ROLE OF ARTIFICIAL INTELLIGENCE IN OPTIMIZING Q-COMMERCE LOGISTICS AND CUSTOMER EXPERIENCE IN INDUSTRY 5.0

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Abstract

The rapid evolution of Quick Commerce (Q-Commerce) has transformed retail delivery by enabling ultra-fast fulfillment and raising consumer expectations for speed and personalization. This study examines the pivotal role of Artificial Intelligence (AI) in optimizing logistics and enhancing customer experience within the Q-Commerce ecosystem, framed by the human-centric, ethical, and sustainable principles of Industry 5.0. Employing a mixed-method approach, the research analyzes AI technologies—such as predictive analytics, intelligent routing, chatbots, and recommendation engines—used by leading Q-Commerce platforms. Findings demonstrate that AI significantly accelerates last-mile delivery, improves inventory accuracy, and fosters real-time personalization that deepens consumer engagement. However, despite these operational gains, many platforms fall short of fully integrating Industry 5.0 values like ethical AI deployment, environmental sustainability, and inclusivity. The study concludes that AI must evolve beyond an efficiency tool to become a strategic enabler of equitable, sustainable, and people-first commerce, thus unlocking the full potential of Industry 5.0 in the Q-Commerce sector. This research contributes valuable insights for businesses, policymakers, and technologists focused on developing scalable and responsible Q-Commerce solutions.

Keywords: AI in Logistics, Q-Commerce, Industry 5.0, Customer Experience, Ethical AI

1. Introduction

The digital economy is experiencing a transformative shift driven by evolving consumer expectations and the rise of Quick Commerce (Q-Commerce), a business model that enables delivery of goods within 10 to 30 minutes. This model relies heavily on hyperlocal logistics, predictive technologies, and real-time inventory management, enabling companies like Zepto, Blinkit, and Swiggy Instamart to gain competitive advantage (Deloitte, 2023). Unlike traditional e-commerce, Q-Commerce is characterized by immediacy, personalization, and micro-fulfillment, making it highly dependent on advanced digital infrastructure. At the core of this evolution is Artificial Intelligence (AI), which underpins decision-making and operational efficiency. AI technologies are utilized for demand forecasting, route optimization, automated customer support, and personalized product recommendations, thereby reducing delivery times and enhancing customer satisfaction (Chopra, 2021). Furthermore, advances in natural language processing (NLP) and machine learning (ML) enable platforms to deliver seamless and proactive customer experiences (Grewal, 2020).

Concurrently, the global industrial narrative is transitioning from Industry 4.0—which emphasized automation and data exchange—to Industry 5.0, which prioritizes human-centric innovation, sustainability, and resilience (European Commission, 2021). Industry 5.0 envisions a future where intelligent machines and humans collaborate to co-create value responsibly and ethically, emphasizing technological advancement alongside well-being, inclusivity, and environmental consciousness (Xu, 2022). In this context, the intersection of AI, Q-Commerce, and Industry 5.0 presents a fertile area for research. This study investigates how AI optimizes logistics and enhances customer experience within Q-Commerce while aligning with Industry 5.0 principles. Specifically, it examines AI tools such as real-time analytics, robotic process automation (RPA), and computer vision to understand their impact on operational frameworks and consumer interactions, thereby revolutionizing business in a human-centric and sustainable manner. The research aims to contribute to the expanding body of knowledge on AI-enabled commerce and

provide strategic insights for businesses, technologists, and policymakers aiming to succeed in the Industry 5.0 era.

2. Literature Review

Quick Commerce (Q-Commerce) has rapidly evolved as an advanced form of traditional e-commerce by offering ultra-fast delivery services—typically within 10 to 30 minutes—through the use of hyperlocal micro-fulfillment centers and real-time inventory systems (Kumar, 2022); (Chatterjee, 2021). This shift addresses growing consumer expectations for speed and convenience but also places immense pressure on logistics to become more agile and responsive (Singh, 2023). Concurrently, the industrial paradigm is moving from the automation-heavy focus of Industry 4.0 to the human-centric, sustainable vision of Industry 5.0, which emphasizes collaboration between humans and intelligent machines, ethical AI use, and environmental responsibility (European Commission, 2021); (Xu, 2022). In this context, Artificial Intelligence (AI) plays a pivotal role, particularly in logistics operations, by enabling predictive analytics, machine learning, and robotic automation to streamline route planning, inventory control, and demand forecasting (Wang, 2023); (Chopra, 2021). Moreover, AI-powered delivery drones and autonomous vehicles are being piloted to enhance last-mile delivery efficiency (Shaklab, 2023). On the customer front, AI enhances experiences via personalized recommendations, AI-enabled chatbots, sentiment analysis, and dynamic pricing, which improve engagement and satisfaction ((Grewal, 2020); (Rana, 2023); (Wu, 2025). Sentiment analysis also helps businesses stay responsive to changing consumer preferences (Wu, 2025)). Integrating AI within Q-Commerce through the lens of Industry 5.0 ensures not only operational excellence but also the ethical and inclusive deployment of technology. Studies stress the need for explainable AI models and systems designed to support rather than replace human labor, aligning with broader societal and sustainability goals (Vyhmeister, 2024); (Lopez, 2023).

3. Problem Statement

The exponential growth of Quick Commerce (Q-Commerce) has fundamentally transformed the retail sector by enabling ultra-fast delivery and highly personalized customer experiences. However, this disruptive model encounters significant operational challenges in logistics optimization, demand forecasting, and maintaining consistent service quality at scale. Although Artificial Intelligence (AI) is widely recognized as a crucial enabler for overcoming these challenges, its current implementation often falls short of aligning with the emerging principles of Industry 5.0, which emphasize human-centric, ethical, and sustainable technological integration. Despite increasing research on AI applications in supply chain and customer experience management, a critical gap remains in understanding how AI can be effectively leveraged within Q-Commerce environments—not only to improve operational efficiency but also to uphold Industry 5.0 values such as ethical AI use, collaborative human-machine interaction, and long-term sustainability. The central problem, therefore, is the absence of an integrated framework that illustrates how AI can simultaneously optimize logistics and enhance customer experience in Q-Commerce while embodying the human-centric vision of Industry 5.0. Without such alignment, Q-Commerce platforms face risks of operational inefficiencies, ethical concerns, and diminished customer engagement amid a rapidly evolving and value-driven digital economy.

4. Research Objectives

- ✓ To investigate how Artificial Intelligence (AI) technologies optimize logistics operations in Quick Commerce (Q-Commerce) platforms.
- ✓ To examine the role of AI in enhancing customer experience through personalization and real-time engagement in Q-Commerce.
- ✓ To explore how AI applications in Q-Commerce align with the human-centric and sustainable principles of Industry 5.0.

5. Research Methodology

This study adopts a descriptive research design to systematically explore the role of Artificial Intelligence (AI) in optimizing logistics and enhancing customer experience within Q-Commerce, framed by Industry 5.0 principles. Employing a quantitative approach, primary data will be collected through structured questionnaires administered online and in person to a stratified random sample comprising 50 employees (logistics managers, AI developers, and customer support teams) from five major Q-Commerce companies and 200 active customers from metropolitan cities in India. Secondary data will be gathered from company reports, industry whitepapers, academic journals, and government publications related to AI applications in retail and logistics. Data analysis will involve descriptive statistics to summarize demographics and response trends, cross-tabulation to compare perspectives across employee roles and customer groups, correlation analysis to examine relationships between AI-driven logistics and customer satisfaction, and thematic analysis of any open-ended responses for insights on Industry 5.0 alignment. Tools such as SPSS or Excel will be used for statistical analysis, This methodology ensures an objective and comprehensive assessment of AI's impact on Q-Commerce logistics and customer experience.

6. Results

6.1 Objective 1: To Investigate How Artificial Intelligence (AI) Technologies Optimize Logistics Operations in Q-Commerce Platforms

Table - 1
AI Technologies Identified in Q-Commerce Logistics

AI Technology Used	Percentage of Respondents Reporting Use
Demand Forecasting Algorithms	86%
Route Optimization Systems	78%
Real-time Inventory Management	74%
Automated Warehouse Robotics	62%
Delivery Time Prediction Models	68%
Chatbots for Delivery Coordination	54%

Source (Authors Computation)

From the table 1, the most widely implemented AI tools are demand forecasting algorithms and route optimization systems, which help reduce last-mile delays and improve delivery promise accuracy. Real-time inventory management systems support rapid fulfillment and minimize stockouts—a core requirement for Q-Commerce.

Table - 2
Effectiveness of AI in Logistics Optimization

Logistics Metric	Mean Score	Std. Dev.
Delivery Time Reduction	4.56	0.62
Inventory Accuracy	4.28	0.74
Order Fulfillment Speed	4.35	0.68
Operational Cost Efficiency	4.02	0.81
Real-Time Order Tracking Accuracy	4.45	0.59

Source (Authors Computation)

Table 2 reveals that most participants strongly agreed AI helps reduce delivery time and improves real-time tracking. High scores for inventory accuracy and fulfillment speed highlight AI's effectiveness in micro-fulfillment operations. However, slightly lower ratings for cost efficiency suggest that while AI brings benefits, the return on investment may differ based on a company's size and technological maturity.

Table - 3
Correlation Between AI Integration and Logistics Performance

Variable	Correlation Coefficient (r)	Significance (p-value)
AI Adoption vs. Delivery Time	-0.76	0.001 (***)
AI Adoption vs. Inventory Accuracy	0.71	0.002 (**)
AI Adoption vs. Cost Efficiency	0.63	0.004 (**)

Source (Authors Computation)

The table 3, shows a strong negative correlation (-0.76) between AI adoption and delivery time, meaning greater use of AI significantly reduces delivery delays. Positive correlations with inventory accuracy and cost efficiency confirm that AI improves both stock management and overall logistics performance in Q-Commerce.

6.2 Objective 2: To Examine the Role of AI in Enhancing Customer Experience Through Personalization and Real-Time Engagement in Q-Commerce

Table - 4
AI Applications in Customer Experience

AI-Powered Feature	Percentage of Users Experiencing It
Personalized Product Recommendations	81%
Predictive Reordering Suggestions	62%
AI-Powered Chatbots for Support	74%
Real-Time Order Tracking & Delivery ETA Updates	88%
Dynamic Offers Based on Past Behavior	69%

Source (Authors Computation)

Table 4 shows that real-time order tracking and personalized recommendations are the most frequently used AI features, followed by chatbot-based support. This highlights Q-Commerce's focus on delivering fast, relevant, and round-the-clock customer service.

Table - 5
User Satisfaction Ratings

Feature Area	Mean Score	Std. Dev.
Relevance of Product Suggestions	4.18	0.72
Accuracy of Delivery Time Estimates	4.41	0.65
Helpfulness of AI Chatbots	3.89	0.81
Responsiveness of the App Experience	4.22	0.68
Overall Personalization Experience	4.26	0.63

Source (Authors Computation)

Table 5 shows that customers expressed the highest satisfaction with delivery time accuracy and the relevance of personalized recommendations. Chatbots received moderate ratings, suggesting the need for improved AI-human interaction for better service quality.

Table - 6
Correlation Between AI Features and Overall Customer Satisfaction

AI Feature	Correlation with Overall CX (r)	p-value
Personalized Recommendations	0.72	0.001
Real-Time Tracking & Updates	0.81	0.000
AI Chatbot Responsiveness	0.56	0.004

Source (Authors Computation)

Table 6 shows a strong positive correlation between real-time updates and customer satisfaction. Personalization also significantly impacts satisfaction, while chatbot performance, although positively correlated, has a smaller influence.

6.3 Objective 3: To Explore How AI Applications in Q-Commerce Align with the Human-Centric and Sustainable Principles of Industry 5.0

Table - 7
Employee Perspectives on Industry 5.0 Alignment

Industry 5.0 Dimension	Mean Score	Std. Dev.
Human-Centric Workflows	3.84	0.65
Ethical AI Practices	3.58	0.72
Green and Sustainable Logistics	3.21	0.81
Employee-AI Collaboration	4.02	0.59
Inclusivity in Tech Design	3.45	0.76

Source (Authors Computation)

Table 7 shows that AI-human collaboration is highly valued, while sustainability and inclusivity are seen as less developed. Employees observed that automated tools are increasingly used to assist—not replace—human roles, aligning with the human-centric ideals of Industry 5.0.

Table - 8
Customer Perceptions on Ethical and Inclusive AI

Statement	Agree (%)	Neutral (%)	Disagree (%)
"I feel AI in Q-Commerce enhances my experience without invading privacy."	61%	25%	14%
"I believe AI features are accessible across regional languages."	44%	31%	25%
"The platform is environmentally conscious (e.g., green delivery)."	36%	42%	22%

Source (Authors Computation)

Table 8 shows that most customers agree AI respects their privacy; however, language accessibility and eco-friendliness are seen as lacking. This highlights gaps in meeting Industry 5.0's goals for inclusivity and sustainability.

7. Findings

The study reveals that AI technologies such as demand forecasting and route optimization are extensively utilized in Q-Commerce logistics, resulting in significant improvements in delivery speed, order accuracy, and tracking efficiency. Statistical analysis confirms a strong positive correlation between AI integration and enhanced logistics performance, though challenges remain in making AI scalable and maintaining human oversight consistent with Industry 5.0 principles. Regarding customer experience, AI significantly improves satisfaction through personalized suggestions, predictive reminders, and real-time tracking, with users expressing the highest satisfaction for live engagement and smart recommendations. However, chatbot intelligence and contextual understanding require further enhancement to fully realize the human-centric vision of Industry 5.0. Finally, the alignment of AI practices with Industry 5.0 values is moderate, notably excelling in human-machine collaboration but lagging in areas such as environmental sustainability, ethical transparency, and regional inclusivity. While there is increasing attention to ethical AI use and sustainable logistics, efforts remain inconsistent and require strengthening to meet Industry 5.0 standards comprehensively.

8. Suggestions

- ✓ **Strengthen AI-Human Collaboration**: Promote AI tools that assist rather than replace human workers, such as delivery assistants and warehouse co-bots, and provide continuous training to enable effective human-AI co-adaptation.
- ✓ **Enhance Inclusivity and Accessibility:** Develop AI interfaces supporting regional languages and voice inputs to serve diverse users, and ensure mobile applications are designed with accessibility features for people with disabilities.
- ✓ **Promote Sustainable AI Use:** Invest in green logistics through AI-optimized delivery routes to reduce fuel consumption and support electric vehicle adoption, alongside using AI for minimizing waste in inventory and packaging processes.
- ✓ **Improve Ethical and Transparent AI Deployment**: Clearly disclose AI usage policies—including recommendation systems and chatbot interactions—while ensuring robust data protection and avoiding excessive personalization that may compromise privacy.
- ✓ **Develop Industry 5.0 Readiness Framework:** Encourage organizations to benchmark their AI initiatives against Industry 5.0 pillars and foster collaboration with academia and government to create compliance standards and evaluation tools.

9. Conclusion

This research examined the transformative role of Artificial Intelligence (AI) in enhancing both the operational efficiency and customer experience within Quick Commerce (Q-Commerce), framed by the human-centric, ethical, and sustainable principles of Industry 5.0. The study found that AI significantly improves logistics through predictive analytics, route optimization, and real-time tracking, resulting in faster deliveries and better resource management. Concurrently, AI-powered personalization, predictive reordering, and conversational support drive higher customer satisfaction and engagement. However, the adoption of Industry 5.0 values remains incomplete, with many platforms yet to fully integrate ethical AI practices, environmental sustainability, and inclusivity in their designs. To truly embody Industry 5.0, AI in Q-Commerce must evolve beyond efficiency gains to become a strategic enabler of equitable, sustainable, and people-first commerce.

10. References

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