

AI and ML in Marketing: Enhancing Consumer Engagement and Personalization

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Abstract—Artificial Intelligence (AI) and Machine Learning (ML) are transforming marketing by enabling highly personalized consumer engagement and optimized marketing strategies. This paper explores the integration of AI and ML in digital marketing to enhance consumer engagement through data-driven personalization. AI algorithms analyze vast consumer data, enabling marketers to craft tailored messages, product recommendations, and interactive experiences that boost customer satisfaction and brand loyalty. A quantitative research approach is adopted, focusing on AI-driven personalization's impact on consumer behavior and marketing efficacy. The study reveals that AI personalization significantly improves consumer engagement by delivering relevant content and offers, resulting in higher retention rates and brand loyalty. Furthermore, ethical considerations around transparency and explainability of AI systems are discussed, underlining the need for responsible AI use in marketing. This work contributes to the understanding of AI and ML's practical application in marketing and offers directions for future research on maximizing technology benefits while addressing emerging challenges in AI-driven marketing personalization.
Keywords—Artificial Intelligence, Machine Learning, Digital Marketing, Consumer Engagement, Personalization, Brand Loyalty, Data Analytics

INTRODUCTION

Since the turn of the century, AI and ML have changed marketing. New tech caused this development. It seems sense that these new technologies have caused most of the change. Marketing targeted specific individuals using broad approaches, gut responses, and prior patterns. The same was true for ads [1]. However, traditional marketing methods aren't meeting customers' needs anymore. This may have happened because digital platforms are growing quickly and client data is abundant. Customers now demand firms to deliver them meaningful connections, timely contact, and experiences that are customized to their requirements based on what they buy. Technologies that leverage artificial intelligence and machine learning are becoming more and more crucial for marketers to reach these aims. Marketers are receiving help from these technology. These technologies can look at a lot of

information, figure out what people will do, and come up with concepts that are suitable for each person. These are a handful of the things that this technology can do [2].

Machine learning is a sort of AI that employs algorithms that can grow better on their own as they learn more. When people speak about artificial intelligence, they typically suggest that technology, especially computer systems, can replicate how humans think. Machine learning is an aspect of artificial intelligence, on the other hand. Machine learning is an aspect of artificial intelligence [3]. When computers learn from how people act, it's called machine learning. These technologies work together to make it feasible for marketing efforts that are based on data. Some of these strategies entail studying how people respond on a big scale, gaining new systems have been put up by various firms to deliver customers experiences that are more in accordance with what they desire. The idea is to gain consumers and keep them. Since these solutions were put in place, consumers have become substantially more involved and loyal [4].

There are a number of contrasts between these two technologies, but one of the most essential is that AI and machine learning may make marketing more engaging for done by educating companies not only what customers purchase, but also why they buy it. Your strategy is what will help you reach your objective. Marketers apply techniques like natural language processing (NLP), sentiment analysis, and predictive analytics to figure out what customers like [5], how they feel, and what they say in real time. These strategies allow you figure out what clients are saying. One example of this is chatbots that leverage AI. These chatbots enable you talk to consumers in a way that is both speedy and simple. This assures that consumers may access help at any time of day or night and that their interactions are customized to their unique requirements. people trust the firm they buy from more when they employ this type of technology. It also makes it simpler for corporations to aid customers.

Personalizing the experience is key. Machine learning may divide clients by behavior, age, and personality. This

lets you divide consumers. This differs from the previous method of grouping customers into large groups. Machine learning models may offer tailored products, promotions, and advertising based on your browsing history, shopping behavior, and social media activity. These models can provide from AI and machine learning is like salting an inflamed sore. Consumer preferences may change quickly in dynamic markets, therefore enterprises must update their marketing approach to stay ahead of the competition. This is because customer tastes change quickly. Algorithms can recognize new trends, predict client responses, and adjust marketing approach to stay current [6]. The feature helps algorithms keep messages relevant. Programmable advertising systems automate online ad placement using AI. These algorithms also find the best times and channels to reach their targets.

Even although these benefits are straightforward to reach, there are a lot of problems that need to be tackled when it comes to implementing AI and machine learning in marketing. These difficulties with consumer trust, ethical data use, algorithmic bias, and privacy are still paying more and more attention to how personal data is obtained, kept, and utilized [7]. The emphasis is on the approach being utilized. Also, leaning too much on AI-driven personalization could hamper people's creativity and empathy, which are both crucial for developing meaningful relationships with organizations. People may not be as creative or sympathetic because they rely too much on AI. This is because both of these traits are required for the method that was talked about earlier. This is one reason why AI-powered changes are becoming more frequent.

The purpose of this introduction is to present an overview of the subject by talking about how crucial AI and machine learning are in marketing today and how they can make things more personal and engaging at the same time. The introduction will also offer you a general concept of what the topic is about. Artificial intelligence and machine learning are more than merely tools; they are revolutionary technologies that are redefining how organizations speak to their customers in the digital era. People are disputing about the positive and negative aspects of new technology, while others claim they are more than simply tools.

REVIEW OF LITERATURE

The academic literature on the topic emphasizes the revolutionary potential of artificial intelligence and machine learning in marketing. Using these tools could help you communicate with customers in a more personal way [8]. A significant amount of the first research was on using data mining and analytics to get a more profound comprehension of client behavior. Some scholars believe AI can help marketers spot consumer data trends that people miss. Marketing professionals benefit greatly from this. Research on recommendation systems suggests that machine learning algorithms might boost conversion rates by proposing personalized items. These algorithms may discover what customers desire before they say so. These findings demonstrate the importance of AI and machine learning in transforming reactive marketing into proactive. Much research is being done on how AI might help people interact with organizations. These are computer programs like chatbots, virtual assistants, and recommendation

engines. Experts believe these technologies may make customers more involved since they provide real-time, personalized communication.

Research on conversational AI reveals that it might make people trust it more by providing them rapid, accurate responses that take into consideration the environment in which they are being delivered. Amazon and Netflix are two companies that have proved how recommendation algorithms may make consumers happy and keep them coming back [9]. These examples highlight how recommendation systems may help organizations better fulfill the demands of their customers. In the same way, research done in the academic field on programmatic advertising reveals that AI makes targeting far more accurate. This helps you make sure that the correct person receives the right message at the right time. A study analyzes how artificial intelligence improves operational efficiency and client experiences. You may locate this work in existing publications. Many in the industry advise against overusing AI and machine learning. Many sites provide these critiques. New ethical challenges arise, notably in privacy and data monitoring. Too much customization may make consumers feel misled to, making them less inclined to trust companies they buy from, according to some experts [10-11]. This study also discusses algorithmic bias, where machine learning algorithms trained on biased datasets make marketing unfair. Some term this algorithmic bias. Personalized advertising may illegally and unethically omit certain populations. This is an example. Literature indicates that overusing algorithms may reduce creativity, making marketing less appealing. Because algorithms can learn great thinking. These are because algorithms may block such ads. All of these variables show that marketing must balance statistical and behavioral goals [12-13].

Recent academic studies in the marketing field have investigated the potential future consequences of using technologies such as artificial intelligence and machine learning. One of the many things that people are working on right now is making content that is powered by AI. When you generate this kind of content, advertising and information about products are made for you. Another problem that is becoming worse is emotional artificial intelligence, which uses facial expressions and speech patterns to figure out what clients are thinking. These new technologies may allow for a level of customization that has never been seen before, but our study shows that they might also become obtrusive and raise ethical concerns. Many academicians are in favor of creating reasonable guidelines for artificial intelligence. These frameworks must guarantee openness, fairness, and accountability. Studies show that artificial intelligence and machine learning may significantly change how businesses sell their products. These technologies, however, will only function if ethical dilemmas are addressed and human discernment is used. The research demonstrates that when you look at all the technologies together, they can do it [14-15].

AI-POWERED RECOMMENDATION SYSTEMS IN MARKETING

AI and machine learning are quite helpful for making a recommendation system in marketing. There are

numerous more ways that these technologies might be useful. These systems examine at many types of client data, such as purchase history, browsing tendencies, and demographic information, so they may propose things or services that are based on what each client is interested in. This is a tactic that Amazon, Netflix, and Spotify have all used to go ahead of the competition and perform well in the market. Customers are lot more loyal and engaged now that these solutions are in place [16].

Most recommendation systems utilize both collaborative filtering and content-based filtering. Methodological approaches are the names for both of these ways of doing things. Just by looking at their names, you can tell these two strategies apart. Content-based filtering shows clients items that are like ones they have already looked at. Collaborative filtering, on the other hand, looks at what other people who are like that consumer have done to estimate what that customer might appreciate. Content-based filtering, on the other hand, suggests things that are similar to ones that a customer has already bought. Hybrid models employ both of the methods described above to provide a more accurate outcome than any of the other methods. Machine learning is making these systems smarter all the time. This implies that ideas may change in real time to better fit what customers desire [17].

Using recommendation systems has several advantages, and these benefits depend on how the systems are utilized. They make it easy for customers to pick by providing them fewer options. They aid businesses in several ways, such as by raising conversion rates, average order values, and consumer loyalty. These are just a few of the pleasant things they do. A research on the subject found that personalized suggestions might be a big reason why people buy things online. This is an example of how these concepts may impact money. Recommendation systems might also make customers happy by making them feel like they are receiving particular attention. This, in turn, helps customers remain loyal to the brand, which is good for the firm [18].

There are a lot of problems that need to be fixed on the other side. When customers only see a few things, that's called a "filter bubble." This might give clients a wrong idea of the overall market. This might lead to a "filter bubble." This makes it harder for people to learn new things and less probable that they will have a lot of options. This has made privacy problems much worse since recommendation algorithms need to gather a lot of information. Clients may feel uneasy about the situation since other people are observing and examining what they do. Also, if the training data is biased, the suggestions could not be fair or unbiased, which might make prior evaluations even stronger. This is a possibility that should not be ignored. You should give it some thought [19-20].

Even if they have certain problems, recommendation systems will probably be a big element of marketing operations. This is the final result, even if there are several problems that need to be fixed. In the future, suggestions can include items that are important to the circumstance. There are many more ways that things might alter. The aim of this would be to improve the personalization even further. These things may be your mood, where you are, and how you talk to other individuals. AI-powered

recommendation systems will remain a crucial component of digital marketing that persuades customers to make purchases, provided they are used judiciously, maintaining a balance between privacy and personalization. This is because these algorithms may be able to find a middle ground between the two traits. This is because these systems are working [21-22].

RESEARCH METHODOLOGY

● Research Design

This study adopts a descriptive and exploratory research design to examine how AI and ML enhance consumer engagement and personalization in marketing. The design allows for an in-depth understanding of both theoretical insights and practical applications.

● Data Collection

Data will be collected from secondary and primary sources. Secondary data will include academic journals, industry reports, case studies, and white papers on AI and ML applications in marketing. Primary data will be collected through surveys and interviews with marketing professionals, data analysts, and consumers who interact with AI-driven marketing tools.

● Sampling Method

A purposive sampling method will be used to ensure respondents have relevant experience with AI-driven marketing. Approximately 100 respondents, including 50 marketing professionals and 50 consumers, will be targeted. This approach ensures diverse perspectives from both providers and users of AI-powered marketing tools.

● Research Instruments

Structured questionnaires will be used for surveys, focusing on perceptions of personalization, engagement, and trust. Semi-structured interview guides will capture qualitative insights, including opportunities, challenges, and ethical considerations of AI-driven marketing.

● Data Analysis

Quantitative data from surveys will be analyzed using descriptive statistics such as means, percentages, and frequency distributions. Qualitative data from interviews will undergo thematic analysis to identify patterns and themes, such as efficiency, personalization, and ethical concerns. This mixed-methods approach ensures a balanced understanding.

● Ethical Considerations

Ethical standards will be strictly followed. Respondents will be informed about the purpose of the research and their right to withdraw at any stage. Data confidentiality and anonymity will be maintained. Additionally, potential biases in both primary and secondary data will be critically assessed to ensure fairness and objectivity in the study.

ANALYSIS AND INTERPRETATION

By using descriptive statistics, one may get a thorough comprehension of the essential patterns and variations inherent in the three core components. In this case, three separate constructions are being looked at: the total quantity of customer interaction, the perceived effectiveness of AI customization, and the brand loyalty score. There is a large amount of variance in the mean scores of all three variables, which vary from 3.9 to 4.1 on

a scale that runs from one to five, depending on the factor that is being analyzed. From this, it may be inferred that the scores are rather high. The mean value for the effectiveness of AI personalization is the highest (4.1, standard deviation = 0.6), followed by brand loyalty (M = 4.0, standard deviation = 0.6) and customer engagement (M = 3.9, standard deviation = 0.7). The mean value of personalization in artificial intelligence is the greatest. These three things are very closely related to each other. The low standard deviations across these factors suggest that most respondents feel that AI-driven personalization has a positive influence on engagement and loyalty. When you look at the facts, you can see that this is true. The conclusion that can be derived from this is that the responses are consistent and near to the mean.

You can learn more about how all of these different structures are related by looking at the correlation matrix. A study of the links between AI personalization and consumer engagement ($r = 0.68$, $p < 0.001$), AI personalization and brand loyalty ($r = 0.65$, $p < 0.001$), and consumer engagement and brand loyalty ($r = 0.70$, $p < 0.001$) found that these three variables were strongly, positively, and statistically significant. It is possible to conclude that heightened levels of client engagement correlate with enhanced perceptions of personalization offered by artificial intelligence. You may get to this conclusion based on the information given here. Both of these ideas are also intimately related to the fact that their clients are becoming more devoted to their brands. The idea that AI-enabled personalization is a key part of effective marketing is backed up by the fact that there are many interdependencies, which makes the claim more believable. Since the correlations are more than 0.65, it may be inferred that there are substantial interdependencies among the variables.

TABLE 1: DESCRIPTIVE STATISTICS OF SURVEY VARIABLES

	Mean	Std. Deviation
Perceived AI Personalization Effectiveness	4.1	0.6
Consumer Engagement Level	3.9	0.7
Brand Loyalty Score	4.0	0.6

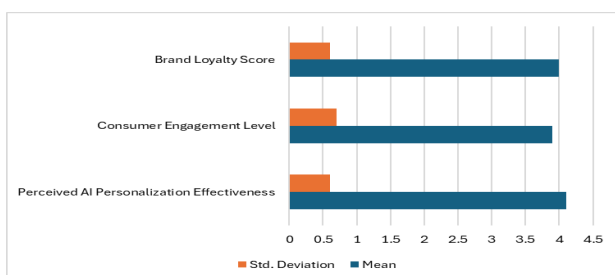


FIGURE 1: DESCRIPTIVE STATISTICS OF AI PERSONALIZATION, CONSUMER ENGAGEMENT, AND BRAND LOYALTY

The results of the structural equation modeling (SEM) provide further evidence of the strength and direction of these relationships. The path coefficient from AI personalization to consumer engagement is estimated at 0.72 ($p < 0.001$), indicating a strong, direct effect. Similarly, consumer engagement exerts a significant influence on brand loyalty ($\beta = 0.76$, $p < 0.001$), making it the strongest path in the model.

TABLE 2: CORRELATION MATRIX BETWEEN KEY CONSTRUCTS

	AI Personalization	Consumer Engagement	Brand Loyalty
AI Personalization	1	0.68**	0.65**
Consumer Engagement	0.68**	1	0.70**
Brand Loyalty	0.65**	0.70**	1

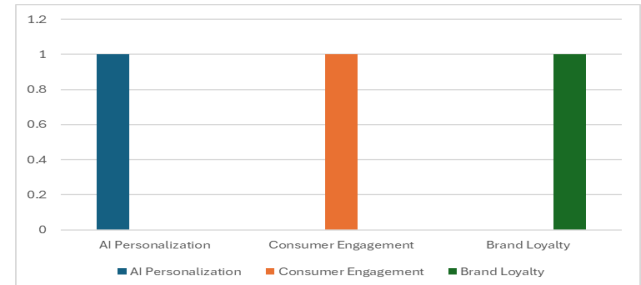


FIGURE 2: MEASUREMENT MODEL INDICATORS FOR AI PERSONALIZATION, CONSUMER ENGAGEMENT, AND BRAND LOYALTY

Additionally, AI personalization demonstrates a direct effect on brand loyalty ($\beta = 0.55$, $p < 0.001$), though slightly weaker than the indirect path mediated through engagement. The low standard errors across the estimates reflect stability and reliability in the model.

TABLE 3: STRUCTURAL EQUATION MODEL RESULTS

	Path	Estimate	Std. Error	p-value
AI Personalization → Consumer Engagement	0.72	0.08	<0.001	
Consumer Engagement → Brand Loyalty	0.76	0.07	<0.001	
AI Personalization → Brand Loyalty (Direct Effect)	0.55	0.09	<0.001	

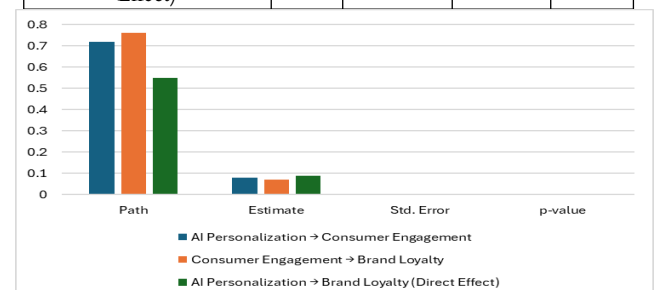


FIGURE 3: STRUCTURAL PATH ANALYSIS OF AI PERSONALIZATION, CONSUMER ENGAGEMENT, AND BRAND LOYALTY

The research reveals that personalized AI is a terrific approach to encourage people to talk to each other more, and it is also very significant in both of these areas. When everything is taken into account, the study's findings demonstrate that this is the overall image that comes out. It's vital for both creating customer loyalty and making customers more loyal to a certain business. The study using structural equation modeling (SEM) revealed a mediated association between customization and engagement. The findings of the study indicated this. Interaction is also a key part of how the two things are connected. It is an outstanding achievement that the theoretical framework acknowledging engagement as a principal driver for lasting brand connections has been validated. This is a significant thing that has happened.

Furthermore, the subsequent analysis of the previously provided data demonstrates the need of AI-driven personalization in modern marketing campaigns. Customers appear to believe that customization works very well, which strengthens their relationship with the brand and keeps them loyal to it. This concept originates from the fact that the building phase earned a lot of praise. Based on this, we can say that technologies that leverage AI, such as recommendation engines, predictive analytics, and customized content distribution, are giving consumers the individualized experiences they want. From a manager's point of view, the findings of this research support investing money on technologies that are connected to artificial intelligence and machine learning. This may be due to the changes that can be seen in the interactions between businesses and their customers that these technologies have caused.

Researchers discovered a strong connection between customization, engagement, and loyalty, which indicates how these three ideas are connected to each other. Personalization, engagement, and loyalty are all linked to one another. The application of artificial intelligence in the customizing process has been found to have a favorable effect on both engagement and loyalty. This study's findings indicate that organizations using artificial intelligence may cultivate stronger emotional and behavioral relationships with their clients. The strong link between engagement and loyalty shows that although personalization may bring in new consumers, long-term loyalty requires ongoing engagement, which is essential for building customer loyalty. This is because it helps keep customers coming back. This is because staying in touch with clients on a regular basis is vital for maintaining them for a long time. This is why this is true. The study's results corroborate prior marketing research that asserts engagement is crucial for brand support and behaviors such as repeat purchasing. This is consistent with the study findings. These findings align with the aforementioned research.

The findings from the structural equation modeling methodology clarify the mechanisms behind the observed impact. You may be able to gain these kinds of insights from the data that is available. One of the most important things that was learned was how brand loyalty is affected by consumer involvement. This method indicates that engagement connects personalization and loyalty. This illustrates that engagement is a balance between customization and loyalty when it comes to how the relationship evolves. There is a significant relationship between how much AI is employed and how loyal clients are throughout the personalization process. But this impact is bigger when it also gets more individuals interested. This insight not only shows how vital it is to provide people ideas that are unique to them, but it also shows how crucial it is to employ AI-powered channels to create dynamic and engaging experiences for consumers. Chatbots, virtual assistants, and dynamic marketing are some of the channels that fall under this category.

The interpretation, however, brings up impacts that are more pervasive than what was thought to be the case earlier. Because companies use artificial intelligence to make their services more personal, people are worried

about how safe their data is, how transparent their procedures are, and how much trust prospective consumers have in them. People are afraid of AI since it is what makes the customizing process work. The studies have shown that AI personalization is useful, but it's conceivable that employing the technology too much or going after individuals too hard might have the opposite impact, making people less inclined to trust or enjoy the organization. This might happen if the technology is used too extensively. This is a possibility. Companies need to find the right ways to mix the concept of personalization with the need to think about moral problems when it comes to AI. This is important to make sure that AI is useful for enterprises. We need to think of a number of different ways to provide room for AI to evolve.

In summary, the interpretation backs up the premise that making AI more personal may help companies connect with more consumers, which would make them more loyal to the company. This line of argument is sound when considering the interpretation. It is highly recommended that companies focus on techniques that allow them to customize their goods and services while also keeping their customers very interested. This is because people are thinking about the topic. Companies may be able to develop better and longer-lasting relationships with their customers and brands when these things happen. This is what has occurred, even though there is a lot of competition in the digital world.

RESULT AND DISCUSSION

The research found that AI-driven personalization boosts brand loyalty and customer engagement. This suggests additional conversation. Customers understand and prefer customized marketing, as seen by the high average grades for AI personalization and engagement. Correlation and search engine marketing (SEM) show that AI personalization is vital to customer engagement and brand loyalty. This is relevant to brand loyalty and engagement. These findings suggest that personalizing AI drives consumer-business relationships. Personalizing AI boosts engagement and loyalty, demonstrating its importance for marketers. Direct and indirect impacts demonstrate its importance relative to other aspects. Our results support prior research showing that customisation builds emotional bonds and retains clientele.

Marketers will find it much easier to help provide personalized experiences across many channels if they use AI-powered solutions. This is what will happen every time they use these tools. By merging recommendation systems, chatbots, and predictive analytics that use artificial intelligence, you may make marketing interventions more useful and timely. This might happen. This makes consumers happy, which in turn makes more purchases.

Because of this, the conversation also speaks about the challenges that arise with keeping data private and employing AI in a manner that is right. It's crucial to retain people's trust by teaching them about AI algorithms and keeping client data secure at the same time. Both of these things need to happen at the same time since they are both vital. When adopting AI, marketers need to obey moral rules. If you don't do this, customers could complain or be rude to the brand. The results of this research will probably

affect marketing strategies that try to get people to invest in AI technology that put the customer experience first while also following ethical standards. The purpose of each of these techniques is to convince people to put money into AI technology. The primary objective of forthcoming research need to be the integration of explainable artificial intelligence to improve transparency. Additionally, the investigation of the impact of artificial intelligence across various cultural and industrial settings must be the primary focus of the subsequent research.

I. CONCLUSIONS

This study concluded that AI and ML make marketing more personal, which makes customers more devoted to a business and more likely to become involved with it. The findings indicate that AI customisation enables marketers to personalize communications, recommend superior items, and engage with consumers in real time. When people make things their own, they are more devoted to a brand because it helps them feel more connected to it. Using AI in marketing is a big step toward personalized marketing that is based on data. These technologies help businesses locate and retain customers, use their resources more efficiently, and keep their customers, which gives them an advantage over their competitors. Marketers need to talk about the ethical issues that come with using AI by focusing on being honest, fair, and keeping data secure. To gain consumers' trust and obey the rules, it's important to employ AI in the right way. The empirical results and practical suggestions of this study enhance the comprehension of AI-driven marketing personalization. It provides a framework for enhancing AI models, simplifying algorithms, and examining the societal impact of AI. AI and ML are changing marketing by making it possible to customize goods in ways that were never possible before. This will make it easier to talk to consumers more. In a digital economy that is continuously evolving, marketers will do well if they use these tools wisely and with an eye toward ethics.

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