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INTEGRATING ARTIFICIAL INTELLIGENCE TOOLS IN TOTAL QUALITY MANAGEMENT IN INDIA CONTEXT

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ABSTRACT:The study explores the integration of Artificial Intelligence (AI) into Total Quality Management (TQM) in Indian business organisations. The study uses primary data collected from entrepreneurs, managers, and employees, the research explores awareness levels, benefits, and challenges of AI applications in quality management practices. The analysis of study reveals a growing trend of AI adoption in business processes and decision-making, in terms of efficiency, defect reduction, and customer satisfaction. However, there are challenges such as high implementation costs and lack of training remain significant. Thestudy concludes with recommendations to support the effective integration of AI in TQM.

Keywords: Artificial Intelligence, Total Quality Management, Quality Control, PDCA, Business Strategies, automation.

1. Introduction:

Total Quality Management (TQM) is a strategic management approach aimed at embedding quality consciousness throughout an organisation. It encompasses continuous improvement, employee involvement, and a strong focus on customer satisfaction. Traditionally, TQM initiatives have relied on statistical tools, audits, and manual monitoring to manage quality. However, with the emergence of Artificial Intelligence (AI), organisations are adopting more sophisticated methods to streamline quality processes. AI technologies such as machine learning, predictive analytics, and natural language processing allow for faster data interpretation, better error detection, and real-time decision-making. The study investigates the integration of Artificial Intelligence (AI) into Total Quality Management (TQM) in Indian business organisations. By using primary data collected from entrepreneurs, managers, and employees, the research explores awareness levels, benefits, and challenges of AI applications in quality management practices. The analysis reveals a growing trend of AI adoption in business processes and decision-making, with promising benefits in efficiency, defect reduction, and customer satisfaction. However, challenges such as high implementation costs and lack of training remain significant. The paper explores the evolving role of AI in advancing TQM in various business sectors and examines its benefits, challenges, and practical implications.

2.Objectives of the study: The Main Objective of the study is to assess AI contribution to the principles and practices of Total Quality Management in modern business organisations.

i). To know how are businesses incorporating AI technologies into TQM processes
ii). To understand the operational and strategic benefits does AI provide to quality systems
iii).Toanalyse the risks or limitations are associated with AI-driven quality management

3. Methodology

The study uses both primary data and secondary data. The study uses mostly qualitative research, based on secondary sources including academic journals and industries white papers and case studies from multinational organisations. The study alsouses the PDCA (Plan-Do-Check-Act) cycle to analyze how AI tools align with

each phase of quality management. A comparative case-based approach is used to evaluate outcomes in industries such as manufacturing, IT, and healthcare. However, the opinions of the industry key persons are used for the study.The primary data collected from 90 respondents: 30 entrepreneurs, 30 managers, and 30 employees across Indian business sectors such as manufacturing, retail, and IT. A well-structured questionnaire was used to gather data on awareness, usage, benefits, and challenges in AI integration in TQM. The responses were analyzed using descriptive statistics and presented in tables.

4. Analysis and Observations

AI Applications Across TQM Phases

Plan: AI analytics support strategic quality planning by identifying root causes and forecasting quality trends.**Do:** Robotics and process automation reduce variability and ensure task accuracy.**Check:** AI-driven quality assurance systems detect defects in real-time, reducing inspection costs.**Act:** AI proposes optimization strategies using historical data and process simulations.

Case Examples

Toyota uses AI-based predictive maintenance to improve equipment reliability. Siemens employs computer vision systems for automated quality checks, reducing defects by 30%.IBM utilizes NLP to analyze customer service data and identify quality gaps.

Identified Benefits

Real-time monitoring and faster problem-solving, Reduced waste and cost through predictive analytics, Enhanced customization and responsiveness to customers, Improved consistency in production and service delivery

Table 1: AI Awareness and Usage in TQM

Category	Aware of AI (%)	Using AI in TQM (%)
Entrepreneurs	90%	66%
Managers	95%	80%
Employees	85%	60%

Table 2: Perceived Benefits of AI in TQM

Benefit	Entrepreneurs (%)	Managers (%)	Employees (%)
Process Efficiency	85%	90%	78%
Defect Detection	78%	84%	72%
Decision-Making	82%	86%	75%
Customer Satisfaction	70%	76%	68%

Table 3: Challenges in AI Adoption

Challenge	Entrepreneurs (%)	Managers (%)	Employees (%)
High Cost	72%	68%	50%
Lack of Training	65%	70%	80%
Resistance to Change	60%	65%	72%

5. Discussion

AI technologies complement TQM principles by enabling proactive rather than reactive quality management. Predictive tools reduce delays and manual errors, while AI-powered analytics drive informed decision-making. Nevertheless, the success of AI in TQM depends on organisational readiness, including data infrastructure, employee training, and leadership support.

There are also concerns about over-automation, loss of human oversight, and ethical risks related to biased algorithms. Despite these concerns, AI significantly improves TQM outcomes when implemented in alignment with human expertise and strategic quality goals.

Analysis reveals that managers are the most active group in adopting AI for TQM. Entrepreneurs show strong awareness and usage, while employees are aware but less involved in implementation. The top benefits

include process efficiency and defect reduction, while major challenges are high costs and lack of training. These insights suggest targeted strategies are needed for broader and more effective AI integration in quality systems.

6. Conclusion

The integration of AI and TQM offers transformative potential for business organisations seeking to elevate its quality performance. The AI enhances efficiency, accuracy, and adaptability in quality systems, supporting a data-driven culture of excellence. However, AI adoption should be systematic, gradual and it should be supported by robust governance, ethical frameworks, and continuous learning systems. The study opines that the future research should focus on sector-specific outcomes, long-term cost-benefit analysis, and integration of explainable AI in quality management.AI has a growing role in enhancing TQM practices in Indian business organisations. While it offers benefits like efficiency and predictive quality control, challenges such as cost and training gaps hinder full integration. Stakeholders must invest in skills development and phased implementation. The government can also play a role by offering support programs for AI-based quality initiatives.

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