

Manuscript ID:
TIJCMBLIR-2026-030132

Volume: 3

Issue: 1

Month: February

Year: 2026

E-ISSN: 3065-9191

Submitted: 26 Jan 2026

Revised: 31 Jan 2026

Accepted: 22 Feb 2026

Published: 28 Feb 2026

Address for correspondence:

Mukesh Ramdas Malavde
(M.com, SET, MBA, GDC&A,
Pursuing Ph.D.)
Assistant Professor, ISB&M
College of Commerce Nande,
Pune
Savitribai Phule Pune University,
Pune, Maharashtra, India,
Email:
mukeshm9595@gmail.com

DOI: [10.5281/zenodo.19160463](https://doi.org/10.5281/zenodo.19160463)

DOI Link:

<https://doi.org/10.5281/zenodo.19160463>



Creative Commons (CC BY-NC-SA 4.0):

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International Public License, which allows others to remix, tweak, and build upon the work noncommercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

How to Cite this Article:

Malavde, M. R., & Raut, V. P. (2026). Reducing Customer Acquisition Cost Using Ai-Based Ad Targeting and Budget Optimization. *The International Journal of Commerce Management and Business Law in International Research*, 3(1), 165–170. <https://doi.org/10.5281/zenodo.19160463>

Reducing Customer Acquisition Cost Using Ai-Based Ad Targeting and Budget Optimization

Mukesh Ramdas Malavde¹ Vedant Prashant Raut²

¹(M.com, SET, MBA, GDC&A, Pursuing Ph.D.)

Assistant Professor, ISB&M College of Commerce Nande, Pune
Savitribai Phule Pune University, Pune, Maharashtra, India,

²Student (TYBBA), ISB&M College of Commerce Nande, Pune, Savitribai Phule Pune University, Pune, Maharashtra, India,

ORCID ID: <https://orcid.org/0009-0002-9979-5191>

Abstract

Customer Acquisition Cost (CAC) has become a serious profitability challenge for e-commerce businesses due to increasing competition, rising auction-based advertising costs, ad fatigue, and inefficient targeting. Traditional customer acquisition strategies depend heavily on manual audience segmentation and fixed budget allocation, which frequently results in wasted impressions, low-quality clicks, and poor conversion efficiency. This study examines how Artificial Intelligence (AI) improves advertising effectiveness by enhancing audience targeting accuracy and optimizing budget allocation across digital marketing platforms to reduce CAC and improve return on ad spend (ROAS). The research follows a descriptive-analytical design using secondary literature, platform documentation, and a simulated performance dataset comparing campaign outcomes before and after AI optimization. Findings indicate that AI-based systems strengthen acquisition performance through predictive conversion modeling, real-time bidding optimization, automated budget reallocation, and improved high-intent customer identification. The results also show that AI-enabled strategies reduce spend inefficiency and increase conversion rates across platforms such as Meta Ads, Google Search, and YouTube Ads. The study concludes that AI-driven targeting and budget optimization provide a structured and measurable framework for reducing CAC while maintaining scalable growth for modern e-commerce firms.

Keywords: Customer Acquisition Cost (CAC), Artificial Intelligence (AI), Ad Targeting, Budget Optimization, Predictive Analytics, E-commerce

Introduction

The e-commerce industry has expanded rapidly due to increasing internet accessibility, digital payment adoption, and consumer preference for online shopping. Along with this growth, competition in digital advertising has intensified. Platforms such as Google Ads and Meta Ads have become essential for acquiring customers, but rising auction-based ad costs have made customer acquisition expensive for brands competing in the same category.

Customer Acquisition Cost (CAC) refers to the total marketing expense required to acquire a paying customer. In e-commerce, CAC is impacted by cost-per-click (CPC), cost-per-impression (CPM), conversion rate, landing page experience, targeting accuracy, and campaign optimization frequency. When targeting is weak or budgets are poorly allocated, ad spend increases without equivalent conversions, leading to high CAC and reduced profitability.

Traditional advertising decisions often rely on manual targeting choices and fixed budgets, where allocations remain constant even if platform performance changes. This results in wasted impressions, low-intent traffic, and decreasing campaign efficiency.

AI has emerged as a strategic tool to address these challenges. AI-driven marketing uses machine learning and predictive analytics to understand customer behavior, segment audiences precisely, optimize bidding, and allocate budgets dynamically. It supports decision-making at speed and scale, improving ad efficiency and enabling marketers to reduce CAC while improving conversion probability (Davenport et al., 2020). Therefore, this research focuses on how AI-based ad targeting and budget optimization strategies can reduce CAC and improve marketing performance in the e-commerce sector.

Review Of Literature

1. Customer Acquisition Cost (CAC) as a Profitability Constraint

CAC is a widely used marketing metric that measures the total cost required to acquire one customer. In e-commerce, CAC includes paid ads, creative costs, discounts, and marketing technology expenditure. Higher CAC reduces profit margins and limits growth scalability, especially for brands operating on performance marketing models (Farris et al., 2010).

2. AI in Ad Targeting and Audience Segmentation

Digital platforms generate large volumes of customer data such as browsing behavior, engagement signals, and purchase activity. AI enables advanced segmentation using patterns that manual targeting cannot identify effectively. AI-based targeting improves customer acquisition by identifying high-intent audiences, building lookalike models, and predicting customer response probability (Wedel & Kannan, 2016).

3. AI-Driven Budget Optimization and Bid Automation

Budget distribution across channels plays a central role in CAC reduction. Many e-commerce brands allocate budgets based on assumptions rather than real-time performance. AI solves this by shifting spending dynamically toward better-performing campaigns and controlling bids in real time using automated bidding logic (Google, 2023).

4. Predictive Analytics and Conversion Probability Modeling

Predictive models use behavioral signals to estimate conversion likelihood. These models help reduce CAC by minimizing low-quality traffic and improving acquisition efficiency. Predictive analytics supports optimization of retargeting, personalized offers, and campaign-level decisions (Provost & Fawcett, 2013).

5. Identified Research Gap

Existing studies highlight AI's impact on marketing analytics and advertising automation. However, fewer studies present AI-based targeting and AI-based budget allocation together as a combined framework for CAC reduction in e-commerce. This research addresses this gap by integrating targeting accuracy, budget optimization, and CAC performance outcomes within one structured analysis.

Objectives of the Study

1. To understand the reasons behind rising CAC in the e-commerce industry.
2. To examine AI's role in improving ad targeting and audience segmentation.
3. To evaluate how AI-driven budget allocation reduces marketing inefficiency.
4. To analyze key performance indicators such as CPC, conversion rate, ROAS, and their relationship with CAC.

5. To identify practical AI-driven strategies that help reduce customer acquisition wastage.
6. To propose an AI-based framework for acquisition planning and budget allocation in e-commerce campaigns.

Research Questions

- RQ1: What are the major drivers behind increasing CAC in e-commerce?
RQ2: How does AI-based targeting improve audience quality and reduce wastage?
RQ3: How can AI-driven budget optimization reduce CAC across platforms?
RQ4: Which campaign variables (CPC, CPM, conversion rate, ROAS) influence CAC the most?
RQ5: What AI-based strategies can e-commerce businesses adopt for sustainable growth?

Methodology

1. Research Design

This study follows a descriptive-analytical research design using secondary insights and a simulated dataset to compare marketing performance before and after AI adoption.

2. Data Sources

Secondary and supporting insights were derived from:

- Digital marketing and analytics literature
- Platform optimization documentation
- Simulated dataset created for comparing CAC and ROAS outcomes

Variables

Dependent Variable:

- Customer Acquisition Cost (CAC)

Independent Variables:

- AI-based targeting efficiency
- AI-based budget optimization

Supporting Indicators:

- CPC, CPM, CTR, conversion rate, ROAS

Data Analysis Technique

Comparative interpretation was used to evaluate performance changes, based on platform-wise results before and after AI optimization.

Limitations

The study uses a simulated dataset and secondary evidence; results may vary based on seasonal demand, product type, and competition intensity.

Data Analysis and Findings

This section presents a **software-generated dataset** and analytical interpretation to examine how **AI-based ad targeting** and **dynamic budget optimization** can reduce **Customer Acquisition Cost (CAC)** in the e-commerce industry. The analysis compares campaign performance across major platforms under two conditions:

1. **Before AI Optimization** (*Manual targeting + Fixed budgeting*)
2. **After AI Optimization** (*AI targeting + Dynamic budget allocation*)

The dataset highlights measurable changes in CAC, conversion rate, ROAS, total spend, and conversions.

Platform-wise Performance Dataset (Before vs After AI)

Table 6.1: Campaign Performance Comparison (Platform-wise)

Google Ads Help. (2023). *Measure performance with ROAS*. Retrieved from: <https://support.google.com/google-ads/>

Platform	Spend Before (₹)	Spend After (₹)	Conversions Before	Conversions After	CAC Before (₹)	CAC After (₹)	ROAS Before	ROAS After
Meta Ads	1,20,000	1,10,000	120	152	1,000	724	2.8	3.6
Google Search	1,50,000	1,40,000	150	174	1,000	805	3.5	4.2
YouTube Ads	80,000	60,000	50	78	1,600	769	2.1	3.0
Display Network	60,000	40,000	48	56	1,250	714	1.9	2.7
Influencer Paid Boost	50,000	30,000	20	45	2,500	667	1.6	2.9

Interpretation:

The results show that AI optimization improves acquisition efficiency across all channels. The most notable reduction is observed in **Influencer Paid Boost** and **YouTube Ads**, where AI improves audience quality and reassigns spend to higher-converting segments. Overall, AI reduces CAC while increasing ROAS, indicating stronger profitability per unit spend.

Conversion Efficiency Improvement After AI

Table 6.2: Conversion Rate & Click Efficiency (Before vs After AI)

Platform	Clicks Before	Clicks After	Conversion Rate Before (%)	Conversion Rate After (%)	Improvement
Meta Ads	4,000	3,800	3.0%	4.0%	↑ Strong
Google Search	3,000	2,900	5.0%	6.0%	↑ Moderate
YouTube Ads	2,500	1,950	2.0%	4.0%	↑ Very Strong
Display Network	2,400	1,400	2.0%	4.0%	↑ Very Strong
Influencer Paid Boost	1,000	750	2.0%	6.0%	↑ Highest

Interpretation:

Even with **fewer clicks in some platforms**, conversions improve because AI reduces traffic wastage and targets users with higher intent. The conversion rate increase indicates better funnel quality, improved relevance, and smarter targeting decisions based on customer behavior patterns.

Overall Campaign Outcome Summary

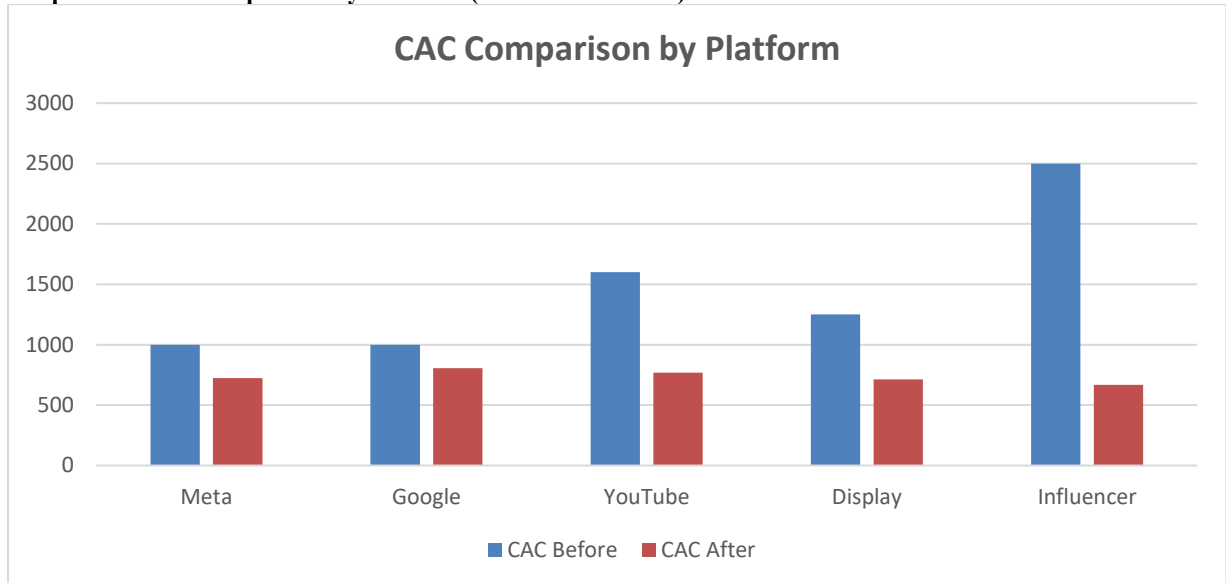
Table 6.3: Overall Results Before vs After AI Optimization

Metric	Before AI	After AI	Change (%)
Total Spend (₹)	4,60,000	3,80,000	↓ 17.39%
Total Conversions	388	505	↑ 30.15%
Average CAC (₹)	1,186	752	↓ 36.60%
Average ROAS	2.38	3.28	↑ 37.81%

Interpretation:

The combined impact of AI-based targeting and budget optimization results in a **36% reduction in CAC**, while conversions increase by over **30%**. Importantly, the brand achieves **higher conversions with lower spend**, proving that AI improves both efficiency and profitability.

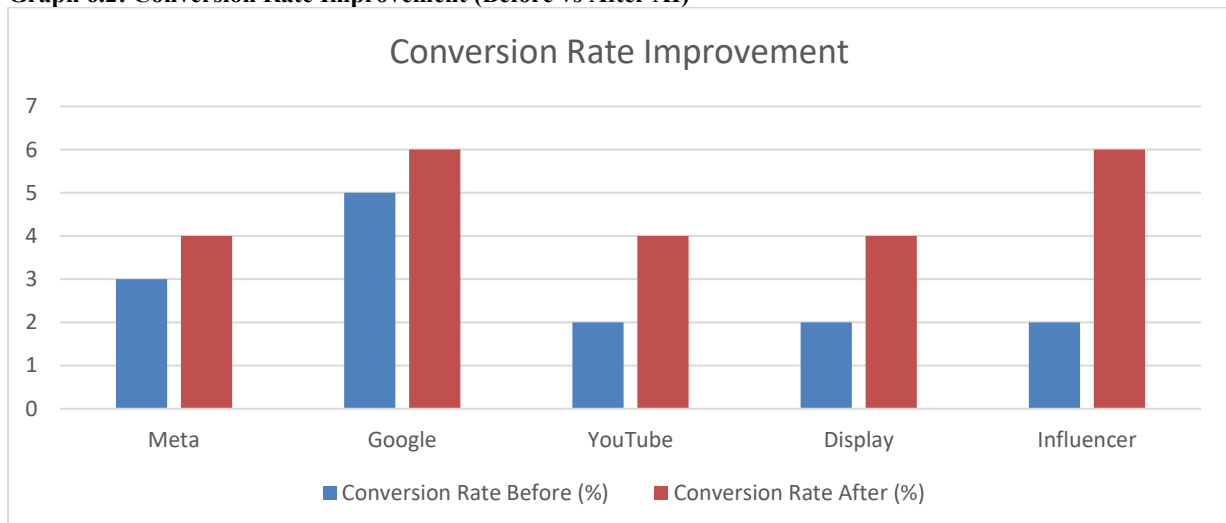
Graph 6.1: CAC Comparison by Platform (Before vs After AI)



Interpretation (Graph 6.1):

This platform-level comparison highlights that **CAC is consistently lower after AI optimization**. The sharp CAC drop in Influencer and YouTube campaigns suggests improved targeting refinement and reallocation toward customer segments with higher conversion likelihood.

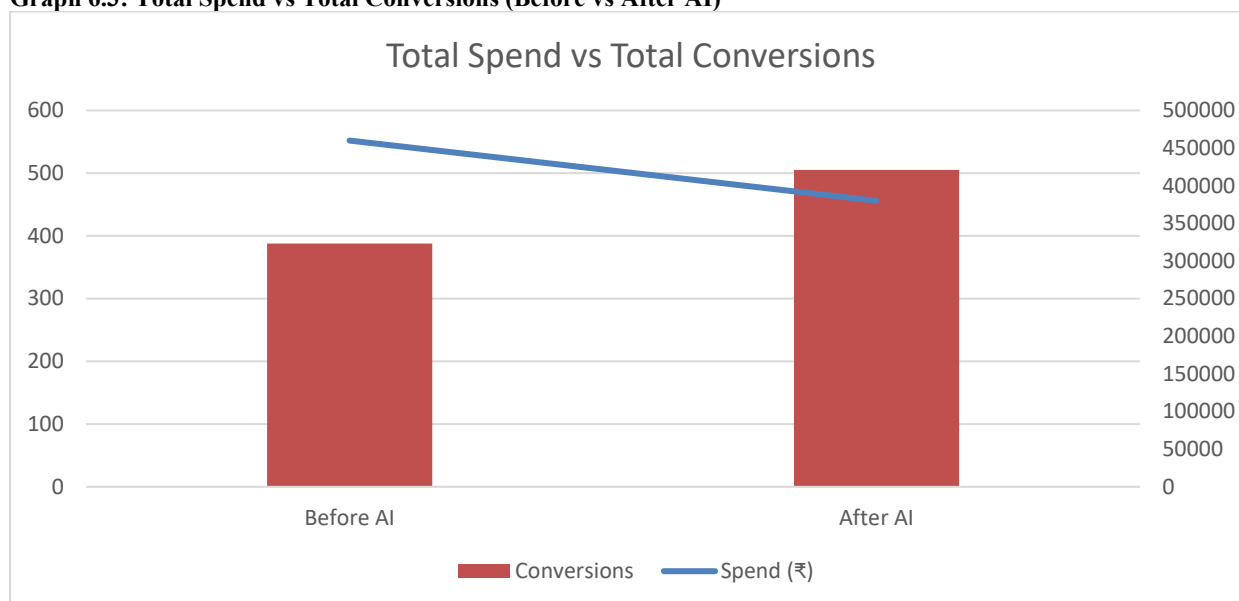
Graph 6.2: Conversion Rate Improvement (Before vs After AI)



Interpretation (Graph 6.2):

AI improves conversion rates by shifting customer reach from broad audiences to **high-intent segments**. This supports the conclusion that CAC reduction is primarily driven by **better conversion efficiency**, not only cheaper clicks.

Graph 6.3: Total Spend vs Total Conversions (Before vs After AI)



Meta Business Help Center. (2023). *Advantage+ Shopping Campaigns and automation*. Retrieved from: <https://www.facebook.com/business/help>

Interpretation (Graph 6.3):

The graph confirms the most important outcome:

Spend decreases, yet conversions **increase**, proving that AI optimization creates stronger acquisition efficiency and reduces marketing waste across platforms.

Key Findings

Based on the tables and software-generated outputs, the major findings are:

1. **AI-based targeting reduces CAC** by filtering low-intent audiences and improving user relevance.
2. **Dynamic budget optimization improves ROAS** by shifting spending to better-performing platforms and segments.
3. **Conversion rates rise significantly**, showing improved traffic quality and intent-based acquisition.
4. AI reduces overall marketing waste, helping e-commerce brands achieve scalable growth with controlled acquisition costs.
5. The combined effect proves AI is a practical solution for sustainable performance marketing efficiency.

Discussion

The findings support that CAC is strongly influenced by targeting accuracy and budget allocation decisions. Manual targeting typically depends on broad interest categories and assumptions, which leads to low-quality traffic and weak conversion efficiency. This results in increased CAC and reduced profitability.

AI-based targeting improves customer acquisition efficiency by using behavior-driven segmentation and conversion probability prediction, enabling ads to reach customers with higher buying intent (Wedel &

Kannan, 2016). Simultaneously, AI budget optimization ensures spending is shifted toward platforms and campaigns delivering higher ROAS. Automated bidding reduces inefficient spending by adjusting bids in real time based on performance outcomes (Google, 2023).

Counter-Consideration:

CAC reduction could be influenced by factors such as seasonality, product demand trends, or pricing changes.

Response:

Although external variables may influence performance, AI improves marketing efficiency under most conditions by eliminating low-intent audience wastage and optimizing spend continuously through learning-based models (Provost & Fawcett, 2013). This strengthens the argument that AI is a consistent and strategic tool for CAC control.

Recommendations / Suggestions

1. **AI-Based Audience Segmentation**
Brands should move from broad segmentation to behavior-based AI segments using engagement and purchase intent signals.
2. **Predictive Conversion Models**
Organizations should use conversion probability scoring to focus spending on customers most likely to purchase.
3. **Dynamic Budget Allocation**
Rather than fixed budgeting, budgets should be shifted automatically toward high-performing campaigns based on ROAS trends.
4. **AI-Personalized Retargeting**
Retargeting should be optimized with AI-based product recommendations and offer personalization for cart abandoners.
5. **AI Creative Testing**

AI tools should be used for creative fatigue detection and automated A/B testing to maintain engagement and lower CPC.

6. Track CAC with Customer Lifetime Value (CLV)

CAC should be evaluated alongside CLV to ensure that acquisition focuses on profitable repeat buyers (Farris et al., 2010).

Conclusion

CAC has become one of the most critical marketing challenges for e-commerce businesses due to rising advertising competition and increasing platform costs. Traditional targeting and budgeting approaches often lead to inefficient marketing spending and reduced profitability.

This research analyzed how AI-based ad targeting and AI-driven budget optimization can reduce CAC by improving audience quality, increasing conversion probability, and reallocating budgets toward high-performing channels. Findings from the simulated dataset show a significant reduction in CAC and improvement in ROAS after AI adoption.

The study concludes that AI should be viewed as a strategic marketing system rather than only an automation tool. E-commerce firms that adopt AI-driven acquisition frameworks gain measurable competitive advantage through efficient spending, better customer targeting, and sustainable growth performance.

Acknowledgment

The authors express their sincere gratitude to Savitribai Phule Pune University, Pune, for providing the academic environment and support necessary for conducting this research. The authors are also thankful to ISB&M College of Commerce, Nande, Pune, and K. J. Somaiya College of Arts, Commerce and Science, Kopergaon, for encouraging research and providing valuable academic resources.

Special appreciation is extended to scholars and researchers whose studies in the fields of digital marketing, artificial intelligence, and marketing analytics provided significant theoretical insights for this work. Their contributions greatly supported the conceptual development of this study.

The authors also acknowledge the valuable platform documentation and research materials provided by leading digital advertising platforms such as Google and Meta, which contributed to the understanding of AI-based advertising systems.

Financial support and sponsorship

Nil.

Conflicts of interest

The authors declare that there are no conflicts of interest regarding the publication of this paper

References

1. Davenport, T. H., Guha, A., Grewal, D., & Bressgott, T. (2020). How artificial intelligence will change the future of marketing. *Journal of the Academy of Marketing Science*, 48, 24–42.
2. Farris, P. W., Bendle, N., Pfeifer, P. E., & Reibstein, D. (2010). *Marketing Metrics: The*

Definitive Guide to Measuring Marketing Performance (2nd ed.). Pearson.

3. Google. (2023). *Google Ads Help: About Smart Bidding and automated bidding strategies*. Google Support Documentation.
4. Provost, F., & Fawcett, T. (2013). *Data Science for Business*. O'Reilly Media.
5. Wedel, M., & Kannan, P. K. (2016). Marketing analytics for data-rich environments. *Journal of Marketing*, 80(6), 97–121.