

Original Article

Smart marketing and advanced personalization in healthcare services: the role of consumer data in improving patient experience and brand interaction

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Abstract

Background: With the expansion of digital technologies in healthcare, smart marketing has emerged as a data-driven approach that plays a prominent role in enhancing patient experience and improving interaction with healthcare service brands.

Methods: This descriptive-analytical study was conducted in a field setting. The study population consisted of 220 managers and experts in healthcare marketing from healthcare institutions and health-focused companies. Using Cochran's formula, a simple random sample of 140 participants was selected. The data collection tool was a researcher-developed questionnaire, whose validity was confirmed by digital health experts and reliability was verified with a Cronbach's alpha of 0.87. Data analysis was performed using SPSS software and multiple regression analysis.

Results: The Results showed that smart marketing significantly and positively influences patient (customer) experience, explaining approximately 62% of its variance ($\beta = 0.55$, $p < 0.01$). Additionally, brand interaction contributed to 56% of the changes in patient experience ($\beta = 0.44$, $p < 0.01$), while the use of consumer data accounted for 22% of its variation ($\beta = 0.81$, $p < 0.01$). Furthermore, patient experience itself explained 28% of the variance in advanced Personalization, confirming its mediating role in enhancing personalized healthcare delivery.

Conclusion: Data-driven smart marketing in healthcare can facilitate the design of personalized healthcare services, leading to sustainable patient interactions and gaining a competitive advantage in the healthcare market.

Keywords: Digital Health; Health Care Sector; Marketing; Medical Records; Patient Participation.

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Introduction

The marketing world has undergone a major transformation thanks to the rapid advancements in digital technologies and the development of big data in the last decade. In this regard, intelligent marketing and advanced personalization are considered key tools for

improving customer experience and brand engagement with customers. Advanced personalization uses consumer data analytics and artificial intelligence algorithms to create unique and timely experiences for each customer, allowing brands to predict customer needs and

respond accurately and effectively (1). This approach increases customer satisfaction and helps build long-term loyalty (2). Customer experience, as a fundamental component of brand success in today's competitive world, is no longer limited to the quality of the product or service but is increasingly affected by the degree of personalization and data-driven interactions (3).

Contemporary consumers increasingly seek brand interactions characterized by empathy, authenticity, and personal relevance. This goal can only be achieved by analyzing and using consumer data (4). Due to these developments, many companies are using artificial intelligence and machine learning to deliver highly personalized offers and experiences that closely mimic their customers' needs (5). However, using these technologies is associated with challenges. Major challenges in this regard are data integration, user privacy, and avoiding over-automation of personalization (6). In addition, misused data can reduce customer trust in brands (7). Thus, it is essential to design scientific and ethical frameworks for the effective use of data in intelligent marketing. This study seeks to answer the question of how intelligent marketing based

on advanced personalization can use consumer data to improve customer experience and increase brand engagement Figure 1.

Theoretical Framework

The current study is grounded in a multidimensional theoretical framework that integrates concepts from smart marketing, data-driven personalization, and customer experience theories. This framework highlights the interplay between AI-powered marketing strategies, consumer data utilization, and their cumulative effects on patient experience, brand interaction, and advanced personalization in healthcare services.

1. AI-Driven Personalized Marketing

Recent studies emphasize the transformative impact of artificial intelligence in enabling predictive, tailored marketing strategies. Bano et al. (2025) and Thapliyal & Bindal (2025) argue that AI-driven personalization fosters a deeper understanding of consumer preferences, leading to improved targeting, emotional engagement, and trust. In healthcare, this means using digital behavior and health data to develop more responsive, needs-based service offers (1,5).

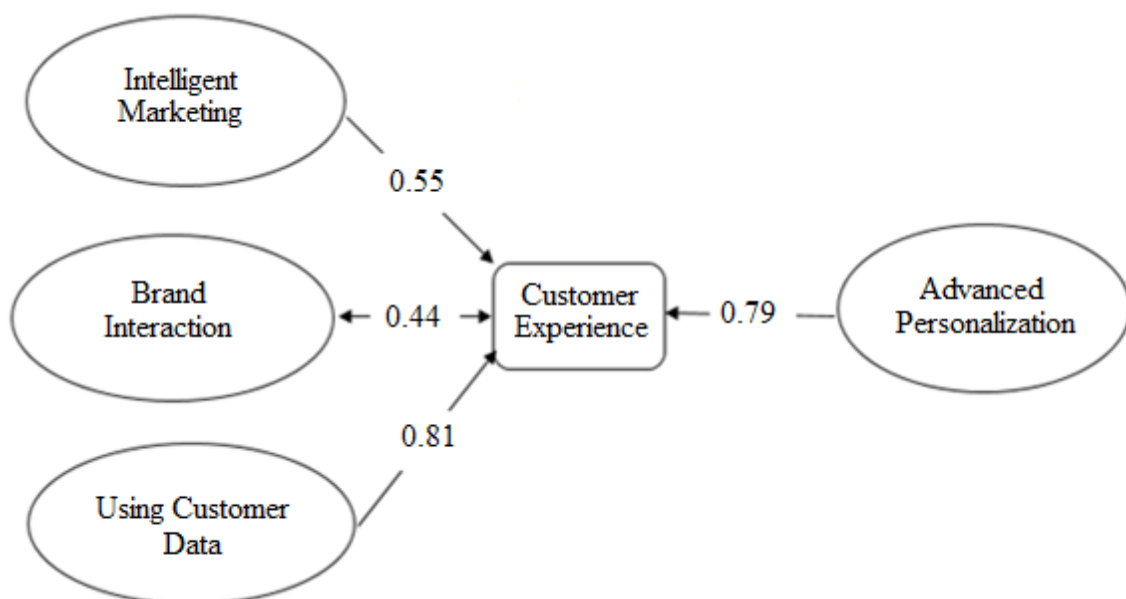


Figure 1. Modeling the relationship between intelligent marketing, advanced personalization, consumer data, customer experience, and brand engagement

2. Personalization Theory

Personalization in marketing has evolved into a critical differentiator in customer-centric environments. According to Chandra et al. (2022), Personalization is not merely about content variation—it involves dynamically adapting offers, channels, and timing based on real-time data (2). Valdez Mendia & Flores-Cuautle (2022) introduce the concept of hyper-Personalization, enabled by big data and AI, which is especially relevant in sensitive and individualized domains like healthcare (4).

3. Customer Experience (CX) Theory

Customer experience is conceptualized as a cumulative perception across various touchpoints during a consumer's interaction with an organization. As Nwosu et al. (2024) suggest, experience is influenced by both rational and emotional elements. In healthcare, Nwosu et al. (2024) highlight that patient experience is shaped by convenience, trust, communication clarity, and perceived responsiveness—factors that AI-enhanced systems can actively optimize (3).

4. Brand Interaction and Engagement

Brand interaction in this framework refers to the depth of a patient's emotional and cognitive involvement with a healthcare brand. Falahati et al. (2025) illustrate how digital engagement, including two-way communication and content Personalization, increases brand loyalty and long-term retention. Brand interaction also plays a mediating role in transforming personalized service into behavioral loyalty (9).

5. Data-Driven Decision-Making and Market Responsiveness

Torabi et al. (2025) and Nurjanti (2025) emphasize the strategic role of data in redefining responsiveness in healthcare marketing. Effective use of patient data supports both operational efficiency and service Personalization, which in turn

enhances perceived value and experience quality (8,7).

Conceptual Model Overview

Based on the above theoretical perspectives, the study proposes a conceptual model in which:

- Smart marketing and consumer data usage act as exogenous variables that directly influence patient experience.
- Brand interaction also contributes significantly to shaping patient experience.
- In turn, patient experience serves as a mediator that enhances the effectiveness of advanced Personalization efforts.

This model aligns with prior findings from Singh & Kaunert (2024), who highlight the importance of real-time feedback loops between AI systems, customer insights, and service adaptation in dynamic digital environments like healthcare.

Methods

Research environment and population

The present study was descriptive and applied regarding its purpose. The study environment was conducted in manufacturing and technology-based companies operating in the field of digital marketing and intelligent marketing strategies. The statistical population of the study included managers and experts operating in these fields. Their number was estimated to be 220 people. The primary goal of this study was to investigate the impact of intelligent marketing and advanced personalization on improving customer experience and brand engagement using consumer data. This study sought to identify effective solutions for utilizing consumer data to create personalized experiences and optimize brand-customer relationships. To select the sample, a convenience random sampling method was used to select a random and unbiased sample from the statistical population. This method allowed the results to be generalized to the larger population. The

sample size was calculated to be 140 people using the Cochran formula.

Calculating the sample size using the Cochran formula

$$n = \frac{N * (z \frac{\alpha}{2})^2 * p * q}{\epsilon^2(N - 1) + (z \frac{\alpha}{2})^2 * p * q}$$

Where:

n=sample size

N= The total number of people in the target population. It was 220 people in this study.

P = The proportion of people who have the desired attribute. Its value was considered to be 0.5 in this study.

Q = The proportion of people who do not have the desired attribute. Its value was considered to be 0.5 in this study.

ϵ = The accuracy of the estimate or the maximum error is the limit. It was considered to be 7 percent in this study.

$z \frac{\alpha}{2}$ = The critical number of the normal distribution at the 95 percent level, because we consider the confidence coefficient to be 95 percent in this study. α will be equal to 0.05. The sample size will be 140 people according to the above formula.

Data collection method

A standard and valid questionnaire was used to collect data. It was designed based on the theoretical foundations of intelligent marketing and advanced personalization.

This questionnaire was evaluated and revised under the supervision of professors and experts in the fields of digital marketing and data analysis to ensure the accuracy and correctness of the tool. The questionnaire's validity was confirmed by reviewing its content by experts in the field of marketing and technology. Cronbach's alpha test was used to measure the reliability of the questionnaire. It was calculated to be 0.83, 0.81, 0.88, 0.79, and 0.75 for intelligent marketing, advanced personalization, consumer data, customer experience, and brand interaction, respectively. The results revealed that the data collection tool has high consistency and acceptable reliability.

Statistical analysis

SPSS-23 software was used to analyze the collected data. Linear regression analysis using the Enter method was used to examine the relationships between the research variables.

Results

Based on Table 1, most of the respondents were aged 30-45 years (55%) and had an employment history of between 5 and 15 years (66%).

Regression analysis was used to examine intelligent marketing and customer experience. The results revealed that about 62% of the changes in the customer experience variable are explained by the intelligent marketing variable with 99% confidence. This result indicates a significant impact of intelligent marketing on improving customer experience.

Table 1. Examining the personal characteristics of respondents

Variable	Class	F	%
Age	20-29 years	45	32
	30-45 years	77	55
	Over 45 years	18	13
	Total	140	100
Employment history	Under 5 years	18	13
	5-15 years	92	66
	Over 15 years	30	21
	Total	140	100

Table 2 shows that the intelligent marketing variable with an impact coefficient of 0.55 can explain a part of the variance in customer experience at the 1% error level. In other words, with a one-unit increase in intelligent marketing, 0.55 units are added to customer experience. This result indicated a significant and positive relationship between intelligent marketing and customer experience.

Table 2. Examining the coefficient of explanation of intelligent marketing variables on customer experience

Variable	Value B	Value Beta	Value T	Sig
Constant	2.27	–	22.23	0.001
Intelligent Marketing	0.91	0.55	20.25	0.001

** Significance at the one percent error level

The results showed that with 99 percent confidence, about 56 percent of the changes in the customer experience variable are explained by brand interaction. These results indicate that the customer's effective interaction with the brand plays a significant role in shaping and improving his experience. Table 3 shows that the brand interaction variable explains 0.44 of the changes in the variance of the customer experience variable at the 1% level. In other words, about 0.44 units are added to the variance of the customer experience with a one-unit increase in the amount of brand interaction. This result indicates that brand interaction significantly and directly affects improving the customer experience.

Table 3. Examining the coefficient of explanation of the brand interaction variable on customer experience

Variable	value B	value Beta	value T	Sig
Constant	0.92	-	17.31	0.001**
Brand Interaction	0.86	0.44	18.22	0.001**

** Significant at the 1% level

The use of consumer data has a statistically significant effect on customer experience, with a correlation coefficient of 0.53 and an R^2 value of 0.22. This means that approximately 22% of the variance in

customer experience is explained by how consumer data is utilized. The F-statistic of 23.17, significant at the 1% level, confirms the strength and reliability of this relationship, suggesting that effective data use meaningfully contributes to enhancing patient or customer experience.

Table 4. Coefficient of Explanation of the Impact of Using Consumer Data on Customer Experience

Variable	B Value	Beta Value	T Value	Sig
Constant	0.59	–	11.32	0.0001
Using Consumer Data	0.96	0.81	15.25	0.0001

The results of table 4 indicate that using consumer data significantly predicts customer experience, with a standardized beta coefficient of 0.81. This implies that a one-unit increase in the use of consumer data leads to a 0.81-unit increase in customer experience. The relationship is statistically significant at the 1% level ($p < 0.0001$), confirming that consumer data analytics plays a key role in shaping positive customer experiences.

The results also revealed that the customer experience variable explains about 28% of the changes in the advanced personalization variable with 99% confidence. These results indicate that as the customer experience improves, the capability and extent of using advanced personalization increases proportionally. In other words, a positive customer experience can pave the way for a brand to provide more personalized services or products. Table 5 shows that customer experience explains about 0.79% of the changes in the advanced personalization variable at the 1% error level. In other words, if the customer experience variable increases by one unit, the variance of advanced personalization increases by 0.79 units. This result suggests the significant role of customer experience in predicting and improving the level of personalization of services or products provided by the brand.

Table 5. Examining the coefficient of explanation of the customer experience variable on advanced personalization

Variable	value B	value Beta	T value	Sig
Constant	0.55	-	11.42	0.0001**
Advanced Personalization	0.93	0.79	16.23	0.0001**

** Significance at the 1% error level

Discussion

The present study investigated the impact of intelligent marketing, brand engagement, the use of consumer data, and advanced personalization on customer experience. The results of regression analysis provide strong evidence of the impact of these factors on improving customer experience and brand engagement with customers.

The results of the analyses showed that the intelligent marketing variable, with an impact coefficient of 0.55, positively and significantly affected customer experience at a 99% confidence level and explains about 62% of the changes in customer experience. Additionally, brand engagement could explain about 56% of the changes in customer experience and its impact coefficient was reported to be 0.44, indicating a positive and significant impact of this variable on improving customer experience. The results of the analyses also revealed that the use of consumer data, with an impact coefficient of 0.81, could explain about 22% of the changes in customer experience, confirming the important role of data-driven marketing (8). The studies revealed that customer experience positively and significantly affected advanced personalization, so this variable could explain about 28 percent of the changes in advanced personalization, and its impact coefficient was obtained as 0.79. This result indicates that as the customer experience improves, the usability of advanced personalization increases proportionally. The results of this study are also consistent with the results of studies by Bano et al. (1), Chandra et al. (2), Nwosu et al. (3), Valdez Mendia & Flores-Cuautle (4), and Thapliyal & Bindal (5). It can be

concluded that intelligent marketing, effective interaction with the brand, and purposeful use of consumer data play a key role in improving the customer experience and this positive experience will pave the way for improving the level of personalization of services and products in brand interactions.

The results suggest that 62% of the changes in customer experience are explained by the variable of intelligent marketing. This significant relationship, with 99% confidence, indicates the vital role of intelligent marketing strategies in shaping customers' perceptions and improving their overall experience with the brand. The regression coefficient ($B=0.91$) indicates that customer experience increases by 0.55 units with a one-unit increase in intelligent marketing. This positive and significant relationship emphasizes the potential of data-driven marketing strategies to enhance customer satisfaction and loyalty. Intelligent marketing creates deeper and more personalized connections with customers by analyzing and responding to customer behaviors, leading to improved customer experience (8, 9).

These results are consistent with those of previous studies, indicating that marketing strategies that use real-world data and personalized offers have a significant impact on creating more engaging customer experiences. Brands that use consumer data to tailor their communications and offers can create a sense of relevance and personal attention in customers, leading to an enhanced experience (10).

The results also showed that 56% of the changes in customer experience are explained by brand engagement, highlighting the importance of ongoing and meaningful interaction between customers and the brand. Regression analysis indicates that a one-unit increase in brand engagement causes a 0.44-unit increase in customer experience. This finding highlights the importance of proactive and personalized brand engagement to improve

customer experience. These results are in line with those of existing studies in the field of brand management, emphasizing that positive and ongoing brand engagement leads to increased customer loyalty and satisfaction. Brands that actively engage with their customers through social media, personalized messaging, or customer support are likely to be more trusted and popular brands. Effective brand engagement creates a two-way relationship in which customers feel valued, which directly affects their overall experience (11, 12).

The analysis showed that 22 percent of the changes in customer experience are explained by the use of consumer data. This result indicates that effective use of consumer data is vital for understanding customers' needs and preferences and plays a fundamental role in shaping their experience. With a regression coefficient of 0.96, the results show that every one-unit increase in the use of consumer data leads to a 0.81-unit increase in customer experience, highlighting the importance of data-driven decision-making in modern marketing. The ability to collect, analyze, and apply consumer data enables brands to more accurately respond to customer needs and deliver more personalized experiences. These findings are consistent with those of previous studies that showed that businesses that use data analytics to optimize their products and services could increase customer satisfaction (13, 14).

The study also investigated the relationship between customer experience and advanced personalization. The results revealed that customer experience explained 28% of the changes in advanced personalization. The regression coefficient of 0.93 indicates that as the customer experience improves, the capability and level of the adoption of advanced personalization also increases. This result indicates the positive impact of customer experience on the promotion of personalized services and products. Personalization, which is based on positive

customer experiences, creates a feedback cycle in which satisfied customers are more likely to pay attention to personalized offers, enhancing their experience. This interrelationship between customer experience and personalization highlights the importance of continuously improving the customer experience to develop personalized services or products (15, 16).

The results emphasized the critical role of intelligent marketing, brand engagement, the use of consumer data, and advanced personalization in improving the customer experience. Companies investing in these areas are likely to experience improvements in customer satisfaction, loyalty, and brand equity. Brands should prioritize using consumer data to create personalized experiences, promote ongoing and effective brand interactions, and implement intelligent marketing strategies. Additionally, brands should use customer experience as the basis for developing their personalization strategies as personalization continues to be a key factor in customer acquisition and retention. This approach increases customer satisfaction and strengthens the long-term relationship between the customer and the brand (17, 18).

It is important to acknowledge that while the study demonstrated a significant relationship between smart marketing, consumer data usage, and customer experience, the model may have overlooked certain potential confounding variables that could have influenced the results. These unaccounted variables include factors such as patients' prior expectations from healthcare services, the perceived or actual quality of clinical care received, the level of individual health literacy, emotional state during service interaction, and socio-demographic characteristics such as age, income, education level, or digital literacy.

Each of these variables can independently or interactively shape how patients perceive their experience, regardless of marketing

efforts or data Personalization. For instance, patients with higher health literacy may respond more positively to personalized messages due to better comprehension and perceived relevance, while those with lower digital literacy might not engage effectively with smart marketing content.

Failing to control for such factors could introduce bias or limit the generalizability of the findings. Future research is encouraged to incorporate these variables as control factors to better isolate the effects of smart marketing strategies on patient experience and brand interaction outcomes.

Conclusion

This study provides strong empirical evidence on the impact of intelligent marketing, brand engagement, the use of consumer data, and advanced personalization on customer experience. Brands can improve customer experience, brand engagement, and overall satisfaction, thereby strengthening their competitive position in the market by adopting data-driven and personalized marketing strategies. These results provide valuable insights for experts and managers seeking to optimize their marketing efforts and create meaningful experiences for customers in a digital and data-driven world.

Recommendations

Consistent with the study results, the following practical recommendations are presented to improve the customer experience, promote brand engagement, and effectively use intelligent marketing. Purposeful use of consumer data: organizations and brands can provide personalized offers and a unique experience for each user by analyzing behavioral data, interests, and customer purchase history, leading to increased customer loyalty. Investing in intelligent marketing: brands can predict customer needs and provide services and products tailored to them by utilizing artificial intelligence, machine

learning, and predictive analytics technologies. Enhancing two-way customer interaction: Creating platforms for direct dialogue, receiving feedback, and customer participation in the development of products and services can play an effective role in improving the overall customer experience and increasing the sense of belonging to the brand.

Author's contribution

Mehrdad Tarassoli and Mohammad Farid Ashouri developed the study concept and design. Mehrdad Tarassoli and Mohammad Farid Ashouri acquired the data. Mehrdad Tarassoli and Mohammad Farid Ashouri analyzed and interpreted the data, and wrote the first draft of the manuscript. All authors contributed to the intellectual content, manuscript editing and read and approved the final manuscript.

Informed consent

Questionnaires were filled with the participants' satisfaction and written consent was obtained from the participants in this study.

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Conflict of interest

The authors declare that they have no conflict of interests.

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