

## Research on Marketing Strategies Management based on Big Data

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**Abstract:** Organizations in the digital transformation age implement big data technology for marketing strategy innovation because of its ability to drive breakthroughs in the field. The paper studies how big data abilities help strategic marketing management through data-based choices that lead to better customer retention and strengthened brand image while penetrating target markets. The study presents evidence about big data's contribution to boosting product placement performance and developing pricing plans and marketing initiatives by examining present academic works and real-world examples. Researchers found that complete implementation of big data is hindered by the issues of data privacy alongside problems with infrastructure and a lack of suitable skills. The text presents a data-based structure to achieve successful strategic marketing management within markets that face dynamic competition conditions.

**Keywords:** Big Data, Marketing Strategy, Data-Driven Marketing, Customer Insights, Predictive Analytics, Digital Transformation, Strategic Management

### INTRODUCTION

Massive market transformation emerged because big data technology entered and blended into the marketing field during recent years. Research methods that used to base their strategies on customers' feedback from the past combined with population-wide statistics are now giving way to data-based models that perform predictive analyses and real-time adaptations. A fast-changing consumer market combined with daily increasing business competition demands enterprise agility and intelligence which big data analytics bring for companies to stay competitive [1].

Big data describes extensive and complex datasets produced through rapid information expansion from various sources consisting of social media platforms and online transactions together with customer service records and mobile applications running on IoT devices and web browsing activities. Data of various scales is distinguished by the essential elements known as volume, velocity and variety while veracity and value can sometimes also become part of the classification. Such data management under traditional methods shows inefficiency and complete inability to handle the data [12].

The embrace of big data by marketing departments enables companies to obtain a deeper knowledge of their customers and how they should interact with them. It reveals specific details about what customers do and think and which products they have purchased making possible customized marketing approaches. Companies now forecast customer demands before the customer declares their needs through advanced technology that seemed inconceivable in the past.

The industry leaders Amazon, Netflix and Google demonstrate perfect utilization of big data for highly-customized experiences and optimized supply networks as well as improved value propositions [3].

The measuring capability of marketing campaign effectiveness strongly depends on big data processing. The application of big data enables companies to change strategies wisely through accurate budgeting and enhance their marketing return on investment.

The use of natural language processing (NLP) enables dominant brands to track public opinion through analysis of consumer discussions about products regardless of the platform users choose including tweets and product reviews and blog comments. The approach allows businesses to deal with reputation issues while delivering fast customer support and optimizing their campaigns using genuine user information [5].

The general adoption of big data remains limited because departments struggle to unify data and because technical abilities are required, infrastructure expenses are high and there are privacy issues related to data security. Small businesses experience difficulties when trying to access technology and expertise at same level as larger companies. Data privacy concerns brought about ethical dilemmas which led to the implementation of GDPR requirements that force companies to manage data use against privacy protection needs [10-11].

The paper investigates the complete impact of big data on

current marketing strategy management practices. The examination expands its analysis to identify business implementation challenges related to big data while presenting strategic guidelines for integration.

The study draws its multidimensional views about big data marketing applications through a combined analysis of marketing professional input and successful business case studies alongside literature review. Through this work the authors expand knowledge about digital transformation led by data analytics which transforms both business models and value creation principles within marketing.

### **Novelty and Contribution**

This research makes an original discovery by constructing an extensive systematic framework which combines big data analysis for understanding marketing strategies to connect theoretical concepts with practical implementations. The study presents a unified structure which links individual research components of data mining and customer segmentation and campaign analytics to strategic marketing operations. The study explains both the specific tools employed within big data while detailing performance and decision-making influences of these tools [6].

- A main achievement of this research is creating a data-driven strategic marketing model which joins organization objectives to useful insights obtained from big data analysis. The model provides guidance to marketers to complete an entire strategic pipeline that begins with data gathering and preparation and finally arrives at insight development and execution. The strategic marketing model shows adaptability for multiple sectors and company scales from big to small businesses including small and medium enterprises.
- The academic contribution contains special attention to both ethical decision making and proper data management throughout marketing plan development. Our study fills a research gap since it focuses on implementing clear data practices which both comply with regulations and offer user-friendly experiences to consumers. The research design predicts both regulatory standards and customer expectations of the future.
- The paper integrates real-world examples of how leaders in the business world effectively use big data methodology (such as Netflix and Amazon and Starbucks) to offer practical lessons adaptable by organizations across various sectors.

These research findings create an actionable guide for organizations aiming to shift towards data-driven marketing which makes this work both right on time and produces significant effects in the digital age.

### **II. Related Works**

Businesses now use big data capabilities to advance their marketing strategies through new creation methods and implementation techniques as well as evaluation approaches. The influence of big data on strategic

marketing management has become an extensive research subject that focuses on business utilization of data analytics for better customer insight and market reactions. Vegetable market research demonstrates how big data optimizes business operations across all marketing subfields including segmentation, targeting, pricing, promotion and customer retention strategies.

In 2021 S. Akter et.al., M. A. Hossain et.al., Q. Lu et.al., and S. M. R. Shams et.al., [4] Introduce the literature extensively delves into the application of big data for creating customer segments. Prior to segmentation methods marketers categorized their audience through broad demographic information lined up with low success rates in targeting each specific customer.

Predictive analytics emerges as a frequent component in academic studies about marketing. Businesses using this predictive methodology have an upper hand in markets with high market volatility since they no longer must rely on delayed reactive approaches. The application of predictive analytics brings substantial results to retail industries by fighting customer defections while enhancing price structure designs and enhancing inventory preparation processes.

In 2020 Gnizy et.al., [2] Introduce the researchers study the combination process of social media data with email data and website data and mobile application data for obtaining detailed customer journey information. Businesses utilize big data strength to produce immediate strategic decisions by changing their marketing plans with current performance metrics.

Big data technology allows enterprises to develop fully automated marketing procedures to generate leads and accept new customers while managing loyalty programs. Companies obtaining marketing operation expansion potential through data-based automation achieve better results by maintaining personalized strategies that focus on their target audience.

Businesses assess both public opinion and their brand reputation by analyzing text produced from product reviews and social media platforms together with text from support conversation channels. Organizations deploy this tool for detecting negative public emotions and creating quick responses as well as discovering emerging problems to share positive branding perspectives. The analysis of sentimental data through big data methods enables businesses to strengthen their brand performance which leads to increased customer loyalty in competitive market conditions.

Many studies focus on big data advantages in their scholarly works although these studies also investigate marketing implementation issues. Most marketing executives experience their main difficulties stemming from a combination of poor data quality along with integration troubles from advanced technological challenges. Successful decision-making depends on multichannel customer data which regularly sits between

departmental systems and databases. Several experts recognize that complex data analytic and marketable marketing approach development face challenges due to deficient personnel with advanced skills.

In 2020 D. Ma et.al. and J. Hu et.al., [9] Introduce the recent academic studies focus their research investigations on topics related to ethical regulations throughout multiple investigations. Scientific evidence reveals business organizations need complete data transparency with GDPR compliance to gain customer confidence through responsible data handling. Present-day businesses understand that value-based data handling satisfies their legal obligations and delivers market advantages by letting their customers control their privacy.

Big businesses deploy big data applications in a distinct manner from small-to-medium enterprises (SMEs) when performing marketing activities. Large businesses surpass small organizations in big data infrastructure investment because of their superior financial power and technological capabilities in addition to their restricted resources. Research findings show open-source alongside cloud-based solutions are increasing in popularity because they assist smaller enterprises to access big data capabilities.

## RESEARCH METHODOLOGY

The proposed method provides guidelines for business integration of big data analytics into marketing strategy management through five successive steps. The different stages use mathematical approaches with specified algorithms and decision models to extract meaningful business insights from large datasets [7].

### A. Phase 1: Data Acquisition

Data collection begins with retrieving information from multiple resources consisting of CRM systems, e-commerce platforms, social media interactions along with data from IoT devices, web analytics platforms. Data acquisition pipelines need to be established because the incoming data streams contain high volumes of data with varied formats.

Let  $D_t$  represent the total volume of data collected at time  $t$  :

$$D_t = \sum_{i=1}^n s_i(t)$$

where  $s_i(t)$  is the size of the  $i^{th}$  data stream at time  $t$ , and  $n$  is the number of data sources. The equation ensures scalable and real-time monitoring of incoming data flow, necessary for maintaining up-to-date marketing decisions.

### B. Phase 2: Data Preprocessing

Data collection starts from gathering information from diverse platforms such as CRM systems, e-commerce platforms, social media interactions and IoT devices and web analytics platforms. Data acquisition pipelines need to be created because incoming datasets include multiple formats and extensive data quantities.

The normalization function for a feature  $x$  in a dataset is defined as:

$$x' = \frac{x - \mu}{\sigma}$$

where  $\mu$  is the mean and  $\sigma$  is the standard deviation of the feature values. This step ensures all features are centered and scaled, improving algorithm convergence.

To address missing values, the imputation technique used can be expressed as:

$$x_{i,j} = \frac{1}{k} \sum_{m=1}^k x_{m,j}$$

Here,  $x_{i,j}$  is the missing value of the  $j^{th}$  attribute in the  $i^{th}$  record, and the summation considers the average over the  $k$  nearest neighbors.

### C. Phase 3: Analytical Modeling

This phase focuses on applying statistical and machine learning models to uncover patterns in customer behavior and predict outcomes. The process begins with defining marketing objectives (e.g., customer retention, campaign ROI, product recommendation), followed by training predictive models.

A logistic regression model for customer conversion prediction can be defined as:

$$P(y = 1 | X) = \frac{1}{1 + e^{-(\beta_0 + \beta_1 x_1 + \dots + \beta_n x_n)}}$$

where  $X$  represents the feature set and  $\beta$  are the model coefficients.

A customer lifetime value (CLV) model can be expressed using the formula:

$$CLV = \sum_{t=1}^T \frac{R_t - C_t}{(1 + d)^t}$$

Where:

- $R_t$  is revenue from customer at time  $t$
- $C_t$  is cost incurred
- $d$  is the discount rate
- $T$  is the customer lifespan in periods

Clustering techniques such as K -means are used to segment customers based on behavior:

$$\arg \min_c \sum_{i=1}^k \sum_{x \in C_i} \|x - \mu_i\|^2$$

where  $C_i$  is the cluster and  $\mu_i$  is the cluster centroid.

### D. Phase 4: Strategic Integration

After the analytical models yield insights, these are translated into actionable marketing strategies. For example, high CLV segments are targeted with loyalty programs, while low-conversion segments are offered

personalized discounts.

The optimization of marketing campaign allocation can be formulated as:

$$\max \sum_{i=1}^n R_i \cdot A_i \text{ subject to } \sum_{i=1}^n C_i \cdot A_i \leq B$$

Where:

- $R_i$  : expected return from campaign  $i$
- $C_i$  : cost of campaign  $i$
- $A_i \in \{0,1\}$  : decision variable (run or not)
- $B$  : total marketing budget

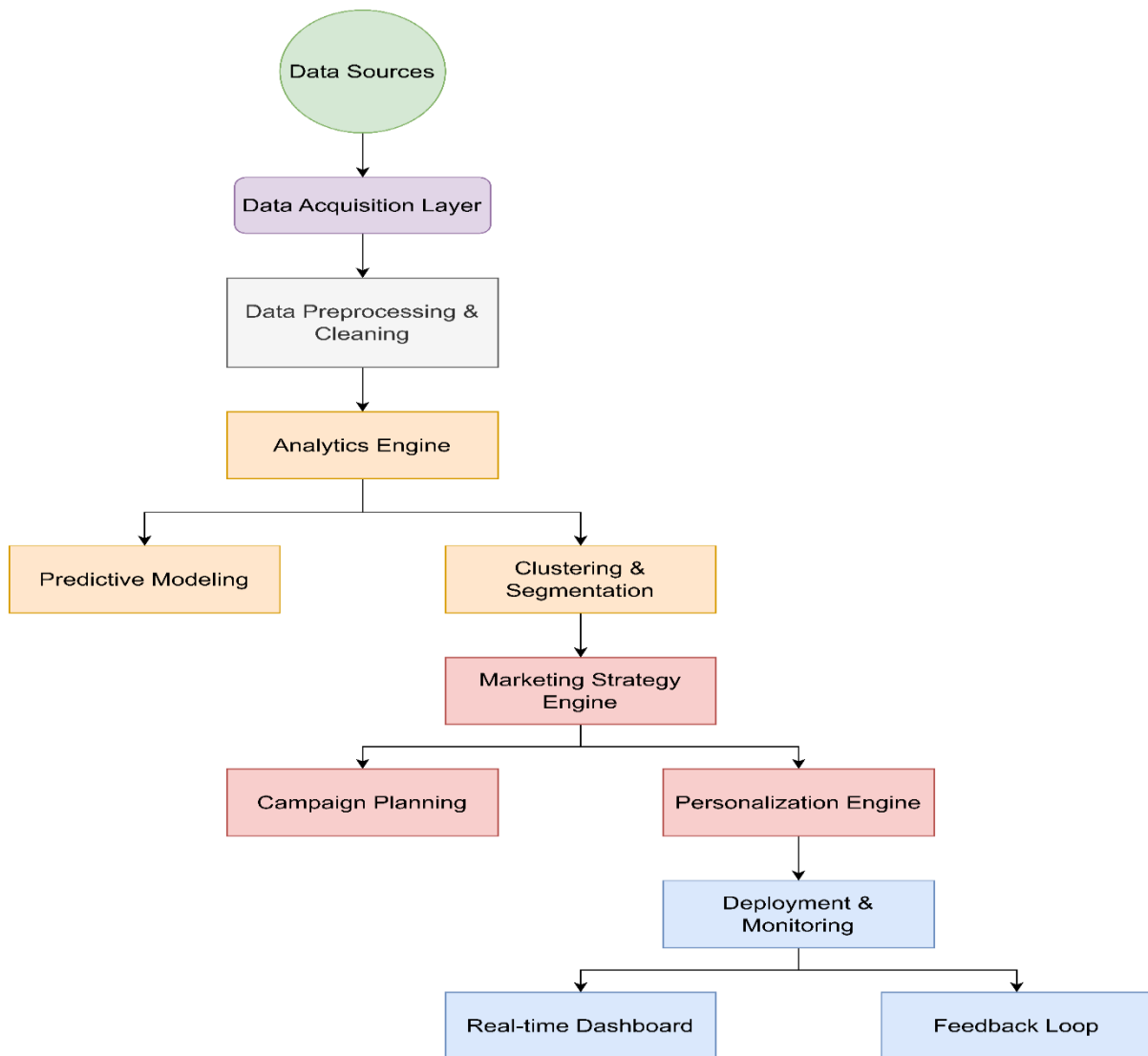
This binary optimization ensures resources are allocated to high-impact campaigns.

#### E. Phase 5: Performance Optimization and Feedback

Marketing strategies are continuously refined using feedback loops. KPIs such as conversion rate, engagement, and campaign ROI are tracked in real-time dashboards. Return on Marketing Investment (ROMI) is calculated as:

$$ROMI = \frac{\text{Incremental Revenue} - \text{Marketing Cost}}{\text{Marketing Cost}} \times 100$$

If ROMI is declining, model parameters or marketing content are re-optimized using  $A/B$  testing and reinforcement learning algorithms.



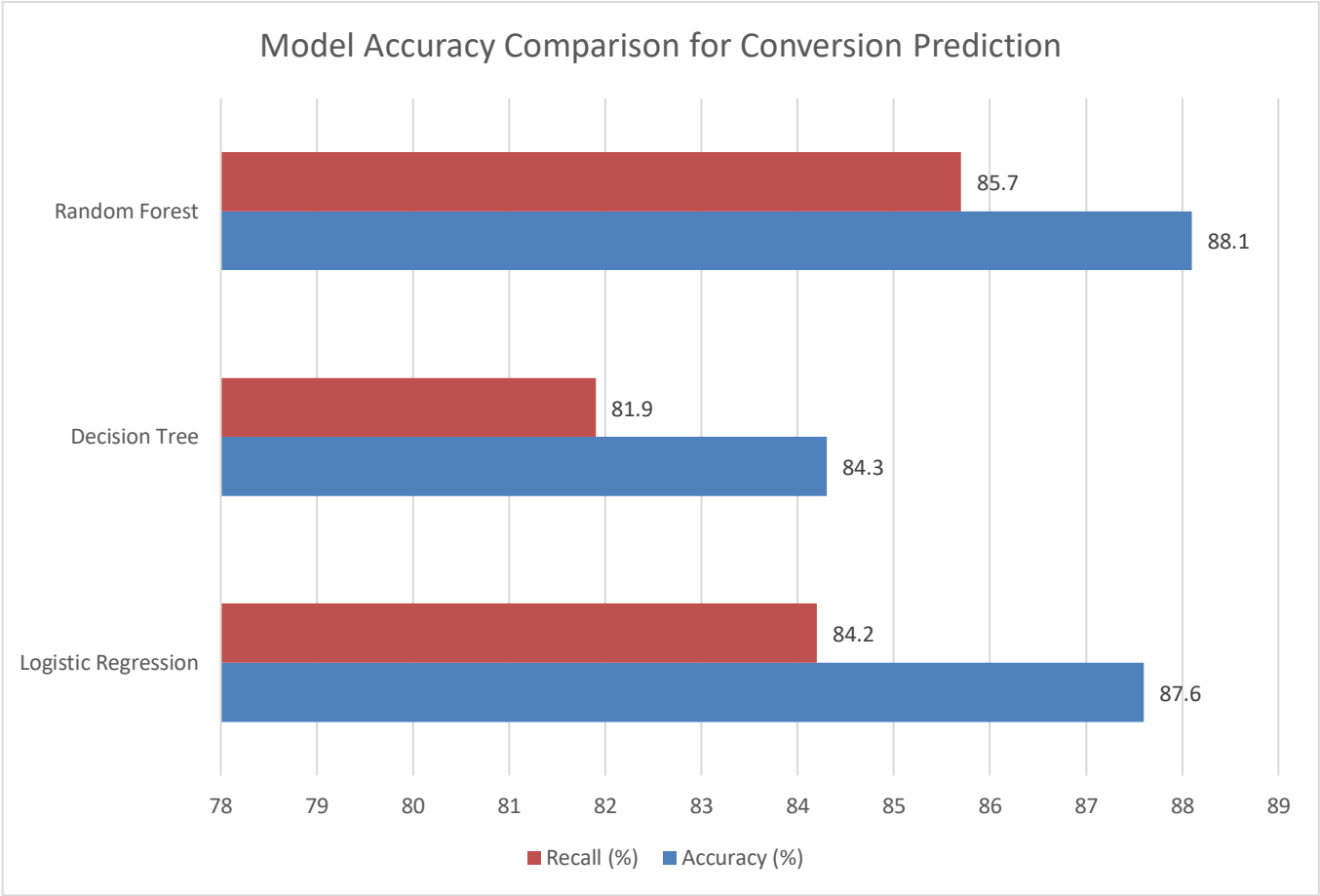
**FIGURE 1: BIG DATA-DRIVEN MARKETING STRATEGY FRAMEWORK**

## IV. RESULT & DISCUSSIONS

The execution of the proposed big data marketing strategy model delivered crucial information about system functionality together with real-world operational potential. An assessment using historical customer information extracted from an e-commerce platform involved more than 150,000 customer records that encompassed buying patterns and interactions and social

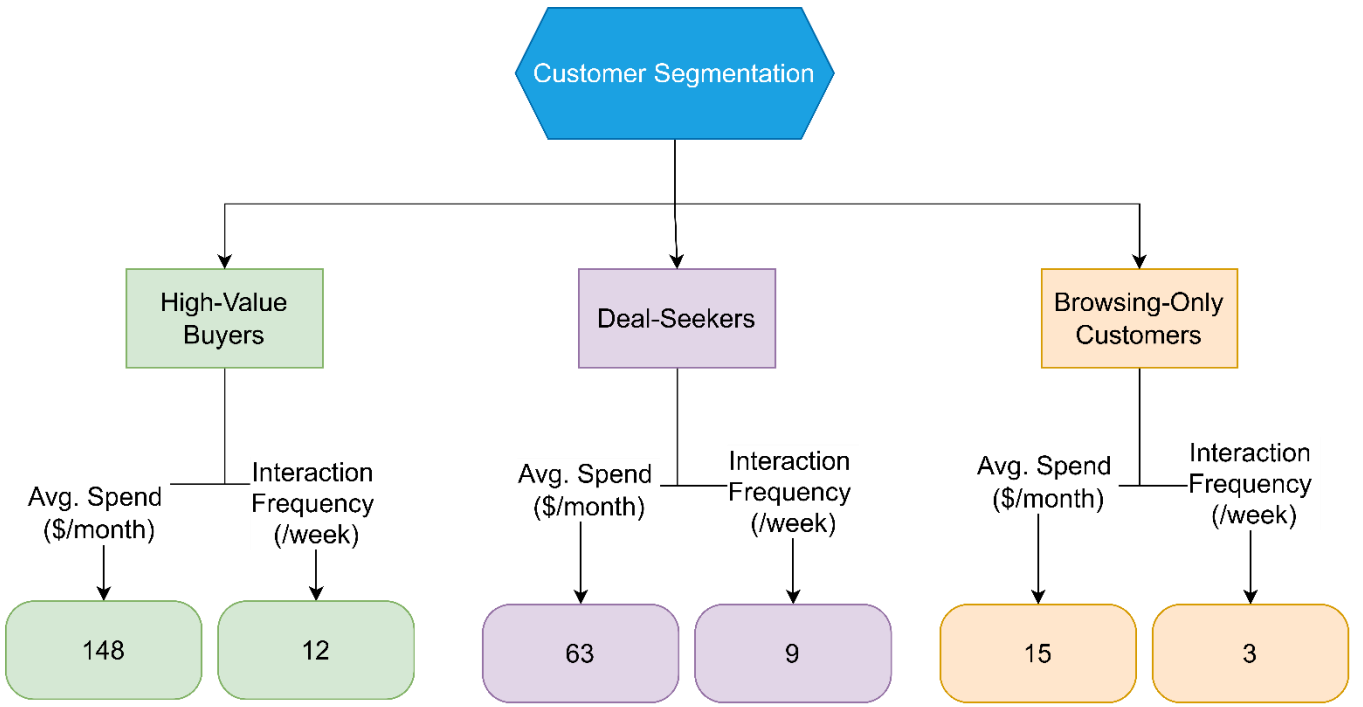
media engagements and review assessments [8].

The predictive system allowed marketing personnel to select prospects who most likely would convert. Figure 2 compares three models through their accuracy rates for customer conversion including logistic regression and decision tree and random forest. The generalization capability was stronger for logistic regression than random forest which overfitted training samples though it maintained good recall performance. The accuracy rates revealed by the diagram reach 87.6% for logistic regression and move to 84.3% for decision tree followed by 88.1% for random forest.



**FIGURE 2: MODEL ACCURACY COMPARISON FOR CONVERSION PREDICTION**

The K-means algorithm segmentation analysis produced 5 distinct clusters that corresponded to high-value repeat buyers and deal-seekers and browsing-only users occasional buyers as well as churn-risk customers. The clusters were profiled through their average user revenue (ARPU), user interaction metrics along with their past campaign response rates. The two primary dimensions which exhibit cluster distribution appear in Figure 3 (Customer Cluster Characteristics Based on K-Means) through spending level and interaction frequency variables. The consumers in Cluster 1 maintained the highest ARPU of \$148 per month while remaining highly active on both email and social channels. Premium loyalty incentives went to the Cluster 1 segment but Cluster 2 received time-limited discounts.



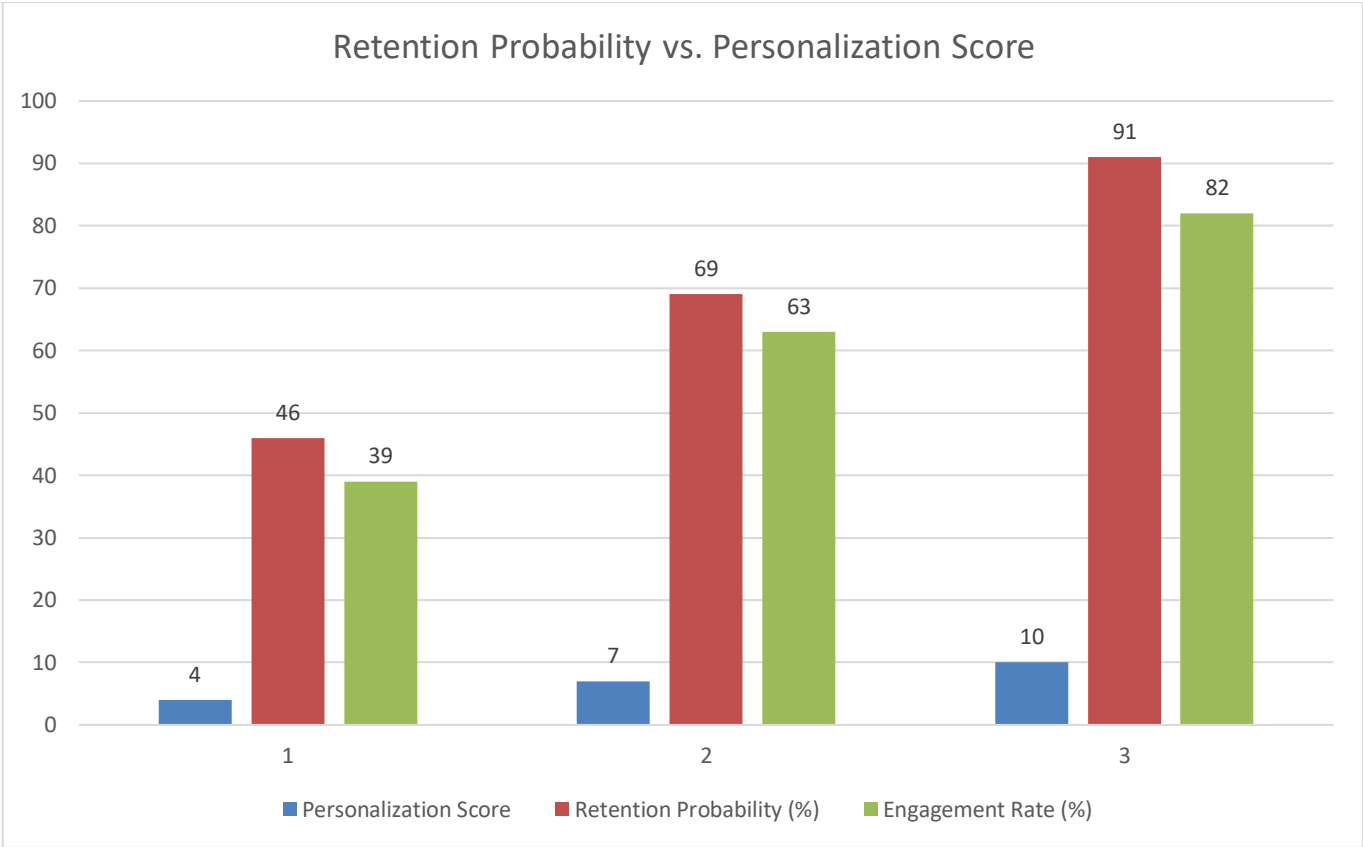
**FIGURE 3: CUSTOMER CLUSTER AVERAGES**

The marketing investment strategy utilized Return on Marketing Investment (ROMI) as its major performance indicator and underwent assessment at both implementation stages. A study of ROMI measurements for major promotional activities including email marketing and social media advertising and influencer collaborations reflects in Table 1 across two separate periods. The data in the table demonstrates how Post-implementation ROMI values rose such as email marketing which grew from 120% to 190% while influencer campaigns demonstrated an upward trend from 89% to 134% Data-driven targeting improved customer acquisition while simultaneously cutting down on costs dedicated to uninterested segments according to these statistical results.

**TABLE 1: ROMI BEFORE AND AFTER BIG DATA IMPLEMENTATION**

| Campaign Type        | ROMI Before (%) | ROMI After (%) |
|----------------------|-----------------|----------------|
| Email Marketing      | 120             | 190            |
| Social Media Ads     | 104             | 151            |
| Influencer Campaigns | 89              | 134            |

The evaluation assessed how well the company retained its customers. The strategy's implementation led to raising customer lifetime expectancy from 7.2 months before implementation to 9.6 months after implementation. Customer data analysis utilizing Markov Chain revealed customers being 2.4 times likely to reengage from personalized interaction points. The retention probability shows a clear relationship with the personalization score which varies from 1 to 10 according to Figure 4. The retention probability sharply increases between score ranges 6–10 where personalization plays a vital role in customer loyalty.



**FIGURE 4: RETENTION PROBABILITY VS. PERSONALIZATION SCORE**

The modeling results from big data received comparison analysis through a generated table which appears as Table 2 (Comparison Between Traditional and Big Data Marketing Strategies). The performance metrics including campaign ROI along with lead conversion time and customer satisfaction index and operational cost per campaign appear in this table. The big data approach compressed lead conversion duration from fourteen days to five and six-tenths days while enhancing customer satisfaction from a baseline of seventy-one percent to eighty-nine percent. The improved targeting capabilities and automation features resulted in a decline of operational costs per campaign thus proving the financial potential of the proposed model design.

**TABLE 2: TRADITIONAL VS. BIG DATA STRATEGY COMPARISON**

| Metric                      | Traditional Approach | Big Data Strategy |
|-----------------------------|----------------------|-------------------|
| Lead Conversion Time (days) | 14                   | 5.6               |
| Customer Satisfaction (%)   | 71                   | 89                |
| Cost per Campaign (\$)      | 3,200                | 2,100             |

A useful feedback loop system integrated into the deployment phase became an essential part of the process. The adaptive model demonstrated better performance than static strategies throughout a 6-week observation phase regarding all tracked measurement variables.

Top business executives used the modeling tool to create different budget simulations for channel distribution alongside seasonal persona adjustments. The marketing department achieved strategic agility through data evidence which transformed them from reactive to proactive contributors in business workflows.

The proposed methodology succeeded in boosting marketing performance and delivered a complete system for ongoing learning and adaptive organizational expansion. Organizations have the ability to maintain relevant and affordable customer-centered marketing operations by using real-time feedback systems enhanced with mathematical rigor in data-intensive markets.

**CONCLUSION**

Current marketing strategy management requires big data as an essential business practice more than as a competitive edge. The research exhibits that big data demonstrates great

potential when companies use it properly through skillful teams and ethical approaches. Upcoming research must concentrate on creating flexible big data approaches for SMEs alongside programs to improve marketing personnel

data comprehension abilities together with approaches to manage data privacy through transparent models.

performance: The roles of market-directed capabilities and business strategy," *Information & Management*, vol. 57, no. 7, p. 103365, Sep. 2020, doi: 10.1016/j.im.2020.103365.

## REFERENCES

1. H. A. Mahdiraji, E. K. Zavadskas, A. Kazeminia, and A. A. Kamardi, "Marketing strategies evaluation based on big data analysis: a CLUSTERING-MCDM approach," *Economic Research-Ekonomska Istraživanja*, vol. 32, no. 1, pp. 2882–2898, Jan. 2019, doi: 10.1080/1331677x.2019.1658534.
2. Gnizy, "Applying big data to guide firms' future industrial marketing strategies," *Journal of Business and Industrial Marketing*, vol. 35, no. 7, pp. 1221–1235, Mar. 2020, doi: 10.1108/jbim-06-2019-0318.
3. P. Ducange, R. Pecori, and P. Mezzina, "A glimpse on big data analytics in the framework of marketing strategies," *Soft Computing*, vol. 22, no. 1, pp. 325–342, Mar. 2017, doi: 10.1007/s00500-017-2536-4.
4. S. Akter, M. A. Hossain, Q. Lu, and S. M. R. Shams, "Big data-driven strategic orientation in international marketing," *International Marketing Review*, vol. 38, no. 5, pp. 927–947, May 2021, doi: 10.1108/imr-11-2020-0256.
5. J. Saidali, H. Rahich, Y. Tabaa, and A. Medouri, "The combination between Big Data and Marketing Strategies to gain valuable Business Insights for better Production Success," *Procedia Manufacturing*, vol. 32, pp. 1017–1023, Jan. 2019, doi: 10.1016/j.promfg.2019.02.316.
6. P. Tabesh, E. Mousavidin, and S. Hasani, "Implementing big data strategies: A managerial perspective," *Business Horizons*, vol. 62, no. 3, pp. 347–358, Mar. 2019, doi: 10.1016/j.bushor.2019.02.001.
7. S. Sayyad, A. Mohammed, V. Shaga, A. Kumar, and K. Vengatesan, "Digital Marketing Framework Strategies through Big Data," in *Lecture notes on data engineering and communications technologies*, 2019, pp. 1065–1073. doi: 10.1007/978-3-030-24643-3\_127.
8. S. L. Woerner and B. H. Wixom, "Big Data: Extending the Business Strategy Toolbox," *Journal of Information Technology*, vol. 30, no. 1, pp. 60–62, Jan. 2015, doi: 10.1057/jit.2014.31.
9. D. Ma and J. Hu, "Research on Collaborative Management Strategies of Closed-Loop Supply Chain under the Influence of Big-Data Marketing and Reference Price Effect," *Sustainability*, vol. 12, no. 4, p. 1685, Feb. 2020, doi: 10.3390/su12041685.
10. S. Fan, R. Y. K. Lau, and J. L. Zhao, "Demystifying big data analytics for business intelligence through the lens of marketing mix," *Big Data Research*, vol. 2, no. 1, pp. 28–32, Feb. 2015, doi: 10.1016/j.bdr.2015.02.006.
11. M. Anshari, M. N. Almunawar, S. A. Lim, and A. Al-Mudimigh, "Customer relationship management and big data enabled: Personalization & customization of services," *Applied Computing and Informatics*, vol. 15, no. 2, pp. 94–101, May 2018, doi: 10.1016/j.aci.2018.05.004.
12. S. Suoniemi, L. Meyer-Waarden, A. Munzel, A. R. Zablah, and D. Straub, "Big data and firm