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LEVERAGING ARTIFICIAL INTELLIGENCE AND DATA ANALYTICS IN MARKETING INFORMATION SYSTEMS FOR ENHANCED CONSUMER ENGAGEMENT AND DECISION-MAKING

Amirah Bahaudeen^{1*}

¹University of Business and Technology, Jeddah, Saudi Arabia, amira@ubt.edu.sa,
<https://orcid.org/0009-0002-8304-5142>

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Corresponding Author: Amirah Bahaudeen
(amira@ubt.edu.sa)

ABSTRACT

This study investigates the impact of Artificial Intelligence (AI) and Data Analytics on Marketing Information Systems (MrkIS), and consequently on customer engagement, and decision-making within the Saudi Arabian market. Using a quantitative approach, data from marketing professionals were analyzed via Partial Least Squares Structural Equation Modeling (PLS-SEM). Findings reveal that AI and Data Analytics significantly enhance MrkIS effectiveness, which in turn positively influences customer engagement and decision behavior. The measurement model demonstrated high reliability and validity, while the structural model showed strong data fit. By integrating advanced AI and analytics into marketing systems, organizations can better understand and connect with customers, leading to improved marketing outcomes. This research fills a critical gap in understanding the role of these technologies in emerging markets, offering actionable insights for firms pursuing digital transformation. It underscores the strategic importance of investing in AI-driven marketing infrastructure to strengthen customer relationships and boost sales. The study contributes to both theoretical discourse and managerial practice in technology-enhanced marketing.

KEYWORDS: Artificial Intelligence, Data Analytics, Marketing Information System, Customer Engagement, Customer Decision Making, Saudi Arabia, Partial Least Squares Structural Equation Modeling.

1. INTRODUCTION

In today's dynamic and digitally driven business landscape, organizations are confronted with unparalleled challenges and opportunities due to the rapid advancement of technology and changing consumer behavior. In this complex terrain, businesses are increasingly turning to cutting-edge tools and systems that not only simplify marketing processes but also offer a greater understanding of customer needs and preferences (Bisht & Varma, 2024). Marketing information systems have become indispensable enablers in this context, in the form of structured frameworks which systematically collect, analyze, and distribute marketing data for use in marketing decision-making (Nordin & Ravald, 2023). These systems allow marketing managers to make use of timely and accurate information and allow them to be more strategic and data-driven in their actions.

The modern development of marketing information systems is strongly affected by the integration of advanced technologies in the form of Artificial Intelligence (AI) and Data Analytics (Shawn & Hossain, 2024). This integration is transforming conventional marketing operations by enhancing the capabilities of Marketing Information Systems to process huge quantities of data, generate sophisticated insights, and enable smarter and faster decisions (Bhalla et al., 2025). The integration of Artificial Intelligence and data analytics within marketing information systems has streamlined marketing operations and ushered in an era of more personalized and more engaging consumer experiences.

With the increasing competition in markets and digitization of the world, the integration of these technologies into marketing systems is becoming integral to businesses that wish to develop sustainable competitive advantages and long-term customer relationships.

Furthermore, the synergy between AI and data analytics in marketing information systems is in line with the increasing demand for responsive, agile, and consumer-centric marketing strategies (Adhikari et al., 2025). Contemporary consumers increasingly expect brands to demonstrate an understanding of their distinct preferences and to deliver contextually relevant, timely interactions across all engagement channels (Nagina et al., 2024).

AI-driven real-time data analysis and predictive analytics enable marketers to personalize their offerings and messages with accuracy, leading to increased engagement and loyalty. Therefore, organizations that utilize AI-enhanced marketing

information systems are capable of predicting future market trends and actively swaying consumer decisions.

Although there is increasing literature in this aspect of Artificial Intelligence and Data Analytics application in marketing information system globally, there is a lack of studies in the context of emerging markets—particularly in the Middle East and Saudi Arabia. Available studies are mostly focused on Western or developed economies, thus there is little information on how these futuristic marketing technologies are adopted and utilized in the special context of Saudi Arabia in terms of its unique socio-economic and cultural background. The Saudi market is in a phase of rapid transformation, with rising digital penetration, the government's thrust towards digital transformation, and evolving consumer behaviors with local values and preferences. However, there remains a limited body of empirical research examining the influence of AI and data analytics-enhanced Marketing Information Systems (MrkIS) on customer engagement and decision-making within this specific contextual setting. Accordingly, this study seeks to address a critical gap in the literature by investigating the roles and impacts of artificial intelligence (AI) and data analytics within Marketing Information Systems (MrkIS) in the context of Saudi enterprises.

Consequently, this research endeavors to address the following research objectives

RQ 1: To examine the impact of artificial intelligence and data analytics on the effectiveness of marketing information system.

RO 2: To analyze the influence of marketing information system on customer engagement and customer decision making.

This study aims to investigate the influence of integrating artificial intelligence and data analytics within marketing information systems, and subsequently, to examine how these systems affect customer engagement and consumer decision-making processes. The proposed research model adopts a mediation framework, wherein marketing information systems serve as mediating variables between the implementation of AI and data analytics and the outcomes of customer engagement and decision-making behavior.

This paper is organized as follows; first an overview of the relevant literature is given, then the research model and hypotheses are presented followed by the research methodology. Afterwards, the data analysis and results are highlighted, then the findings are discussed, and study implications are detailed.

2. LITERATURE REVIEW

2.1. Artificial Intelligence

Artificial Intelligence is a wide-range set of technologies for making machines intelligent and capable of convergent tasks like learning, reasoning, pattern recognition and autonomous problem-solving (Vinothkumar & Karunamurthy, 2023). From natural language processing and chatbots to advanced machine learning algorithms that analyze consumer data and make predictions, the applications of AI in marketing are numerous. With the integration of AI into marketing information systems, organizations can leverage the capabilities of automation and advanced analytics to drive operational efficiency and strategic effectiveness (Susilo & Susanto, 2024).

AI improves marketing functions by automating routine tasks such as data collection, customer segmentation and campaign management. More importantly, AI-based predictive analytics help marketers forecast customer needs, optimize product recommendations, and personalize marketing messages with a high degree of accuracy (Islam et al., 2024). AI analytics enable decision-makers to react promptly to changes in the market and feedback from customers to ensure that marketing plans are relevant and effective. Moreover, the integration of AI-driven technologies—such as sentiment analysis and image recognition—enhances the depth of insight into consumer perceptions and interactions with digital content, thereby enriching marketing information systems with multidimensional data inputs. The incorporation of artificial intelligence into these systems has fundamentally transformed the processes of generating and utilizing marketing intelligence, shifting the role of marketing professionals from data analysts to strategic decision-makers empowered by AI-derived insights. Furthermore, the adaptive learning capabilities of AI enable marketing systems to dynamically respond to evolving consumer behaviors and market fluctuations, thereby fostering sustained organizational agility and resilience.

Ozkaya and Demirhan (2023) utilized data from the 2021 edition of “The Global AI Index” to assess the contemporary landscape of artificial intelligence governance across 62 countries. The authors argued that nations at the forefront of AI innovation—particularly the United States and China—allocate substantial budgetary resources and pursue extensive project portfolios aimed at securing strategic dominance notably in the domain of AI research and development. In addition, several AI-

leading Western nations have cultivated expertise in specialized domains aligned with their small-state profiles or national comparative advantages, positioning them as influential contributors to global standard-setting. The United Kingdom, for instance, demonstrates significant advancement in the field of medical technology. Meanwhile, a subset of countries aspires to join these leading cohorts but currently lacks alignment in strategic objectives or investment capacity. At the lower end of the index are nations such as Armenia, Kenya, Egypt, South Africa, and Pakistan. These divergent trajectories in AI development are poised to reshape global power dynamics within the emerging digital economy. In their study, it is seen that countries in the Middle East are lagging in the competitive landscape of artificial intelligence research and development. However, Saudi Arabia (KSA), United Arab Emirates (AUE) and Qatar are actively pursuing initiatives to accelerate their participation in the global race for artificial intelligence adoption.

In a study that aimed at providing a clear view into how consumers in the United Arab Emirates and Saudi Arabia as an example of non-western countries are engaging with digital technology, media, and connectivity, 2,000 individuals aged 18–50 across both countries were surveyed. Drawing on the survey data, the study identified key trends including the rapid adoption of generative artificial intelligence (AI), increased smartphone usage, rising demand for connected devices, and a pronounced shift toward e-commerce. The findings underscore a strong regional enthusiasm for emerging technologies, suggesting a growing market for AI-driven applications. However, the report also acknowledges the accompanying challenges posed by this surge in demand. Although results in KSA, UAE and Qatar cannot be generalized to non-western countries but there is a trend for integrating AI into different aspects of life (Durou et al., 2025)

There is a growing research body of adopting AI in digital marketing strategies in the Middle East. Vij et al., (2025) conducted a study on evaluating the impact of AI systems on improving customer conversion in UAE. The results of this study proved the hypothesis that artificial intelligence positively influences predictive analytics which subsequently enhances customer conversion rate within the UAE’s digital marketing sector. In particular, the integration of AI technologies—most notably machine learning and natural language processing—enhances the capacity of marketers to extract actionable insights from large-scale data sets, thereby strengthening strategic decision-making and campaign

effectiveness.

2.2. Data Analytics

The proliferation of digital data generated through e-commerce platforms, social media interactions, mobile applications, and Internet of Things (IoT) devices has positioned data analytics as an indispensable component of contemporary marketing practice. Within this domain, analytics facilitate granular customer profiling, campaign performance evaluation, market segmentation, and return-on-investment (ROI) assessment. Advancing beyond descriptive analytics, predictive and prescriptive methodologies offer forward-looking insights that inform strategic marketing decisions. When integrated into marketing information systems (MrkIS), data analytics transforms raw and unstructured datasets into actionable marketing intelligence. Techniques such as clustering, regression analysis, and classification are employed to uncover latent patterns and behavioral correlations among consumers (Chaudhary et al., 2021), thereby guiding resource allocation and strategic planning. Real-time analytics further enable adaptive campaign management, allowing marketers to respond dynamically to evolving market conditions. This iterative feedback mechanism enhances both the precision and accountability of marketing operations.

The convergence of data analytics and artificial intelligence (AI) significantly amplifies the functional capacity of marketing information systems. While data analytics provides the quantitative foundation, AI contributes intelligent automation and nuanced contextual interpretation. This synergy enables more refined consumer segmentation, accurate prediction of customer lifetime value, and the identification of up-selling and cross-selling opportunities. Collectively, the integration of data-driven methodologies within MrkIS supports a comprehensive, end-to-end marketing strategy that underpins sustainable competitive advantage and fosters customer-centric organizational growth.

2.3. Marketing Information Systems

Marketing Information Systems (MrkIS) have long served as foundational infrastructures for the systematic collection, organization, and management of marketing-related data. Historically, their primary function centered on supporting decision-making processes through structured market research, customer databases, and sales tracking mechanisms (Upadhyay et al., 2024). However, advancements in information technologies have transformed MrkIS

into sophisticated, technology-driven ecosystems that integrate heterogeneous data sources with advanced analytical capabilities. The strategic integration of artificial intelligence (AI) and data analytics within MrkIS represents a pivotal evolution in marketing practice. These innovations have enabled the automation of complex data processing tasks, the development of predictive analytical models, and the delivery of real-time marketing intelligence. AI-enhanced MrkIS systems possess the capacity to evaluate consumer profiles, segment customers based on purchasing behavior, optimize the utilization of marketing channels, and tailor promotional strategies with precision (Ramya et al., 2025). Therefore, not only does marketing information systems modernization drive operational efficiency, but also empower marketers to make data-driven decisions in highly competitive environments.

Critically, Marketing Information Systems (MrkIS) enhanced with artificial intelligence and analytics capabilities facilitate cross-functional decision-making across organizational units, fostering strategic alignment among marketing, sales, finance, and product development teams. This integrative approach ensures that marketing initiatives are coherently aligned with overarching business objectives and that resource allocation is optimized for maximum impact. Consequently, AI-empowered, data-driven MrkIS constitutes an essential infrastructure for organizations seeking to modernize their marketing operations and achieve superior market performance.

2.4. Customer Engagement

Customer Engagement describes the interactive relationship between customer and brand that goes beyond transactional exchanges to include emotional and experiential aspects of the relationship (Rasool et al., 2021). When customers engage and feel connected to your brand, it fosters brand loyalty, improves customer satisfaction, and drives word of mouth. In today's digital age, customer engagement strategies are becoming more data-driven, relying on insights gained from analytics and AI to tailor their interactions and make them more relevant and personalized (Nazneen et al., 2024).

Hyper-personalization within Marketing Information Systems (MrkIS) is increasingly enabled through the synergistic integration of artificial intelligence (AI) and data analytics. This convergence facilitates the delivery of highly tailored content, product recommendations, and promotional offers that align with individual consumer preferences and

behavioral patterns. Moreover, AI-driven interfaces such as chatbots and virtual assistants support real-time, context-aware customer engagement, thereby enhancing responsiveness, relevance, and overall quality of service delivery. Furthermore, predictive analytics facilitates the early identification of potential customer attrition risks and optimal engagement windows, thereby enabling marketers to implement timely and targeted retention strategies (Adekunle et al., 2023).

Marketing Information Systems (MrkIS) augmented by artificial intelligence (AI) facilitate omni-channel engagement by synchronizing customer data across diverse digital touchpoints, including social media platforms, email communications, websites, and mobile applications. This capability enables organizations to deliver consistent and contextually relevant experiences across channels, thereby enhancing customer satisfaction and brand coherence (Bhalla et al., 2024; Anozie et al., 2024).

This integrative framework ensures that organizational messaging remains consistent and attuned to customer expectations, thereby enhancing the continuity and coherence of brand experience (da Silva Fernandes, 2022). Through the incorporation of artificial intelligence and data analytics, Marketing Information Systems (MrkIS) transition customer engagement from reactive responses to proactive, anticipatory interactions. This strategic shift fosters deeper brand-customer relationships and contributes to sustained business value over time.

2.5. Decision Making

Marketing decision-making depends, in essence, on access to reliable, accurate, up-to-date data within a relevant context (Shemshaki, 2024). With today's marketing landscapes characterized by volatile markets, diverse customer segments, and competitive pressures, data-driven and analytical decision-making has become an absolute necessity. AI and data analytics as part of marketing

information systems provide marketing managers with advanced tools that aid strategic, tactical, and operational decisions.

AI-driven analytics facilitate both predictive and prescriptive insights, enabling organizations to anticipate market dynamics, consumer behaviour, and campaign outcomes with greater precision. These capabilities support proactive strategic planning across key marketing domains, including product launches, pricing optimization, promotional design, and audience segmentation. Real-time data processing further enhances decision-making by ensuring that managerial actions are grounded in the most current market intelligence, thereby reducing uncertainty and increasing operational agility.

Moreover, the automation of routine analytical tasks through AI technologies allows marketing professionals to redirect their focus toward higher-order strategic functions, such as policy formulation and long-term planning (Dhand et al., 2025). Enhanced decision-making, underpinned by AI-enabled systems, contributes to more efficient allocation of marketing resources, improved customer acquisition and retention rates, and overall superior campaign performance. Consequently, AI and advanced data analytics serve as critical enablers of intelligent, responsive, and outcome-oriented marketing decisions.

3. RESEARCH MODEL AND HYPOTHESES

The literature review indicates that Marketing Information Systems (MrkIS) function as mediating mechanisms in the relationship between Artificial Intelligence (AI) and Data Analytics, and the outcomes of customer engagement and customer choice. Accordingly, the conceptual model proposed in this study illustrates how the capabilities of AI and data analytics enhance the effectiveness of MrkIS, which subsequently exerts a positive influence on customer engagement and decision-making behaviour (figure 1).

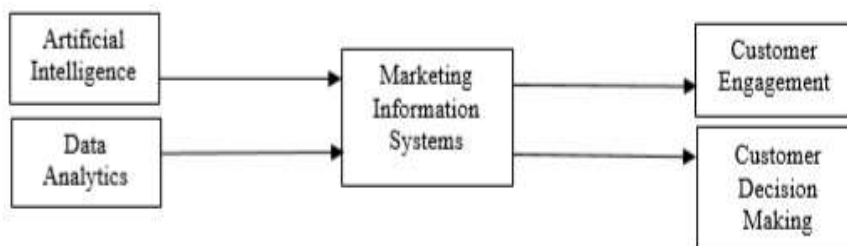


Figure 1: Research Model.

3.1. Artificial intelligence (AI) and Marketing Information Systems (MrkIS)

Artificial Intelligence (AI) has emerged as a transformative force within the marketing domain, significantly enhancing the capabilities of Marketing Information Systems (MrkIS) to process, analyze, and operationalize data with greater efficiency and strategic relevance (Oprea & Bara, 2025). AI-based technologies such as machine learning, natural language processing and predictive analytics have the ability to automate complex tasks, identify patterns within large datasets and provide actionable insights for marketing decisions (Chatterjee et al., 2022).

Recent scholarship underscores the transformative role of Artificial Intelligence (AI) in enhancing Marketing Information Systems (MrkIS), particularly through real-time data analysis and adaptive decision-making. Jain and Kumar, (2024) provides a comprehensive review of AI applications in marketing over the past two decades, emphasizing how AI integration enables marketers to monitor performance metrics and consumer behavior in real time, thereby facilitating rapid strategic adjustments. This capability is especially critical in dynamic market environments, where responsiveness and agility are essential for maintaining competitive advantage. Artificial Intelligence (AI) powered MrkIS is a key enabler of personalized marketing campaigns to optimize customer interactions and improve efficiency (Kaur et al., 2024a).

Recent literature underscores the strategic significance of Artificial Intelligence (AI) in augmenting the capabilities of Marketing Information Systems (MrkIS), particularly in transforming raw data into predictive intelligence that supports informed decision-making. Huang and Rust (2021) propose a comprehensive framework in which AI contributes across three critical marketing functions: market intelligence, strategic planning (including segmentation, targeting, and positioning), and marketing execution.

Their study highlights how AI technologies enhance MrkIS by enabling real-time responsiveness, personalized consumer engagement, and adaptive campaign optimization. Furthermore, the self-adaptive nature of AI technologies fosters the continuous evolution of MrkIS, thereby sustaining innovation and reinforcing competitive advantage within marketing practice. Hence this research tests the following hypothesis:

H1: Artificial Intelligence positively impacts Marketing Information System.

3.2. Data Analytics and Marketing Information Systems.

Data analytics is an important part of extending the functional domain of Marketing Information Systems and offers methodologies to make sense of complex and huge data from various sources (Kaur et al., 2024b). The tremendous growth of digital data generated through social media, e-commerce, and mobile technologies presents challenges to marketers to extract viable insights across multiple channels. The integration of advanced analytical techniques within Marketing Information Systems (MrkIS) has been widely recognized as a catalyst for enhancing the precision and strategic utility of market intelligence (Adewale et al., 2024). Wedel and Kannan (2016) emphasize that methods such as clustering, regression analysis, and predictive modeling are instrumental in extracting actionable insights from complex and voluminous marketing data. When embedded within MrkIS frameworks, these techniques enable more granular segmentation, accurate forecasting, and optimized decision-making processes. This analytical depth not only strengthens the responsiveness of marketing strategies but also reinforces the system's capacity to support data-driven innovation in dynamic market environments. These advancements enable marketing managers to perform precise customer segmentation, evaluate campaign performance rigorously, and allocate resources strategically on data-driven evidence basis.

The integration of streaming data analytics into Marketing Information Systems (MrkIS) represents a significant advancement in enabling agile, data-responsive marketing strategies. Alam et al. (2024) provide a systematic review of stream processing frameworks, emphasizing their capacity to support real-time data ingestion, continuous analysis, and dynamic feedback loops. These capabilities allow MrkIS to facilitate timely strategic adjustments in response to evolving consumer behavior and market conditions. By embedding real-time analytics into MrkIS architectures, organizations can enhance decision-making precision, sustain innovation, and maintain competitive advantage in fast-paced digital environments. Academic literature underscores that the integration of Artificial Intelligence (AI) and data analytics within Marketing Information Systems (MrkIS) significantly strengthens marketing decision-making processes, while simultaneously enabling organizations to deliver personalized customer experiences at scale. This synergistic capability contributes to improved marketing performance and a higher return on investment through data-driven strategic alignment. Hence this

research tests the following hypothesis

H2: Data Analytics positively impacts Marketing Information System.

3.3. Customer Engagement and Marketing Information Systems

Customer engagement constitutes a foundational element in cultivating brand loyalty and sustaining long-term customer relationships. Within this context, Marketing Information Systems (MrkIS) serve as critical enablers of engagement strategies by integrating and operationalizing customer data across diverse touchpoints (Rowi et al., 2024). These systems facilitate the construction of a comprehensive, 360-degree customer profile, thereby empowering marketers to deliver personalized and contextually relevant interactions (Vivek et al., 2014). The integration of artificial intelligence (AI) and advanced data analytics within MrkIS architectures significantly augments their functional capacity, enabling hyper-personalization, predictive modeling, and real-time management of customer interactions.

Empirical evidence underscores the efficacy of AI-enhanced MrkIS in fostering targeted communication, adaptive content dissemination, and anticipatory customer service—all of which contribute to heightened levels of customer attention, engagement, and affective resonance (Inavolu, 2024; Vivek et al., 2014). Moreover, MrkIS play a pivotal role in harmonizing multi-channel engagement efforts, ensuring that brand messaging remains consistent and coherent across platforms such as social media, mobile applications, and web interfaces (Ojha et al., 2024). Scholars have increasingly acknowledged the evolving nature of customer engagement in the digital era, positing that intelligent analytics embedded within MrkIS can transform engagement paradigms from reactive to proactive, thereby enabling organizations to dynamically anticipate and fulfill customer needs (Kaur et al., 2024c).

Accordingly, it is hypothesized that

H3: Marketing Information System positively influences Customer Engagement.

3.4. Marketing Information Systems and the Consumer's Choice

It is widely recognized that the provision of accurate, timely, and contextually relevant information is fundamental to effective customer decision-making. In this regard, advanced Marketing Information Systems (MrkIS) serve as pivotal instruments for enabling such informational

precision (Singh et al., 2025). The integration of artificial intelligence (AI) and data analytics into contemporary MrkIS frameworks has endowed marketing managers with enhanced predictive and prescriptive capabilities, thereby facilitating more informed and strategically sound decisions across key domains such as product development, pricing, promotional planning, and distribution (Shuvo et al., 2025).

Modern MrkIS architectures increasingly incorporate dynamic dashboards and visualization technologies that transform heterogeneous consumer data into actionable insights. These tools significantly alleviate cognitive load and reduce decision-making uncertainty by presenting complex datasets in intuitive and decision-relevant formats. Empirical research further demonstrates that the deployment of machine learning and AI-driven analytical tools within MrkIS environments enables the generation of personalized content, thereby improving the precision of consumer behavior predictions. This, in turn, enhances the effectiveness of customer communication strategies and fosters greater brand loyalty (Kravets et al., 2025).

Moreover, AI-enabled MrkIS enhance organizational responsiveness to evolving market conditions and facilitate the optimization of marketing budgets in alignment with customer expectations and prevailing market trends. Post-purchase feedback analysis, supported by MrkIS functionalities, enables iterative refinement of marketing strategies and contributes to sustained improvements in customer satisfaction (Kaur & Madaan, 2023). Collectively, these developments underscore the strategic significance of data-driven MrkIS in enabling agile, evidence-based marketing decisions that are positively correlated with organizational performance outcomes (Goyal et al., 2023). Accordingly, it is hypothesized that:

H4: Marketing Information System positively influences Customer Decision Making.

4. RESEARCH METHODOLOGY

4.1. Research Design

This study employs a quantitative research design to investigate the impact of Artificial Intelligence (AI) and Data Analytics on Marketing Information Systems (MrkIS) and its subsequent influence on Customer Engagement and Decision Making. Quantitative methods are appropriate given the structured nature of the research objectives, allowing for systematic measurement and statistical analysis of relationships among variables.

4.2. Sampling Design

The target population consists of marketing professionals and decision-makers working in companies operating within Saudi Arabia. A non-probability convenience sampling approach was used to select respondents, ensuring access to relevant participants knowledgeable about the marketing information systems and AI/data analytics applications in their organizations. The sampling aimed to capture diverse industries to reflect varied uses of marketing technologies.

4.3. Data Collection

A structured questionnaire was developed based on validated measurement scales adapted from prior reliable studies to ensure validity and comparability. The questionnaire incorporated the following scales

- Artificial Intelligence scale adapted from Chatterjee et al. (2022).
- Data Analytics scale adapted from Panigyrakis and Chatzipanagiotou (2006).
- Marketing Information Systems scale adapted from Panigyrakis and Chatzipanagiotou (2006).
- Customer Engagement scale adapted from Vivek, Beatty, and Morgan (2014), and Ojha, Bharti, Singh, and Baronia (2024).
- Customer Decision Making scale adapted from Sachdeva (2015).

The questionnaire was distributed electronically to 250 marketing professionals via email and professional networks. Data collection resulted in 155 complete and usable responses, representing a response rate of 62%. The sample size meets the minimum criteria recommended for structural equation modeling analysis, offering sufficient statistical power for model estimation.

4.4. Measurement Scales

All constructs were measured using multiple-item Likert-type scales ranging from 1 (strongly disagree) to 5 (strongly agree). The scales were adapted from multiple established sources to capture the multifaceted nature of each construct accurately. This approach increases the robustness of the measurement model and aligns with best practices in marketing research.

4.5. Data Analysis Method

Data analysis was conducted using SmartPLS (Partial Least Squares Structural Equation Modeling) software. SmartPLS was chosen for this research because:

- It effectively handles complex models with multiple constructs and indicators.
- Suitable for smaller to medium sample sizes such as 155 responses.
- Does not assume normal data distribution, making it flexible for real-world data.
- Provides robust estimates for relationships between latent variables and tests hypotheses through path coefficients, significance values, and variance explained (R^2).
- Enables simultaneous assessment of measurement reliability, validity, and structural relationships, aligning well with the study's comprehensive framework.

5. DATA ANALYSIS

The data obtained from 155 respondents were first submitted to reliability analysis through Cronbach's alpha to find out internal consistency of the measurement scales. The overall Cronbach's alpha coefficient was 0.8, showing a good level of reliability, and reflecting that the items in each construct are coherent measures of the intended variables. After reliability measurement, the data were analyzed by SmartPLS software. The model type selected was Partial Least Squares Structural Equation Modeling (PLS-SEM), which is suitable for complex models with more than one construct and indicator variables. PLS-SEM provides a robust analysis without assuming a normal distribution of the data and is able to handle smaller sample sizes while concurrently testing the measurement model (measurement validity and reliability) and the structural model (hypothesized relationships). This methodological approach brings rigor and robustness to studying the effects of Artificial Intelligence and Data Analytics on Marketing Information Systems and their effects on customer engagement and decision making.

Using the Fornell-Larcker criterion, the constructs' discriminant validity of the research model was tested by comparing the square root of the Average Variance Extracted (AVE) value of each construct with the correlations of constructs. The diagonal values in the table (the square root of AVE) must be greater than the correlations between the constructs in order to be able to establish discriminant validity. However, the Average Variance Extracted (AVE) values square root of the diagonal entries of the matrix are above 0.80 for all constructs (i.e., Artificial Intelligence 0.814, Customer Decision Making 0.842, Customer Engagement 0.832, Data Analytics 0.805, Marketing Information System 0.787), indicating that they all have strong convergent validity.

Table 1: Discriminant Validity (Fornell-Larcker Criterion).

	Artificial Intelligence	Customer Decision Making	Customer Engagement	Data Analytics	Marketing Information System
Artificial Intelligence	0.814				
Customer Decision Making	0.608	0.842			
Customer Engagement	0.596	0.610	0.832		
Data Analytics	0.678	0.579	0.590	0.805	
Marketing Information System	0.676	0.682	0.674	0.559	0.787

Importantly, all of the off-diagonal correlations between constructs are less than their respective diagonal AVE values. For example, the correlation of Artificial Intelligence with Data Analytics is 0.678, which is smaller than its diagonal value of 0.814, verifying these as distinct constructs. In addition, Marketing Information Systems show some moderate correlations with other constructs, e.g., Customer Decision Making (0.682) and Customer Engagement (0.674), all of which are less than the square root of AVE (0.787), supporting the concept of construct uniqueness.

Results show that each construct captures a conceptually separate dimension, supporting the structure of the study and allowing powerful hypothesis testing. The discriminant validity also confirms that Artificial Intelligence, Data Analytics and Marketing Information Systems are distinct but correlated predictors, whereas Customer Engagement and Decision Making are distinct outcome variables. So, the reliability and validity of the measurement model are well supported for further structural analysis.

Table 2: R-square.

	R-square	R-square adjusted
Customer Decision Making	0.465	0.461
Customer Engagement	0.454	0.450
Marketing Information System	0.803	0.800

Table 2 shows R-squared (R²) and adjusted R-squared values of the endogenous constructs in the research model, that is Customer Decision Making, Customer Engagement, and Marketing Information System. R-squared is the amount of variance in the dependent construct that is explained by its predictor variables in the model. The adjusted R-squared adjusts for the number of predictors, giving a better estimate by penalizing model complexity.

In this study, the R² values are 0.465 for the Customer Decision Making, 0.454 for the Customer Engagement, and an exceptionally high 0.803 for the Marketing Information System. Their respective adjusted R² values are 0.461, 0.450 and 0.800, which are only slightly smaller, meaning that there is little penalty for model complexity, and the models are well fit.

According to Hair et al. (2014), R² values of 0.25, 0.50, and 0.75 were found to be interpreted as weak, moderate and substantial explanatory power

respectively. Similarly, Henseler et al. (2009) point out higher R² values to indicate stronger predictive power of the model. In this regard, Marketing Information System has a significant R² of 0.803, meaning that Artificial Intelligence and Data Analytics are together responsible for more than 80% of the variation in the MrkIS construct. Customer Decision Making and Customer Engagement both have moderate explanatory power (R² approximates 0.45), suggesting the MrkIS is a powerful factor, but there may be other forces at work.

Within this analytical framework, the findings indicate that the model robustly captures the effectiveness of Marketing Information Systems facilitated by AI and Data Analytics. Moreover, it elucidates the mechanisms through which this effectiveness translates into tangible impacts on customer engagement and decision-making processes. The large R² for MrkIS validates that AI and data analytics are an important driver, and the

moderate R2 values for customer-related constructs attest to the multifactorial nature of consumer

behavior, which needs to be explored further in future research to identify other drivers.

Table 3: List of Path Coefficients.

	Path coefficients
Artificial Intelligence -> Marketing Information System	0.530
Data Analytics -> Marketing Information System	0.394
Marketing Information System -> Customer Decision Making	0.682
Marketing Information System -> Customer Engagement	0.674

Table 3 lists the path coefficients which show the strength and direction of relationships between constructs in the model. Path coefficients represent the direct influence of one latent variable on another; the values of path coefficients are generally between -1 and +1. According to Hair et al. (2014), larger absolute values mean larger relationships with coefficients over 0.20 being deemed meaningful in social sciences and coefficients over 0.50 being strong.

The path coefficient between Artificial Intelligence and Marketing Information Systems is 0.530 in this study, that showed the strong and positive effect of Artificial Intelligence on MrkIS performance. Data analytics impact on MrkIS has a coefficient of 0.394, which shows a medium but significant contribution. These results contribute to the literature which has identified AI and data analytics as important enabling agents for marketing system capabilities.

Further, Marketing Information System is found to have strong impacts on customer-related outcomes with coefficients of 0.682 in terms of

Customer Decision Making and 0.674 in terms of Customer Engagement. These high path coefficients support the central position of MrkIS in customer behavior, which is consistent with previous studies identifying MrkIS as the crucial mediator that converts technology input into consumers' better daily experience and decision making (Vivek et al., 2014; Sachdeva, 2015).

Together, these path coefficients tell us that the integration of AI and Data Analytics contributes to a significant improvement in MrkIS, which in turn has a significant impact on customer engagement and decision-making. These results further support the theoretical framework linking technology-based marketing systems to customer-focused results and re-emphasize the need for investments in intelligent MrkIS in order to improve marketing performance.

Overall, the empirical results of this research work agree with and expand the literature by quantitatively validating the significant influence of AI and data analytics on MrkIS and downstream impact on consumer engagement and decision making in Saudi context.

Table 4: Model Fit Indices.

	Saturated model	Estimated model
SRMR	0.042	0.045
d_ULS	0.084	0.015
d_G	0.088	0.044
Chi-square	0.618	0.831
NFI	0.961	0.902

Table 4 reports primary model fit indices for both the saturated and estimated models, showing a very good fit between the theoretical model and the empirical data. The Standardized Root Mean Square Residual (SRMR) values (Saturated = 0.042, Estimated = 0.045) are well below the recommended threshold of 0.08, after Hu and Bentler (1999), indicating that the differences between observed and predicted correlations are not significant, so it can be considered that the model has a good fit.

The values of geodesic distance (d_G) and unweighted least squares discrepancy (d_ULS),

which are computed as the average distance between the estimated and observed data matrices, are relatively small. The saturated model gives d_ULS and d_G values of 0.084 and 0.088, respectively, whereas the estimated model predicts even smaller values of 0.015 and 0.044, respectively. According to Henseler et al. (2016), the lower the values in the indices, the better is the representation of the model of the data.

Interestingly, the Chi-square values about 0.618 (saturated) and 0.831 (estimated) point to an exceptionally good fit of the model to the data. Such

low chi-square statistics indicate that the covariance structures are essentially the same in observed and implied sense. This is in line with the widely accepted rules that a non-significant chi-square value ($p > 0.05$) is indicative of a perfect fit of model, but chi-square is best interpreted with caution, due to the sensitivity to sample size and model complexity (Kline, 2015).

In addition, values of the Normed Fit Index (NFI) of 0.961 and 0.902 are well within the range accepted to indicate model fit (Bentler & Bonett, 1980), since values greater than 0.90 are considered to indicate a good-fitting model.

The results of the model fit indices indicate that the proposed structural model in this study is a reliable and a valid model. The acceptable fit matches previous studies done through PLS-SEM technique, showing that the results of this research can be trusted based on the interpretation of the relationships between Artificial Intelligence, Data Analytics, Marketing Information System, Customer Engagement, and Customer Decision Making. This strong model fit validates the theory and empirical findings, in the context of marketing technology integration in the Saudi Arabian context.

Table 5: Cronbach Alpha.

	Cronbach's alpha
Artificial Intelligence	0.873
Customer Decision Making	0.818
Customer Engagement	0.836
Data Analytics	0.891
Marketing Information System	0.846

Table 5 provides the Cronbach's alpha value for the five major constructs in the study: Artificial Intelligence, Customer Decision Making, Customer Engagement, Data Analytics and Marketing Information System. Cronbach's alpha is a frequently used measure of internal consistency reliability which estimates the extent to which a series of items are interrelated in respect to a construct. According to Nunnally and Bernstein (1994), Cronbach's alpha values of 0.70 or greater are considered acceptable, values over 0.80 are good reliability, and values over 0.90 are considered excellent internally consistent.

In this study, the Cronbach's alpha values indicated a range from 0.818 for Customer Decision Making to 0.891 for Data Analytics, with the rest of the constructs - Artificial Intelligence (0.873), Customer Engagement (0.836) and the Marketing Information System (0.846) all lying in the good reliability range. These results indicate that the survey items measuring each construct are measuring what they theoretically are intended to measure and provide reliable data for further analysis.

The high internal consistency is consistent with previous research that stressed the need to use valid and reliable scales to be used in marketing and technology research. In fact, measurement is critical to the credibility of findings, especially when looking at the complex relationships that exist such as between results from AI, Data Analytics, MrkIS and customer outcomes.

Reliability of the constructs was shown to be good which lends validity to the measurement model on

which this study is based. These values give confidence that the scales are capturing the constructs as intended and allowing valid interpretations to be made of the relationships that have been tested. This reliability was as expected from the literature and adds to the methodological rigor of the study in the context of emerging marketing technologies and consumers' behavior in the Saudi context.

Table 6 reports outer loadings of the measurement items for each of the constructs, which express the strength of association between observed indicators and their corresponding latent variables. Loadings are key to assessing the reliability and the validity of measurement items, and values higher than 0.70 are deemed acceptable, meaning that an item adequately reflects the underlying construct.

In this study, all outer loadings are above the 0.70 threshold, from 0.730 for MrkIS to 0.868 for CE7. For Artificial Intelligence, the item loadings are on the order of 0.776 to 0.839; for Customer Decision Making, on the order of 0.781 to 0.866; and for Customer Engagement, on the order of 0.790 to 0.868. Loadings for Data Analytics items range anywhere from 0.774 to 0.856, whereas Marketing Information System items have loadings ranging from 0.730 to 0.829. High loadings point to the fact that every indicator is an adequate measure of the factor it is trying to measure (convergent validity) and that all indicators are measuring the same thing (internal consistency).

Strong outer loadings are in line with best practice in Partial Least Squares Structural Equation

Modeling (PLS-SEM), in which indicators are expected to contribute substantially to measuring constructs and the measurement error is minimized.

The strong loadings allude to the previously validated scales in literature and demonstrate theoretical and empirical consistency.

Table 6: Outer Loadings.

	Outer loadings
AI1 <- Artificial Intelligence	0.776
AI2 <- Artificial Intelligence	0.838
AI3 <- Artificial Intelligence	0.839
AI4 <- Artificial Intelligence	0.808
AI5 <- Artificial Intelligence	0.809
CDM1 <- Customer Decision Making	0.852
CDM2 <- Customer Decision Making	0.854
CDM3 <- Customer Decision Making	0.857
CDM4 <- Customer Decision Making	0.866
CDM5 <- Customer Decision Making	0.781
CDM6 <- Customer Decision Making	0.840
CE1 <- Customer Engagement	0.827
CE2 <- Customer Engagement	0.790
CE3 <- Customer Engagement	0.835
CE4 <- Customer Engagement	0.827
CE5 <- Customer Engagement	0.843
CE6 <- Customer Engagement	0.815
CE7 <- Customer Engagement	0.868
CE8 <- Customer Engagement	0.849
DA1 <- Data Analytics	0.781
DA2 <- Data Analytics	0.840
DA3 <- Data Analytics	0.774
DA4 <- Data Analytics	0.789
DA5 <- Data Analytics	0.856
DA6 <- Data Analytics	0.788
MrkIS1 <- Marketing Information System	0.818
MrkIS2 <- Marketing Information System	0.829
MrkIS3 <- Marketing Information System	0.771
MrkIS4 <- Marketing Information System	0.783
MrkIS5 <- Marketing Information System	0.730

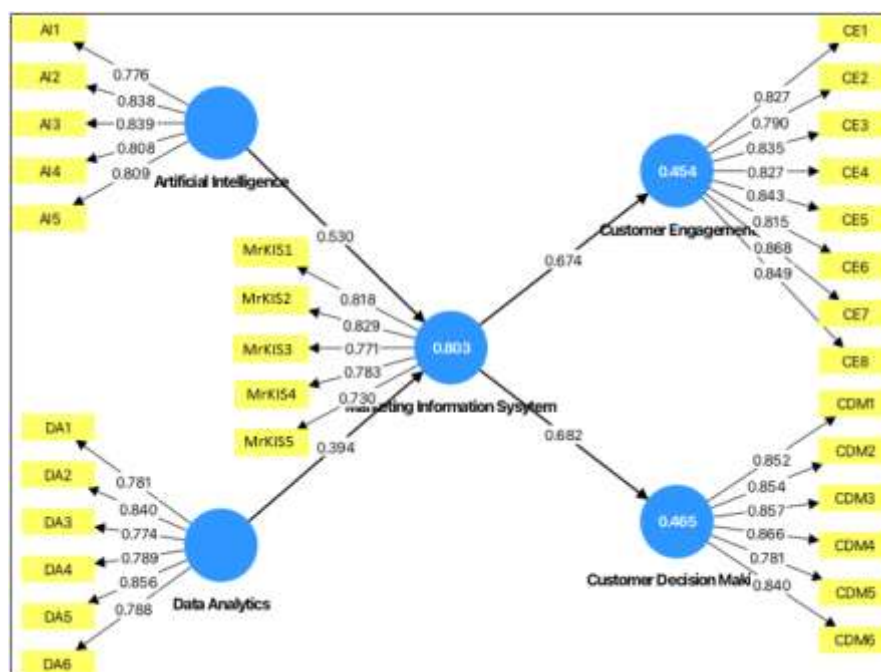


Figure 2: The Model Path Coefficients and R2 (From SmartPLS).

These results constitute strong empirical evidence for the validity of the survey items used as valid indicators of the corresponding constructs. The high outer loadings contribute to the overall credibility of the measurement model and reassured confidently to the structural model analysis. This rigor further bolsters the reliability and accuracy of the study's conclusions on the role of Artificial Intelligence, Data Analytics and Information System Marketing in affecting Customer Engagement and Customer Decision Making in the Saudi Arabian marketing context.

Figure 2 shows the connections between five major concepts of the study: Artificial Intelligence (AI), Data Analytics (DA), Marketing Information Systems (MrkIS), Customer Engagement (CE), Customer Decision Making (CDM). The figure depicts the path coefficients and R2 that illustrate both the measurement model (relations between latent variables and their observed indicators), and the structural model (relations between latent variables).

The Marketing Information Systems (MrkIS) stands as a central node with significant explanatory power (R2 = 0.803) in the middle of the picture. The R2 value describes the variance that is accounted for by Artificial Intelligence and Data Analytics combined as 80.3%, which is a high value for SEM. The Marketing Information Systems then affect two of the key customer outcomes, Customer Engagement (R2 = 0.454) and Customer Decision Making (R2 = 0.465), with this model accounting for about 45.4% and 46.5% of the variance for these customer-oriented constructs, respectively.

The measurement model is strong, as indicated by the loadings for each observed variable (the survey items). For example, the loadings of the five items measuring Artificial Intelligence (AI1 - AI5) are 0.776 - 0.839, whereas the loadings for Data Analytics (DA1

- DA6) items are 0.774 - 0.856, and similar robust loadings are found for the other constructs. These values are above the recommended cut score (0.70) such that all items report test-retest reliability for their latent variable.

Returning to the structural model, several path coefficients are worth highlighting. The correlation between Artificial Intelligence and MrkIS is 0.530 which has a very positive effect. This means that increased levels of artificial intelligence (whether in automation, data processing or smart analytics) result in improved effectiveness and capability of marketing information systems. Similarly, the relationship between Data Analytics and MrkIS is 0.394, indicating that there is a significant, positive impact: the more advanced analytics tools and data-driven techniques are used, the better, the more accurate, and the more actionable the MrkIS performance becomes.

MrkIS has a significant effect on the outcomes. The coefficient from MrkIS to Customer Engagement is 0.674 highlighting the fact that more responsive, data-integrated and robust MrkIS are able to maximize the channels marketers can communicate and engage with their audience. In practical terms, better MrkIS help organizations send more personalized, relevant and timely communications, which in turn extends customer involvement and emotional engagement with the brand.

In addition, the coefficient of MrkIS to Customer Decision Making is 0.682, which suggests a powerful path in which effective MrkIS not only inform but also influence consumer purchase decisions. Simply put, when marketing information systems work in the best possible ways (gather, process, and deliver appropriate and timely data), customers trust marketing messages, are better equipped to make comparative decisions, and are more apt to turn from prospects to buyers.

Table 7: Hypothesis Testing Results for Structural Model Path Coefficients.

Hypothesis	Path Relationship	Path Coefficient	Decision
H1: Artificial Intelligence positively impacts Marketing Information System.	Artificial Intelligence → Marketing Information System	0.530	Accepted
H2: Data Analytics positively impacts Marketing Information System.	Data Analytics → Marketing Information System	0.394	Accepted
H3: Marketing Information System positively influences Customer Engagement.	Marketing Information System → Customer Engagement	0.674	Accepted
H4: Marketing Information System positively influences Customer Decision Making.	Marketing Information System → Customer Decision Making	0.682	Accepted

In the context of the research, these findings strongly evidence the research hypotheses, showing that AI and data analytics play a crucial role in improving the effectiveness of MrkIS, thus

influencing the customer engagement and the decision-making process. In practical terms, this would mean that organizations in the Saudi market, the market where the data were collected, would find

it profitable to invest in the development of advanced AI and analytics capabilities within their marketing systems if they want to be more responsive for consumers and increase sales conversions.

Ultimately, a technologically empowered marketing information system is the intersection between technological investment (AI, analytics) and tangible consumer benefit that increases customers' level of engagement and improves their likelihood of taking decisive actions in response to marketing efforts. The empirically based model provides practical guidance for strategic marketing leadership and digital transformation efforts in today's organizations.

6. CONCLUSION

This research paper examines the effect of Artificial Intelligence (AI) and Data Analytics on Marketing Information Systems (MrKIS) effectiveness and, in turn, their effect on customer engagement and customer decision making in the context of Saudi Arabia. The research methodology is quantitative, the research utilized valid measurement scales, and the analysis of the data was carried out using Partial Least Squares Structural Equation Modeling (PLS-SEM) using SmartPLS software.

The findings of this study support the hypotheses that AI and Data Analytics create a positive effect on marketing information Systems effectiveness in the digital marketing within Saudi Arabia. The introduction of advanced technologies such AI and data analytics into the marketing systems significantly increases their capacity to effectively process, analyze, and use marketing information.

The statistical results support the hypotheses linking Marketing Information Systems to improved customer engagement and customer decision making in Saudi Arabia digital marketing context. Consequently, Marketing Information Systems was identified as a strong mediator of Customer Engagement and Customer Decision Making, demonstrating the central mediating role of Marketing Information Systems between technological inputs that is AI and Data Analytics in one hand and customer centric outcomes that is customer engagement and customer decision making on another hand. Accordingly, this study contributes to the theoretical advancement of technology-mediated customer engagement and decision-making by empirically validating the mediating function of Marketing Information Systems (MrKIS) in converting artificial intelligence and data analytics into customer-oriented outcomes.

By demonstrating the significant impact of AI and

data analytics on the effectiveness of MrKIS, the research offers a more refined conceptual framework for understanding how digital technologies facilitate strategic customer engagement and enhance decision-making processes. Marketing Information Systems enhanced by artificial intelligence (AI) and data analytics (DA) facilitate tailored customer interactions by leveraging large-scale data analysis to uncover distinct behavioral patterns and preferences. This capability enables marketers to deliver personalized content, thereby optimizing strategic outreach and fostering deeper customer engagement.

The measurement model of the study presented robust reliability and validity with high values of Cronbach's alpha and acceptable outer loadings for all the constructs, which was appropriate as per best practices of marketing research and SEM methodology (Kaur et al., 2023). The structural model proved to have a very good fit based on various indices such as SRMR, Chi-Square, and NFI, which proves the theoretical model is robust.

These findings build on the emerging literature on the strategic importance of AI and data-driven analytics to improve marketing information systems (Vivek et al., 2014). The results indicate that organizations in Saudi Arabia can leverage better customer engagement and more effective decision-making by investing in advanced Marketing Information Systems facilitated by AI and analytics. This research fills an important gap in emerging market contexts and offers local knowledge on technology-driven marketing transformation. In conclusion, this research has deepened the understanding of technology-driven marketing practices within the Saudi Arabian market by generating empirically grounded, localized evidence. By anchoring the analysis in a regional framework, it offers context-sensitive insights for practitioners aiming to deploy AI and analytics effectively, while also enriching the global discourse on digital marketing transformation through perspectives shaped by regional specificity.

7. IMPLICATIONS OF THE STUDY

The study has several important implications for theory and practice, especially for businesses operating in the fast digitizing and technology advancing environment of Saudi Arabia. This research makes a theoretical contribution by empirically validating the critical role of Artificial Intelligence (AI) and Data Analytics in increasing the effectiveness of Marketing Information Systems (MrKIS). The results show how AI and data-driven capabilities are key drivers of MrKIS performance

that has a positive impact on customer engagement and decision-making. This builds upon existing academic claims about the symbiotic relationship between AI technologies, data analytics and marketing systems, and provides an important regional context by focusing on Saudi Arabian organizations - an area that has generally been lacking in such research.

From a practical point of view, the study has useful implications for marketing managers and decision-makers. It highlights the importance of Saudi businesses to strategically invest in AI-driven tools and sophisticated data analytics platforms to optimize their marketing information systems. This investment has been demonstrated to improve real-time data processing and predictive analytics, as well as customer profile capabilities that are essential for creating personalized marketing programs that yield stronger engagement and enable more informed customer purchase decision making.

In the Saudi context, these findings speak volumes about the future gains of AI and analytics in shaping Vision 2030 and industrial digital transformation to enable companies to react quickly to market forces,

be more accurate in understanding customer segments and respond to them more culturally and timely via marketing communications. For example, AI-powered segmentation and content personalization can significantly enhance customer experience, leading to increased customer loyalty and conversion rates.

In addition, this research demonstrates the need for combining technological readiness with quality data infrastructure to get the most of AI and data analytics-as suggested by new market research in Saudi Arabia. The study also calls on organizations to adopt not only new technologies but also to focus on data quality, employee training, and cross-functional collaboration to take advantage of digital marketing innovations.

Overall, the results provide strong insights into the necessity of adopting AI and data analytics within Marketing Information Systems frameworks for Saudi enterprises to succeed in today's increasingly digital and competitive landscape. These insights are fueling marketers to embrace a forward-thinking technology-enabled approach as part of their strategic marketing planning.

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