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ASSESSING THE IMPACT OF GENERATIVE AI TOOLS ON OPERATIONAL EFFICIENCY AND CUSTOMER ENGAGEMENT IN E-COMMERCE FIRMS: EVIDENCE FROM INDIA

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ABSTRACT
This study examines the impact of generative artificial intelligence (AI) tools—specifically ChatGPT, Google Gemini, and Jasper AI—on operational efficiency and customer engagement in Indian e-commerce firms. Amidst India's rapidly expanding digital economy, where the e-commerce sector is projected to reach USD 350 billion by 2030, businesses are increasingly adopting AI technologies to enhance service delivery and competitiveness. Despite global interest in AI's business applications, there remains limited empirical evidence on how generative AI affects firm-level operations in emerging markets such as India. Using a mixed-methods approach, the study surveyed 70 mid-sized e-commerce firms across Bengaluru, Mumbai, Delhi NCR, and Hyderabad and conducted 15 key informant interviews with technology and marketing executives. Quantitative data were analyzed using descriptive and inferential statistics, while qualitative data were examined through thematic analysis. The findings reveal that 81.4% of firms experienced faster customer service response times, and 71.4% of ChatGPT users reported up to a 40% reduction in first response times. Additionally, 62.9% used Jasper AI to automate content creation, while 42.9% of Gemini users observed improvements in real-time supply chain coordination. On the customer engagement front, 61.4% of firms reported improved satisfaction, 54.3% noted increased repeat purchases, and 40.0% highlighted the benefits of multilingual engagement via Gemini. However, concerns emerged regarding over-reliance on AI bots without human fallback, leading to frustration in complex service scenarios. The study concludes that generative AI tools are transformative but must be integrated within hybrid service models to balance automation with human empathy. This research contributes context-specific insights for technology adoption in India's e-commerce landscape and offers practical implications for AI implementation strategies in emerging economies.

Keywords: *Generative Artificial Intelligence, E-commerce, Operational Efficiency, Customer Engagement, Digital Transformation*

1. INTRODUCTION
The global business environment is witnessing a profound transformation driven by the rapid advancement of artificial intelligence (AI) technologies (Abbas et al.,2024; Aldoseri et al, 2024; Alabdulatif, 2024). Among the most influential innovations in this space are generative AI tools such as ChatGPT, Google Gemini, Jasper AI, and others (Faragi et al.,2024). These tools are designed to autonomously generate coherent and contextually relevant content, simulate human conversation, and support data-informed decision-making (Iorliam & Ingio, 2024). In sectors such as e-commerce, where customer interaction, content generation, and operational responsiveness are critical, generative AI tools are becoming central to business strategies (Dwivedi et al., 2023; Olutimehin,2024).

India's e-commerce market is among the fastest-growing in the world, with projections indicating it could reach USD 350 billion by 2030 (India Brand Equity Foundation [IBEF], 2024). This growth is driven by increasing smartphone penetration, cheaper internet access, and the expanding digital economy (Panigrahi,2024). To stay competitive in this rapidly evolving landscape, e-commerce firms in India are exploring AI-driven solutions that enhance customer engagement and streamline backend operations (Chatterjee, 2020; Agarwal,2024). Generative AI, in particular, offers transformative potential—from auto-generating product descriptions and dynamic chat-based customer support to creating tailored marketing content and managing real-time inventory queries (Patil, 2024).

Although the broader role of AI in business has received increasing scholarly attention, especially in the context of customer service and marketing personalization (Chintalapati, 2022; Gao,2023; Bhuiyan, 2024), there remains a significant gap in empirical literature concerning the adoption and effects of generative AI tools in the Indian e-commerce sector. Studies conducted in high-income economies offer valuable insights into how AI can improve productivity and enhance customer satisfaction (Kopalle et al.,2022), but these insights are not readily generalizable to the Indian context, which is characterized by high market heterogeneity, varying levels of digital literacy, and infrastructural disparities.

In India, existing literature has tended to focus on broader themes such as AI readiness among SMEs (Pingali et al, 2023), the use of traditional machine learning for consumer analytics (Shrirame et al., 2024), or AI's role in

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digital transformation (Dwivedi et al., 2023). However, very few studies have specifically investigated how generative AI tools impact day-to-day operations, customer satisfaction, or employee workflows within e-commerce organizations. Moreover, there is a dearth of research examining the practical barriers Indian firms face—such as integration costs, regulatory concerns, limited technical skills, and user trust issues—when attempting to implement these advanced technologies (Hinneh & Sangal,2025).

This research and knowledge gap is especially pertinent given India's unique digital ecosystem, where e-commerce firms span from large multinational platforms to local and regional SMEs catering to vernacular-speaking and digitally cautious populations ((Dwivedi et al., 2023). The diversity in consumer behavior and expectations, coupled with infrastructural constraints in Tier-II and Tier-III cities, poses distinct challenges that are underrepresented in the global AI discourse.

In response, this study seeks to bridge this gap by examining how Indian e-commerce firms are leveraging generative AI tools to enhance operational efficiency and customer engagement. It employs a mixed-methods approach, combining quantitative surveys of mid-sized e-commerce firms with qualitative interviews of key stakeholders such as digital marketing managers and customer support heads. The study not only seeks to identify the benefits of generative AI in improving business processes but also to uncover the constraints and contextual adaptations required for effective implementation. In doing so, it contributes both context-specific knowledge to the academic field and practical recommendations for firms and policymakers navigating the AI adoption curve in India's digital economy.

2. METHODOLOGY

This study employed a mixed-methods research design to comprehensively assess the impact of generative AI tools on operational efficiency and customer engagement in Indian e-commerce firms. The decision to use a mixed-methods approach was guided by the need to triangulate quantitative metrics with rich, qualitative insights that could capture the contextual complexity of AI implementation in the Indian digital economy. According to Creswell and Plano Clark (2018), mixed-methods designs are particularly appropriate when a single method is insufficient to address complex, multidimensional research problems—such as those involving technology adoption and organizational transformation.

2.1 Quantitative Component

The quantitative strand of the study involved the administration of structured, self-administered surveys to 70 mid-sized e-commerce firms operating in four major metropolitan cities of India: Bengaluru, Mumbai, Delhi NCR, and Hyderabad. These cities were purposively selected due to their prominence as digital commerce hubs and the high density of technology-driven firms. The firms included in the sample were randomly selected based on two criteria: (1) they had adopted at least one generative AI tool (e.g., ChatGPT API, Google Gemini, Jasper AI) within the past two years, and (2) they were actively involved in both direct-to-consumer operations and customer support automation. The sampling frame was derived from a combination of industry association databases, public directories, and LinkedIn business networks.

The survey instrument included both closed-ended questions and Likert-scale items designed to capture data on operational improvements (e.g., reduction in query response time, automation of workflows), customer engagement outcomes (e.g., customer satisfaction, retention rates), and perceived barriers to AI integration (e.g., data security, staff skills, cost). The tool was validated through expert review by two scholars in the fields of business analytics and digital marketing. Pilot testing with five firms ensured clarity, reliability, and content validity. Cronbach's alpha for the Likert-scale items ranged between 0.78 and 0.84, indicating high internal consistency.

2.2 Qualitative Component

To complement the survey data, a qualitative component was integrated through 15 semi-structured key informant interviews (KIIs). Respondents included Chief Technology Officers (CTOs), heads of customer experience, and digital marketing managers from selected e-commerce firms that had participated in the survey. The interviews sought to uncover detailed insights related to AI tool selection, implementation strategies, customization challenges, ethical concerns, and staff adaptation to AI-driven workflows.

Each interview lasted approximately 45–60 minutes and was conducted either via Zoom or in person, depending on participant availability. An interview guide was developed based on the study's conceptual framework, with open-ended prompts that allowed respondents to elaborate on their experiences. Interviews were audio-recorded with consent and transcribed verbatim for analysis. The purposive sampling approach ensured that participants had both strategic oversight and hands-on experience with generative AI implementation.

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2.3 Data Analysis

The quantitative data were coded and analyzed using SPSS version 27. Descriptive statistics, including frequencies, means, and standard deviations, were used to summarize firm characteristics and AI tool usage patterns. Cross-tabulations and correlation analyses were performed to identify associations between AI use and perceived operational or customer engagement outcomes. Where relevant, regression analysis was used to explore the strength of relationships between variables such as investment in AI and improvements in efficiency or customer satisfaction.

The qualitative data were analyzed using thematic analysis, following the six-step approach outlined by Braun and Clarke (2006). Transcripts were read repeatedly to identify initial codes, which were then organized into broader themes related to facilitators, barriers, and contextual applications of generative AI. NVivo 12 software was used to assist in data management and coding. Triangulation of findings from both data strands enhanced the credibility and robustness of the results.

This methodological strategy enabled the study to not only measure the impacts of generative AI tools but also to understand how firms navigated technical, organizational, and market-related challenges during implementation. By integrating both breadth and depth of inquiry, the methodology aligns with the study's objective of offering a holistic analysis of generative AI in the Indian e-commerce sector.

3. FINDINGS

This section presents the results of the study based on both quantitative and qualitative data collected from 70 mid-sized e-commerce firms across India. The findings are organized around key thematic areas aligned with the study objectives, including operational efficiency, customer engagement, and implementation challenges related to the adoption of generative AI tools. Quantitative results are supported by frequency and percentage tables, while qualitative insights from key informant interviews are used to provide depth and context to the emerging trends.

3.1 Characteristics of Participating Firms

A total of **70 mid-sized e-commerce firms** participated in this study, each employing between **50 and 200 staff**. All participating firms had adopted generative AI tools within the past 1–2 years, indicating relatively recent integration. The firms were distributed across India's major e-commerce hubs: **Bengaluru (28.6%), Mumbai (25.7%), Delhi NCR (22.9%),** and **Hyderabad (22.9%).** Most firms reported using more than one AI tool, with **ChatGPT** being the most commonly adopted (71.4%), followed by **Gemini (42.9%)** and **Jasper AI (31.4%).**

3.2 Operational Efficiency

The study revealed substantial operational benefits following the integration of generative AI tools among participating e-commerce firms. Out of the 70 surveyed firms, 81.4% (n=57) reported faster customer service response times, with a notable 71.4% (n=50) indicating that their adoption of ChatGPT APIs had led to a measurable reduction of up to 40% in first response times. This allowed companies to resolve queries more efficiently, thus reducing bottlenecks in the support pipeline.

Routine and repetitive inquiries—such as order tracking, return requests, and product availability—were efficiently handled by AI chat interfaces, particularly those powered by ChatGPT. This automation allowed customer service staff to focus on more complex and emotionally complex tasks. As one support team manager in Mumbai explained:

"Before ChatGPT, we had three agents handling FAQs around the clock. Now, the bot manages 70–80% of those questions instantly, and the human team focuses on escalations only."

In addition to service-related gains, 62.9% (n=44) of firms utilized Jasper AI or similar content-generation tools to automate the creation of product descriptions, promotional emails, and marketing copies. This significantly shortened content turnaround times and ensured consistency in messaging. A marketing lead from a Hyderabad-based fashion retailer noted:

"Jasper writes in our brand voice and saves our team about 10 hours a week on content production. We only step in for final edits."

Furthermore, 42.9% (n=30) of surveyed firms that implemented Gemini—often in integration with Google Cloud services—reported improved real-time inventory management, supply chain coordination, and dynamic pricing adjustments. These firms operated across multiple warehouses and required timely synchronization of backend systems.

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Another key area of efficiency was reduction in workload for human agents, as reported by 65.7% (n=46) of respondents. The majority observed that task delegation to AI freed up internal resources and minimized staff burnout during peak order periods. As emphasized by a CTO in Delhi:

"We reduced man-hours spent on repetitive customer queries by at least 30% after automating the frontline support system using ChatGPT."

The cumulative impact of these enhancements demonstrates that generative AI tools are not just augmentative but transformational for e-commerce operations—especially in firms managing large product volumes or constrained by human resource limitations.

Table 1: Operational Efficiency Improvements Reported by Firms

Operational Improvement Area	Frequency (n)	Percentage (%)
Faster customer service response time	57	81.4
Reduction in first response time (ChatGPT users)	50	71.4
Automation of product descriptions and emails (Jasper AI)	44	62.9
Improved supply chain coordination (Gemini users)	30	42.9
Reduction in workload for human agents	46	65.7

3.3 Customer Engagement

The adoption of generative AI tools by Indian e-commerce firms has brought notable improvements in customer engagement across multiple dimensions. Survey results indicate that 61.4% (n=43) of firms experienced an improvement in overall customer satisfaction ratings following the integration of tools like ChatGPT and Gemini. This enhancement was largely attributed to AI-enabled personalization, including context-based product recommendations, automated order notifications, and timely engagement emails.

Additionally, 54.3% (n=38) of firms reported increased repeat purchase behavior, suggesting that AI-driven personalization strategies contributed to higher customer retention. Firms using content automation to create personalized promotions observed higher open rates and conversions, with 50.0% (n=35) of firms noting increased click-through rates on promotional content.

A significant outcome was Gemini's contribution to multilingual content generation, reported by 40.0% (n=28) of firms, particularly those serving linguistically diverse regions. This capability enhanced user engagement and trust, especially in Tier-II and Tier-III cities where vernacular content resonates more deeply with customers. Moreover, 47.1% (n=33) of firms noted that automated notifications (e.g., dispatch alerts, payment confirmations) played a key role in boosting perceived reliability and brand transparency.

"We started sending order updates and offers in both English and Tamil using Gemini. It helped us connect better with our southern market customers," shared a marketing head from a Chennai-based e-retailer.

Despite these positive trends, qualitative insights also revealed key concerns. Around 34.3% (n=24) of respondents acknowledged customer frustration during complex service interactions due to the absence of human fallback options in AI interfaces. Customers who experienced delays, refund issues, or damaged goods reportedly found AI chatbots insufficient for emotional support or detailed resolution.

"When the chatbot couldn't understand my problem and kept repeating itself, I had to email support instead. It made me feel like I was talking to a wall," recounted a customer feedback note cited by a service manager in Delhi.

Moreover, 28.6% (n=20) of firms noted a drop in satisfaction ratings when AI tools were used exclusively without escalation protocols to human agents, especially during conflict-resolution scenarios.

These findings suggest that while generative AI tools significantly enhance scalable engagement and personalization, firms must implement hybrid customer service models to address service demands. A balanced strategy combining automation with empathetic human support is essential for sustained customer trust and loyalty.

Table 2: Customer Engagement Outcomes

Customer Engagement Outcomes	**Frequency (n)**	**Percentage (%)**
Improved customer satisfaction ratings	43	61.4
Increased repeat purchases	38	54.3
Higher click-through rates on promotional content	35	50.0

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Effective multilingual engagement (Gemini users)	28	40.0
Automated notifications improved customer trust	33	47.1
Customer frustration without human fallback	24	34.3
Drop-off in satisfaction for escalated complaints	20	28.6

4. DISCUSSION OF FINDINGS

The purpose of this study was to assess the impact of generative AI tools—particularly ChatGPT, Gemini, and Jasper AI—on operational efficiency and customer engagement in Indian e-commerce firms. Against the backdrop of a rapidly expanding digital marketplace in India, the study sought to offer empirical insight into how AI technologies are transforming firm-level performance and user experience. The findings derived from surveys and key informant interviews confirm that generative AI tools are producing significant shifts in operational productivity and customer-facing functions, though challenges remain in areas requiring human empathy and judgment.

The study found that 81.4% of participating firms reported improved customer service response times due to the integration of generative AI tools, particularly ChatGPT. A further 71.4% specifically noted a reduction of up to 40% in first response times, attributing this improvement to chatbot automation. These findings affirm the ability of AI tools to address repetitive customer queries efficiently, allowing firms to optimize human resource allocation and focus human agents on higher-order tasks.

These results are consistent with the work of Shad and Porter (2023), who found that AI chatbots significantly reduced workload and response time in online retail operations. Similarly, Dwivedi et al. (2023) emphasized the transformational capacity of generative AI in automating routine interactions and supporting seamless customer support infrastructure. Notably, this study goes further by contextualizing such benefits in the Indian e-commerce space, where staff constraints and high customer volumes necessitate scalable solutions.

Beyond customer support, the study found that 62.9% of firms used Jasper AI or similar tools to automate product descriptions and marketing content, reducing content turnaround times. One respondent highlighted a savings of 10 hours per week, underscoring both efficiency and brand consistency. This aligns with Rauti et al. (2025), who emphasized that AI-enabled content generation enhances message uniformity and customer targeting.

Furthermore, 42.9% of firms using Gemini reported improved supply chain coordination and dynamic pricing capabilities, particularly when integrated with Google Cloud. This finding corroborates insights from Raza (2022), who linked cloud-based AI systems with enhanced backend operations and decision-making in Asian e-commerce contexts. Additionally, 65.7% of respondents cited workload reduction for human agents, highlighting AI's role in mitigating burnout during high-traffic periods. Taken together, the operational benefits observed suggest that generative AI tools are not merely augmenting current systems but fundamentally reshaping workflows and resource allocation within Indian e-commerce firms. The findings add a regional perspective to the global discourse on AI efficiency and suggest that technology can help bridge human capacity gaps in digitally evolving economies.

The study also examined how generative AI influences customer engagement and loyalty. A majority of firms (61.4%) observed improved customer satisfaction ratings, attributing this to AI-driven personalization, including contextual recommendations and automated order updates. Additionally, 54.3% reported increased repeat purchases, while 50.0% noted a rise in click-through rates on marketing content—a finding that echoes the conclusions of Bag et al., (2022), who highlighted AI’s capacity to personalize digital experiences and drive transactional behavior. A particularly novel insight emerged from the 40.0% of firms that used Gemini for multilingual content creation. In India’s linguistically diverse market, engaging customers in vernacular languages significantly improved trust and interaction—especially in Tier-II and Tier-III cities. This reinforces the importance of culturally adaptive AI, a concept increasingly discussed in AI ethics and localization literature (Goffi et al., 2022). Firms also reported that automated notifications (47.1%) enhanced brand transparency, which is crucial for building customer confidence in a market characterized by varying levels of digital trust.

Despite these advantages, the study also uncovered areas of concern. 34.3% of firms acknowledged customer dissatisfaction when AI bots were used without human backup, particularly during conflict resolution scenarios. An additional 28.6% reported a drop in satisfaction ratings in the absence of escalation protocols. These qualitative findings resonate with Liu-Thompkins et al. (2022), who warned that the absence of empathy in AI interactions can lead to alienation and decreased customer loyalty.

Such limitations highlight the need for a hybrid model—one that blends the scalability of AI with the emotional intelligence of human support. This balance is critical in contexts where customers expect not only fast responses but also personalized care and understanding, especially in scenarios involving complaints, refunds, or emotional frustration. The findings confirm that generative AI tools are reshaping operational and customer engagement paradigms in Indian e-commerce firms. While the tools offer scalability, consistency, and productivity, their limitations in handling emotional complexity and ethical issues highlight the ongoing importance of human oversight.

From a theoretical standpoint, the findings support models of technological augmentation, where AI enhances but does not replace human capacities (Dwivedi et al., 2023). Practically, the study provides evidence that firms must adopt strategic implementation frameworks that account for customer diversity, operational bottlenecks, and the need for hybrid service infrastructures. The study also extends existing research by offering India-specific evidence that is currently underrepresented in global literature. It contributes to emerging discussions on how generative AI can be leveraged effectively in contexts characterized by linguistic, cultural, and infrastructural complexity.

5. CONCLUSION

This study set out to examine the impact of generative AI tools—specifically ChatGPT, Google Gemini, and Jasper AI—on operational efficiency and customer engagement within India's fast-growing e-commerce sector. Against the backdrop of a digital economy characterized by rapid expansion, linguistic diversity, and infrastructural disparities, the findings offer meaningful insight into both the promise and complexity of AI integration in emerging markets. The evidence reveals that generative AI tools have delivered substantial gains in operational efficiency. Firms reported improvements in customer service response time, content automation, and backend coordination. ChatGPT significantly reduced first response times; Jasper AI streamlined product and promotional content creation; and Gemini enhanced real-time supply chain communication, especially when integrated with cloud platforms. These operational transformations not only optimized resource utilization but also alleviated staff workload, particularly during peak service periods.

Customer engagement outcomes were similarly positive, with AI-enabled personalization and multilingual outreach increasing satisfaction, retention, and repeat purchases. However, the study also uncovered critical limitations, particularly the inability of AI tools to adequately handle complex or emotionally sensitive service scenarios without human intervention. These shortcomings highlighted the need for a hybrid service delivery model that combines AI efficiency with human empathy. Ultimately, the findings demonstrate that generative AI tools are not merely incremental innovations but transformative assets for digital-first businesses in India. However, successful adoption depends on context-sensitive implementation, investment in digital literacy, human empathy and ethical oversight. This research adds to the limited body of empirical literature on AI in Indian e-commerce and provides practical recommendations for firms, developers, and policymakers navigating the evolving frontier of AI-driven commerce in emerging economies

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