Evolution of Artificial Intelligence in India from Pre to Post Pandemic Era: A Sociological Analysis

Aishna Verma

Research Scholar, Department of Sociology, University of Lucknow

Abstract

The global pandemic of Covid-19 has profoundly impacted societies and economies worldwide, and India is no exception. Countries worldwide implemented a range of measures to combat the virus, including lockdowns, mask mandates, social distancing, and vaccination campaigns. As the world grappled with the crisis, AI technologies played a pivotal role in shaping responses to the pandemic, influencing social behaviours, and raising critical questions about ethics, inequality, and the future of work. This paper thus explores the evolution of AI, its significance in the pre and the post pandemic, and makes a sociological analysis of the present circumstances and prospects for its continued growth.

Keywords: Artificial intelligence, Covid-19, India

Introduction

The global pandemic of COVID-19 had seen several waves and upsurges, with varying levels of severity and impact in different parts of the world, including India since its inception in December, 2019 (Spiteri et. al., 2020). The COVID-19 pandemic has not only reshaped our daily lives but has also brought into sharp focus the profound social implications of artificial intelligence. Artificial intelligence (AI) is the science and engineering of making intelligent machines, especially intelligent computer programs (John McCarthy, the father of AI). It is a specialization within the computer science discipline which uses symbolic representation, inference, and heuristic search strategies to attempt sophisticated tasks once thought possible only for humans (Brent, 1989). The technology of AI has the capacity to efficiently and broadly tackle complex issues. Artificial Intelligence (AI) has permeated nearly every aspect of our lives, reshaping industries, influencing human behavior, and posing intricate questions about societal dynamics. As a result of which every person, business, and government has experienced the influx of AI into many aspects of their lives over the past several years. The most widespread uses of AI are chatbots, facial recognition, picture classification, aggregators, recommendation engines, and targeted marketing.

While AI holds great promise in solving complex problems and enhancing our lives, it also presents significant challenges that demand careful consideration. As we navigate the AI-driven future, it is essential for researchers, policymakers, and society as a whole to address the ethical, economic, and social implications of AI adoption. By understanding and actively shaping the

impact of AI on society, we can harness its potential while minimizing its adverse effects, striving for a future where AI serves as a positive force for all. The emergence of AI in India, both in the pre-COVID and post-COVID eras, reflects its transformative potential and adaptability. While the pandemic accelerated AI adoption across various sectors, its long-term impact on India's development and society remains promising. The sociology of artificial intelligence underscores this intricate relationship between technology and society. In this paper, the first part explores the multifaceted impact and development of AI in India in pre and post pandemic era and the later part presents the relevance of sociological theories in this context concluding with the streaming challenges and measures.

Pre-COVID Era: Building the Foundation

Prior to the pandemic, AI in India was in its nascent stages. The Indian government recognized the potential of AI and launched initiatives such as the National AI Strategy to promote research and development in the field. The goal was to position India as a global AI leader. India's startup ecosystem began to witness the emergence of AI-driven startups across various sectors, from healthcare to e-commerce. These startups aimed to address local challenges with innovative AI solutions. Hence, AI was seen as a driver of economic growth. It contributed to increased productivity and cost reduction across various sectors, leading to a competitive advantage for businesses that integrated AI into their operations. Educational institutions started offering AI courses, and online platforms provided AI-related training to bridge the skill gap and prepare a workforce for the AI-driven future. In healthcare, AI was utilized for early disease detection, drug discovery, and personalized medicine. Machine learning algorithms were developed to analyze medical data and assist doctors in making more accurate diagnoses. The pre-COVID era saw significant advancements in robotics and automation, with AI-powered robots performing tasks in industries like manufacturing and logistics.

Therefore, the pre-COVID era was characterized by the groundwork laid by the government, businesses, and educational institutions to foster AI research and development. The AI applications were largely focused on improving efficiency, automating routine tasks, and enhancing user experiences. Industries such as finance, manufacturing, and customer service were early adopters of AI, deploying chatbots, predictive analytics, and recommendation systems to streamline operations and deliver better services (The Economist, 2023).

Post-COVID Era: Acceleration and Transformation

The COVID-19 pandemic surely changed our environment in many ways and hastened the deployment of previously considered futuristic technologies. It in a way acted as a catalyst for AI adoption, pushing its boundaries in addressing healthcare, economic and societal challenges. The pandemic highlighted the importance of AI in healthcare, facilitating COVID-19 testing, contact tracing, and drug discovery (Bali et. al., 2022). It was reported by Analytics Insight (2023) that AI was used to optimize supply chains, predicting disruptions, and ensuring essential goods reached their destinations efficiently. Businesses relied on AI-driven forecasting to adapt to rapidly changing demand patterns. According to Big Commerce (2021) Online shopping surged during lockdowns, and AI-driven recommendation engines played a crucial role in enhancing user experiences and increasing sales in the e-commerce industry. Indian agriculture began adopting AI-

driven solutions for crop monitoring, weather forecasting, and precision agriculture, improving crop yields and sustainability (Krishnan, 2023). AI-powered chatbots and digital lending platforms expanded access to financial services, particularly in rural areas, promoting financial inclusion (Kumar, 2023).

According to a PwC report titled 'Towards a smarter tomorrow: Impact of AI in the post-COVID era' (2023), Indian enterprises are adopting AI more frequently in post- Covid era. It further stated, almost 64 per cent of organisations surveyed in industrial products and manufacturing sector say they are currently at an early stage of their AI-based transformation journey. The report highlighted some of the key trends seen in the market today:

1. **Generative AI (GenAI):** The advancements in this field have made content generation, content summarization, and search possible. Creation of intricate 3D drawings and prototypes, conversational analytics, highly personalised and interactive suggestion chatbots, etc. are some potential uses for GenAI. It has enabled companies to increase the capability, speed and volume of content search and content creation. For example, a GenAI model can assist with the simultaneous creation of scripts, voiceover, translation and images for a successful ad campaign.

2. **Remote work and collaboration:** The pandemic accelerated the adoption of remote work, leading to greater reliance on AI for virtual collaboration, productivity tracking, and automation. This shift blurred the boundaries between work and personal life, affecting job satisfaction and work-life balance.

3. **Data-driven decision making:** AI is used to collect and analyse large quantities of data, which can then be used to make better decisions about product development, marketing, customer service, etc.

4. **Increasing availability of AI-enabled tools and services:** The cost of AI-powered tools and services has been declining, making them more accessible to businesses of all sizes. This has also led to an increase in the number of AI start-ups, which are developing new and innovative solutions.

India's AI Revolution: A Vision for the Future

As India navigates the transition from the post-COVID era to the future, AI's role is poised to expand further with several promising prospects.

1. India is one of the leading markets of artificial intelligence in APAC (Asia Pacific). IIT Madras partnering with Taylor & Francis Group in the field of AI and data science was initiated to amplify the research in the domain (India Today, 2021).

2. Stanford University's AI Index report states that India is ranked fifth in terms of investments received by startups offering AI-based products and services in 2022. (AI Index Report, 2023)

3. The Indian Institute of Science (IISc) announced the setting up of a state-of-the-art Artificial Intelligence & Machine Learning (AI-ML) Centre, aka Kotak-IISc AI-ML Centre (under the CSR initiative of Kotak) at the IISc campus in Bengaluru (The Hindu, 2021). The Centre was inaugurated on 18 January 2023.

4. According to a report by Atal Innovation Mission 2021(AIM) Research titled "How The Indian Government Is Championing The AI Revolution", the use cases of AI in the Indian government include facial recognition and hotspot analysis, biometric identification, criminal investigation,

traffic and crowd management, wearables to empower women safety, optimising revenues in the forest, cleaning river, tiger protection, digital agriculture, student progress monitoring and more.

5. The market size in the Artificial Intelligence market is projected to reach US$4.11bn in 2023. The market size is expected to show an annual growth rate (CAGR 2023-2030) of 19.99%, resulting in a market volume of US$14.72bn by 2030 (Statista, 2023).

Challenges and Future Prospects for AI

As the world grappled with the crisis, AI technologies played a pivotal role in shaping responses to the pandemic, influencing social behaviors, and raising critical questions about ethics, inequality, and the future of work. PwC report (2023) claimed that while the technology, media, telecom, healthcare and pharmaceutical sectors have seen steady progress, they are facing certain challenges around measuring the return-on-investments, especially in the pre- and post-Covid-19 times. The pandemic has accelerated the integration of AI into healthcare systems. However, ethical concerns surrounding data privacy, consent, and the potential for AI to reinforce healthcare disparities need addressing. The number of incidents concerning the misuse of AI is rapidly rising. (AI Index, 2023). In Indian context, advanced technology is yet to be harnessed to its full extent. Preparing for the future of work in an AI-driven world is crucial. Policies and training programs must ensure a just transition for workers displaced by automation. Ensuring equitable access to AI-driven healthcare solutions is a critical concern. Also, educational system is yet to be upgraded to add these technologies potential benefits on wider basis.

The pandemic highlighted existing social inequalities in access to AI-driven resources Governments and institutions must establish regulations and governance frameworks to ensure that AI benefits all of society and doesn't harm marginalized groups. Access to AI-driven technology is not uniform, creating a digital divide that exacerbates existing social inequalities. Bridging the digital divide and addressing bias in AI systems are essential for creating a more equitable society post-pandemic. AI decisions, such as those made in criminal justice or lending, have raised questions about bias, fairness, and justice within societal systems. Biased algorithms could disproportionately affect certain demographic groups, leading to social and racial injustices. Understanding and mitigating these biases is crucial for equitable AI adoption. The collection and analysis of vast amounts of personal data by AI systems raise privacy concerns. Societal norms and regulations must adapt to protect individuals' privacy in this data-driven age.

Sociology of Artificial Intelligence in the COVID-19 Pandemic

Studying the growth of artificial intelligence (AI) in India from a sociological perspective involves analyzing the complex interplay between technology and society. Several sociological theories are relevant to understand and study this phenomenon. This section presents the key sociological theories and concepts to gain a comprehensive understanding of how growth of AI in India is shaped by and, in turn, shapes the social fabric of the country. Such a holistic perspective addresses both the opportunities and challenges posed by AI in the Indian context.

Structural-Functionalism focuses on the stability and functions of social institutions. This theory focuses on the role of institutions and their functions in society. Analyzing how AI functions within these structures and how it contributes to or disrupts their stability is essential and hence this theory

helps to understand how AI has served functional roles during the pandemic, such as supporting healthcare systems, enabling remote work and education, and facilitating contact tracing. AI growth in India is examined by AI's impact on different institutions, such as education, healthcare, and the workforce. AI proved instrumental in analyzing vast datasets for tracking the spread of the virus, developing models for vaccine distribution, and even assisting in the creation of new treatments. Telemedicine services and AI-driven diagnostics became essential for providing healthcare remotely during lockdowns. On the front of education and work, with the sudden shift to remote work and online education, AI-powered tools for video conferencing, virtual classrooms, and collaboration became indispensable. As India's education sector swiftly shifted to online learning creating a demand for AI-powered e-learning platforms and personalized learning experiences.

Also, the pandemic increased the demand for contactless solutions, such as AI-enabled self-service kiosks and chatbots. This has also led to an increase in the number of AI start-ups, which are developing new and innovative solutions. These technologies ensured business continuity and enabled millions to continue learning from home. AI-driven mental health applications and chatbots emerged to address the mental health challenges exacerbated by the pandemic, providing accessible and immediate support to individuals in need. Hence, this perspective thus shows how AI has contributed to societal stability during a crisis.

Conflict theory emphasizes power struggles and social inequality. Investigating conflicts over resources and decision-making in the AI sector is also relevant. This perspective is relevant to study how AI adoption in India during the pandemic might exacerbate or alleviate existing disparities in access to healthcare, technology, education, and employment opportunities. The pandemic exacerbated the digital divide, with marginalized communities lacking access to necessary technology for remote learning, work, and healthcare services. AI and automation have altered labor markets, with some jobs becoming obsolete while others evolve. This transformation has implications for employment, income distribution, and economic inequality. AI in the field of healthcare has the potential to improve outcomes, but it also risks exacerbating disparities in access to quality care. Automation and AI-driven job displacement intensified during the pandemic, particularly in industries like retail, hospitality, and manufacturing. The socioeconomic consequences, including income inequality, became more pronounced. Therefore, the conflict theory helps identify conflicts over resources and access to AI-driven solutions.

Symbolic Interactionism theory focuses on how individuals interact and attach meaning to symbols, including technology. It thus helps to understand how people perceive and interact with AI technologies, including their attitudes, beliefs, and the social implications of these interactions in the time of pandemic and post pandemic era. This perspective helps uncover the meaning-making process of AI adoption; Human-AI Interactions, i.e., chatbots, virtual assistants, and social robots are becoming increasingly integrated into daily life, impacting human communication patterns and potentially changing how we form relationships. Personalization and filter bubbles, i.e., AI algorithms curate content and recommendations tailored to individual preferences. While this enhances user experience, it also reinforces information bubbles, potentially limiting exposure to diverse viewpoints. Isolation during lockdowns led to increased human-AI interactions, with individuals forming emotional attachments to chatbots and virtual assistants. This raises questions about the potential impact of AI on human relationships.

Social Construction of Technology (SCOT) suggests that technology is socially constructed or shaped by social factors and human choices. It thus emphasises how AI in India is socially constructed, examining the actors, institutions, and societal norms that influence AI development, deployment, and regulation. The social situation of COVID-19 crises acted as a catalyst for AI adoption, pushing its boundaries creating demand to deploy robots with artificial intelligence for preventing the spread of illness and being used to examine patients and give drugs to them. With lockdowns affecting traditional retail, e-commerce companies in India turned to AI for demand forecasting, inventory management, and last-mile delivery optimization. The online execution of teaching practices and simulators have replaced the classroom mode of teaching due to the epidemic. The pandemic forced many businesses to adopt remote work and collaboration solutions which often rely on AI-enabled technologies. For example, AI-powered chatbots are being used to answer customer questions, and AI-enabled video conferencing tools are being used to facilitate meetings and enable collaboration. This advocates how social factors enabled the acceleration of AI adoption.

Technological Determinism theory, on the contrary suggests that technology shapes and determines social outcomes. It helps to analyze how AI technologies have influenced pandemic responses, potentially leading to changes in healthcare practices, education methods, and work structures. As discussed previously, AI-powered tools played a significant role in healthcare during the pandemic; from diagnostic algorithms to contact tracing apps, AI facilitated the monitoring and containment of the virus. However, this also raised concerns about the surveillance state and individual privacy as well as ethical considerations. This perspective thus helps assess the extent to which AI has driven societal changes, which might have exacerbated or even mitigated existing disparities and opportunities.

Risk society theory, proposed by Ulrich Beck (1980), focuses on how modern societies deal with risks and uncertainties. This theory advocates how AI is used to manage and mitigate risks associated with the pandemic, such as tracking the spread of the virus, vaccine development, and resource allocation.

Globalization and Modernization theories examine how globalization and modernization processes affect societies. In the context of AI in India, researchers can analyze how globalization influences the import/export of AI technologies, talent mobility, and the country's position in the global AI landscape. In this regard, Innovation Diffusion theory explores how innovations spread through society. In the context of AI revolution in India, the factors that influence the adoption and diffusion of AI technologies among different social groups and regions differ.

Cultural studies examine the role of culture in shaping technology and vice versa. Researchers can study how cultural factors, values, and narratives influence the adoption and use of AI in India, including how cultural norms might affect AI ethics and regulations; ethical dilemmas and societal responsibilities associated with AI development, use, and governance.

Conclusion

Artificial Intelligence (AI) has played a pivotal role in both pre-COVID and post-COVID eras, transforming industries, healthcare, and our daily lives. From improving efficiency in the pre-pandemic world to becoming a lifeline during the crisis, AI has proven its worth. As we move forward, AI's role in shaping the future of industries, healthcare, and society will only continue to

grow. However, it is essential to approach its development and deployment with a keen awareness of ethical considerations and responsible use to maximize its benefits for humanity. The COVID-19 pandemic has acted as a crucible, revealing the complex interplay between artificial intelligence and society. While AI has been a vital tool in responding to the crisis, it has also raised pressing sociological questions about privacy, inequality, and ethics. As we move forward, it is imperative to address these issues to harness the potential of AI for the betterment of society while safeguarding against unintended consequences. The sociology of AI in the COVID-19 pandemic underscores the need for thoughtful consideration of the social and ethical dimensions of AI in a rapidly changing world.

At last, it is to be concluded that the review is rapidly emerging literature on smart technology use during the current COVID-19 pandemic. Sociology encompasses various branches and perspectives, each offering unique lenses through which to analyze the interplay of AI (Artificial Intelligence) and the COVID-19 pandemic. The branches of sociology like medicine, environment, post human and cyborg sociology along with political, economic and legal sciences are extensively important in the field of sciences to explore the crucial phenomenon of AI embedding in the pandemic and post pandemic society.

References

1. Sudipta G., Dr. Indranil M., Arnab C., Uttam N., Ijaj A. (2023), "Towards a smarter tomorrow: Impact of AI in the post-COVID era", (Report No. M&C 31444), PricewaterhouseCoopers.
2. Brent Jr, E. E., Glazier, J., Jamtgaard, K., Wetzel, E., Hall, P. M., Dalecki, M., & Bah, A. (1989), "Erving: A program to teach sociological reasoning from the dramaturgical perspective", Teaching Sociology, 38-48.
3. Spiteri, G., Fielding, J., Diercke, M., Campese, C., Enouf, V., Gaymard, A., ... & Ciancio, B. C. (2020), "First cases of coronavirus disease 2019 (COVID-19) in the WHO European Region", 24 January to 21 February 2020, Eurosurveillance, 25(9), 2000178.
4. The Hindu "Artificial Intelligence centre to come up at IISc", (2021, September 17), https://www.thehindu.com/news/cities/bangalore/artificial-intelligence-centre-at-iisc/article36506224.ece
5. Kumar G. (2021, December 06), "Top Five AI Initiatives from Indian Academia in 2021", INDIAai. https://indiaai.gov.in/article/top-five-ai-initiatives-from-indian-academia-in-2021
6. Stanford University (2023), "Artificial Intelligence Index Report 2023".
7. Statista (2023), "Artificial Intelligence-India". https://www.statista.com/outlook/tmo/artificial-intelligence/india
8. The Economist, (2023, June 06), "Our early-adopters index examines how corporate America is deploying AI", https://www.economist.com/business/2023/06/25/our-early-adopters-index-examines-how-corporate-america-is-deploying-ai
9. Alka B. & Nishu B. (2022), "Role of artificial intelligence in fast-track drug discovery and vaccine development for COVID-19", In Novel AI and Data Science Advancements for Sustainability in the Era of COVID-19 (pp. 201-229), Academic Press.
10. Aishwarya PM, (2023, September 13), "Top 10 Ways AI Impacts Supply Chain and Logistics", Analytics Insight.

https://www.analyticsinsight.net/top-10-ways-ai-impacts-supply-chain-and-logistics/#:~:text=AI's%20data%20analytics%20capabilities%20provide,time%20visibility%20into%20their%20operations.

11. Aditya K. (2023, January 20), "AI-led smart farming solutions transforming agriculture in India", ET Edge Insights.

12. Rakesh K. (2023, August 15), "How AI & ML can help in realising India's dream of inclusive financial growth", The Economic Times. https://economictimes.indiatimes.com/news/how-to/how-ai-ml-can-help-in-realising-indias-dream-of-inclusive-financial-growth/articleshow/102745874.cms?utm_source=contentofinterest&utm_medium=text&utm_campaign=cppst

13. IndiaToday, (2021, September 23), "IIT Madras partners with Taylor & Francis Group for Data Science and AI to amplify research". https://www.indiatoday.in/education-today/news/story/iit-madras-partners-with-taylor-francis-group-for-data-science-and-ai-to-amplify-research-1856455-2021-09-23