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Artificial Intelligence and Employment Shifts in India's E-Commerce Sector: A Sectoral Post-Covid Analysis

S.K.S. Yadav[a], Samreen Khan[b]*
[a]Faculty of Commerce & Business Administration, Meerut College, Meerut, U.P., India
[b]Department of Commerce & Business Administration, Meerut College, Meerut, U.P., India
E-mail: sudhiryadavmeerut@gmail.com[a], samreen55555.sk@gmail.com[b]

Abstract
The COVID-19 pandemic accelerated digital adoption across sectors, rapidly restructuring Indian e-commerce. AI is a critical enabler of operational efficiency-from planning supply chains to automating customer support. The study attempts to understand post-COVID transformations in AI-related employment trends in various e-commerce subsectors in India. While AI threatens entry-level, routine applications, it creates a demand for professional jobs further involving AI development, data science, and digital operations. The study, thus, employs mixed methods, using secondary data sets and qualitative case studies, to comprehend the sectoral landscape of AI impacts on employment. It attempts to understand the potentials and challenges of AI, drawing on assessment of its socio-economic impact so as to arrive at recommendations on reskilling policies and inclusive employment strategies.

Key Words: *Artificial Intelligence (AI), E-Commerce, Employment Impact, Post-COVID Economy, Automation, Job Displacement, Workforce Reskilling.*

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**Corresponding Author*
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1. INTRODUCTION

Artificial Intelligence (AI) continues to disrupt a number of sectors. One of the most affected is e-commerce. The COVID-19 pandemic was one of the most transformational events to happen globally. It forced industries to identify and visit the use of digital technologies at a velocity unprecedented in history. COVID-19 presented challenges to how consumers browsed, purchased products, and demanded contactless service. In India in particular, e-commerce helped stabilize supply chain disruptions, and gave consumers access to essential goods and services. The dramatic increase in digital dependency has paralleled advancements in Artificial Intelligence (AI) portrayals in e-commerce. AI iterations, including: machine learning, natural language processing, robotic process automation, and predictive analytics - are utilized by e-commerce businesses. Automation is changing how e-commerce businesses operate. From chatbots dealing with customer inquiries, AI logistics and recommendation engines - automation is changing the way we work. This transformation has dramatically improved business efficiency and elevated customer satisfaction, but is also starting to shift the landscape of employment in the e-commerce sector.

Artificial intelligence has a significant role in e-commerce, and is now seen as one of the best technologies when it comes to increasing efficiency in areas such as inventory management, customer service, logistics, and marketing. Although it will improve e-commerce's efficiency, it will also result in the loss of low-skilled jobs. However, AI provides opportunities for high-skilled jobs where the nature of employability changes. In India the pandemic has accelerated this digital shift as social distancing and lockdowns enforced by the government saw consumers relying solely on online platforms to satisfy their purchase needs, and using AI tools to keep up with rapid demand. Still, the impact of this technology on jobs will be mixed; while automation is used to improve efficiency and lower operational costs, the disruption of a low-skilled and mid-skilled job is unavoidable. The purpose of the paper is to look at how AI is changing the employment landscape in the e-commerce sector in India, and detail what the opportunities and challenges from a post COVID landscape could be, with policy recommendations to provide inclusive and sustainable employment growth in a time of AI.

2. LITERATURE REVIEW

The study by **Kumar, A. (2021)** deals with Artificial Intelligence and Its Impact on Employment in India. Amit Kumar reflects upon how AI is fundamentally changing the landscape of jobs in India. He highlights AI's incredible ability to drive productivity and economic growth, yet he elucidates a very legitimate concern: many low-skill, routinized jobs are at-risk. Instead of sounding an alarm, Kumar advocates for strategies for the future of work such as empowering worker training through better training programs and education systems, as well as more inclusive policies to ensure marginalized groups are not left behind. His overall message is clear: when we think about an increasingly tech-based future, we need to consider investing in people just as much as we invest in innovation.

The study by **Verma (2022)** effectively explores Artificial Intelligence in relation to supply chains in India's burgeoning e-commerce sector. Verma uses companies such as Flipkart and Amazon India to demonstrate that machine learning and reinforcement learning capabilities are helping

these organizations with demand prediction, inventory control and last mile delivery optimization. However; she indicates serious challenges that the e-commerce sector grapples with; such as data coverage and access to proper technological infrastructure.

The research paper authored by **Kulshrestha et al. (2024)** explores the role of Artificial Intelligence (AI) in India's e-commerce sector. By using sales data across a period of six years, before and after 2019, they examined how AI appropriated the e-commerce market using a paired two-tailed t-test. Their study found that approximately 54% of e-commerce businesses used AI tools in 2020, and that the AI models had student improvements in both sales and overall efficiency. They were able to draw a conclusion that AI aided in enhancing business operational performance in the e-commerce sector.

In their study--Role of Artificial Intelligence (AI) in Indian E-Commerce Industries-- **Dhaland Kumar (2024)** take a deeper dive into how Artificial Intelligence (AI) is changing the future of e-commerce in India. They discuss how AI is becoming a crucial aspect of daily operations, by enabling businesses to personalize marketing, increase customer service efficiencies, and be more deliberate with inventory as they adapt to AI paradigms. The paper considers the transition consumers have taken to digital platforms, particularly during the post-pandemic period, and the ways in which AI will support that transition. While Dhal and Kumar provide a lot of theoretical benefits of AI, they do note a limitation in their research in that there was generally more conceptual analysis. They call for future studies to go beyond theory and explore how AI is practically applied across different sectors, not just e-commerce.

The research conducted by **Singh (2024)** examines the impact of AI on India's e-commerce industry, particularly in the wake of COVID-19. Singh's message is that the pandemic has sped up the adoption of AI tools, such as chatbots and smart recommendations, which companies have adopted, not just to improve sales, but also to provide a better, more personalized shopping experience. Singh's research found that AI is not only adding a new interface on the backend for companies, it is enabling growth opportunities for businesses, reducing the disconnect between shoppers, and enabling many companies to stay competitive in the digital marketplace.

While these studies explore various AI applications in Indian e-commerce, few provide a sector-specific, post-COVID employment analysis. This study fills that gap by examining employment transformation across multiple e-commerce subdomains.

3. OBJECTIVE OF THE STUDY

- To examine how AI is implemented in various sectors of the E-commerce industry and how it affects employment dynamics of each sector Post Covid in India.
- To examine how AI has impacted employment across different sectors within the E-commerce sector of India Post Covid.
- To identify challenges of AI-driven employment models when it comes to applying AI to the E-commerce industry.
- Identify needs for a reskilling of workforce and provide recommendations and suggestions for policy makers to help mitigate negative impacts on employment and develop inclusive growth strategies for the E-commerce sector of India.

4. RESEARCH METHODOLOGY

4.1. Research Design

The study employs a descriptive research design, which critically examines Artificial Intelligence (AI) adoption across India's e-commerce industry - both sector wise and through the lens of employment - in the post-COVID (coronavirus disease) context. It will also be exploratory in nature, as the research seeks to understand emerging trends in the implementation of AI use in India, and the implications for the labor market as it entails very rapidly evolving uses of technology.

4.2. Data Collection

The study relies exclusively on secondary data sources, which include: Government reports (e.g., NITI Aayog, MeitY), Industry publications (e.g., NASSCOM, KPMG, PwC), News articles and case studies (e.g., Economic Times, Business Today), Academic journals and working papers (e.g., MIT-IBM Watson AI Lab) and Online databases, policy documents, and white papers. These sources were analyzed to evaluate the impact of AI on employment structures, sectoral transformation, skill requirements, and policy challenges in the Indian e-commerce landscape.

4.3. Data Collection Technique

Systematic review of existing literature, reports, articles, case studies, and policy briefs related to AI and employment in the Indian context.

5. SECTOR WISE REVIEW ON EMPLOYMENT DYNAMICS AFFECTED BY AI ADOPTION IN INDIA'S E-COMMERCE SECTOR

The e-commerce industry in India obtained a comparatively rapid digital acceleration after COVID-19, with AI quickly becoming an essential tool for resiliency and scalability. AI-based technologies have now infiltrated nearly all areas of the e-commerce value chain, changing the way efficiency and roles are defined.

5.1. Customer Service

One of the most significantly transformed areas is customer service. AI chatbots and virtual assistants have drastically reduced the need for live customer agents. For example, Meesho found that AI addressed 95% of 60,000 calls daily without the need for human agents **(ET Bureau, 2023).** In similar events, Dukaan, a B2B retail platform, replaced 90% of its support staff with AI chatbots and reduced its average response time from more than two hours to three minutes **(Business Today, 2023).** While job displacement for entry-level support staff is clearly a negative impact, jobs for AI conversation designers, NLP trainers, and bot management engineers are likely to be in-demand.

5.2. Logistics and Supply Chain

The logistics and supply chain sector has also adopted many AI applications for route optimization, automated warehouse management, and live delivery tracking. Amazon India for example has started to deploy robotics and other AI through partnerships, like Covariant, which automates fulfillment centers (Economic Times, 2023), and reduces single manual handling.

5.3. Supply Chain Management

Supply chain management also leveraged AI's predictive models to enhance inventory management processes, maintaining optimal stock levels and reordering automatically. AI-informed demand forecasting further accentuates the scope for human supervision while improving efficiencies. Based on research reported by **PwC India (2023),** businesses enhancing their inventory plan with AI experienced an increase of about 30% in stock accuracy. As a result, jobs morphed away from traditional warehousing roles to data-related jobs such as inventory analysts and systems optimization professionals.

5.4. Marketing and Personalization

Marketing and personalization experienced similar transformation especially with AI tools like recommendation engines and predictive analytics that help platforms tailor user experiences at scale. Flipkart's AI-based recommendation engine systems helped drive click-through rates for banners by 25–70%, confirming that AI is effective in targeted marketing **(NASSCOM, 2022).** Therefore, this progress is shifting the nature of development from generic jobs in marketing towards data-based campaign strategists, engineers of personalization, and algorithm-based testing jobs for ads.

5.5. Fraud detection and Cyber Security

The emergence of AI capabilities for real-time processing of transactional data and detection of potentially fraudulent transaction activity increasingly benefitted Fraud detection and cyber security. Companies like Razorpay and Paytm have deployed machine learning capabilities to instantaneously identify fraudulent transaction activity and conduct KYC approvals. As AI-based available technology can perform many of the lower-level fraud checks, roles have shifted towards compliance monitoring for AI activity and fraud-related data analysis **(PwC India).**

5.6. Search and Discovery Function

The search and discovery functions are another area where Artificial Intelligence (AI) has reshaped business infrastructure through natural language processing (NLP), and visual recognition. Voice and visual search solutions, made famous by e-commerce companies such as Amazon, and fashion sites like Myntra, to transform time-consuming manual work for tagging and categorizing into intuitive, and easier to use, visuals for customers while creating brand new career opportunities within the field for data annotators and semantic search engineers **(KPMG, 2022).**

5.7. Payment and Checkout

The Payments and Checkout space is also being transformed by AI through smart fraud detection and prevention, automation for identity checks, and ultimate personalization of payment. By utilizing AI models that identify buyer behavior, AI determines payment options and allows for alternative methods of checking out while allowing for more reliable AI to identify risky transactions and employees, so it lessens the manual verification by agents despite the shift of jobs to Fintech-AI connection specialists and automated risk analysts slowly on the horizon **(World Economic Forum, 2020).**

5.8. Human Resource Management

There are now significant changes occurring to human resource management in e-commerce companies using AI. AI powered algorithms are screening resumes, scheduling interviews for e-commerce roles, and monitoring gig worker's work timelines. Organizations like Flipkart and Swiggy are using AI to allocate shifts for workers while monitoring performance, which translates to serious ramifications for the future of work and workers in the gig economy despite legal and ethical concerns and violation of some Community Guidelines due to the labour authorities lacking defined protections (NITI Aayog, 2021). The use of this technology supplants jobs from being human resources and now creates new jobs including demand for HR data analysts, digital designer workers, and ethical AI auditors but lessens - if it can be claimed to offset - many HR administrative jobs.

6. THE IMPACT OF AI ADOPTION AND EMERGING CHALLENGES ON INDIA'S E-COMMERCE INDUSTRY EMPLOYMENT (POST-COVID ERA)

6.1. Workforce Displacement and Job Redundancy

AI is automating routine functions and operational processes across every facet of e-commerce, leading to job losses. As an example, Dukaan replaced 90% of its customer service representatives with AI chatbots in 2023 **(Business Today, 2023)** and Amazon India utilized robotics guided by AI to minimize human labor in its warehouses **(Economic Times, n.d.).** These changes disproportionately affect lower levels of the skill spectrum - specifically, individuals who do not have access to digital training - thereby increasing the probability of unemployment and marginalizing these individuals economically.

6.2. Shift in Demand for High-Skill Technology-Centric Roles

The adoption of AI has led to a reduction in demand for low-skilled jobs in India's e-commerce sector and a demand for specialized roles in AI development, data science, Natural Language processing, and cyber security. The uptake of AI has led to an increase in demand for personnel in data science, AI and development, and cyber security roles. More than 60% of e-commerce businesses mentioned an increase in hiring in these areas **(NASSCOM, 2022),** but enhanced skill requirements have magnified the talent gap and limited participation among unprepared workers.

6.3. The Digital Skills Divide

The transition to AI-centric jobs highlighted a digital divide. Only 34% of workers felt positively about being ready for AI-induced changes in the workforce **(NITI Aayog, 2021).** This digital divide is compounded, particularly in Tier II/III cities, for women, older workers, and rural populations which solidifies this structural divide.

6.4. Gig Workers and Algorithmic Management

AI systems are managing an increasing number of gig workers - delivery workers and support agents - using actual versus expected productivity, by tracking performance in real time and managing workloads, and employee expectations on-the-fly. While this may create more efficiency, this also often results in employees experiencing limited job security, surveillance, and

added pressure to perform in accordance with an algorithm. For instance, Swiggy's AI task allocations have been linked to increasing pressure on workers to exceed efficiency targets **(NITI Aayog, 2021).**

6.5. Ethical and Governance Concerns

AI hiring systems (e.g. resume screening, candidate scoring) may incorporate algorithmic biases, resulting in unfair rejections based on attributes like region, gender or education. Additionally, the lack of transparency in these AI systems undermines trust and raises ethical issues **(MIT-IBM Watson AI Lab, 2021).**

6.6. Upskilling and Reskilling Imperatives

To curtail job displacement, workers need to be reskilled in emerging work areas such as digital literacy, AI ethics, and customer technology. Future Skills Prime from NASSCOM and Digital India from MeitY exist, but these programs have not been sufficiently scaled-up yet.

6.7. High Cost of AI Implementation

Developing relevant advanced AI tools incurs significant costs, making it prohibitive for SMEs. A **KPMG report (2022)** indicated that 65% of Indian SMEs believe it's not financially viable to adopt AI without assistance, exacerbating the market concentration risk.

6.8. Infrastructure and Connectivity Barriers

AI deployment relies heavily on stable internet access and cloud space, often unavailable in rural and semi-urban communities, which broadens the digital divide between urban-rural communities and encourages a lack of nationwide adoption.

6.9. Regulatory and Policy Uncertainty

India is in the process of developing AI-related policies through institutions like NITI Aayog and MeitY. A coherent AI regulatory framework does not exist in India. Unclear guidelines on product liability, ethics, and consumer protection make its responsible adoption difficult and increase legal exposure.

7. FINDINGS AND DISCUSSION

The research identifies critical areas of difficulty with respect to AI uptake in India, including concerns around possible loss of employment for low-skilled workers. It is estimated that between 60-69% of jobs - and especially jobs procedures that are repetitive or more manual - may fall under AI-driven automation. This statistic illustrates the widening gap between the skills developed in the workforce at present and the capabilities needed to interface with emerging AI technologies. Furthermore, with the rapid acceleration of AI post-COVID-19, new concerns related to algorithmic bias, the precarious position of gig economy workers, and increasing digital skills gaps have surfaced.

These results highlight the essential requirement for inclusive solutions that could facilitate equally beneficial technology growth. The multi-stakeholder plan - an approach involving (re)skilling the workforce, ethical governance of AI, and leveraging partnerships between the public and private sector - must engage in developing ways of minimizing the socio-economic risks of automated processes. Otherwise, the benefits of digital advancement may be enjoyed

only by digital inclusion and advanced organisations. Given that, policymakers, educators and industry leaders must collaborate to bring together AI development with sustainable working ideals and ethical accountability.

7.1. Post-COVID Specific Trends

The pressures for implementation resulting from COVID-19, have in some cases, led to deployment of AI systems with minimal or even no plan for workforce transitions. Whereas some labour markets have been gradually shifting towards flexible, technology-based demand. The demand for flexible, technology-oriented roles stems from a change in the demand for jobs, while traditional roles exhibited demand (or were projected to be in demand) prior to the pandemic. Many actors in the private and government sectors are beginning to pay attention to up-skilling and re-skilling programs that will fill this emerging skills gap.

8. RECOMMENDATIONS AND SUGGESTIONS

The application of Artificial Intelligence (AI) technologies in India's e-commerce sector has drastically transformed employment structures and approaches to employment. To enable AI adoption to lead to inclusive, ethical, and sustainable growth, the following recommendations are made:

8.1. Implement National Training and Reskilling Programs on AI Technologies Targeted

The displacement of low-skilled roles due to automation has created a greater demand for scaling up reskilling efforts. Research indicates that over 50% of displaced workers in digitally disrupted industries can transition to new roles with minimal training support **(NASSCOM, 2022).**

- ***Actionable Steps:*** Leverage initiatives such as NASSCOM Future Skills Prime and Skill India, developing modules specific to AI on topics such as machine learning, data analytics, and AI ethics.
- Engage with ed-tech organizations (ex. Coursera, upGrad) to offer accessible subsidized certifications designed for gig economy workers and the lower level workforces **(KPMG, 2022).**
- Provide a tax benefit to companies (and funds) that invest in up-skilling their workers in order to offset costs of the training and encourage development of the labour force **(PwC India, 2023).**

8.2. Establish a Regulatory Framework for Ethical AI Deployment

The lack of transparency with many algorithmic systems has led to biases in recruitment, credit scoring, task allocation, etc. In the absence of an oversight regulatory body there will be fairness and transparency repercussions **(MIT-IBM Watson AI Lab, 2021).**

- ***Actionable Steps:*** Implement the Digital Personal Data Protection Act quickly with specifics (guidelines) for use of AI.
- Implement auditing algorithms especially when making high-risk employment decisions.

- Form an independent AI Ethics Commission to oversee compliance to guidelines and to conduct grievance investigations **(NITI Aayog, 2021).**

8.3. Protection and Formalization of Platform-Based Gig Workers

Platform workers in e-commerce industries are increasingly subject to algorithmically managed work, with no labor protections. Performance rankings, shift assignments and variability in wages are governed by AI based models creating precarity in work **(ILO, 2021).**

- ***Actionable Steps:*** Recognize gig workers under the Indian Labor laws, which provide minimum wage, social security and collective bargain rights.
- Require the reporting of algorithmically calculated logic behind performance ratings and shared fall out penalties (NITI Aayog, 2021).
- Support the development of platform cooperatives with shared governance structures.

8.4. Promotion of Inclusive AI Adoption among SMEs

Without intention and support from Governments, SMEs in India will be further excluded from adopting AI solutions as these will become cost prohibitive, and their technical capacity is limited. Left unsupported, without support with AI adoption we will continue to see market concentration **(KPMG, 2022).**

- ***Actionable Steps:*** Provide funded opportunities and AI-as-a-service models for small retailers to fund access to AI-enabled logistics, Marketing, and tools for Customer interaction.
- Bring Open-source AI infrastructure from public innovation platforms.
- Undertake regional based capacity building workshops, in partnership with industry, the private sector and academic partners.

8.5. Investment in Digital Infrastructure for Tier II and III Cities

Other than the mega-cities, digital infrastructure is undeveloped, impeding the reach of AI innovation and digital jobs **(World Economic Forum, 2020).**

- ***Actionable Steps:*** Expand BharatNet and Digital India to underserved districts.
- Develop regional AI hubs that encourage local innovation and job creation.
- Ensure that AI platforms are inclusive by supporting vernacular language interfaces and low-data applications.

8.6. Facilitation of Multi-Stakeholder Collaboration for Responsible AI Development

Inclusive and responsible AI deployment will necessitate coordination between government, business, academia, and civil society **(NASSCOM, 2022).**

- ***Actionable Steps:*** Develop national AI advisory councils that include worker representation, as well as SMEs and academic experts.
- Pilot co-funding for ethical AI research, especially on issues of labor rights and automation risks.

- Launch public awareness campaigns to improve understanding of AI systems, digital rights for individuals and workplaces, and accountability.

9. CONCLUSION

Artificial Intelligence (AI) has quickly advanced in India's e-commerce industry since COVID, creating both massive opportunities and serious challenges. AI has been decisive in enhancing operational efficiency, scalable digital infrastructure, and customer personalization. However, its rapid adoption raises concerns regarding algorithmic bias, displacement of labor, and the expanding digital divide. Although machines can automate repetitive tasks, they cannot simulate basic human qualities such as creativity, empathy, and contextual judgment. Therefore, the workplace must move towards a collaborative model, where AI augments human capabilities while being managed strategically and ethically by humans.

To ensure a positive development outcome from the AI adoption, specific interventions must be enacted. These encompass extensive reskilling initiatives, equitable governance frameworks, gig worker protection and inclusion, and investment in digital infrastructure, particularly in disadvantaged contexts. To develop a balanced ecosystem that harnesses innovation in tandem with labor, a multi-stakeholder partner engagement (government, business, higher education and civil society) is required. If appropriately navigated, artificial intelligence (AI) could catalyze not just technological development, but equitable and sustainable economic transformation in India's digital economy.

10. LIMITATIONS OF THE STUDY

- Primary data was not collected through surveys or interviews.
- Heavy reliance on secondary data could produce results that are outdated or contextually specific.
- Qualitative content can always be interpreted subjectively.

11. FUTURE SCOPE OF THE STUDY

- Future research should focus longitudinal data in order to monitor trends over time and to evaluate longitudinal effectiveness of the reskilling programs.
- Comparisons between urban and rural areas could yield deeper influences related to inequalities within socio cultural regions.

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