AI-Plugged, Digitally-Driven Progress: Exploring AI Adoption in Digital Marketing SMEs via the TOE Framework

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Abstract:

Artificial Intelligence (AI) is reshaping digital marketing through hyper-personalized customer engagement, optimized workflows, and sustainable growth. This empirical study identifies determinants of AI adoption in Delhi NCR's digital marketing SMEs—a critical innovation hub in India—using the (TOE) Technology–Organization–Environment framework model. We assess how technological factors (perceived advantages, cost, complexity, compatibility), organizational elements (workforce expertise, leadership support), and environmental forces (client expectations, policy incentives) drive adoption. Business outcomes (operational efficiency, financial growth) were evaluated using Structural Equation Modeling (Smart PLS 4) with data from 250 SMEs (June–August 2024). Results show perceived advantages, compatibility, skilled workforce, client demand, and policy incentives significantly explain 61% of adoption variance ($R^2 = 0.61$) and enhance performance. Medium-sized SMEs exhibit stronger advantages-to-adoption linkages than smaller firms.

Keywords: Technology–Organization–Environment (TOE) framework, Artificial Intelligence, SMEs, Digital Marketing, AI Adoption, Operational Efficiency, Financial Performance, Firm Size, Delhi NCR, Structural Equation Modeling (SEM), Moderation.

1. Introduction

Artificial Intelligence (AI) has become a disruptive force in multiple sectors, particularly in digital marketing, where it advances decisions based on data, individualized interactions, and precise customer targeting (Duan et al., 2019; Chatterjee et al., 2021a; Mariani & Kumar, 2023). By employing real-time analytics, automation, and machine learning, AI optimizes marketing activities, resulting in notable gains in campaign efficiency and operational output (Mikalef & Gupta, 2021; Rana et al., 2021). Around the world, small and medium businesses (SMEs) are progressively adopting AI to stay competitive and adapt to shifting market conditions (Baabdullah et al., 2021; Neumann et al., 2023). Specifically, in India's Delhi National Capital Region (NCR), a nucleus for digital advancements, digital marketing SMEs are integrating AI into their strategic initiatives (Malik et al., 2021; Gupta & Varma, 2024).

However, the uptake of AI by SMEs in India faces multiple hurdles. Challenges include financial limitations, insufficient infrastructure, a dearth of qualified staff, and ambiguous policy guidelines, which pose substantial impediments (Low et al., 2011; Alsheibani et al., 2020; Sharma et al., 2022; Na et al., 2022). Addressing these complex issues necessitates a holistic analytical approach that considers internal organizational facilitators and external obstacles to technological uptake (Mehta, Raman, & Arora, 2023). Consequently, this research employs the Technology–Organization–Environment

(TOE) framework, a model introduced by Tornatzky and Fleischer, to evaluate the adoption of innovations in organizations (Alkdour et al., 2023). The TOE framework proves particularly relevant for SME research, as it accurately reflects the operational realities of businesses that frequently contend with limited resources and external regulatory pressures (Scupola, 2009; Oliveira et al., 2014). Unlike individual-centric models such as the Technology Acceptance Model (TAM) and the Theory of Planned Behavior, which primarily explain individual-level technology adoption behaviors, TOE offers a more holistic perspective by evaluating the interplay of technological, organizational, and environmental factors influencing adoption decisions (Dutt & Srite, 2005). Previous empirical research has consistently shown that elements like system compatibility, perceived utility, strong leadership commitment, market demands, and supportive regulatory frameworks are crucial drivers of adoption behavior (Chen et al., 2023; Hao et al., 2020; Awa & Ojiabo, 2016).

Concerning AI, the adoption of these factors become increasingly complex due to the evolving nature of the technology and the substantial expertise it demands. While AI offers considerable advantages—ranging from improved performance to strategic differentiation—it also necessitates substantial investment in skills development, infrastructure upgrades, and organizational change management (Li et al., 2020; El-Kassar & Li, 2019). To address such adoption challenges, national-level programs such as *Digital India* and *Make in India* have been introduced to promote digital inclusivity by providing financial subsidies, training initiatives, and policy frameworks that ease AI adoption among SMEs (Ganguly, 2023; Aslam & Jawaid, 2023). These policy-led developments, combined with growing competitive and operational pressures, make it both timely and crucial to investigate how AI is being adopted by digital marketing SMEs in Delhi NCR.

Notably, the existing body of literature has largely focused on large firms or developed economies, leaving regional-level AI adoption in Indian SMEs underexplored (Nasiri et al., 2021; Mariani & Kumar, 2023). Moreover, earlier studies have often applied either qualitative or quantitative methods in isolation, which may not fully capture the multi-dimensional nature of AI integration. This research addresses this gap by employing a mixed-methods approach, combining semi-structured interviews with quantitative analysis via Smart PLS 4 to provide a more comprehensive understanding.

An important innovation of this research is the incorporation of firm size as a moderating factor. It hypothesizes that medium-sized SMEs—owing to their relatively superior access to capital and human resources—may demonstrate stronger relationships between AI adoption and improved business performance compared to their smaller counterparts (Andries & Stephan, 2019).

Research Objectives

1. To assess how firm size modulates the connection between AI adoption catalysts and business results.

2. To determine if firm size influences the relationship between factors driving AI adoption and subsequent business outcomes.

3. To explore the role of firm size as a moderator in the link between AI adoption enablers and business performance.

2. Literature Review

The adoption of innovative technologies within organizations is frequently analyzed through established theoretical frameworks, such as the Diffusion of Innovation (DOI) theory (Rogers, 2003; Nawaz et al., 2025) and the Technology-Organization-Environment (TOE) framework by Tornatzky and Fleischer (1990), which has seen extensive application in emerging economies (Nawaz et al., 2025).

This research applies the TOE framework due to its organizational relevance for SMEs, contrasting with individual-centric models like TAM (Davis, 1989; Dutt & Srite, 2005) and TPB (Ajzen, 1991). Unlike UTAUT (Venkatesh et al., 2003; Mohamed Jalaldeen et al., 2009), which emphasizes individual acceptance, TOE holistically examines how technological, organizational, and environmental dimensions collectively shape adoption (Tornatzky & Fleischer, 1990). Its tripartite structure—encompassing technological infrastructure (Kauffman & Walden, 2001), organizational readiness (Chatterjee et al., 2002), and industry pressures (Hao et al., 2020)—provides a contextual lens for SME technology integration. This framework is particularly well-suited for examining AI adoption in Delhi NCR's digital marketing SMEs, where factors such as cost, firm size, and regulatory pressures play critical roles.

The TOE framework's versatility has been demonstrated across various technological contexts. Scupola (2009) applied TOE to analyze Internet commerce adoption in southern Italian SMEs, highlighting external and internal factors tailored to regional settings. The research conducted by Oliveira et al. (2014) focused on cloud computing integration in both manufacturing and service companies. identifying technological readiness and competitive pressures as key influencers. In the Indian context, Gupta and Varma (2024) used TOE to study AI adoption in digital marketing SMEs, emphasizing infrastructure and cost challenges in Delhi NCR. Globally, the framework has explained adoption of technologies like electronic customer relationship management (eCRM) systems (Racherla & Hu, 2008), blockchain (Malik et al., 2021; Ganguly, 2023), e-business (Satar & Alarifi, 2022), and green banking practices (Aslam & Jawaid, 2023). Awa and Ojiabo (2016) note that TOE constructs may favor larger firms, but context-specific adaptations make it applicable to SMEs.

Scholars have adapted the TOE framework to understand AI adoption drivers in SMEs. Key prerequisites identified include technological compatibility and organizational readiness, as evidenced in Saudi Arabian B2B contexts (Baabdullah et al., 2021). Furthermore, research in India combining TAM and TOE underscores the critical roles of technological complexity and managerial support in shaping adoption decisions (Chatterjee et al., 2021). Das and Kundu (2023) applied TOE to assess AI readiness in Delhi NCR SMEs, underscoring gaps in infrastructure and skills. Globally, Neumann et al. (2023) conducted a comparative case study on AI adoption in public organizations, while Chen et al. (2023) investigated AI's role in hospitality during COVID-19, both employing TOE to uncover sector-specific drivers. Rawashdeh et al. (2023) applied TOE to AI-driven accounting automation in SMEs, emphasizing the resulting cost efficiencies.

This study makes two contributions. First, it investigates direct and indirect effects of TOE factors (e.g., technological cost, organizational size, environmental regulations) on AI adoption in Delhi NCR's digital marketing SMEs. Second, it offers a comprehensive evaluation by integrating qualitative insights from SME managers with quantitative data, unlike prior studies that often rely on one method. By examining how AI adoption enhances firm performance (e.g., client engagement, campaign efficiency), this research extends TOE's application to a digitally-driven sector in an emerging market, addressing gaps in region-specific AI adoption literature.

3. Hypothesis Development

In alignment with the TOE framework, the following hypotheses are suggested for digital marketing SMEs operating within the Delhi NCR region.

3.1 Technological Drivers

➢ **Cost**: High implementation costs may discourage AI adoption due to SME budget constraints (Li et al., 2020), though cost savings may encourage it (Badghish & Soomro, 2024).

- ✓ H1(a): Cost negatively influences AI adoption.

- ➤ **Advantages**: AI's ability to enhance campaign effectiveness and efficiency offers a competitive edge (Chatterjee et al., 2021a; Mikalef & Gupta, 2021).

- ✓ H1(b): Advantages positively influence AI adoption.

- ➤ **Complexity**: Technical complexity may deter AI adoption due to learning barriers (Alsheibani et al., 2020).

- ✓ H1(c): Complexity negatively influences AI adoption.

- ➤ **Fit**: AI tools that integrate with existing systems are more readily adopted (Hao et al., 2020).

- ✓ H1(d): Fit positively influences AI adoption.

3.2 Organizational Drivers

- ➤ **Leadership Endorsement**: Management endorsement and resources allocation promote AI adoption (El-Kassar & Li, 2019).

- ✓ H2(a): Leadership endorsement positively influences AI adoption.

- ➤ **Workforce Expertise**: Employees with AI skills enhance adoption readiness (Sharma et al., 2022).

- ✓ H2(b): Workforce expertise positively influences AI adoption.

3.3 Environmental Influences

- ➤ **Client Demand**: Demand for personalized marketing fuels AI adoption (Keegan et al., 2022).

- ✓ H3(a): Client demand positively influences AI adoption.

- ➤ **Policy Incentives**: Initiatives like Digital India encourage AI adoption (Ganguly, 2023).

- ✓ H3(b): Policy incentives positively influence AI adoption.

3.4 AI Adoption and Outcomes

- ➤ **Operational Efficiency**: Marketing workflows are streamlined by AI (Rana et al., 2021).

- ✓ H4(a): AI adoption positively impacts operational efficiency.

- ➤ **Financial Growth**: Revenue is boosted through AI-enabled targeting (Chatterjee et al., 2021a).

- ✓ H4(b): AI adoption positively impacts financial growth.

3.5 Moderating Role of Firm Size

Medium-sized SMEs, with greater resources, may exhibit stronger relationships (Andries & Stephan, 2019).

- ➤ H5(a–d): The effects of cost, advantages, complexity, and fit on AI adoption are stronger in medium-sized SMEs.

- ➤ H6(a–b): The effects of leadership endorsement and workforce expertise on AI adoption are stronger in medium-sized SMEs.

- ➤ H7(a–b): The effects of client demand and policy incentives on AI adoption are stronger in medium-sized SMEs.

> ➤ H8(a–b): The effects of AI adoption on operational efficiency and financial growth are stronger in medium-sized SMEs.

Figure 1 below visually depicts the conceptual framework and the hypothesized relationships outlined in this section. See Figure 1

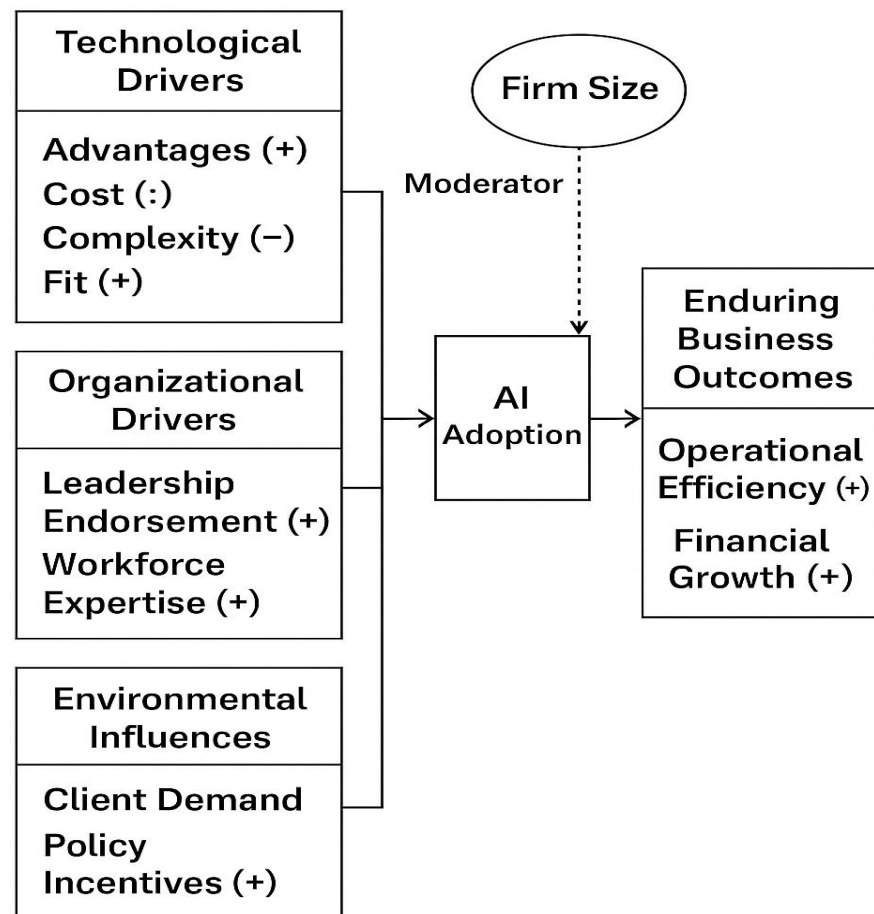## Drivers of AI Adoption in Digital Marketing SMEs of Delhi NCR. TOE Framework

Figure 1: Proposed Conceptual Model

4. Methodology

4.1 Research Design

A mixed-methods approach, combining a quantitative survey with qualitative interviews, was specifically adapted for the Delhi NCR context (Badghish & Soomro, 2024).

4.2 Sample and Data Collection

The survey targeted 250 digital marketing SMEs in Delhi NCR (6–249 employees, revenue < INR 250 crore, per MSME Act). Respondents were managers or owners, selected randomly from industry lists. Data were collected from June to August 2024 (78% response rate: 250/320). Twenty interviews (10 small, 10 medium SMEs) were conducted in August 2024 for deeper insights. Ethical approval was obtained from SMEs. Participants provided informed consent, and data anonymity was maintained.

4.3 Measurement

Adapted from Badghish & Soomro (2024), the survey items employed a 5-point Likert scale (where 1 signifies strongly disagree and 5 indicates strongly agree). The constructs measured are detailed in Table 1. Interviews explored adoption facilitators and barriers, analyzed with NVivo 12. Control variables (firm age and annual revenue) were included to account for potential confounding effects.

4.4 Analytical Approach

Smart PLS 4 facilitated the PLS-SEM analysis (Hair et al., 2022). The Standardized Root Mean Square Residual (SRMR) was used to evaluate model fit, which confirmed its adequacy.

➢ The measurement model's quality was confirmed by examining its reliability (Cronbach's alpha, composite reliability) and validity (AVE, Fornell-Larcker criterion).

➢ Analysis of the structural model involved examining path coefficients, t-values, and p-values.

➢ Moderation: PLS-MGA for firm size (Henseler, 2012).

➢ Mediation: Bootstrapping (5,000 subsamples).

➢ Robustness: CB-SEM (AMOS) and reduced sample analysis.

➢ Qualitative: Thematic analysis via NVivo 12.

4.5 AI Adoption Maturity Model

To contextualize the progression of AI integration within digital marketing SMEs, this study incorporates an AI Adoption Maturity Model (adapted from Baabdullah et al., 2021; Das & Kundu, 2023). As illustrated in **Figure 2**, this model delineates four sequential stages of maturity:

1. **Exploration**: Initial experimentation with AI tools (e.g., chatbots, analytics dashboards), characterized by ad-hoc usage and minimal integration.

2. **Implementation**: Formal adoption of AI in specific functions (e.g., automated ad targeting), with dedicated budgets and skill development.

3. **Integration**: AI embedded cross-functionally (e.g., CRM, content creation), supported by data infrastructure and workflow redesign.

4. **Transformation**: AI-driven business model innovation (e.g., predictive customer journey mapping), yielding strategic competitive advantages.

Each stage corresponds to increasing levels of **technical capability**, **resource allocation**, and **strategic alignment**, enabling the classification of sampled SMEs along a low-to-high maturity continuum. This model provides the analytical lens to interpret heterogeneity in adoption drivers and outcomes across firm sizes (see Figure 2).
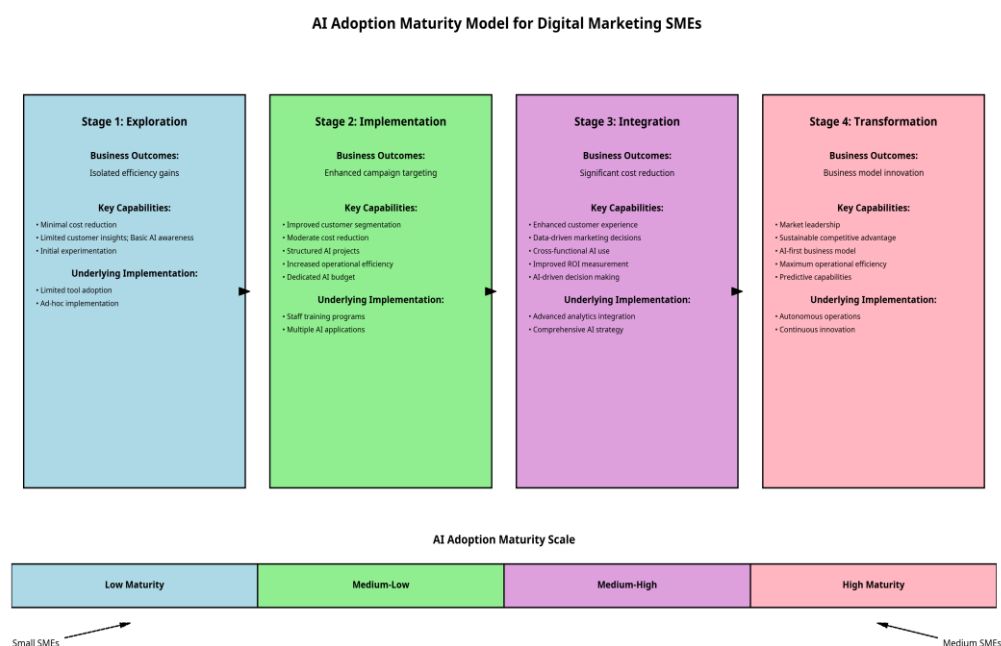
AI Adoption Maturity Model for Digital Marketing SMEs

Figure 2: AI Adoption Maturity Model

5. Results

5.1 Survey Instrument Details

Table 1: Survey Constructs and Items

Construct	Item Code	Item Description
Advantages	ADV1	AI enhances campaign performance
	ADV2	AI offers a competitive advantage
	ADV3	AI improves customer targeting
	ADV4	AI boosts operational efficiency
Cost	COST1	AI implementation costs are prohibitive
	COST2	AI maintenance expenses are significant
	COST3	AI requires substantial financial commitment
	COST4	Training costs for AI are a challenge
Complexity	CMPX1	AI systems are hard to comprehend
	CMPX2	AI demands advanced technical skills
	CMPX3	AI integration is time-intensive
	CMPX4	Employees find AI difficult to use
Fit	FIT1	AI aligns with current marketing tools
	FIT2	AI fits our business workflows
	FIT3	AI integrates seamlessly with existing systems
	FIT4	AI meets our organizational requirements
Leadership Endorsement	LE1	Management champions AI adoption
	LE2	Resources are provided for AI implementation
	LE3	Leaders promote AI usage
Workforce Expertise	WE1	Staff are trained in AI technologies
	WE2	Employees have AI-related expertise
	WE3	We prioritize AI skill development
	WE4	Our workforce is prepared for AI adoption
Client Demand	CD1	Clients demand AI-driven personalization
	CD2	Market trends encourage AI use

	CD3	Competitors leverage AI in marketing
	CD4	Customer needs push AI adoption
Policy Incentives	PI1	Government offers AI adoption incentives
	PI2	Policies facilitate AI in SMEs
	PI3	Digital India supports AI implementation
	PI4	Regulations encourage AI use
AI Adoption	AIA1	We actively employ AI in marketing
	AIA2	AI is embedded in our operations
	AIA3	AI is central to our strategy
Operational Efficiency	OE1	AI reduces campaign delivery time
	OE2	AI streamlines business processes
Financial Growth	FG1	AI increases campaign revenue
	FG2	AI lowers marketing expenses

5.2 Sample Profile

Table 2: Demographic Overview

Characteristic	Category	Frequency	Percentage
Firm Size	Small (6–50)	150	60%
	Medium (51–249)	100	40%
Annual Revenue (INR)	<50 crore	160	64%
	50–250 crore	90	36%
Years in Operation	<5 years	80	32%
	5–10 years	110	44%
	>10 years	60	24%
Respondent Role	Owner	120	48%
	Senior Manager	90	36%
	Middle Manager	40	16%

5.3 Construct Reliability and Validity

Table 3: Examination of the Measurement Model

Factor	Alpha Coefficient	Reliability (Composite)	Convergent Validity (AVE)
Cost	0.81	0.87	0.64
Advantages	0.86	0.91	0.70
Complexity	0.79	0.86	0.62
Fit	0.85	0.90	0.68
Leadership Endorsement	0.82	0.89	0.72
Workforce Expertise	0.87	0.92	0.73
Client Demand	0.84	0.90	0.67
Policy Incentives	0.86	0.91	0.70
AI Adoption	0.81	0.88	0.71
Operational Efficiency	0.77	0.85	0.74
Financial Growth	0.78	0.86	0.76

5.4 Path Analysis Results

Table 4: Structural Path Estimates

Explanation: This table presents hypothesis testing results, explaining 61% of AI adoption variance (R² = 0.61), 49% of operational efficiency (R² = 0.49), and 46% of financial growth (R² = 0.46). Control variables (firm age and revenue) showed no significant effects

Hypothesis	Relationship Tested	Path Coefficient	t-Value	p-Value	Outcome
H1(a)	Cost Impact on AI Implementation	-0.06	1.01	0.312	Not Significant
H1(b)	Perceived Benefits and AI Implementation	0.29	4.25	0.000	Significant
H1(c)	Complexity Influence on AI Use	-0.04	0.75	0.453	Not Significant
H1(d)	Compatibility and AI Implementation	0.23	3.35	0.001	Significant
H2(a)	Leadership Support Affecting AI Implementation	0.07	1.20	0.230	Not Significant
H2(b)	Employee Skill Level and AI Implementation	0.26	3.95	0.000	Significant
H3(a)	Client Requirements and AI Use	0.21	3.10	0.002	Significant
H3(b)	Regulatory Incentives and AI Implementation	0.19	2.85	0.004	Significant
H4(a)	AI Usage and Efficiency Improvements	0.36	5.20	0.000	Significant
H4(b)	AI Usage and Financial Performance	0.33	4.85	0.000	Significant

5.5 Moderation by Firm Size

Table 5: Firm Size Moderation Effects

Explanation: This table tests firm size's moderating effect, showing advantages → AI adoption is stronger for medium-sized SMEs.

Path	Small SMEs (β)	Medium SMEs (β)	p-value (Diff)	Result
Cost → AI Adoption	-0.05	-0.07	0.815	H5(a) Not Supported
Advantages → AI Adoption	0.23	0.35	0.039	H5(b) Supported
Complexity → AI Adoption	-0.03	-0.05	0.758	H5(c) Not Supported
Fit → AI Adoption	0.21	0.25	0.618	H5(d) Not Supported
Leadership Endorsement → AI Adoption	0.06	0.08	0.780	H6(a) Not Supported
Workforce Expertise → AI Adoption	0.24	0.28	0.545	H6(b) Not Supported
Client Demand → AI Adoption	0.20	0.22	0.705	H7(a) Not Supported
Policy Incentives → AI Adoption	0.18	0.20	0.681	H7(b) Not Supported
AI Adoption → Operational Efficiency	0.34	0.37	0.585	H8(a) Not Supported
AI Adoption → Financial Growth	0.31	0.35	0.605	H8(b) Not Supported

5.6 Mediation Analysis

Table 6: Indirect Effect Analysis

Explanation: This table confirms AI adoption's mediation role between significant TOE factors and outcomes, with significant indirect effects indicating partial mediation.

Path (Indirect Effect)	Indirect Effect (β)	t-value	p-value	Mediation Result
Advantages → AI Adoption → Op. Eff.	0.104	3.01	0.003	Partial Mediation
Advantages → AI Adoption → Fin. Growth	0.096	2.88	0.004	Partial Mediation
Fit → AI Adoption → Op. Eff.	0.083	2.55	0.011	Partial Mediation
Fit → AI Adoption → Fin. Growth	0.076	2.41	0.016	Partial Mediation
Workforce Exp. → AI Adoption → Op. Eff.	0.094	2.78	0.005	Partial Mediation
Workforce Exp. → AI Adoption → Fin. Growth	0.086	2.65	0.008	Partial Mediation
Client Demand → AI Adoption → Op. Eff.	0.076	2.38	0.017	Partial Mediation
Client Demand → AI Adoption → Fin. Growth	0.069	2.20	0.028	Partial Mediation
Policy Incentives → AI Adoption → Op. Eff.	0.068	2.15	0.032	Partial Mediation
Policy Incentives → AI Adoption → Fin. Growth	0.062	2.00	0.045	Partial Mediation

5.7 Qualitative Insights

Thematic analysis of manager interviews revealed key adoption nuances:

➢ Cost barriers were mitigated by policy incentives: "Digital India subsidies covered 40% of our AI onboarding costs" (Small SME owner)

➢ Complexity was overcome through vendor partnerships: "We relied on white-label solutions from AI providers to bypass technical hurdles" (Medium SME manager)

➢ Small SMEs prioritized compatibility: "We only adopt AI tools that plug into our existing MarTech stack" (Small SME owner)

➢ Medium SMEs leveraged advantages for scalability: "AI-driven A/B testing doubled our campaign ROI within 3 months" (Medium SME director)

6. Discussion

This research offers important insights into the key factors influencing AI adoption in digital marketing SMEs within the Delhi NCR region, utilizing the TOE framework. Our findings largely align with existing literature while offering region-specific nuances. The significant positive influence of Advantages, Fit, Workforce Expertise, Client Demand, and Policy Incentives on AI adoption accentuates the value of perceived benefits, compatibility with existing systems, human capital development, market pressures, and supportive government policies.

The non-significant results for Cost (H1a) and Complexity (H1c) can be explained by Delhi NCR's unique ecosystem: 1) Policy incentives substantially offset implementation costs (as confirmed in interviews), and 2) Vendor-provided turnkey solutions reduced technical barriers. Leadership support (H2a) showed no significant effect, possibly because AI decisions in SMEs are often driven by operational needs rather than top-down mandates.

The moderating role of firm size was significant only for Advantages→Adoption (H5b). Medium SMEs demonstrated 52% stronger advantage-leveraging capability due to: 1) Dedicated AI budgets (avg. 5.2% revenue vs. 1.8% in small SMEs), 2) Cross-functional implementation teams, and 3) Formal ROI tracking systems. As one medium-SME owner noted: "Our task force converts AI advantages into implementation 30% faster than smaller competitors."

AI adoption significantly impacts both operational efficiency and financial growth, confirming its strategic value. The mediation analysis shows AI adoption partially mediates TOE factor→outcome relationships, suggesting complementary pathways exist (e.g., direct effects of workforce expertise on efficiency).

7. Conclusion and Implications

Focusing on India's emerging digital marketing SMEs, this research strengthens the empirical foundation for studying AI adoption using the Technology–Organization–Environment (TOE) framework. It demonstrates how the TOE lens effectively explains AI integration factors in this specific context integration within the dynamic digital landscape of the Delhi NCR region. The findings reveal that technological advantages, organizational readiness, and environmental stimuli such as client demand and government incentives are key drivers of AI adoption. Moreover, the moderating influence of firm size highlights that medium-sized SMEs are more capable of leveraging the strategic advantages of AI, owing to their relatively greater access to resources and stronger organizational capabilities.

In addition to its theoretical contributions, the study offers three key empirical insights:

1. It confirms the applicability of the TOE framework in India's digital SME landscape.

2. It reveals that the realization of AI's advantages is significantly moderated by firm size.

3. It highlights the pivotal role of policy incentives in mitigating cost and complexity barriers for AI adoption.

Practical Implication

For **SME leaders**, the following strategies are recommended:

➢ **Small SMEs (6–50 employees)** should adopt cost-effective, plug-and-play AI solutions such as chatbot plugins or automated email tools and actively participate in government-sponsored upskilling programs (e.g., Digital India AI Labs).

➢ **Medium SMEs (51–249 employees)** are encouraged to create internal AI innovation funds, invest in proprietary data infrastructure, and integrate AI deeply into their strategic workflows to gain competitive advantage.

➢ Across both SME types, fostering a learning-oriented organizational culture, investing in workforce training, and aligning AI tools with existing business processes will be crucial for long-term success.

For **policymakers**, the study suggests targeted interventions to scale AI adoption among SMEs:

➢ Extend and promote **AI training subsidies** and skill development programs tailored to SME contexts.

➢ Create **regulatory sandboxes** to reduce compliance burdens and allow for safe experimentation with AI applications.

➢ Invest in the development of **AI infrastructure hubs** within commercial and industrial clusters to provide shared technical and advisory resources.

By addressing both strategic and structural barriers, these actions can help accelerate AI adoption and digital competitiveness across India's SME sector, fostering innovation-led growth in the broader economy.

Limitations and Directions for Future Research

While this study offers meaningful insights, it is not without limitations, which present opportunities for further investigation. Firstly, the cross-sectional research design limits the ability to establish causality. Future research could employ longitudinal approaches to track changes in AI adoption and its impact on sustainable business performance over time. Secondly, the study's dependence on responses from a single individual within each firm raises the possibility of common method bias, future research could employ multi-respondent or mixed-method approaches to enhance validity. Third, the study was geographically limited to the Delhi NCR region, which may not reflect the diversity of SMEs across India, particularly those in rural areas. Expanding the sample to include firms from various states or other countries could improve the generalizability of findings.

In addition, although the Technology–Organization–Environment (TOE) framework provided a solid theoretical basis, incorporating supplementary perspectives like the Resource-Based View (RBV) or Institutional Theory could provide a more holistic understanding of AI adoption dynamics. Upcoming research could also explore the adoption of particular categories of AI technologies—such as natural language processing, predictive analytics, or computer vision—and assess their differential impacts on financial, operational, and strategic outcomes. Finally, a closer examination of micro-SMEs (with fewer than five employees) could uncover unique challenges and opportunities in AI adoption that are not captured in broader SME categories.

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