Adopting Generative AI in Digital Marketing Campaigns: An Empirical Study of Drivers and Barriers

Vishvesh Soni
Marketing specialist and market research analyst at Alliage, inc

Abstract

Digital marketing, being a results-driven field, necessitates a clear understanding of the tangible benefits and potential drawbacks of integrating new technologies. Generative AI promises efficiency, scalability, and personalization in content creation, which are key factors in successful digital marketing campaigns. However, concerns such as the complexity of AI systems, the requirement for human oversight, the potential for reduced creativity, and challenges in integration with existing marketing tools pose significant barriers. This study aims to explore the factors influencing the adoption of Generative AI in digital marketing campaigns. A questionnaire survey was conducted among 411 professionals across three roles: Digital Marketing Managers, Content Strategists or Managers, and Social Media Managers. The primary goal was to understand the drivers and barriers affecting the adoption of Generative AI, categorized into three adoption classes: Not Adopted, Undecided, and Adopted. The methodology involved both traditional statistical models (Ordered Choice and Probabilistic models) and machine learning approaches (Decision Tree, Random Forest, SVM, and KNN). The findings from the Ordered Choice model indicate significant positive coefficients for variables like Efficiency and Scalability, Content Generation and Personalization, Cost-effectiveness, Data-Driven Insights and Automated Optimization, and Chatbot Integration and Innovative Campaigns. In contrast, negative coefficients were observed for Complexity and Human Editing Requirement, Risk and Uncertainty, Integration Challenges and Compatibility, Limited Creativity and Idea Generation, and Limited Knowledge of Recent Events. The Probabilistic model echoed similar trends. The machine learning models demonstrated varying degrees of accuracy in predicting adoption classes, with SVM showing the highest accuracy at 83%. The Random Forest and Decision Tree models highlighted the importance of variables such as Efficiency and Scalability, Content Generation and Personalization, and Cost-effectiveness. The study reveals that while efficiency, scalability, and the potential for personalized content generation drive the adoption of Generative AI in digital marketing, concerns about complexity, creativity limitations, and knowledge gaps pose significant barriers.

Keywords: Adoption, Barriers, Content Personalization, Digital Marketing, Drivers, Efficiency and Scalability, Generative AI, Machine Learning Models

Introduction

Digital marketing has evolved from being a mere subtype of traditional marketing into an entirely new domain, characterized by its unique ability to blend customization with broad distribution, aimed at achieving marketing objectives [1], [2]. This transformation is driven by the convergence of technology and the proliferation of digital devices, which have expanded the scope and understanding of internet-based marketing. This evolution has given rise to a modern concept of digital marketing, which is more user-centric, measurable, omnipresent, and interactive, marking a significant shift in how marketing strategies are developed and executed.

In the field of digital marketing, which is fundamentally driven by results, a thorough comprehension of the concrete advantages and potential disadvantages that come with integrating new technologies is crucial. This integration, often led by advancements in data analytics, artificial intelligence (AI), and machine learning, has significantly altered marketing strategies [3], [4]. The use of these technologies provides unparalleled access to

vast consumer data, allowing for highly targeted marketing tactics and enhanced precision in strategy development.

The influence of technology in digital marketing is particularly pronounced in data-driven decision-making. Modern marketing tools offer advanced capabilities for analyzing data, which enables audience segmentation, predictive modeling of consumer behaviors, and real-time campaign adjustments [5], [6]. This focus on data not only improves the efficacy of marketing campaigns but also optimizes return on investment (ROI). The integration of AI and machine learning further automates tasks like ad bidding and content customization, enhancing efficiency. Yet, this extensive use of data brings forth issues related to data accuracy, potential algorithmic biases, and the ethical handling of personal information, presenting challenges that require careful and transparent management [7], [8]. Moreover, the incorporation of new technologies in digital marketing significantly affects customer engagement and experience. Innovations such as augmented reality (AR), virtual reality (VR), and interactive chatbots have introduced novel methods for creating immersive brand experiences, thereby deepening customer engagement and fostering loyalty. These technologies allow marketers to craft distinctive, tailored experiences that resonate with their audiences, leading to increased engagement and conversions [9], [10].

Recently, there has been significant attention on the progress of artificial intelligence (AI), particularly with the advent and swift evolution of publicly accessible AI tools. These developments have elicited a range of responses, from excitement and optimism to caution. At the heart of this shift is the concept of "generative AI," a forefront area in machine learning technologies noted for its exceptional ability to generate new content. This includes a variety of outputs like text, images, music, and video. Generative AI operates by analyzing patterns in existing data to produce new, unique content. Its influence reaches beyond the reach of technology, affecting creative fields, academic circles, and daily social interactions [11]. The ability of generative AI to create new content from existing information represents a significant advancement in the way machines comprehend and interact with the world, increasingly merging the boundaries between human and machine-driven creativity.

A key example of generative AI is the development of Large Language Models (LLMs). These models are a specialized kind of neural network, particularly skilled in handling data that follows a sequence [12]. An LLM functions by predicting the next word in a sequence, using the context of the words that came before. This ability stems from training the model on a vast array of text, which may include varied sources such as Wikipedia, digitized literature, or online materials. This extensive training allows the LLM to understand the statistical relationships between words, enabling it to produce text that is not just grammatically correct but also semantically rich. While the name "large language model" implies a focus on human language, these models are adaptable enough to be used for other sequential data types. They can be employed for tasks like creating protein sequences, composing audio, writing computer code, and devising strategies for games like chess.

The recent advancements in the capabilities and applications of generative AI can be traced back to several key factors. First, there's been a notable increase in the scale of computing power, which has enabled the creation and training of more intricate and advanced models. This development builds on previous breakthroughs in model architecture, which established the groundwork for modern AI models. Another important aspect is the use of

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large amounts of unlabeled data to 'pre-train' these models. This initial training phase is crucial, as it equips the AI with a wide-ranging understanding of knowledge and patterns, which is essential for generating new content [13]. Additionally, enhancements in training methodologies have been significant. These advancements have fine-tuned the learning process, allowing AI models to reach greater accuracy and efficiency in creating content.

Rationale of the study

In recent years, digital marketing has witnessed a paradigm shift, driven by technological advancements and changing consumer behaviors. The advent of Generative AI, with its potential to revolutionize content creation and campaign strategies, presents a new frontier for marketers. However, the adoption of such disruptive technologies is often met with a mix of enthusiasm and skepticism. Understanding the drivers and barriers to Generative AI adoption in digital marketing is critical for both practitioners and scholars. It provides insights into how these technologies can be effectively harnessed to enhance marketing efforts, while also identifying the challenges that need to be addressed to facilitate broader acceptance and implementation. This study aims to fill the gap in current knowledge by empirically investigating these factors among professionals directly involved in digital marketing strategies.

Generative AI, in particular, offers promising enhancements in terms of efficiency, scalability, and personalization in content generation, all of which are pivotal for the success of digital marketing campaigns. However, this technological advancement is not without its barriers to adopt. These include the complex nature of AI systems, the essential need for human supervision, the risk of decreased creativity, and the difficulties in assimilating these technologies within established marketing frameworks. This understanding is crucial for businesses to make informed decisions about adopting these technologies and for developers to tailor AI solutions that align with the needs of the digital marketing industry.

The methodological approach of the study employs a combination of traditional statistical models and modern machine learning techniques. Traditional statistical models offer a structured way to quantify the impact of various factors on the adoption decision, while machine learning models provide a more nuanced understanding of these patterns. By leveraging both approaches, the study aims to offer robust findings into the factors influencing the adoption of Generative AI.

Drivers and barriers

The adoption of Generative AI in digital marketing campaigns is increasingly driven by several compelling factors. Among these, Efficiency and Scalability (E_S) stand out as primary motivators. One of the most prominent drivers for the adoption of Generative AI in digital marketing campaigns is its substantial contribution to efficiency and scalability. Traditional marketing strategies often involve a significant amount of manual effort in conceptualizing, creating, and deploying campaigns, which can be both time-consuming and resource-intensive. Generative AI, however, introduces automation and advanced algorithms that streamline these processes. By harnessing machine learning and natural language processing, Generative AI tools can analyze vast data sets, understand consumer trends, and adapt marketing strategies in real-time. This level of efficiency enables marketers to rapidly scale their campaigns, reaching a wider audience with less effort.

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Moreover, the ability of these AI systems to learn and improve over time ensures that the efficiency and scalability benefits grow continuously, making them an increasingly valuable asset in the competitive field of digital marketing.

Table 1: Share of respondents reporting regular use of generative AI [14]	
Function	**Percentage (%)**
Marketing and Sales	14
Product and/or Service Development	13
Service Operations	10
Risk	4
Strategy and Corporate Finance	4
HR	3
Supply Chain Management	3
Manufacturing	2

The capacity of Generative AI to rapidly produce a wide array of content is a critical driver for its adoption in this field. This technology leverages advanced algorithms to create high-quality, engaging content, ranging from written articles and blog posts to images and videos. The speed and effectiveness with which Generative AI can generate this content are unparalleled, particularly in comparison to the manual creation process. For content-heavy marketing strategies, this means being able to keep up with the relentless demand for fresh, relevant content that resonates with the target audience. Additionally, Generative AI's ability to analyze and adapt to user engagement metrics ensures that the content remains aligned with consumer preferences, enhancing the overall impact and effectiveness of marketing campaigns.

Table 2: Most regularly reported generative AI use cases within function [14]		
Function	**Use Case**	**Percentage (%)**
Marketing and Sales	Crafting first drafts of text documents	9
Marketing and Sales	Personalized marketing	8
Marketing and Sales	Summarizing text documents	8
Product and/or Service Development	Identifying trends in customer needs	7
Product and/or Service Development	Drafting technical documents	5
Product and/or Service Development	Creating new product designs	4
Service Operations	Use of chatbots (e.g., for customer service)	6
Service Operations	Forecasting service trends or anomalies	5
Service Operations	Creating first drafts of documents	5

Budget constraints are a universal consideration in marketing, and the cost-saving potential of Generative AI is a significant factor driving its adoption. By automating various aspects of marketing campaigns, Generative AI reduces the need for extensive human resources, thereby cutting down labor costs. Furthermore, the precision and effectiveness of AI-driven campaigns often result in higher ROI, as these campaigns can be more accurately targeted and personalized, leading to better engagement rates and conversions. This efficiency not only saves money in the short term but also optimizes budget allocation for future campaigns. Additionally, the scalability and continuous learning capabilities of Generative AI mean that the same tools can be used across various campaigns and strategies, further enhancing the cost-effectiveness of this technology in the long term.

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The integration of Generative AI in digital marketing campaigns brings forth the power of data-driven insights and automated optimization, marking a significant shift from traditional, intuition-based marketing strategies. Generative AI excels in processing and analyzing large volumes of data, extracting meaningful insights about consumer behaviors, preferences, and trends. This capability enables marketers to make informed decisions, tailoring their campaigns to better resonate with their target audience. The automated optimization feature of Generative AI can continuously monitors campaign performance, automatically adjusting variables such as ad placements, content, and targeting parameters in real-time to maximize engagement and conversion rates. This level of responsiveness not only enhances the effectiveness of individual campaigns but also contributes to a more dynamic and adaptive overall marketing strategy, grounded in concrete data and responsive to the ever-changing digital landscape.

Another driver for Generative AI adoption in digital marketing is its role in enhancing customer engagement through chatbot integration and innovative campaigns. Chatbots, powered by Generative AI, are revolutionizing customer service and engagement in the digital space. They offer instant, personalized interaction with users, providing support, answering queries, and even facilitating transactions. This level of customer interaction is invaluable in building brand loyalty and improving customer experience. Moreover, Generative AI enables the creation of innovative and interactive marketing campaigns that can engage customers in novel ways. These campaigns often utilize AI-generated content to create immersive experiences, interactive storytelling, and personalized marketing messages, which are more likely to capture and retain consumer interest.

The adoption of Generative AI in digital marketing campaigns can offer businesses a significant competitive advantage. Generative AI allows for more targeted, personalized, and effective marketing strategies, which directly contribute to better customer acquisition and retention rates. By staying ahead of the curve in utilizing AI for data analysis, content creation, and campaign optimization, businesses can position themselves as industry leaders, appealing to tech-savvy consumers and setting new standards in digital marketing.

The table 1 and 2 presented an overview of how generative AI tools are integrated into various business operations [14], with the highest adoption in marketing and sales (14%), followed closely by product and service development (13%), and service operations (10%). Notably less prevalent were the uses in risk management, strategy and corporate finance, HR, supply chain management, and manufacturing, all falling at or below 4%. In terms of specific AI applications, marketing and sales functions commonly use these tools for drafting initial text documents, personalizing marketing efforts, and summarizing texts, each scoring between 8-9%. In product and service development, generative AI helps in identifying customer trends, drafting technical documents, and creating new product designs, whereas service operations deploy AI primarily for chatbots, forecasting trends, and document drafting.

The adoption of Generative AI in digital marketing campaigns faces several significant barriers. One of these is the Complexity and Human Editing Requirement (CHE). Generative AI systems, by their nature, are complex and require a sophisticated understanding of both the technology and the domain in which they are applied. This complexity is not just technical but also conceptual, as the outputs generated by AI must be contextually relevant and aligned with the brand's message. Moreover, the requirement

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for human editing is crucial. AI-generated content often requires human oversight to ensure it meets quality standards and aligns with strategic objectives. This need for human intervention adds layers of time and resource investment, which can be challenging for businesses, especially those with limited expertise in AI or constrained resources.

Another barrier is the Risk and Uncertainty (RU) associated with using Generative AI, including potential factual inaccuracies. AI systems, while advanced, are not infallible and can produce errors or content that is not entirely accurate. This risk is particularly significant in digital marketing, where misinformation can damage a brand's reputation and credibility. Additionally, there is uncertainty regarding how consumers will perceive AI-generated content and whether they will trust and engage with it. The nascent state of regulations around AI-generated content also adds a layer of uncertainty for businesses, as they must operate with uncharted legal and ethical considerations while adopting these technologies.

The third barrier is Limited Creativity and Idea Generation (CL). Generative AI, despite its capabilities, still faces limitations in terms of creativity and the generation of novel ideas. AI algorithms are inherently dependent on the data they are trained on and, as such, can be limited to replicating or recombining existing ideas rather than generating truly innovative concepts. This limitation can be particularly constraining in digital marketing, where creativity and uniqueness are often key differentiators. Businesses might find that while AI can assist in generating a volume of content, the depth and originality required to make a lasting impact on consumers may still rely heavily on human creativity. This inherent limitation of AI in producing truly novel and out-of-the-box ideas poses a challenge for its adoption in the dynamic field of digital marketing.

Integration Challenges and Compatibility (IC). challenges stem from the need to seamlessly incorporate AI tools into existing marketing ecosystems, which often comprise various software platforms and data sources. The compatibility of AI technologies with these diverse systems is not always straightforward. There are technical hurdles in ensuring that AI tools can effectively communicate with and utilize data from existing CRM systems, analytics tools, and content management systems. Furthermore, the integration process often requires substantial customization and fine-tuning to align the AI's output with the company's specific marketing goals and brand voice. This integration complexity can pose a significant barrier, especially for businesses that lack the technical infrastructure or resources to effectively integrate these advanced AI tools into their existing systems.

Generative AI systems are typically trained on existing datasets, which may not include the most recent events or trending topics. This limitation can be particularly problematic in digital marketing, where timeliness and relevance are crucial. AI-generated content might lack the context or awareness of recent developments, making it seem outdated or out of touch. This gap in knowledge can hinder the effectiveness of marketing campaigns, as they fail to resonate with audiences who expect current and topical content.

The Talent and Expertise Requirements (TE) also pose a significant barrier to the adoption of Generative AI in digital marketing. The effective deployment and management of AI tools require a unique blend of skills, including expertise in AI and machine learning, data science, and digital marketing strategies. Finding individuals with this combination of skills can be challenging, and the demand for such talent often exceeds the supply.

Additionally, there is a need for ongoing training and development to keep pace with AI technologies. This talent gap can be a major hindrance for organizations, particularly those that are smaller or have limited resources.

Methods

Data

The questionnaire survey was designed to gather response from 411 professionals, spanning three distinct roles in the digital marketing field: Digital Marketing Managers, Content Strategists or Managers, and Social Media Managers. This diverse group was selected to cover a broad spectrum of experience and perspectives within the industry. The respondents were also sourced from various sectors, including tech startups, established corporations, and independent consultancies, ensuring a well-rounded representation of the field. The data collection process was conducted over a three-month period. 5-point Likert scale was utilized to collect data on the drivers and barriers for the adoption of Generative AI in digital marketing. This scale ranges from 1 (Strongly Disagree) to 5 (Strongly Agree), allowing respondents to express their level of agreement or disagreement with each statement. Before running the analysis, the data collected through this scale were normalized.

Table 3. Questionnaire items for the drivers	
Driver	**Likert Scale Items**
Efficiency and Scalability (E_S)	E_S1: Generative AI significantly increases the speed of our digital marketing processes.
	E_S2: We can manage larger marketing campaigns more effectively with Generative AI.
	E_S3: Generative AI helps in scaling our marketing efforts with ease.
	E_S4: Our organization's overall efficiency has improved due to Generative AI.
Content Generation and Personalization (CGP)	CGP1: Generative AI enables us to create more relevant and personalized content.
	CGP2: We can produce a diverse range of content quickly with Generative AI.
	CGP3: Personalization of content has improved with the use of Generative AI.
	CGP4: Generative AI aids in keeping our content fresh and engaging.
	CGP5: Generative AI helps in understanding audience preferences better for content creation.
Cost-effectiveness (CE)	CE1: The use of Generative AI has reduced our marketing costs.
	CE2: We achieve better ROI with Generative AI in our marketing campaigns.
	CE3: Generative AI is a cost-effective solution for our marketing needs.
	CE4: The cost savings from using Generative AI are significant.
Data-Driven Insights and Automated Optimization (DIO)	DIO1: Generative AI provides valuable insights from marketing data.
	DIO2: Automated optimization through Generative AI improves campaign performance.
	DIO3: We rely on data-driven strategies more effectively because of Generative AI.
	DIO4: Generative AI helps in making informed marketing decisions.
	DIO5: The AI's predictive analytics enhance our marketing strategies.
Chatbot Integration and Innovative Campaigns (CI)	CI1: Integrating chatbots using Generative AI has enhanced customer engagement.
	CI2: Generative AI contributes to the innovation in our marketing campaigns.
	CI3: Our chatbots are more effective and versatile with Generative AI.
	CI4: Generative AI helps us in executing more creative marketing ideas.
Competitive Advantage (CA)	CA1: Generative AI provides us a competitive edge in digital marketing.
	CA2: Our market positioning has improved due to Generative AI.
	CA3: We are better able to adapt to market changes with Generative AI.
	CA4: Generative AI aids in outperforming competitors in key marketing areas.

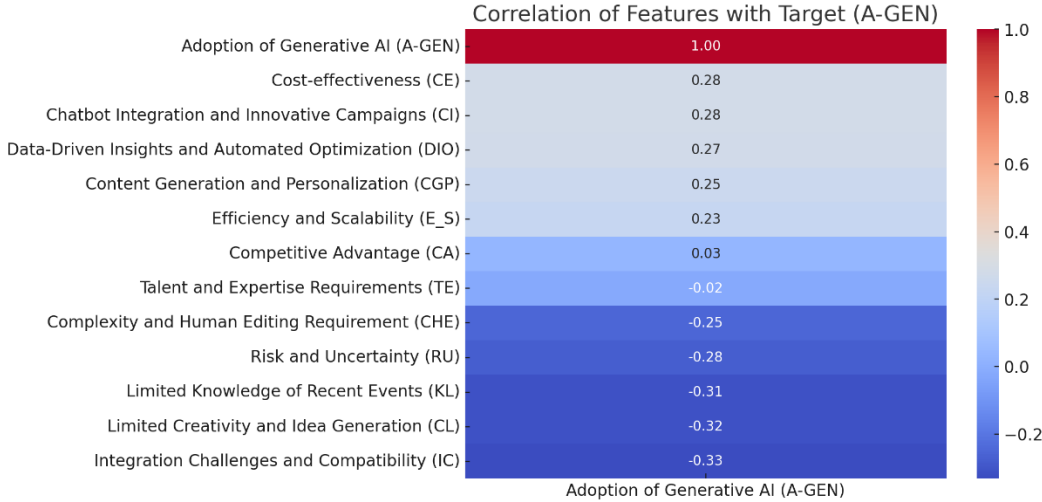| Table 4. Questionnaire items for the barriers	
Barrier (Notation)	**Likert Scale Items**
Complexity and Human Editing Requirement (CHE)	CHE1: The complexity of Generative AI systems is a major challenge for our team.
	CHE2: The need for frequent human editing reduces the efficiency of Generative AI.
	CHE3: Our team struggles with the technical aspects of Generative AI.
	CHE4: The integration of Generative AI requires significant human intervention.
Risk and Uncertainty (Including Factual Inaccuracies) (RU)	RU1: The risk of factual inaccuracies in AI-generated content is a concern.
	RU2: We are uncertain about the reliability of Generative AI.
	RU3: Generative AI poses a risk of misinformation in our campaigns.
	RU4: The unpredictable nature of AI-generated content is a barrier.
	RU5: We are hesitant to rely on AI for critical decision-making due to potential inaccuracies.
Limited Creativity and Idea Generation (CL)	CL1: Generative AI limits the scope of creative ideas.
	CL2: We find AI-generated content to be less innovative.
	CL3: There is a lack of originality in AI-generated marketing strategies.
	CL4: Generative AI restricts human creative inputs.
Integration Challenges and Compatibility (IC)	IC1: Integrating Generative AI with our existing marketing tools is challenging.
	IC2: Compatibility issues arise frequently with Generative AI.
	IC3: The integration process of AI into our systems is cumbersome.
	IC4: We face technical difficulties in seamlessly integrating Generative AI.
Limited Knowledge of Recent Events (KL)	KL1: Generative AI often lacks up-to-date information on recent events.
	KL2: The inability of AI to incorporate the latest trends is a barrier.
	KL3: AI-generated content is sometimes outdated.
	KL4: The lack of real-time updates in AI systems affects our marketing relevance.
Talent and Expertise Requirements (TE)	TE1: Finding skilled professionals to manage Generative AI is challenging.
	TE2: The need for specialized AI expertise is a barrier.
	TE3: There is a lack of sufficient training for our team in using Generative AI.
	TE4: The requirement for ongoing learning and development in AI is a constraint.

Result

The heatmap analysis in figure reveals varying degrees of association between the features and the target variable, Adoption of Generative AI. Notably, Efficiency and Scalability shows a relatively strong positive correlation, suggesting that higher efficiency and scalability are associated with increased adoption of generative AI. In contrast, Limited Creativity and Idea Generation and Risk and Uncertainty exhibit negative correlations, indicating that concerns about creativity limitations and risks might hinder AI adoption. Other features, such as Content Generation and Personalization and Data-Driven Insights and Automated Optimization, demonstrate moderate positive correlations, implying their potential influence in fostering AI adoption.

Table 5 of the Ordered Choice model with logistic distributions provides a detailed analysis of various factors impacting the system's performance. The coefficients for variables such as Efficiency and Scalability (E_S), Content Generation and Personalization (CGP), and Cost-effectiveness (CE) are high, each exceeding 22, which suggests a strong

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positive impact on the model. These factors, along with Data-Driven Insights and Automated Optimization (DIO) and Chatbot Integration and Innovative Campaigns (CI), have significant z-Statistics values over 5, and probabilities less than 0.01, indicating a high level of statistical significance. On the other hand, variables like Complexity and Human Editing Requirement (CHE), Risk and Uncertainty (RU), and Integration Challenges and Compatibility (IC) show negative coefficients, implying a contrasting influence on the model.

Figure 1. correlation between features and with the adoption of Generative AI in digital marketing

Correlation of Features with Target (A-GEN)

Variable	Coefficient
Adoption of Generative AI (A-GEN)	1.00
Cost-effectiveness (CE)	0.28
Chatbot Integration and Innovative Campaigns (CI)	0.28
Data-Driven Insights and Automated Optimization (DIO)	0.27
Content Generation and Personalization (CGP)	0.25
Efficiency and Scalability (E_S)	0.23
Competitive Advantage (CA)	0.03
Talent and Expertise Requirements (TE)	-0.02
Complexity and Human Editing Requirement (CHE)	-0.25
Risk and Uncertainty (RU)	-0.28
Limited Knowledge of Recent Events (KL)	-0.31
Limited Creativity and Idea Generation (CL)	-0.32
Integration Challenges and Compatibility (IC)	-0.33

Adoption of Generative AI (A-GEN)

Table 5. Ordered Choice model with logistic distributions				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
Efficiency and Scalability (E_S)	25.64193	5.053858	5.073733	<0.01
Content Generation and Personalization (CGP)	22.6851	4.343604	5.222645	<0.01
Cost-effectiveness (CE)	22.14532	4.295334	5.155669	<0.01
Data-Driven Insights and Automated Optimization (DIO)	22.4179	4.341995	5.163041	<0.01
Chatbot Integration and Innovative Campaigns (CI)	24.44144	4.631511	5.277207	<0.01
Complexity and Human Editing Requirement (CHE)	-23.2815	4.527466	-5.14228	<0.01
Risk and Uncertainty (RU)	-21.0638	4.215515	-4.99674	<0.01
Integration Challenges and Compatibility (IC)	-22.0212	4.216072	-5.22315	<0.01
Limited Creativity and Idea Generation (CL)	-22.4572	4.485341	-5.00679	<0.01
Limited Knowledge of Recent Events (KL)	-23.0604	4.456637	-5.1744	<0.01
Competitive Advantage (CA)	0.272612	1.186682	0.229726	0.2818
Talent and Expertise Requirements (TE)	-0.01844	1.164777	-0.01583	0.5774
LIMIT_1:C(13)	-21.3134	4.462928	-4.77565	<0.01
LIMIT_2:C(14)	18.31872	3.924174	4.668171	<0.01

Table 6 shows the performance metrics of the Ordered Choice model. The Pseudo R-squared value of 0.908005 is high, suggesting that the model explains a significant portion of the variability in the response variable. The low values in Akaike Information Criterion (0.233597) and Schwarz Criterion (0.370483) indicate a good fit of the model to the data.

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The Log Likelihood value at -34.00411, compared to the Restricted Log Likelihood of -369.6291, and a highly significant LR statistic of 671.2499 (with a probability close to zero) further validate the model's robustness. The model's strong performance is also evident in its convergence after just 10 iterations, emphasizing its efficiency in capturing the underlying data patterns among the 411 observations included.

Table 6. Performance of the ordered choice model			
Pseudo R-squared	0.908005	Akaike info criterion	0.233597
Schwarz criterion	0.370483	Log likelihood	-34.00411
Hannan-Quinn criter.	0.287747	Restr. log likelihood	-369.6291
LR statistic	671.2499	Avg. log likelihood	-0.082735
Prob(LR statistic)	0.000000	Number of ordered indicator values	3
Included observations:	411	Convergence achieved after 10 iterations	
Coefficient covariance computed using observed Hessian			

Table 7 presents the Probabilistic model, revealing different dynamics compared to the Ordered Choice model. Variables like Chatbot Integration and Innovative Campaigns (CI), Content Generation and Personalization (CGP), and Efficiency and Scalability (E_S) show positive coefficients, suggesting beneficial effects on the model. However, the coefficients of these variables are markedly higher than in Table 5, indicating a potentially stronger impact in the probabilistic setting. In contrast, Complexity and Human Editing Requirement (CHE) and Integration Challenges and Compatibility (IC) are notable for their substantial negative coefficients, implying a significant adverse effect. The Probabilistic model also includes variables such as Competitive Advantage (CA) and Talent and Expertise Requirements (TE), which have smaller coefficients and higher probabilities, suggesting a less pronounced influence on the model's outcomes.

Table 7. Probabilistic model				
Variable	Coefficient	Std. Error	z-Statistic	Prob.
Chatbot Integration and Innovative Campaigns (CI)	39.84842	17.71744	2.249107	0.0245
Competitive Advantage (CA)	4.340133	5.432436	0.798929	0.4243
Complexity and Human Editing Requirement (CHE)	-32.13993	13.85457	-2.319807	0.0204
Content Generation and Personalization (CGP)	42.91841	20.57611	2.085837	0.0370
Cost-effectiveness (CE)	38.72088	17.57219	2.203532	0.0276
Data-Driven Insights and Automated Optimization (DIO)	38.93662	18.21985	2.137044	0.0326
Efficiency and Scalability (E_S)	46.39700	20.74312	2.236742	0.0253
Integration Challenges and Compatibility (IC)	-41.28763	19.16142	-2.154727	0.0312
Limited Creativity and Idea Generation (CL)	-31.94973	12.53638	-2.548561	0.0108
Limited Knowledge of Recent Events (KL)	-35.75032	17.17463	-2.081577	0.0374
Risk and Uncertainty (RU)	-44.13194	21.23101	-2.078655	0.0376
Talent and Expertise Requirements (TE)	-5.276629	3.975790	-1.327190	0.1844
C (Constant)	31.55963	13.03163	2.421772	0.0154

The classification report in table 9 provides performance of four machine learning models. The Decision Tree Classifier achieved an accuracy of 52%. In terms of precision, recall, and F1-score for each class, it performed reasonably well, with class 1 having the highest precision at 72% and class 0 having the highest recall at 45%. The macro-average metrics

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indicate balanced performance across all classes, with precision, recall, and F1-score all averaging around 47%. The weighted averages emphasize that precision is slightly higher at 58%, indicating that the model performs better on the majority class.

Table 8. Performance of the probabilistic model			
McFadden R-squared	0.932905	Mean dependent var	0.834416
S.D. dependent var	0.372312	S.E. of regression	0.091107
Akaike info criterion	0.144642	Sum squared resid	2.448646
Schwarz criterion	0.302081	Log likelihood	-9.274858
Hannan-Quinn criter.	0.207593	Deviance	18.54972
Restr. deviance	276.4701	Restr. log likelihood	-138.2351
LR statistic	257.9204	Avg. log likelihood	-0.030113
Prob(LR statistic)	0.000000		

The Random Forest Classifier outperformed the Decision Tree with an accuracy of 70%. Notably, it achieved 100% precision for class 0, but with a low recall of 9%, highlighting potential class imbalance. Class 1 exhibited high precision at 67% and exceptional recall at 98%, resulting in a high F1-score of 80%. The macro-average metrics show balanced performance, with precision, recall, and F1-score averaging around 85%. The weighted averages indicate an overall precision of 77%, reflecting the model's strength in handling class imbalances effectively.

The Support Vector Machine (SVM) model excelled with an accuracy of 83%. It achieved 100% precision for class 0 and 78% precision for class 1, combined with a perfect recall of 100%. This resulted in an impressive F1-score of 88% for class 1. The macro-average metrics demonstrate balanced performance across all classes, with precision, recall, and F1-score averaging around 93%. The weighted averages emphasize an overall precision of 87%, indicating the SVM's strong ability to generalize well. Finally, the K-Nearest Neighbors (KNN) model achieved an accuracy of 72%, with balanced precision and recall values across all classes. The weighted averages reveal an overall precision of 73%, highlighting the model's ability to handle class imbalances effectively while maintaining performance across the categories.

Table 9. Classification report for machine learning models						
Model	Accuracy	Class 0 (Precision, Recall, F1-Score)	Class 1 (Precision, Recall, F1-Score)	Class 2 (Precision, Recall, F1-Score)	Macro Average (Precision, Recall, F1-Score)	Weighted Average (Precision, Recall, F1-Score)
Decision Tree Classifier	52%	28%, 45%, 34%	72%, 52%, 60%	41%, 55%, 47%	47%, 47%, 47%	58%, 52%, 53%
Random Forest Classifier	70%	100%, 9%, 17%	67%, 98%, 80%	89%, 36%, 52%	85%, 48%, 49%	77%, 70%, 64%
Support Vector Machine (SVM)	83%	100%, 36%, 53%	78%, 100%, 88%	100%, 68%, 81%	93%, 68%, 74%	87%, 83%, 81%
K-Nearest Neighbors (KNN)	72%	67%, 18%, 29%	71%, 92%, 80%	80%, 55%, 65%	72%, 55%, 58%	73%, 72%, 69%

Table 10. feature importance		
Category	Decision Tree Importance	Random Forest Importance
Efficiency and Scalability (E_S)	12.27%	9.87%
Content Generation and Personalization (CGP)	8.52%	10.08%
Cost-effectiveness (CE)	10.63%	11.21%
Data-Driven Insights and Automated Optimization (DIO)	15.83%	10.05%
Chatbot Integration and Innovative Campaigns (CI)	3.19%	9.01%
Complexity and Human Editing Requirement (CHE)	9.95%	9.01%
Risk and Uncertainty (RU)	10.06%	8.77%
Limited Creativity and Idea Generation (CL)	9.63%	9.97%
Integration Challenges and Compatibility (IC)	12.45%	11.90%
Limited Knowledge of Recent Events (KL)	7.47%	10.13%

The percentages provided for Decision Tree (DT) and Random Forest (RF) importance in various categories in table 10 shows the prioritization of factors. Notably, Data-Driven Insights and Automated Optimization (DIO) emerges as highly significant, with DT assigning it a weight of 15.83%, while RF attributes 10.05% importance to it. This shows the role of data-driven insights and automation in modern business practices, where harnessing data for optimization is paramount. Similarly, Integration Challenges and Compatibility (IC) shows substantial importance, scoring 12.45% for DT and 11.90% for RF. This suggests the complexities and considerations involved in integrating new systems and ensuring seamless compatibility, a critical aspect for efficient operations.

In contrast, Chatbot Integration and Innovative Campaigns (CI) register comparatively lower importance, with 3.19% for DT and 9.01% for RF. These percentages suggest that while chatbot integration and innovative campaigns hold relevance, they may not carry the same weight as other factors in the decision-making process within the context of the analyzed models. Efficiency and Scalability (E_S) also stand out, with 12.27% for DT and 9.87% for RF, emphasizing the significance of efficient and scalable solutions.

It is worth noting that Cost-effectiveness (CE) and Content Generation and Personalization (CGP) receive relatively high importance scores for both DT and RF, indicating their important roles in optimizing operations and tailoring content to enhance user experiences. On the other hand, Limited Knowledge of Recent Events (KL) ranks lower in importance.

Conclusion

The recent paradigm shifts in digital marketing, largely driven by technological innovation, has prominently featured the emergence of Generative AI. This advancement stands to fundamentally alter the landscape of content creation and campaign strategy, eliciting a mixture of excitement and caution within the industry. A critical aspect of this evolution is understanding the determinants influencing the adoption of Generative AI in digital marketing. Such an understanding is vital, as it sheds light on effective application methods for these technologies to augment marketing initiatives, and identifies key challenges that must be addressed to facilitate broader acceptance and practical

implementation. This study endeavors to enrich the existing body of knowledge by conducting empirical research on these factors among professionals actively engaged in digital marketing strategies.

In the domain of digital marketing, which prioritizes outcomes and efficiency, it is imperative to fully comprehend the potential benefits and inherent challenges associated with the integration of emerging technologies like Generative AI. This technology offers promising enhancements in terms of efficiency, scalability, and personalization in content generation, elements that are crucial for the efficacy of digital marketing campaigns. However, the incorporation of Generative AI also presents significant hurdles, including the intricate nature of AI systems, the indispensable requirement for human supervision, the possibility of diminished creativity, and the challenges of integrating such technologies within established marketing frameworks. Gaining a thorough understanding of these aspects is essential for organizations contemplating the adoption of these technologies and for developers tasked with creating AI solutions that align with the specific requisites of the digital marketing sector.

The variables such as Efficiency and Scalability, Content Generation and Personalization, Cost-effectiveness, Data-Driven Insights and Automated Optimization, and Chatbot Integration and Innovative Campaigns display positive coefficients, indicating a strong and favorable impact on the likelihood of adopting Generative AI in digital marketing campaigns. These variables, characterized by high coefficients and statistically significant z-statistics, highlight the critical importance of operational efficiency, personalized content creation, cost savings, data insights, and innovative campaign integration in driving the adoption of Generative AI technologies.

Conversely, variables like Complexity and Human Editing Requirement, Risk and Uncertainty, Integration Challenges and Compatibility, Limited Creativity and Idea Generation, and Limited Knowledge of Recent Events show negative coefficients. This suggests that these factors pose significant barriers to the adoption of Generative AI. The high magnitude of these coefficients and the corresponding significant z-statistics reinforce the impact these barriers have on decision-making processes in digital marketing. These negative factors reflect the challenges related to the complexity of managing AI tools, the risks associated with potential inaccuracies and uncertainties, integration difficulties, perceived limitations in AI's creative capabilities, and its inability to stay abreast of the latest events.

The Probabilistic model results align with and expand upon these findings. Here, the positive impact of variables like Chatbot Integration and Innovative Campaigns, Content Generation and Personalization, Cost-effectiveness, Data-Driven Insights and Automated Optimization, and Efficiency and Scalability is reaffirmed. The coefficients in this model are higher, suggesting an even more substantial impact on the adoption decision in a probabilistic setting. This reinforces the notion that the capabilities of Generative AI to create innovative and personalized content, provide cost-effective solutions, and offer data-driven insights are highly valued in digital marketing.

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The negative coefficients for Complexity and Human Editing Requirement, Risk and Uncertainty, Integration Challenges and Compatibility, Limited Creativity and Idea Generation, and Limited Knowledge of Recent Events remain consistent in the Probabilistic model. This consistency across models indicates a reliable and significant concern about these barriers within the digital marketing field. These factors represent the apprehensions and challenges that marketers anticipate when considering the integration of Generative AI into their strategies.

Efficiency and Scalability, Data-Driven Insights and Automated Optimization, and Integration Challenges and Compatibility emerge as highly influential in both models, suggesting their critical role in decision-making processes related to Generative AI adoption. The importance percentages vary slightly between the two models. The differing levels of significance among models indicate that a mix of elements affects the implementation of Generative AI in digital marketing. This involves operational, technical, and strategic factors.

References

[1] T. Piñeiro-Otero and X. Martínez-Rolán, "Understanding Digital Marketing—Basics and Actions," in *MBA: Theory and Application of Business and Management Principles*, C. Machado and J. P. Davim, Eds. Cham: Springer International Publishing, 2016, pp. 37–74.

[2] A. Goldfarb and C. Tucker, "Chapter 5 - Digital marketing," in *Handbook of the Economics of Marketing*, vol. 1, J.-P. Dubé and P. E. Rossi, Eds. North-Holland, 2019, pp. 259–290.

[3] A. Charlesworth, "Digital marketing: A practical approach," 2014.

[4] J. Wind and V. Mahajan, "Digital Marketing," *Symphonya Emerg. Issues Manag.*, no. 1, pp. 43–54, Jun. 2002.

[5] A. Parsons, M. Zeisser, and R. Waitman, "Organizing today for the digital marketing of tomorrow," *Journal of Interactive Marketing*, vol. 12, no. 1, pp. 31–46, Feb. 1998.

[6] A. Sawicki, "Digital Marketing," 2016. [Online]. Available: https://bibliotekanauki.pl/articles/1189712.pdf. [Accessed: 07-Jul-2023].

[7] M. Bala and D. Verma, "A Critical Review of Digital Marketing," *(2018). A Critical Review of Digital Marketing …*, 01-Oct-2018.

[8] D. Chaffey and F. Ellis-Chadwick, *Digital Marketing ePub eBook*, 7th ed. London, England: Pearson Education, 2019.

[9] A. Puthussery, *Digital Marketing: An overview*. Mountain View, CA: Notion Press, 2020.

[10] P. K. Kannan and H. "alice" Li, "Digital marketing: A framework, review and research agenda," *International Journal of Research in Marketing*, vol. 34, no. 1, pp. 22–45, Mar. 2017.

[11] D. Oniani *et al.*, "From Military to Healthcare: Adopting and Expanding Ethical Principles for Generative Artificial Intelligence," *arXiv [cs.CY]*, 04-Aug-2023.

[12] W. Badawy, *Generative AI*. Wael Badawy, 2023.

[13] G.-A. Odri and D. J. Yun Yoon, "Detecting generative artificial intelligence in scientific articles: evasion techniques and implications for scientific integrity," *Orthop. Traumatol. Surg. Res.*, p. 103706, Oct. 2023.

[14] M. Chui, L. Yee, B. Hall, and A. Singla, "The state of AI in 2023: Generative AI's breakout year," 2023.