggregation of consumer research data from sources such as social media, online surveys, and customer reviews. By employing Natural Language Processing (NLP) techniques, AI supports sentiment analysis, topic modeling, and social listening, empowering researchers to derive valuable insights from unstructured data. AI-driven chatbots enable real-time surveys, enhancing data precision.

Secondly, AI research excels in predictive analytics and forecasting, enabling the precise anticipation of future trends and consumer behavior. Machine learning algorithms scrutinize historical data to unveil underlying patterns, facilitating the construction of predictive models. These models can predict market demand, customer preferences, and sales. Prominent platforms like Netflix leverage AI algorithms to predict user preferences and provide personalized recommendations, thereby significantly enhancing content production and revenue.

Furthermore, AI automates market segmentation, a foundational component of market research. Through the analysis of the heterogeneous characteristics and behaviors of consumers, AI identifies discrete customer groups, enabling the formulation of targeted marketing strategies. Automated segmentation algorithms efficiently process large datasets and adapt to real-time market shifts.

Finally, AI-driven market research accumulates profound consumer insights by analyzing substantial volumes of consumer data. By integrating AI technology with research methodologies like eye-tracking and facial scanning, researchers gain deeper insights into consumer behavior, preferences, and emotional responses. For example, AI-powered eye-tracking technology aids in understanding consumer reactions to advertisements and product displays, resulting in more effective marketing campaigns. The future of AI in market research is promising, with emerging technologies like deep learning, blockchain for secure data management, and augmented reality for immersive consumer feedback experiences. The integration of AI with Internet of Things (IoT) devices will allow researchers to gather real-time data from an even broader range of sources. Furthermore, the synergy between AI and human expertise is likely to produce richer and more actionable insights, enhancing the overall quality of market research.

The case study of Nike responses to its expanding presence beyond traditional retail and growing e-commerce channels. Nike implemented a strategy known as "Nike Direct" as part of its initiative in 2017. This strategy aimed to offer personalized customer experiences based on product recommendations and search-driven results. To achieve this, Nike acquired several data analytics companies in 2018, including Invertex, Zodiac, and Celect. By merging their acquired technologies and data resources, Nike enhanced

personalized customer experiences, improved product design, and optimized logistics strategies. The goal was to meet consumer demands efficiently. This investment in data analytics led to a 12% annual increase in sales through Nike Direct, totaling \$10.4 billion in 2018. Direct sales accounted for approximately 30% of Nike's profits, with sustained growth. Nike also leveraged artificial intelligence for customer trust and loyalty, leading to a clear increase in footwear sales. The brand fostered personal customer relationships through its stores, self-designable workout regimens, and AI-driven product recommendations, exemplified by the development of the "Nike+" program for loyal customers. This approach aimed to enhance customer engagement and provide personalized sports equipment recommendations, fostering customer participation in product design (Owen, 2021).

### *F. Other Technology-driven Market Research*

Aside from the aforementioned technologies, research has also integrated other emerging technologies to enhance research efficiency and data effectiveness. These technologies are part of online research, focusing on large datasets and artificial intelligence.

**Blockchain Research:** Blockchain technology is utilized for market research by storing data in digital blocks that link together, creating a secure data chain. Data stored in these blocks can encompass personal details, online consumer behavior, financial transactions, and other information that requires secure storage. This data can be shared publicly, but only accessible to authorized users through public and private keys (Stallone *et al.*, 2021). This approach enhances transparency and data ownership, making research participants more willing to provide accurate and complete data during surveys, which, in turn, streamlines the research process.

**Chatbot Research:** Chatbots, powered by artificial intelligence and natural language processing, are employed in market research to efficiently collect data from millions of respondents without requiring extensive human labor. Users can survey via these chatbots on mobile browsers without downloading separate applications, making data collection both quick and efficient. Additionally, chatbots equipped with AI can understand natural language at an advanced level, providing deeper insights into user emotions and preferences, enhancing the overall quality of the data (Rapp *et al.*, 2021).

**Voice Assistant Research:** Voice assistants like Amazon Alexa, Apple Siri, Google Assistant, and Microsoft Cortana are integrated into market research to conduct interviews and gather data. A study found that 65% of voice assistant owners were interested in participating in interviews through voice assistants and sharing their opinions, showing the convenience and preference for this approach (Flavián *et al.*, 2023). Voice assistant research fosters more comfortable and familiar interactions, making it a popular method for data collection. Moreover, voice assistant research allows real-time data gathering, as respondents can easily interact with voice assistants at their convenience.

H&M, a global fashion retailer, recognized that today's consumers are increasingly focused on personalized style rather than generic clothing options, as they plan outfits

tailored to their individual identities and unique occasions. To address this growing need, H&M developed a chatbot powered by artificial intelligence on the Kik platform, which quickly became a popular messaging app with 300 million users. H&M's chatbot engages users by asking questions about their preferences and tastes, often through images of clothing, enabling them to provide insights about their style. The chatbot also found that online shoppers are highly active in discussing and evaluating products through social media groups. H&M's chatbot offers features like previewing available outfits and voting on them, ultimately acting as a personal digital stylist, saving customers time that would otherwise be spent browsing hundreds of clothing options. Importantly, the chatbot can learn from individual user data to better understand and predict their preferences, guiding future marketing targets and further enhancing the personalized customer experience (Makarenko, 2023).

This chatbot example demonstrates how H&M utilized AI chatbot to adapt to the evolving consumer landscape, focusing on individualized customer engagement and data-driven market insights.

In summary, the application of these technologies in market research provides several advantages, including improved data accuracy, faster data collection, and more convenient and efficient data collection methods. Market researchers are increasingly utilizing these technologies to enhance their data-gathering capabilities and streamline their research processes.

## V. CONCLUSION

In conclusion, this article has provided an overview of the diverse modern technology-driven approaches and case studies in the field of marketing research. These methodologies, including Online Research, Real-time Research, Neuroscience Research, VR/AR Research, AI Research, and other technology-driven research, offer a spectrum of tools and techniques aimed at enhancing the efficiency of data collection, analysis, and, consequently, decision-making processes. The adoption of these technology-driven methodologies signifies a pivotal shift in market research, offering businesses a wealth of valuable insights and tools for staying competitive in today's dynamic market landscapes. As technology continues to advance, the landscape of marketing research is likely to evolve even further, with new methods and tools continually enhancing the field.

Despite its remarkable advantages, the use of technology in market research presents several challenges and ethical considerations. Researchers must be cautious about privacy concerns, ensuring that data collection adheres to regulations such as the General Data Protection Regulation (GDPR) and that informed consent is obtained from participants. In AI market research, there is also a risk of algorithmic bias, where AI systems may inadvertently perpetuate existing biases in data and decision-making processes. Ethical transparency and bias mitigation measures are essential to maintain the integrity and fairness of technology-driven market research.

The future of technology in market research is characterized by continuous innovation and evolution.

Advancements in augmented and virtual reality, blockchain technology for secure data management, and Internet of Things (IoT) integration hold the promise of richer, more immersive research experiences. The research synergy between human expertise and technological capabilities is expected to yield more actionable insights and drive strategic marketing decision-making in an increasingly dynamic market situation.

## CONFLICT OF INTEREST

The author declares no conflict of interest.

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