Impact of AI on Human Replacement in Labour Market with Special Reference to the Manufacturing Sector in Chennai Metropolis

Journal of Development Economics and **Management Research Studies (JDMS)** ***A Peer Reviewed Open Access International Journal***
ISSN: 2582 5119 (Online)
Crossref Prefix No: 10.53422
11 (19), 113-123, January-March, 2024

Impact of AI on Human Replacement in Labour Market with Special Reference to the Manufacturing Sector in Chennai Metropolis

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Abstract

This study examines how Artificial Intelligence (AI) is slowly replacing Human Manpower in the Manufacturing Sector. AI technologies are becoming smarter and more capable, which has led to concerns about potential job losses for humans. This research explores the effects of AI on human workers and their roles in factories. This is important because it can affect people's work and livelihoods. We looked specifically at the manufacturing sector, where things like cars and machines are made. We have found that AI is replacing humans in some jobs, like those that are repetitive or routine. This means that some people might lose their jobs to AI. But we also discovered that new jobs are being created because of AI, like fixing and programming AI systems. We look at how AI is being used to perform tasks that were traditionally done by humans and the implications for employment. In conclusion, AI is making changes in the manufacturing sector, and while some jobs might be taken by AI, new jobs are also appearing because of it. It's important for workers and companies to adapt and learn new skills to stay successful in this changing job market.

Keywords: Artificial Intelligence (AI), Job loss, Job Creation, Manufacturing Sector

INTRODUCTION:

In recent times, there has been a significant change in the way work is done, especially in industries like manufacturing. This change is due to the rise of Artificial Intelligence, often referred to as AI. AI is like a smart computer program that can think and learn from the information it gathers. It is being used to do tasks that were primarily done by humans, like assembling products in factories. Some people worry that, as AI gets better at doing tasks, it might replace more and more workers. This could mean that some people might lose their jobs because machines can do the work faster and sometimes cheaper. But it's not all bad news. AI

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can also create new types of jobs that involve working with and managing these smart machines. In this article, we'll look at how AI is replacing human manpower in the manufacturing sector. We'll explore both the challenges it brings, like the possibility of job loss, as well as the opportunities, like the chance to learn new skills to work alongside AI. It's important to understand both sides of the story to figure out how AI is changing the world of work, especially in its quest for human replacement.

STATEMENT OF PROBLEM:

The use of AI in manufacturing has increased efficiency and innovation, but there are concerns about its impact on human workers. We need to investigate the implications and develop strategies for upskilling and reskilling the workforce to ensure a smooth transition toward a sustainable future dominated by AI technologies.

RESEARCH OBJECTIVES:

- To examine the scenarios and projections for the future of AI-driven labour replacement in the manufacturing sector.
- To Investigate potential societal implications, such as shifts in job opportunities and changes in workforce dynamics.
- To study the historical development and current state of AI technologies in the manufacturing sector.
- To identify Skills and Roles Most Vulnerable to Displacement.

REVIEW OF LITERATURE:

Chaudhuri, Satabda & Krishnan, Lrk & s, Poorani. (2022). Impact of using ai in manufacturing industries. Journal of the International Academy for Case Studies. 28. 1-10. Satabda Chaudhuri, Krishnan LRK, Poorani S October 2022:

Our study on AI in manufacturing has revealed some interesting insights. We found that employee decision-making quality is particularly linked to the evolution of AI. This means that as AI continues to develop and improve, it will have a positive impact on decision-making quality. On the other hand, errors in instant decision-making can disrupt production, which is why it is important to carefully consider the implementation of AI in manufacturing. Despite the potential risks, however, our study also found that AI implementation can have a positive impact on small manufacturing businesses and improve productivity at the plant level. Overall, it is clear that AI has the potential to revolutionize the manufacturing industry, but it is important to approach its implementation with caution and care.

Shao, Shuai & Shi, Zhanzhong & Shi, Yirong. (2022). Impact of AI on employment in the manufacturing industry. International Journal of Financial Engineering. 09. 10.1142/S2424786321410139. March 2022

Integrating AI into manufacturing can bring transformation, but also affects the workforce. We need to consider its impact on different segments of the industry and labor market. Our study analyzes AI's progress, labor market supply and demand, and impact on employment. We construct a model to inspect employment structure before and after AI integration. It's crucial to find practical solutions for employment structure while upgrading manufacturing.

Krishnan, LRK, Impact of Using AI in Manufacturing Industries (2022). Journal of the International Academy for Case Studies, Volume 28, Special Issue 4, 2022:

A study found that incorporating AI into manufacturing has an impact on workforce and industry segments. The study analyzed AI's progress, labor market supply and demand, and employment impact. A model was constructed to inspect employment structure before and after AI integration. It's important to find practical solutions for employment structure while upgrading manufacturing. The study also revealed trends in AI reliability and its connection to employee decision-making quality. Companies must balance human and AI decision-making for long-term viability.

ANALYSIS AND INTERPRETATIONS:

Table 1: Analysis of the relationship between genders of respondents and their opinion on the long-term impact of ai (in reference to human displacement) in the manufacturing sector.

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	352.6	4	88.15	2.988136	0.130516	5.192168
Within Groups	147.5	5	29.5			
Total	500.1	9				

H_0: There is no significant relationship between the gender of the respondent and their prediction of the of impact AI would have in the near future in reference3 to labour displacement in the manufacturing industry.

H_1: There is significant relationship between the gender of the respondent and their prediction of the of impact AI would have in the near future in reference to labour displacement in the manufacturing industry.

Interpretation: From the above conducted analysis we can infer that the 'P- Value' (0.130516) is greater than the level of significance (0.05) taken to conduct the test. Thus, we should accept the null hypothesis. There is no significant relationship between the gender of the respondent and their prediction of the of impact AI would have in the near future in reference3 to labour displacement in the manufacturing industry.

Table 2: Analysis of the relationship between genders of respondents and their opinion on how ai might revolutionise jobs in the future with regard to the manufacturing sector

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	208.6	4	52.15	1.420981	0.349106	5.192168
Within Groups	183.5	5	36.7			
Total	392.1	9				

H_0: There is no significant relationship between the gender of the respondent and their opinion on how AI would revolutionise jobs in the future with regard to the manufacturing sector.

H_1: There is significant relationship between the gender of the respondent and their opinion on how AI would revolutionise jobs in the future with regard to the manufacturing sector.

Interpretation: From the analysis conducted above we can see that the P value (0.349106) is greater than the level of significance ascertained for this test (0.05). Thus, we must accept the null hypothesis. There is no significant relationship between the gender of the respondent and their opinion on how AI would revolutionise jobs in the future about the manufacturing sector.

Table 3: Analysis of the relationship between the qualification of respondents and their opinion on the type of job that is most vulnerable to be replaced by AI.

H_0: There is no significant relationship between the qualification of the respondents and their opinion on the type of job that is most vulnerable to be replaced by AI.

H_1: There is a significant relationship between the qualification of the respondents and their opinion on the type of job that is most vulnerable to be replaced by AI.

Interpretation: From the above-conducted analysis, we infer that the 'P-Value' (0.016783) is lesser than the level of significance (0.05) taken to the conduct test. Thus we need to reject the null hypothesis. There is a significant relationship between the qualification of the respondents and their opinion on the type of job that is most vulnerable to be replaced by AI.

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	174.5	4	43.625	4.263029	0.016783	3.0555683
Within Groups	153.5	15	10.233333			
Total	328	19				

Table 4: Analysis of the relationship between the age of the respondents and their opinion on the probability of ai replacing human creativity and innovation in the manufacturing process.

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	162.5	4	40.625	3.085443	0.048584	3.05556828
Within Groups	197.5	15	13.166667			
Total	360	19				

H_0: There is no significant relationship between the age of the respondents and their opinion on the probability of ai replacing human creativity and innovation in the manufacturing process.

H_1: There is a significant relationship between the age of the respondents and their opinion on the probability of ai replacing human creativity and innovation in the manufacturing process.

Interpretation: From the above-conducted analysis, we can infer that the 'P-value' (0.048584) is lesser than the level of significance (0.05) taken to conduct the test. Thus we need to reject the null hypothesis. There is a significant relationship between the age of the respondents and their opinion on the probability of ai replacing human creativity and innovation in the manufacturing process.

FINDINGS:

The following findings are based on an analysis of a questionnaire and responses from a sample size of 50 individuals, primarily residing in Chennai City, as well as several books and research articles on related topics. It should be noted that any variations in the scope of the study may produce different results. The statements below represent the conclusions of our investigation.

- One of the primary concerns regarding the implementation of AI in the manufacturing industry is the potential for significant job displacement and subsequent unemployment.

- Our research indicates that the substantial initial investment required to establish an AI-based manufacturing facility is a significant barrier preventing many organizations from adopting this technology.
- Over 50% of the respondents and experts surveyed express a desire for a balance between the positive and negative effects of AI integration
- It is worth noting that employees in lower-level factory positions, such as those responsible for assembly and sub-assembly lines, are at the highest risk of job loss due to AI's increasing prevalence in the manufacturing sector.

SUGGESTION:

Upon conducting a comprehensive study on the influence of AI in the manufacturing industry, we have observed a clear trend towards an increased reliance on AI for production. However, we firmly believe that a coexistence model that integrates both human expertise and AI technology would be most advantageous for manufacturing organizations. By doing so, the production process can be optimized while still leveraging human skills and AI capabilities to reduce the potential for significant labour displacement.

CONCLUSION:

Upon conducting an in-depth analysis, it has been ascertained that the implementation of AI-based manufacturing systems is poised to become an essential requirement for organizations in the foreseeable future due to the wide array of benefits it offers. However, the potential loss of jobs resulting from the integration of AI in manufacturing plants is a significant disadvantage that cannot be overlooked. While there are both advantages and disadvantages to the incorporation of AI in the manufacturing sector, it is believed that the current level of AI expertise is still in its developmental phase, and is thus unlikely to lead to significant job losses. It is incumbent upon organizations to strike a proper balance between the utilization of AI and human resources, thus maximizing operational efficiency for the organization.

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Questionnaire

1. How familiar are you with the concept of Artificial Intelligence (AI) in the context of the manufacturing industry?

a) Very familiar

b) Familiar

c) Somewhat familiar

d) familiar at all

2. What concerns do you have about the impact of AI on jobs in the manufacturing sector? (Choose all that apply)

a) Job displacement and unemployment

b) Lack of necessary skills to work alongside AI

c) Ethical considerations in AI decision-making

d) Increased dependence on technology

Other (please specify) _____

3. Can AI fully replace human creativity and innovation in the manufacturing process?

a) Yes, AI can replace all aspects of human creativity

b) No, AI can only support and enhance human creativity

c) AI is irrelevant to the creative aspects of manufacturing

d) AI cannot understand creativity and innovation

4. In the future, how do you think AI might revolutionize job roles in the manufacturing sector?

a) By making all human roles redundant

b) By creating new job roles centered around AI technology

c) By maintaining the current job roles without any changes

d) By replacing only entry-level positions with AI-driven automation

5. Which industry might experience a boom due to the growth of AI in manufacturing?

a) Traditional manual labor industries

b) AI development and programming sector

c) Unskilled labor industries

d) Agricultural sector

5. Which of the following is an advantage of using AI in manufacturing?

a) Increased human creativity

b) Greater job security for workers

c) Enhanced decision-making capabilities

d) Slower production times

6. Please indicate to your level of agreement regarding the potential downside of introducing Artificial Intelligence as a replacement of Human labour in the Manufacturing Industry

(SA-STRONGLY AGREE, A-AGREE, N-NEUTRAL, D-DISAGREE, SD-STRONGLY DISAGREE)

S. No.	PARTICULARS	SD 1	D 2	N 3	A 4	SA 5
1.	High initial investment costs					
2.	Security and privacy concerns					
3.	Over-reliance on human decision-making					
4.	Resistance from the workforce					

7. Please indicate to your level of agreement regarding the potential jobs at risk for replacement by AI in the Manufacturing Sector

S. No.	PARTICULARS	SD 1	D 2	N 3	A 4	SA 5
1.	Assembly line operations					
2.	Management decision-making					
3.	Inventory management					
4.	Quality control					

1. How familiar are you with the concept of Artificial Intelligence (AI) and its applications in research and innovation?

a) Very familiar

b) Familiar

c) Somewhat familiar

d) Not familiar at all

2. In which fields of research or innovation have you observed or experienced the integration of AI technologies?

a) Healthcare and medicine

b) Finance and economics

c) Natural sciences (e.g., physics, chemistry, biology)

d) Social sciences (e.g., psychology, sociology, anthropology)

e) Engineering and technology

f) Other (please specify) _____

3. How do you think AI has impacted the research process?

a) Accelerated data analysis and processing

b) Enabled new research methodologies and approaches

c) Improved accuracy and reliability of results

d) Increased collaboration between researchers

e) All of the above

f) None of the above

4. Have you encountered any ethical considerations or challenges related to the use of AI in research and innovation?

a) Yes, please describe briefly ____

b) No

c) Not sure

5. What are the potential benefits of integrating AI in research and innovation?

a) Facilitating the discovery of new knowledge and insights

b) Enhancing predictive modeling and simulations

c) Enabling automation of repetitive tasks

d) Improving decision-making processes

e) All of the above

f) None of the above

6. Are there any specific AI tools or algorithms that you have found particularly useful in your research or innovation projects?

a) Yes, please specify _____

b) No

7. What concerns do you have about the impact of AI on research and innovation?

a) Overreliance on AI leading to a reduction in critical thinking skills

b) Potential job displacement in the research community

c) Bias and fairness issues in AI-generated results

d) Data privacy and security concerns

e) All of the above

f) None of the above

8. How do you see the role of researchers evolving with the increasing integration of AI in the research process?

a) Shifting focus to more creative and exploratory tasks

b) Emphasizing interdisciplinary collaboration with AI experts

c) Enhancing the ability to interpret and apply AI-generated insights

d) All of the above

e) None of the above

9. In your opinion, how can research institutions and organizations best prepare for the AI-driven changes in the research landscape?

a) Investing in AI infrastructure and training programs for researchers

b) Establishing ethical guidelines and standards for AI usage

c) Fostering partnerships with AI companies and experts

d) All of the above

e) None of the above

10. What do you predict will be the long-term impact of AI on research and innovation? Will it be more positive or negative?

a) More positive

b) More negative

c) Balanced mix of positive and negative impacts

d) Not sure

11. Have you encountered any barriers or challenges in implementing AI technologies in your research or innovation projects?

a) Yes, please describe briefly ____

b) No

c) Not sure

12. How do you think the integration of AI in research and innovation will affect the publication and dissemination of research findings?

a) Increased accessibility and reach of research findings

b) Improved accuracy in reporting research outcomes

c) Potential issues with copyright and intellectual property

d) All of the above

e) None of the above

13. What role do you foresee AI playing in enhancing the peer review process of research papers and grant proposals?

a) Automating the review process for efficiency

b) Identifying potential bias in peer review

c) Enhancing reviewer selection based on expertise matching

d) All of the above

e) None of the above

14. Are there any specific ethical guidelines or frameworks in place at your institution or organization to govern the responsible use of AI in research?

a) Yes, please describe briefly ____

b) No

c) Not sure

15. In which areas do you believe AI is most promising for breakthroughs and advancements in research and innovation?

a) Drug discovery

b) Climate modeling

c) Robotics

d) All of the above

e) None of the above

16. Do you believe that AI will lead to more interdisciplinary collaborations in the research community? Why or why not?

a) Yes, because AI can offer insights across multiple fields

b) No, because AI may limit researchers to their own domain

c) Not sure

17. How do you think the integration of AI in research will impact the demand for skilled researchers versus AI specialists?

a) Increased demand for skilled researchers to leverage AI technologies

b) Increased demand for AI specialists to develop and maintain AI systems

c) Both a and b

d) Not sure

18. Are there any concerns about the potential bias in AI-generated insights that could influence research outcomes? How can researchers address this issue?

a) Yes, by using diverse and unbiased datasets

b) No, AI systems are inherently unbiased

c) Not sure

19. In your opinion, what are the main factors driving the adoption of AI in research and innovation?

a) Efficiency gains in data analysis

b) Cost reduction in research processes

c) Advancement of scientific knowledge

d) All of the above

e) None of the above

20. What is your perception of public attitudes towards AI's role in research and innovation? Is there a general acceptance of AI or skepticism?

a) General acceptance of AI's role in research

b) Skepticism towards the use of AI in research

c) Mixed opinions and varied attitudes

d) Not sure

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