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IMPACT OF ARTIFICIAL INTELLIGENCE ADOPTION ON EMPLOYEE PRODUCTIVITY AND ORGANIZATIONAL PERFORMANCE WITH SPECIAL REFERENCE TO MANUFACTURING INDUSTRIES IN COIMBATORE

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Abstract
Artificial intelligence (AI) has emerged as a game-changing technology that is revolutionizing manufacturing sectors by improving operational performance, enabling data-driven decision-making and raising worker productivity. There are still few empirical studies examining how AI technologies impact worker productivity and organizational performance in India's manufacturing sector despite their increasing use. This study investigates the impact of AI adoption on worker productivity and organizational performance with specific reference to the manufacturing sectors in Coimbatore a renowned industrial hub known for engineering, textile machinery, automobile components, pumps and precision manufacturing. The study uses a quantitative, descriptive research methodology to examine the relationships between the variables under investigation. The universe consists of managers and workers in Coimbatore's ten AI-adopting manufacturing sectors. A structured questionnaire with a five-point rating system will be used to gather data from 200 respondents using a stratified random sample technique. In addition to improving organizational performance through increased operational efficiency, product quality, innovation and competitiveness, the results are anticipated to show that AI adoption has a significant positive impact on employee productivity by improving work efficiency, decision-making capability and task accuracy. In addition to offering useful insights for industrial companies looking to use AI for sustainable growth and improved organizational performance, the study is expected to add to the body of information already available on AI-enabled management practices.

Keywords*:**Artificial Intelligence Adoption, Employee Productivity and Organizational Performance.*

Introduction

One of the most important technical advancements influencing the modern organization's transition is artificial intelligence (AI). AI describes computer programs that are able to carry out tasks like learning, reasoning, problem-solving, decision-making and pattern recognition that normally need human intelligence (Russell & Norvig, 2021). In order to improve operational effectiveness, product quality and organizational competitiveness, artificial intelligence (AI) technologies like machine learning, computer vision, predictive analytics, intelligent robotics and the industrial Internet of things (IIoT) are being increasingly incorporated into production processes in the manufacturing sector. Adoption of AI enables manufacturing companies to enhance quality control, minimize production downtime through predictive maintenance, maximize resource utilization and support data-driven decision-making (Brynjolfsson & McAfee, 2017). By promoting smart manufacturing systems that integrate automation and real-time analytics to promote sustainable organizational performance, Industry 4.0 has further expedited the deployment of AI (Frank et al., 2019). Additionally, researchers have noted that AI is now seen as a strategic organizational skill that fosters innovation, company resilience and long-term competitive advantage rather than just a technological advancement (Mikalef & Gupta, 2021).

Among the most important results of a successful AI adoption are employee productivity and organizational performance. According to Davenport and Ronanki (2018), AI-powered systems help

workers by automating monotonous tasks, offering real-time information for decision-making, facilitating workplace collaboration and allowing workers to concentrate on value-added activities, all of which increase total productivity. AI enhances operational performance, innovative capacity, customer response and financial results at the corporate level (Raisch & Krakowski, 2021). While industrialized nations have claimed significant advancements in AI-enabled production, there is still little empirical data from Indian manufacturing sectors, especially in regional industrial clusters. AI technologies are increasingly being used in Coimbatore one of India's top industrial hubs, to boost business performance and production efficiency. The city is well-known for its engineering, textile machines, pumps, automotive components, foundries and precision engineering sectors. To investigate how AI deployment affects worker productivity and organizational performance in this local setting, thorough empirical study is necessary. Therefore with particular reference to Coimbatore's manufacturing industries, the current study aims to examine the effects of AI adoption on worker productivity and organizational performance. In addition to offering insightful information to industry practitioners, policymakers and scholars interested in digital transformation and sustainable organizational development, the findings are anticipated to add to the expanding corpus of AI and management literature.

Need of the Study

Artificial intelligence (AI) is transforming industrial firms by enabling intelligent automation, predictive maintenance, quality improvement and data-driven decision-making. Despite the fact that many manufacturing organizations have begun integrating AI technology into their operations, there is currently insufficient empirical data on how AI adoption affects worker productivity and organizational performance, particularly in the Indian manufacturing sector. Because prior study has largely focused on industrialized economies, there is a research gap in regional industrial clusters like Coimbatore, which is well-known for its engineering, textile machinery, pump, automobile component and precision manufacturing industries. It is crucial to assess whether investments in AI-enabled technologies under the Industry 4.0 paradigm result in quantifiable gains in worker productivity and organizational outcomes. Additionally, firms may develop successful implementation strategies, training programs and change management techniques by taking into account employees' experiences with AI adoption (Davenport & Ronanki, 2018; Mikalef & Gupta, 2021). As a result, this study is required to present actual data regarding the connection between AI adoption, worker productivity and organizational success in Coimbatore's manufacturing sectors.

Importance of the Study

It is anticipated that the results of this study will make a substantial contribution to both academic research and business practice. From an academic standpoint, the study will add quantitative data from the manufacturing sector in an emerging market to the body of knowledge already available on AI adoption. By analyzing the organizational results of AI implementation, it will also add to the body of knowledge on technology management, organizational behavior and strategic management. From an industrial standpoint the study will help manufacturing companies comprehend how AI technologies might enhance worker productivity, operational effectiveness, capacity for innovation and overall organizational performance. The findings could help managers create AI adoption plans, employee training programs and digital transformation projects that strike a balance between workforce growth and technology innovation. The results can also be used by business associations and legislators to create regulations that promote responsible AI deployment and boost industrial competitiveness (Brynjolfsson & McAfee, 2017; Raisch & Krakowski, 2021). As a result the study is useful for businesses looking to use AI-enabled change to achieve sustainable success.

Statement of the Problem

Artificial intelligence technologies are being used more and more in the industrial sector to boost productivity, competitiveness and product quality. However the impact of AI on workers and organizational procedures is just as important to its successful application as its technological prowess. Even though artificial intelligence (AI) has many advantages, many manufacturing companies still struggle with issues like employee acceptance, skill adaptability, integrating AI systems and uncertainty about how AI will affect organizational performance and productivity. Despite the region's substantial contribution to India's industrial economy, there are still few empirical studies looking at these links in the context of Coimbatore's manufacturing industry. Managers' capacity to make well-informed decisions about AI investments and workforce development is hampered by the lack of context-specific evidence. Thus it is necessary to thoroughly examine how the use of AI affects worker productivity and organizational performance in Coimbatore's manufacturing sectors. According to Frank et al. (2019) and Russell & Norvig (2021), the results will assist determine whether the deployment of AI results in quantifiable organizational advantages and offer strategic recommendations for boosting productivity and attaining lasting competitive advantage.

Review of Literature

Mikalef, Gupta, Pappas and Krogstie (2023) investigate the impact of AI capabilities on organizational performance in industrial and service businesses. The study's universe consisted of medium-sized and big enterprises that have deployed AI-enabled business applications and it used a cross-sectional descriptive research design. A structured questionnaire was used to gather data from 342 managers and IT workers using stratified random sampling. Structural Equation Modeling (SEM) was used to assess the data. The results showed that by enhancing operational effectiveness, innovation capacity and strategic decision-making, AI capability greatly enhanced organizational performance.

Bag, Dhamija, Bryde and Singh (2024) looked into how employee productivity and operational excellence in manufacturing businesses relate to the use of AI. Employees and production managers in manufacturing companies using Industry 4.0 technology made up the universe and the researchers used a quantitative descriptive research design. 386 respondents from different industrial companies were chosen using a proportionate stratified random sampling technique. Reliability analysis, correlation and structural equation modeling were used in the analysis of the data using SPSS and AMOS. The findings showed that the use of AI increased worker productivity by decreasing repetitive jobs, increasing production accuracy and facilitating quicker decision-making.

Verhoef, Broekhuizen, Bart, Bhattacharya, Dong, Fabian and Haenlein (2024) investigated how AI affected business performance and organizational transformation in digitally enabled firms. Managers and senior executives from companies executing AI-driven digital transformation projects made up the study's universe, which used a quantitative survey research design. The researchers gathered responses from 410 people who represented the manufacturing and service sectors using simple random sampling. The data was analyzed using structural equation modeling and multiple regression analysis. The results showed that the use of AI greatly improved corporate performance through increased customer response, workforce productivity, innovation capacity and strategic agility.

Methodology of the Study

Objectives of the Study

1. To ascertain the respondents' personal profiles.
2. To evaluate the respondents' overall level of adoption of AI, worker productivity and organizational performance.
3. To examine the variations in the respondents' organizational performance, staff productivity and adoption of AI.
4. To provide suggestions for the respondents' organizational performance, staff productivity and use of artificial intelligence.

Research Design

The current study's quantitative descriptive research strategy is acceptable since it enables the systematic collection and analysis of quantitative data to determine the connections among the study variables without changing the research environment. The study collects data from participants all at once using a cross-sectional methodology. This design is often recommended for organizational and management researches because it enables researchers to test hypotheses, assess associations and provide empirical evidence using statistical techniques (Creswell & Creswell, 2018; Saunders, Lewis, & Thornhill, 2023).

Universe of the Study

Employees and managers from ten industrial businesses in Tamil Nadu's Coimbatore District make up the study's universe. Predictive analytics, industrial automation, robotics, machine learning, computer vision and intelligent production systems are just a few of the AI-enabled technologies that have been adopted by the engineering industries, textile machinery manufacturers, automobile component manufacturers, pump and motor industries, foundries and precision engineering firms. In order to offer accurate information about AI adoption, employee productivity and organizational performance, respondents are needed to have sufficient understanding about AI applications within their businesses (Frank et al., 2019).

Sample Size

A sample size of 200 respondents is recommended for the study in order to ensure adequate statistical power and representativeness. The sample consists of middle-level managers, senior managers, supervisors and workers from Coimbatore's AI-adopting manufacturing enterprises. This sample size is believed to be sufficient for conducting reliability and correlation analyses while simultaneously enhancing the generalizability of the results.

Method of Sampling

The study employs proportionate stratified random sampling to ensure that respondents from ten different industry sectors are fairly represented. Initially manufacturing industries are divided into strata based on their industrial nature. Examples of these industries include engineering, textile machines, automotive components, pumps and motors and foundries. Next based on the number of employees in each organization, 20 respondents are randomly selected from each strata. This sampling strategy increases the validity and reliability of the study's conclusions by lowering sampling bias and improving sample representativeness (Sekaran & Bougie, 2020).

Data Gathering Instruments

A systematic questionnaire with two sections will be used to gather primary data. Demographic data, such as age, gender, educational background, occupation, work experience and manufacturing industry

type are gathered in the first section. Standardized assessment scales that have been modified from earlier research are used in the second section to assess the study constructs. Employee productivity and organizational performance will be assessed using validated organizational performance and employee effectiveness measures, while AI adoption items will be modified from AI capabilities and technology adoption research (Mikalef & Gupta, 2021). Every item will be evaluated using a five-point Likert scale, with 1 denoting "strongly disagree" and 5 denoting "strongly agree." Before being administered, the questionnaire will go through expert validation and pilot testing to guarantee content validity, clarity and reliability.

Research Gap

Despite the fact that AI is now a major force behind Industry 4.0 and digital transformation, there are still few empirical studies looking at how AI affects worker productivity and organizational performance in India's manufacturing sector. The majority of previous research has been on the adoption of AI technology, automation or organizational performance in industrialized nations; localized industrial clusters like Coimbatore have received relatively little attention. Additionally few studies have used an integrated quantitative approach to concurrently investigate AI adoption, employee productivity and organizational success. By offering empirical data from Coimbatore's manufacturing sectors, this study aims to close this gap adding to the expanding body of knowledge on AI-enabled organizational transformation and providing managers and policymakers with useful insights (Raisch & Krakowski, 2021; Mikalef & Gupta, 2021).

Data Collection Tool

In order to collect primary data the researcher used a structured questionnaire based on the five-point scale created by Venkatesh et al. (2003), Koopmans et al. (2014), Delaney and Huselid (1996), Venkatraman and Ramanujam (1986) and Davis (1989). These scales are suitable for studies looking at the relationship between Artificial Intelligence Adoption, Employee Productivity and Organizational Performance. The 35 items on the test had ratings ranging from 1 (strongly disagree) to 5 (strongly agree). Inverse values were used to guarantee consistency in interpretation when negative or wrongly coded replies were found.

Ethical Considerations

Throughout the entire research procedure the study will follow accepted ethical guidelines. All respondents will be asked for their informed consent prior to data collection and participation will be completely optional. The study's goals will be explained to participants and they will be free to leave at any time without facing any repercussions. By making sure that personal names and organizational information are kept private, confidentiality and anonymity will be rigorously upheld. The gathered information will be maintained safely to avoid unwanted access and used only for academic and research reasons. In compliance with recognized research ethics norms, the researcher will guarantee integrity, openness and objectivity in data collection, analysis and reporting (American Psychological Association, 2020; Saunders et al., 2023).

Finds of the Study

S.No	Personal Variables	Frequency	Respondents	Percentage %
1	Age	30yrs - 40yrs	155	78%
2	Gender	Male	150	75%
3	Educational Qualification	UG	141	71%
4	Type of organization	IT, Manufacturing and	133	66%

		Software Professional		
5	Type of family	Nuclear Family	138	69%
6	Job Position	Executive/Officer	135	68%
7	Monthly Income	Rs .35,000 to Rs.40000	130	65%
8	Organization formally implemented AI technologies	Yes	170	85%
9	Place of Residence	Semi-urban	140	70%

1. The majority of the respondents (78%) belong to the 30–40 years age group.
2. The majority of the respondents (75%) are male.
3. The majority of the respondents (71%) have completed an undergraduate (UG) degree.
4. The majority of the respondents (66%) are employed as IT, Manufacturing and Software Professional.
5. The majority of the respondents (69%) belong to nuclear families.
6. The majority of the respondents (68%) Job Position is Executive/Officer.
7. More than half of the respondents (60%) have a monthly income ranging from ₹35,000 to ₹40,000.
8. The majority of the respondents (85%) yes organization formally implemented AI technologies.
9. The majority of the respondents (70%) reside in semi-urban areas.

Distribution of the Respondents According To Their Level of Employee Productivity

Employee Productivity	No. of Respondents	Percentage (%)
High	107	54
Moderate	62	31
Low	31	15
Total	**200**	**100**

Interpretation

According to the above table 54% of respondents have high employee productivity, 31% have moderate productivity and 15% have low productivity according to the previously cited data.

Distribution of the Respondents According To Their Level of Organizational Performance

Organizational Performance	No. of Respondents	Percentage (%)
Good	110	55
Moderate	55	28
Poor	35	17
Total	**200**	**100**

Interpretation

According to the above table 55% of the respondents exhibit a good level of organizational performance, while 28% demonstrate a moderately high level and the remaining 17% exhibit a poor level of organizational performance.

Difference between of personal profile and level of employee productivity and organizational performance

Variables	Statistical tool	Value	Result
Age and employee productivity and organizational performance of the respondents.	ANOVA	F= 15.165 P<0.05	Significant
Gender and employee productivity and organizational performance of the respondents.	t-test	t = .225 P>0.05	Not- Significant
Education qualification and employee productivity and organizational performance of the respondents.	ANOVA	F= .635 P>0.05	Not-Significant
Type of organization and employee productivity and organizational performance of the respondents.	ANOVA	F =13.644 P<0.05	Significant
Type of family and employee productivity and organizational performance of the respondents.	t-test	t= 8.840 P<0.05	Significant
Job Position and employee productivity and organizational performance of the respondents.	ANOVA	F= .158 P>0.05	Not- Significant
Monthly Income and employee productivity and organizational performance of the respondents.	ANOVA	F = 18.868 P< 0.05	Significant
Organization formally implemented AI technologies and employee productivity and organizational performance of the respondents.	ANOVA	F = .248 P> 0.05	Not Significant
Place of residency and employee productivity and organizational performance of the respondents.	ANOVA	F = 16.113 P< 0.05	Significant

Apply independent sample t-tests and one-way ANOVA, the different between the respondents' demographic traits and worker productivity and organizational performance was investigated. Age ($F = 15.165$, $p < 0.05$), type of organization ($F = 13.644$, $p < 0.05$), type of family ($t = 8.840$, $p < 0.05$), monthly income ($F = 18.868$, $p < 0.05$) and place of residence ($F = 16.113$, $p < 0.05$) all showed statistically significant differences in employee productivity and organizational performance. On the other hand work position ($F = 0.158$, $p > 0.05$), gender ($t = 0.225$, $p > 0.05$), educational background ($F = 0.635$, $p > 0.05$) and the organization's official use of AI technologies ($F = 0.248$, $p > 0.05$) did not exhibit statistically significant differences, indicating that these factors were unrelated to respondents' disparities in organizational performance and worker productivity. Overall the findings show that while some demographic traits have no discernible impact on the study population, others have a significant impact on employee productivity and organizational effectiveness.

Recommendation

1. Manufacturing sectors should create a clear plan for using artificial intelligence (AI) that links AI efforts to long-term company performance, productivity gains and organizational objectives.
2. To improve employees' digital competences, confidence and capacity to use AI-enabled technology in their daily work, organizations should regularly offer AI-focused training and up skilling programs.
3. By encouraging employees to actively participate in AI deployment, experimentation and process improvement activities, management can foster a culture of ongoing learning and innovation.
4. To guarantee the successful integration and application of AI technologies, manufacturing companies should make investments in dependable digital infrastructure, sophisticated automation systems and safe data management procedures.
5. Organizations should establish ethical AI governance policies that promote transparency, fairness, accountability, data privacy and responsible decision-making while minimizing potential risks associated with AI applications.
6. In order to promote acceptance of AI-driven work processes and decrease resistance to technological change, employee involvement should be encouraged during the conception, deployment and evaluation of AI systems.
7. To increase operational efficiency, decrease downtime and improve overall organizational performance, AI technologies should be integrated with current production, quality control, inventory management and predictive maintenance systems.
8. To promote evidence-based decision-making, organizations should frequently monitor and assess how AI deployment affects worker productivity, job satisfaction, work quality and organizational results using quantifiable performance metrics.
9. To advance AI research, innovation, workforce development and information sharing, cooperation between manufacturing sectors, universities, technology companies and research organizations should be reinforced.
10. To improve productivity, competitiveness and sustainable industrial growth, policymakers and industry associations should develop supportive policies, financial incentives and technical assistance programs that encourage AI adoption among manufacturing industries, especially small and medium-sized businesses.

Conclusion

Artificial intelligence (AI) has emerged as a game-changing technology that is transforming manufacturing industries through improved decision-making, higher operational efficiency and creativity. By incorporating AI-driven technologies like robots, intelligent automation, machine learning, predictive analytics and quality monitoring, businesses may improve production processes, reduce operating costs and better respond to shifting market demands. With the increasing usage of AI in manufacturing, it is now critical to understand how these technologies impact worker productivity and organizational success. While AI has the potential to improve productivity, accuracy and resource utilization, its successful implementation also requires organizational readiness, employee acceptance and continuous skill development. Because of its varied industrial base and increasing investment in cutting-edge technologies, Coimbatore one of India's main manufacturing cities, offers a suitable environment to study these new trends. In order to provide insights that support technology-driven growth, workforce development and sustainable organizational competitiveness, this study examines the effects of artificial intelligence adoption on employee productivity and organizational performance in Coimbatore's manufacturing industries.

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