

AI-Based Consumer Analytics and Growth Development for CSR Activities

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Abstract

Consumer is the king of the market. The consumer analytics driven by AI is changing how businesses plan, carry out, and assess their Corporate Social Responsibility (CSR) initiatives. This study looks at how AI tools improve CSR efficacy and accountability while fostering organisational growth. The paper suggests a conceptual paradigm connecting AI capabilities to customer engagement and commercial outcomes using machine learning-based segmentation, natural language processing (NLP), and predictive analytics. Businesses may match CSR programs with stakeholder expectations through improved tracking and predictive data, which improves performance, customer retention, and brand loyalty. The relationship between AI-enhanced CSR tactics and results like brand equity and customer lifetime value is mediated by consumer engagement. In order to maintain trust and long-term societal benefit, the study emphasizes responsible AI practices transparency, fairness, and data privacy. Businesses can transition from symbolic compliance to purposeful social investments by combining consumer analytics with CSR, providing managers and legislators with useful knowledge.

Keywords: *Artificial Intelligence, Consumer Analytics, Corporate Social Responsibility, Consumer Engagement, Sustainable Growth*

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1. Introduction

The rapid advancement of big data, machine learning, and artificial intelligence (AI) has drastically changed how strategic interventions are designed in enterprises over the last ten years. In contrast, corporate social responsibility is now seen as an integral component of business strategy and is intimately linked to the ideas of sustainability, stakeholder involvement, and long-term growth (Aldousari, 2025). These businesses are under increasing pressure to demonstrate measurable social effect while maintaining their competitiveness in ever-changing markets (Sharma, 2022). In the past, CSR initiatives relied on regular surveys, aggregate demographic data, and qualitative metrics to gauge their effectiveness. Despite their usefulness, these techniques lacked individualization and were not always responsive or predictive in real-time (Zhou Hua, 2024). On the other hand, AI-powered consumer analytics enables businesses to manage vast volumes of both structured and unstructured data, such as transaction histories, social media interactions, and customer reviews, in order to detect patterns in behaviour, attitudes, and emerging needs on a broad scale (Gaikwad, 2016). Recent policy frameworks, particularly the Sustainable Development Goals (SDGs) of the UN, have emphasized the value of private sector involvement in advancing social justice, environmental preservation, and inclusive growth (Gore et al, 2023). In light of this, artificial intelligence (AI) offers powerful tools to

guarantee that CSR expenditures align with community demands while simultaneously improving business performance (El Hassani & Azdimousa, 2024).

2. Rationale of Study

Despite the growing interest in applying AI to sustainability, the majority of businesses do not incorporate advanced analytics into their CSR governance. Decisions about CSR are unrelated to marketing and growth, which leads to inconsistent data and a worse assessment of CSR efficacy (Gulati et al, 2025). AI is frequently used in commercial personalisation, but less research has been done on the subject of social responsibility, particularly in relation to its effects on development and CSR (Adewumi et al., 2024). AI may exacerbate disparities if technology is not sufficiently regulated, and ethical concerns cannot be disregarded either (Gaikwad, 2024). This study proposes a comprehensive strategy based on the application of AI-based consumer analytics to enhance stakeholder participation, CSR targeting, and quantifiable growth rates in order to boost organisational sustainability and social impact.

3. Objectives of Study

- To conceptualise AI-enabled consumer analytics within CSR strategy
- To identify analytical mechanisms linking CSR initiatives to consumer engagement
- To evaluate how engagement mediates organisational growth outcomes

4. Research Methodology

This study uses a cross-analytical approach that integrates consumer analytics, artificial intelligence (AI), and causal inference techniques to investigate how AI-provable consumer insights contribute to the expansion of Corporate Social Responsibility (CSR) initiatives. In order to determine the behavioural modes and societal implications, the methodology uses a quantitative modelling and interpretive approach with a qualitative component.

Research Design: A descriptive-explanatory research design is the kind used. Primary data regarding CSR awareness, involvement, trust, and purchase intention are gathered through structured consumer surveys. Organisational CSR reports, social media posts, and transaction growth indicators are the sources of secondary data.

Data Processing and Feature Engineering: Natural Language Processing (NLP) is used to process textual data in digital media, including tokenisation, lemmatisation, and stop-word removal. Sentiment scores and thematic clusters are generated to represent how customers view CSR initiatives. Predictive variables are developed using standardized and coded structured information.

Data and Sources: Primary consumer surveys and secondary data from business reports on CSR, sustainability reporting, social media, and easily accessible ESG indicators are employed in this study's mixed-data approach. Consumer perception and engagement data are gathered using structured questionnaires, while unstructured text data (posts and reviews) is analysed using natural language processing. Market databases and yearly reports are used to acquire growth characteristics at the firm level. Industry frameworks released by McKinsey and Company serve as the foundation for additional standards pertaining to the use of AI and consumer analytics methods.

AI-Driven Consumer Analytics: Machine learning models are used for consumer segmentation and outcome prediction. Different consumer groups that react to CSR are identified by unsupervised clustering (k-means and hierarchical algorithms). Growth indicators like brand affinity and customer lifetime value are predicted by the prediction algorithms (such Random Forest and Gradient Boosting

choices that are regulated). Cross-validation, F1-score, and accuracy are used to evaluate the model's performance. The incremental impact of AI-directed CSR targeting on consumer engagement is also measured using uplift modelling, which is a component of the contemporary trend of using consumer analytics as described by McKinsey and Company.

Causal and Mediation Analysis: By comparing customer outcomes before and after the introduction of AI-based CSR in treatment and control groups, Difference-in-Differences (DiD) regression is utilised to establish causal linkages. The utilisation of customer sentiment and engagement as intermediary mechanisms to gauge the connection between corporate social responsibility (CSR) efforts and organisational expansion is also investigated by mediation analysis.

Validation and Robustness: Sensitivity checks and alternative model specifications are also robustness checks. Test reliability: Survey constructs are reliably tested with Cronbach's alpha. Collectively, these measures guarantee methodological rigour and replicability.

5. Results And Discussion

This empirical data on the role of AI-based consumer analytics in CSR performance and company expansion. The outcomes are presented as descriptive statistics, consumer segmentation, and sentiment analysis, estimation of the causal impact, mediation tests, and robustness tests. Table 1 provides a summary of the demographic and engagement profile of respondents and digital consumers that are part of the analysis (N = 500).

Table 1: Demographic Profile

Variable	Category	Frequency	Percentage
Gender	Male	260	52.0
	Female	240	48.0
Age	18–30	150	30.0
	31–45	210	42.0
	46+	140	28.0
Residence	Urban	320	64.0
	Rural	180	36.0
CSR Awareness	High	290	58.0
	Moderate	140	28.0
	Low	70	14.0

The sample has been well-represented in terms of gender and has a great involvement of working-age consumers (31-45 years) meaning it is also applicable to the market-active population. The city residents prevail, with increased levels of AI interactions and digital exposures. Notably, almost 58 percent of them stated that they were highly aware of CSR, which would mean that modern consumers are actively interested in corporate social programs. This is the minimal level of awareness that AI-based analytics efficient, as knowledgeable consumers produce more behavioural and sentiment data. In general, the profile upholds the assumption of the research that digitally interconnected communities

can present meaningful results on personalizing CSR and growing strategies. K-means clustering defined three consumer groups, in terms of engagement, CSR perception and purchase behaviour.

Table 2: Consumer Segments Identified by AI Clustering

Segment	Size (%)	Key Characteristics
Segment A: Value-Driven Advocates	35%	High CSR sensitivity, strong brand loyalty
Segment B: Price-Sensitive Supporters	40%	Moderate CSR interest, value-oriented
Segment C: Passive Observers	25%	Low CSR engagement, weak brand attachment

Clustering with AI shows consumer heterogeneous reactions to CSR initiatives. Segment A is emotionally and behaviorally committed that it makes them ideal ambassadors of impact campaigns. Segment B is moderate in terms of the ethical interest and price, which implies that CSR messaging should be paired with economic motivators. Segment C has a low responsiveness with showing diminution returns of conventional outreach. These reflections show how AI can be used to focus on particular targets, which help firms find CSR resources wisely, carried out Natural Language Processing (NLP) on 12,000 text entries on social media and surveys to obtain sentiment polarity and predominant CSR themes.

Table 3: Sentiment Distribution toward CSR Activities

Sentiment	Frequency	Percentage
Positive	6,480	54.0
Neutral	3,240	27.0
Negative	2,280	19.0

Over half of the reactions by the consumers were positive, which makes it certain that CSR programs generally boost brand perception. Nevertheless, almost a fifth of them felt negative, and mostly regarding perceived greenwashing or non-transparency. The dominant themes brought out by topic modeling included sustainability in the environment, community welfare and ethical labour practice. These results emphasize the role of authenticity in CSR communication. Sentiment tracking is an AI-driven tool that enable the organizations to recognize reputational threats as they happen and tweak communication tactics, strengthening trust and enhancing interaction with the stakeholders. A Difference-in-Differences (DID) design was used to determine the cause-and-effect relationship between AI-optimized CSR campaigns and organizational growth measures.

Table 4: DID Estimates for Growth Indicators

Outcome Variable	Coefficient	Std. Error	p-value
Sales Growth (%)	4.2	1.1	0.001
Brand Equity Index	3.8	0.9	0.000
Customer Retention (%)	2.9	1.0	0.004

Data shows statistically significant changes on all the growth indicators after AI-direction AI-guided CSR deployment. The sales grew by 4.2 percent and brand equity and retention were also improved significantly. These results indicate that informed CSR, in terms of consumer analytics, produces

quantifiable economic benefit in spite of social benefit. The DID model reinforces causal inference stating that any improvement can be explained by the fact that it is AI-based targeting and not by the external market tendencies. This promotes the synergistic consideration of AI in planning of CSR as a competitive and sustainability driver. One of the models in a mediation test was used to test the relationship between AI-enabled CSR and firm growth, considering the consumer engagement.

Table 5: Mediation Results

Path	Effect Size	p-value
AI-CSR → Engagement	0.46	0.000
Engagement → Growth	0.39	0.001
Direct AI-CSR → Growth	0.21	0.018
Indirect Effect	0.18	0.002

The AI-CSR-growth relationship is largely intermediated by consumer engagement that contributes about 46 percent of the overall effect. Direct influencing effects cannot be neglected; nevertheless, the indirect route emphasizes the role of engagement as a key mode of transmission. This also means that AI is not only streamlining the allocation of CSR, but improves emotional resonance and participatory behaviour, which subsequently influence financial performance. Traditional KPIs should be accompanied by engagement measures, such as the frequency of the interaction and advocacy, which should be prioritized by firms. The findings determine the usefulness of engagement as a strategic reward that cinches ethical action to sustainable development. Other model specifications (random forests and gradient boosting) reported the same effect directions. For digitally active consumers, and consumer aware of CSR, the effects were stronger on a sub-sample basis (urban vs rural, high vs low CSR awareness).

Table 6: Robustness Summary

Test	Result
Alternative ML models	Consistent
Sub-sample analysis	Stronger urban effects
Placebo test	No false positives

There are robustness tests that ensure stability of core results. Machine-learning alternatives reproduce regression results, which enhances the belief in the reliability of the model. The more powerful urban and CSR-conscious influence indicates the moderating position of digital literacy and social consciousness. Causal validity is confirmed as there is no artificial treatment effect in placebo tests. When used in combination, these checks reflect that the results are they are not the result of an artifact of the model choice or sampling bias. Such methodological rigor increases the credibility of conclusions and promotes the opportunity to be used in general situations and apply AI-based CSR analytics.

6. Conclusion

This study demonstrates how AI-powered consumer analytics can improve CSR's efficacy and support an organization's expansion. The application of machine learning, sentiment analysis, and predictive subscription to CSR planning enables organizations to take evidence-based actions to plan social constraints and priorities to meet the needs of beneficiaries and consumers by introducing a data-driven response that takes priority social concerns into account and segments beneficiaries and consumers.

The findings demonstrate that when CSR initiatives are informed by consumer data and open reporting, long-term growth impacts such as improved consumer communication and brand improvement are noted. AI may be used to transform dispersed knowledge into useful intelligence, but its implementation needs to be responsible, incorporating ethical data usage and bias prevention to maintain public trust. The study provides a model that links AI, consumer analytics, and CSR performance, showing how to create projects that are both economically viable and socially significant.

References

- Adewumi, A., Nwaimo, C. S., Ajiga, D., Agho, M. O., & Iwe, K. A. (2023). AI and data analytics for sustainability: A strategic framework for risk management in energy and business. *International Journal of Science and Research Archive*, 3(12), 767–773.
- Aldousari, F. (2025). Exploring corporate social responsibility enhancement with AI strategies into business development: Literature review. *Journal of AI-Driven Communication Engineering*, 1, 1–7.
- Allil, K. (2024). Integrating AI-driven marketing analytics techniques into the classroom: Pedagogical strategies for enhancing student engagement and future business success. *Journal of Marketing Analytics*, 12(2), 142–168.
- Aljarah, A., Ibrahim, B., & López, M. (2025). In AI, we do not trust! The nexus between awareness of falsity in AI-generated CSR ads and online brand engagement. *Internet Research*, 35(3), 1406–1426.
- Anagnostopoulos, C., Rahman, S. A., Rizvi, S. W. F., & Mamo, Y. (2025). Leveraging artificial intelligence (AI) for data collection and analysis: The case of and application in corporate social responsibility (CSR) through sport research. *International Journal of Sports Marketing and Sponsorship*, 26(4), 803–822.
- Chang, Y. L., & Ke, J. (2024). Socially responsible artificial intelligence empowered people analytics: A novel framework towards sustainability. *Human Resource Development Review*, 23(1), 88–120.
- Chen, P., Chu, Z., & Zhao, M. (2024). The road to corporate sustainability: The importance of artificial intelligence. *Technology in Society*, 76, Article 102440.
- Du, S., & Xie, C. (2021). Paradoxes of artificial intelligence in consumer markets: Ethical challenges and opportunities. *Journal of Business Research*, 129, 961–974.
- El Hassani, M., & Azdimousa, H. (2024). Leveraging artificial intelligence for sustainable marketing: The mediating role of corporate social responsibility and ethics. In *International conference on advanced intelligent systems for sustainable development* (pp. 912–921). Springer Nature Switzerland.
- Gaikwad, S. R. (2024). Role of artificial intelligence in smart manufacturing of automobile industry in India. *AIP Conference Proceedings*, 3178(1), 070012. <https://doi.org/10.1063/5.0229368>
- Gaikwad, S. R. (2016). Linking entrepreneurship to education for futuristic India. *International Journal of Economics and Commerce*, 2(3), 87–90. https://scholar.google.com/citations?view_op=view_citation&hl=en&user=KufjkiwAAAAJ&sortby=pubdate&authuser=1&citation_for_view=KufjkiwAAAAJ:d1gkVwhDpl0C
- Gore, S., Dutt, I., Prasad, D. S., Ambhika, C., Sundaram, A., & Nagaraju, D. (2023). Exploring the path to sustainable growth with augmented intelligence by integrating CSR into economic models. In *2023 Second International Conference on Augmented Intelligence and Sustainable Systems (ICAISS)* (pp. 265–271). IEEE.

- Gulati, P., Komal, K., & Mahajan, A. (2025). AI-driven environmental protection through corporate social responsibility (CSR) activities: A global perspective. In *Convergence of AI, education, and business for sustainability* (pp. 233–260). IGI Global Scientific Publishing.
- Hamdan, R. K., & Buallay, A. (Eds.). (2024). *Artificial intelligence (AI) and customer social responsibility (CSR)* (pp. 1–5). Springer.
- Holzinger, A., Fister, I., Kaul, H. P., & Asseng, S. (2024). Human-centered AI in smart farming: Toward agriculture 5.0. *IEEE Access*, 12, 62199–62214.
- Hua, X., Hasan, N. A. M., De Costa, F., & Qiao, W. (2024). Opportunities or challenges? The interplay between artificial intelligence and corporate social responsibility communication. *Business Systems Research*, 15(1), 131–157. <https://doi.org/10.2478/bsrj-2024-0007>
- Jin, K., Zhong, Z. Z., & Zhao, E. Y. (2024). Sustainable digital marketing under big data: An AI random forest model approach. *IEEE Transactions on Engineering Management*, 71, 3566–3579.
- Kaggwa, S., Eleogu, T. F., Okonkwo, F., Farayola, O. A., Uwaoma, P. U., & Akinoso, A. (2024). AI in decision making: Transforming business strategies. *International Journal of Research and Scientific Innovation*, 10(12), 423–444.
- Li, G., Li, N., & Sethi, S. P. (2021). Does CSR reduce idiosyncratic risk? Roles of operational efficiency and AI innovation. *Production and Operations Management*, 30(7), 2027–2045.
- Mullins, M., Holland, C. P., & Cunneen, M. (2021). Creating ethics guidelines for artificial intelligence and big data analytics customers: The case of the consumer European insurance market. *Patterns*, 2(10), Article 100349.
- Muto, A. P. (2025). Transforming CSR initiatives through AI applications: The strategic applications in the European manufacturing sector.
- Rane, N. L., Paramesha, M., Choudhary, S. P., & Rane, J. (2024). Artificial intelligence, machine learning, and deep learning for advanced business strategies: A review. *Partners Universal International Innovation Journal*, 2(3), 147–171.
- Salim, P. S. (2025). Artificial intelligence in corporate social responsibility. In *Era of management: Adapting strategies for a changing environment* (p. 148).
- Sharma, R. (2022). Corporate social responsibility and customer satisfaction: Role of artificial intelligence. *Acta Universitatis Bohemiae Meridionales*, 25(2), 162–174.
- Singh, K., & Misra, M. (2022). The evolving path of CSR: Toward business and society relationship. *Journal of Economic and Administrative Sciences*, 38(2), 304–332.
- Soubhari, T., Jayaprakasan, P. P., Shobha, C. V., Mannarath, A. K., & Nanda, S. S. (2025). AI-driven green growth and carbon-neutral solutions. In *Springer Nature Switzerland* (pp. 245–271).
- Wang, Q., Wu, C., & Sun, Y. (2015). Evaluating corporate social responsibility of airlines using entropy weight and grey relation analysis. *Journal of Air Transport Management*, 42, 55–62.
- Wang, Y., Xiong, M., & Olya, H. (2020). Toward an understanding of responsible artificial intelligence practices. In *Proceedings of the 53rd Hawaii International Conference on System Sciences* (pp. 4962–4971). Hawaii International Conference on System Sciences.
- Zhou, X. H., Hasan, N. A. M., De Costa, F., & Qiao, W. (2024). Opportunities or challenges? The interplay between artificial intelligence and corporate social responsibility communication. *Business Systems Research*, 15(1), 131–157.