



COST EFFECTIVENESS ANALYSIS OF AI GENERATED ROBOTIC TECHNOLOGY WITH REFERENCE TO IRIS.A CASE STUDY ON KERALA DISTRICT INDIA

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ABSTRACT

This paper examines the influence of artificial intelligence (AI) in the education sector on student's behaviour in Kerala, India. The study aims to investigate how AI affects child psychology in school education, focusing on IRIS, and assess the return on investment (ROI) by comparing the cost effectiveness of robotic technology with human teachers. Conducted in 2023-2024, following the introduction of the first female robot teacher (IRIS) in Kerala schools, the research employs an exploratory approach using observational and interview techniques supplemented by secondary data. The investigation analyzes the psychological impact of an artificial teacher on Indian children's minds.

KEYWORDS: Neuron AI, IRIS, ROI, Education Sector

INTRODUCTION

Emerging technologies such as artificial intelligence (AI), virtual reality, and cloud computing are transforming education, offering new tools for teaching and learning. AI, in particular, is reshaping traditional methods by enabling personalized learning, streamlining administrative tasks, and creating engaging classroom environments. A pioneering initiative in Thiruvananthapuram, Kerala, has introduced IRIS, an AI-powered humanoid robot teacher developed by Maker Labs. This robot, built on generative AI and natural language processing (NLP), communicates with students, answers questions, and provides explanations in a human-like manner.

IRIS adapts its teaching through machine learning, analyzing student responses and adjusting instructional strategies for personalized learning. This flexibility addresses diverse learning needs, helping students understand complex concepts effectively. Beyond teaching, IRIS assists with classroom management tasks like attendance, progress tracking, and real-time feedback to both students and teachers. The humanoid design enhances its presence, making it approachable and comfortable for students to interact with, fostering an engaging, interactive environment. The integration of robots like IRIS highlights a trend where AI supports, rather than replaces, human teachers. While AI-powered robots are reshaping educational landscapes, they complement the expertise and emotional intelligence that human educators provide. This collaboration between AI and teachers offers potential solutions to longstanding educational challenges, enhancing both learning engagement and administrative efficiency. As students' expectations shift towards more interactive, technology-driven learning experiences, innovations like IRIS are increasingly relevant. The development of AI in education not only meets current educational needs but also opens doors to future learning environments that are tailored, efficient, and inclusive. This balance between AI's capabilities and human guidance is poised to create an adaptive, effective educational environment, benefiting students, teachers, and administrators alike.

The integration of AI-based robotic technology in education is transforming learning environments by enhancing student engagement, personalizing educational experiences, and fostering essential skills. This technology facilitates interactive learning through intelligent tutoring systems and virtual assistants, which adapt to individual student needs, thereby improving motivation and performance (Chipantiza et al., 2024) (Hamdi, 2024).



Problem Statement:

- Limited infrastructure and internet connectivity in rural schools.
- Educators and students may require training and support to effectively utilize new technologies.
- Assessing the influence of AI interactions on children's self-esteem and self-efficacy.
- Concerns around data privacy and cyber security must be addressed to build trust.
- Long-term financial sustainability of AI integration in education.
- Ongoing expenses for software updates and technical support.

OBJECTIVE OF THE STUDY:

The objective of the study is:

1. To assess the financial implications of adopting AI robotics, including initial investments and ongoing operational costs.
2. To analyze the economic viability of AI robotic technology against conventional approaches, focusing on expense versus benefit.
3. To identify and define quantifiable measures that can evaluate improvements in productivity and performance due to AI robotics.
4. To explore and predict the enduring advantages and ecological implications of integrating AI robotics into the local economy.

LITERATURE OF REVIEW

Ristyana Suryanti, et., al., (2024) in this research paper researcher discussed about the AI in the field of education in the recent days. AI influenced the industrial age of 5.0, technology can be used to make it easier for humans to do their everyday work. Therefore, there is a need for a literary study to find out the trends of research on artificial intelligence in the field of education in order to facilitate further researchers in determining the themes of their research. The four components are the benefits of AI, the application of artificial intelligence, the positive and negative impacts of AI, and the challenges to be faced with AI.

Shan Wang et., al., (2024). The researcher studies the Artificial intelligence in education (AIED) has evolved into a substantial body of literature with diverse perspectives. In this review paper. Research topics delve into both the technical design of education system and the examination of the adoption, impacts, and challenges associated with AIED. Furthermore, the multidisciplinary nature of publication venues, and underexplored research areas. In sum, this research offers valuable insights for interested scholars to comprehend the current state of AIED research and identify future research opportunities in this dynamic field.

Muhammad Tahiret., al., (2024). In the paper, author discussed about the AI present challenges and future opportunities in the education field. The field of education is also witnessing an increasing use of AI. Accordingly, we noted that AI is being used in the Education field as evidenced by global initiatives

such as UNESCO. We also discussed key challenges including ethical issues such as data privacy, lack of inclusion and equity for students of all backgrounds, and lack of human touch. Based on these themes we concluded that AI's role in education will increase in the future, but the challenges also need to be addressed to fully unlock the benefits of AI in the education field.

Several studies explore the role of AI in creating adaptive learning environments that cater to individual students' learning needs. **Nguyen et al. (2020)** highlight AI's role in creating formative assessment tools that can analyze written responses and provide instant feedback, facilitating self-paced learning and enhancing student motivation. AI's text and speech recognition capabilities enable accurate assessment of essays, short responses, and oral presentations, providing a comprehensive analysis of student performance.

Integrating AI with gamification in education has become a popular strategy to enhance student engagement.

Pardo et al. (2019) examine AI-driven learning analytics in higher education, highlighting the benefits of early identification of at-risk students. By leveraging machine learning algorithms, institutions can intervene early, offering support and resources to students who may otherwise struggle or drop out.

The shift toward virtual learning environments has accelerated the use of AI to support online learning. Huang et al. (2019) found that AI-powered virtual classrooms can replicate many of the benefits of in-person learning by fostering interaction, collaboration, and continuous engagement. AI assists by scheduling activities, moderating discussions, and even answering students' questions.

Chaudhuri and Mavani (2020) explore the use of AI chatbots and virtual assistants in education, noting their success in addressing routine student inquiries, reducing the administrative load on educators, and allowing them to focus on higher-order teaching activities. Virtual assistants also provide students with 24/7 access to information, supporting a more flexible and accessible learning environment.

Williamson and Eynon (2020) discuss the ethical considerations in deploying AI in schools, pointing out the need for transparency, accountability, and data protection to maintain student trust.

RESEARCH DESIGN AND METHODOLOGY

This study adopts a mixed-method research design, combining both qualitative and quantitative approaches to provide a comprehensive understanding of the cost-effectiveness of AI-generated robotic technology with reference to IRIS in Kerala. The quantitative dimension focuses on measurable indicators such as cost savings, efficiency gains, and return on investment, while the qualitative aspect emphasizes insights from stakeholders, user experiences, and institutional perspectives. Together, these methods ensure a holistic evaluation of the technology's financial and operational impact.

Data Collection

It will involve both primary and secondary sources. Primary data will be collected through structured surveys and semi-structured interviews with healthcare professionals, policymakers, and technology users to capture their perceptions of effectiveness, challenges, and long-term sustainability. Secondary data will be obtained from published reports, government documents, case studies, and financial records relevant to robotic technology adoption in healthcare. This dual strategy ensures reliability and triangulation of findings.

The Cost-Benefit Analysis Framework

It will serve as the evaluation tool. Parameters include direct cost savings from reduced manpower requirements, improved efficiency in diagnostic and surgical procedures, reduction in errors, and long-term return on investment through enhanced service delivery. Intangible benefits such as patient satisfaction, accessibility, and innovation-driven growth will also be considered, ensuring that both economic and social impacts are captured.

The Study Area focuses on Kerala, India, owing to its advanced healthcare infrastructure, high literacy rate, and progressive adoption of technology in the medical sector. Kerala provides an ideal context to analyze how AI-driven robotic solutions such as IRIS can address cost-effectiveness while maintaining quality healthcare. Moreover, the state's emphasis on digital transformation and public health reforms strengthens the justification for selecting it as the study location.

RESULTS AND FINDINGS

This study examines the integration of AI in education through IRIS, Kerala's first AI-powered robot teacher, highlighting both benefits and challenges. IRIS, designed by Maker Labs, uses natural language processing and machine learning to engage students in conversation, fostering interaction and tailoring instruction to individual needs. Students showed increased engagement, though some psychological impacts, such as dependency on AI, were noted, potentially affecting self-confidence without AI support. Administratively, IRIS automates tasks like attendance, progress tracking, and feedback, enabling teachers to focus more on personalized instruction. However, the study emphasizes that IRIS complements rather than replaces human teachers, as qualities like empathy and moral guidance remain irreplaceable. Key challenges include limited infrastructure in rural areas, where unreliable connectivity and resources restrict AI access, leading to educational inequities. Financial sustainability is another issue, as maintaining AI requires ongoing costs, including updates and technical support, which may be unfeasible in low-resource settings. Despite AI's potential to reduce some operational costs, it cannot fully replace the human touch essential in education. Overall, the study highlights the need for balanced integration, where AI enhances education without undermining the critical role of human educators in fostering empathy and personal growth in students.

SUMMARY AND CONCLUSIONS

In conclusion, the study emphasizes that while AI, exemplified

by IRIS, shows promise in transforming educational experiences in Kerala, careful consideration must be given to the psychological, infrastructural, and financial implications. Addressing these challenges holistically will be crucial for harnessing the full potential of AI in a way that complements and enhances traditional education rather than replacing it.

REFERENCES

1. Ninfa et. al, (2024). 1. Systematic analysis of artificial intelligence integration in robotics learning secondary education. doi: 10.47460/uct.v28i123.811
2. Mounir, Hamdi. (2024). 2. How AI is Transforming and Shaping the Future of Education. doi: 10.1109/ines63318.2024.1062908ash
3. Deo, N., & Anjankar, A. (2023). Artificial intelligence with robotics in healthcare: A narrative review of its viability in India. *Journal of Medical Systems*,
4. Piccininni, C. R. (2019). Cost-effectiveness of robotics and artificial intelligence in healthcare. *University of Western Ontario Medical Journal*, 87(2), 49–51. <https://doi.org/10.5206/uwomj.v87i2.1179>
5. Islamic Journal (2024). Humanoid robotics: IRIS—India's first robot teacher. *International Research Journal of Modernization in Engineering, Technology and Science*, 6(11). <https://doi.org/10.56726/>
6. Sharma, S. (2024, March 7). Kerala school introduces IRIS: India's first AI teacher robot, redefining education.
7. New Indian Express. (2024, August 30). Students flock to this 'intelligent robot' to clear doubts in Kerala.
8. Warriar, S. (2024, March 13). Meet Iris, India's first AI teacher.
9. Lázaro, I. (2024, April 11). Meet Iris: India's first AI-powered robot teacher.
10. Satish, S. (2024, March 17). IRIS: Kerala introduces India's first AI teacher robot.
11. Financial Express. (2024). Is Kerala's premier AI teacher Iris, a step towards advancement or a threat? Financial Express Education Section. Piccininni, C. R. (2019). Cost-effectiveness of AI-based robotic surgery (e.g., robot-assisted prostatectomy) and implications for long-term sustainability. *University of Western Ontario Medical Journal*. <https://doi.org/10.5206/uwomj.v87i2.1179> • (2024). Case Centre. (n.d.). India's first AI teacher "Iris": A case study. The Case Centre.
12. National Institute for Transforming India (NITI Aayog). (2021). Atal Tinkering Labs initiative overview..
13. Makerlabs Edutech. (2024). IRIS—functionality and educational capabilities of India's first AI teacher robot. (Derived from multiple sources including Times of India,