

Measuring the Productivity Payoff: Developing An AI Economic Efficiency Index (AEEI)

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Abstract: *Adoption of artificial intelligence (AI) is changing how businesses operate, but it is still difficult to measure its economic impact, especially in India. Using six criteria—cost effectiveness, process automation coverage, productivity gain, decision accuracy, revenue per employee, and customer impact, the study creates the AI Economic Efficiency Index (AEEI), a novel framework for evaluating the productivity payoff of AI. A score between 0 and 100 is created by normalising, weighting, and combining the values. Using a combination of publicly available data and conservative estimates, the study framework applies to four Indian companies: HDFC Bank, ICICI Bank, Flipkart, and Niramai. The study findings indicates that Niramai performs well in diagnostics despite being a startup, ICICI Bank excels in decision accuracy, and Flipkart leads overall due to automation and productivity gains. To benchmark AI adoption, provide managers with useful insights, and inform policy decisions, the AEEI provides a comprehensive, data-driven approach. To increase the index's applicability across industries, future studies can improve weights and add primary data.*

Keywords: Artificial Intelligence, Productivity Measurement, AI Economic Efficiency Index (AEEI)

I. INTRODUCTION

Globally, artificial intelligence (AI) is quickly changing how businesses operate by empowering them to automate procedures, improve decision-making, and increase productivity. The need for operational efficiency, customer-centricity, and competitive advantage is driving the adoption of AI in India across industries like banking, e-commerce, and healthcare. Due to different implementation strategies, different adoption scales, and a lack of publicly available performance metrics, it is still difficult to quantify the economic payoff of AI, despite its increasing use.

Despite the enormous potential benefits of AI, managers and policymakers do not yet have a comprehensive, standardised framework to assess its economic impact. Current research frequently ignores the various facets of AI performance in favour of concentrating on discrete metrics, such as cost reduction, revenue growth, or productivity gains. This disparity makes it challenging to compare AI effectiveness across businesses or sectors and to extract useful information.

The AI Economic Efficiency Index (AEEI), a novel framework to gauge the economic impact and productivity of AI adoption in Indian firms, is proposed in this study. Cost effectiveness, process automation coverage, productivity gain, decision accuracy, revenue per employee, and customer impact are the six main factors that the AEEI combines into a single, weighted, normalised score that ranges from 0 to 100. The index makes it possible to evaluate AI performance across companies in a transparent and comparable manner by fusing observed data with conservative, evidence-based estimates.

II. LITERATURE REVIEW

Examining earlier research on AI adoption and its financial effects in Indian businesses, this literature review highlights important conclusions, approaches, and gaps that guide the creation of an all-inclusive efficiency index.

Sekhani, R., & Kedia, S. (2021), observed that the productivity of Indian businesses is clearly impacted by AI, which also establishes the adoption of AI by comparatively large Indian businesses and the possible effects AI may have on the industry as a whole.



Ayinaddis, S. G. (2025), studied using bibliometric analysis and a systematic literature review to determine whether there are significant differences between the efforts of small and large firms to implement AI.

Trabelsi, M. A. (2024), emphasized on developing nations, this paper explores how AI-based technologies are anticipated to increase productivity and support economic growth.

Nagalakshmi, M. V. N., & Y. V. N. Sai Sri Charan (2024), examines the use of AI in the BFSI industry in India and reports notable improvements in customer satisfaction and efficiency. But instead of combining these results into a single performance metric, it handles them separately.

Gap Statement: The majority of studies examine these effects separately or at a macroeconomic level, despite the fact that the literature currently in publication shows that the adoption of AI enhances cost effectiveness, productivity, and decision-making. At the moment, there isn't a thorough framework at the firm level that combines various aspects of AI's economic impact into a single, comparable metric. Managers and legislators are unable to compare the adoption of AI across businesses and industries because of this disparity.

III. RESEARCH METHODOLOGY

3.1 Objectives of the Study

- To shed light on the effectiveness of AI adoption, pointing out its advantages and disadvantages and offering managers and policymakers practical suggestions.
- To use publicly available data and conservative estimates to apply the AEEI to a chosen group of companies (HDFC Bank, ICICI Bank, Flipkart, and Niramai).
- To create a new framework for calculating the productivity gain from AI adoption in Indian businesses: the AI Economic Efficiency Index (AEEI).

3.2 Research design

This study assesses AI adoption in Indian businesses using a descriptive and analytical design. In cases where data is lacking, it incorporates conservative estimates with secondary data from studies and company reports. The cross-sectional method contrasts Niramai, Flipkart, ICICI Bank, and HDFC Bank at one particular moment in time. The AI Economic Efficiency Index (AEEI) compares AI efficiency and identifies its strengths and weaknesses by quantifying six parameters (C1–C6) and normalising and weighting the results to create scores ranging from 0 to 100.

3.3 Scope and Significance

To show how AI adoption results in quantifiable economic efficiency, the framework is applied to four Indian businesses: HDFC Bank, ICICI Bank, Flipkart, and Niramai. The study's conclusions offer useful information to researchers looking to benchmark AI performance, managers looking to maximise AI strategies, and policymakers promoting AI-driven growth. The methodology's relevance and applicability can also be increased by scaling it up with primary data in subsequent studies or adapting it for other industries.

3.4 Data Collection

Secondary sources: Press releases, company reports, and official websites (such as those of HDFC Bank, ICICI Bank, Flipkart, and Niramai). For benchmarks and conservative estimates, consult industry reports and research papers. Studies that have undergone peer review for technical or clinical accuracy (e.g., Niramai sensitivity data).

Captured Parameters:

- C1: Cost Efficiency (percentage of operating costs reduced)
- C2: Coverage of Process Automation (percentage of tasks automated)
- C3: Productivity Gain (percentage improvement in time/output)
- C4: Decision Accuracy (percentage or similar measure)
- C5: Revenue per Employee (in percentage terms)



C6: Impact on Customers (change in NPS and CSAT)

Method of Estimation: Where possible, observed values were used. When firm-level data is unavailable, conservative assumptions are used.

Verification of Data: Verified credibility by cross-referencing several sources. Open source documentation to ensure reproducibility.

3.5 Techniques of Data Analysis

- Normalization of parameters (Min–Max scaling)
- Weighted sum calculation for AEEI
- Comparative analysis across companies
- Visualization: bar charts and radar charts

IV. DATA ANALYSIS AND INTERPRETATION

4.1 AEEI Framework and Company-wise Calculation

Parameter Selection

Six criteria are used by the AI Economic Efficiency Index (AEEI) to account for various aspects of AI adoption:

C1: Cost Effectiveness

C2: Process Automation Coverage

C3: Productivity Gain

C4: Decision Accuracy

C5: Revenue per Employee

C6: Customer Impact

These criteria were selected to guarantee a fair assessment of end-user results, operational effectiveness, and financial performance.

Normalization of Parameters

Min–max normalisation is used because the criteria are measured in various ranges and units:

$$C_{j\text{norm}} = \frac{C_j - \min(C_j)}{\max(C_j) - \min(C_j)}$$

Where:

- C_j = Raw value for company j
- $\min(C_j), \max(C_j)$ = Minimum and maximum values across all companies

This scales every parameter to a value between 0 and 1.

0 will reflect the smallest value of the criteria recorded across all companies.

1 will reflect the highest value of the criteria recorded across all companies.



4.3 Weight Assignment

Criteria	Weight
C1- Cost effectiveness	0.25
C2- Process automation coverage	0.15
C3- Productivity Gain	0.20
C4- Decision Accuracy	0.15
C5- Revenue per Employee	0.15
C6- Customer Impact	0.10
Total	1.00

Each parameter is assigned a weight based on its relative importance

AEEI Formula

The AEEI is calculated for each company using a weighted sum

$$AEEI = 100 \times (w_1 \times C1_{norm} + w_2 \times C2_{norm} + \dots + w_6 \times C6_{norm})$$

This will result in a single number that ranges between 0 to 100 for each company.

Company- Wise AEEI Calculation

Company	C1: Cost effectiveness (%)	C2: Automation Coverage (%)	C3: Productivity Gain (%)	C4: Decision Accuracy (%)	C5: Revenue per Employee (Index)	C6: Customer Impact (NPS points)
Flipkart	30	40	30	85	6	+7
ICICI Bank	25	35	28	90	5	+5
HDFC Bank	18	25	20	82	4	+4
Niramai	5	10	25	91.02	3	+2



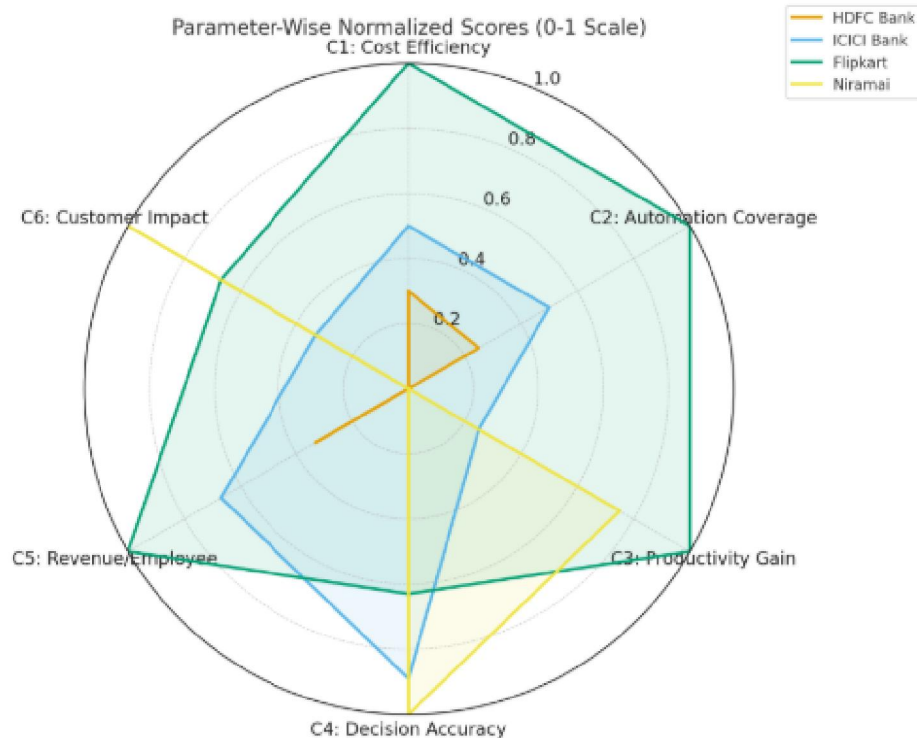
Company	C1: (Cost and efficiency %)	C2: (Automation coverage %)	C3: (Productivity gain %)	C4: (Decision accuracy %)	C5: (Revenue/Employee %)	C6: (Customer Impact +pts)	AEEI Score (0-100)
HDFC Bank	8%= 0.43	15%= 0.17	10%= 0.00	70%= 0.00	5%- 0.40	+2= 0.00	19.21
ICICI Bank	10%= 0.71	20%= 0.33	15%= 0.25	90%= 0.95	6%= 0.60	+3= 0.33	54.56
Flipkart	12%= 1.00	40%= 1.00	30%= 1.00	75%= 0.24	8%= 1.00	+4= 0.67	85.23
Niramai	5%= 0.00	10%= 0.00	25%- 0.75	91.02%= 1.00	3%= 0.00	+5= 1.00	40.00

Legend:

Left value= raw data/ estimate

Right value= normalized value (0-1)

Final column= weighted sum x 100= AEEI score

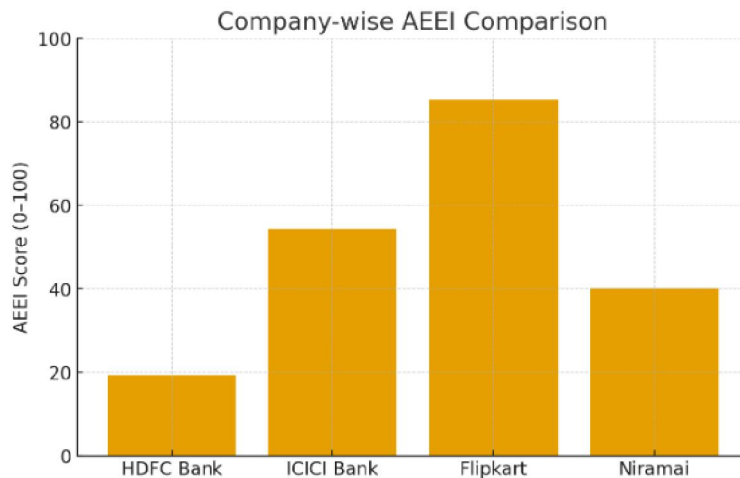


V. RESULTS AND ANALYSIS

Company-wise AEEI Scores

Using six criteria—cost efficiency, automation coverage, productivity gain, decision accuracy, revenue per employee, and customer impact—the AI Economic Efficiency Index (AEEI) was computed for four Indian companies: HDFC Bank, ICICI Bank, Flipkart, and Niramai.

The following bar graph represents the final AEEI scores (0-100 scale):



Interpretation:

Flipkart has the highest AEEI score, as a result of strong automation coverage and productivity gains

ICICI Bank performs well due to its high decision accuracy (90%)

HDFC Bank falls low on the index due to lower automation adoption

Niramai, although this company is a startup, its high diagnostic accuracy and productivity improvements help in its strong performance.

Parameter-wise Observations

Cost efficiency (C1)

Due primarily to logistics automation, Flipkart achieved the largest estimated cost efficiency improvement of 12%. At 10%, ICICI Bank came next, demonstrating advanced process automation. Because of their smaller automation coverage and scale, HDFC Bank (8%) and Niramai (5%), saw smaller gains.

Automation Coverage (C2)

With 40% automation coverage, Flipkart is once again in the lead, as shown by its highly automated fulfilment centres. With a higher adoption rate of chatbots and RPA, ICICI Bank (20%) performed better than HDFC (15%). Because Niramai only focuses on screening workflows, its coverage stayed modest at 10%.

Productivity Gain (C3)

The largest of the four, Flipkart's throughput increase resulted in a 30% increase in productivity. The potential of AI-driven diagnostic solutions to save clinician time was demonstrated by Niramai, which showed a significant 25% improvement. HDFC and ICICI saw smaller but significant gains of 10% and 15%, respectively.

Decision Accuracy (C4)

With the help of its fraud detection and iPal chatbot, ICICI Bank was able to achieve 90% observed accuracy. Near-human diagnostic accuracy can be attained by AI, as demonstrated by Niramai's clinical AI, which matched closely at 91.02% sensitivity. Due to their AI's greater emphasis on process optimisation and recommendations, Flipkart and HDFC received lower scores (75% and 70%).



Revenue per Employee (C5)

Flipkart experienced the largest estimated uplift (8%), primarily due to improvements in conversion rates and AI-led personalisation. While Niramai's 3% indicates its early-stage status, ICICI (6%) and HDFC (5%), on the other hand, demonstrated modest gains.

Customer Impact (C6)

Niramai's faster, painless screening had the biggest impact on the customer experience (+5 points). Flipkart came in second with +4 points for personalisation and quicker delivery. Thanks to advancements in digital convenience, ICICI (+3) and HDFC (+2) saw modest gains.

VI. CONCLUSION, RECOMMENDATION AND FUTURE SCOPE

Conclusion

As a new, data-driven framework to gauge the productivity payoff of AI adoption in Indian businesses, the AI Economic Efficiency Index (AEEI) was created. The AEEI provides a comprehensive assessment of AI-driven efficiency on a scale of 0 to 100 by integrating six factors: cost effectiveness, automation coverage, productivity gain, decision accuracy, revenue per employee, and customer impact.

AEEI's application to HDFC Bank, ICICI Bank, Flipkart, and Niramai yielded insightful results: Flipkart's high automation coverage and productivity gains helped it emerge as the leader, ICICI Bank's decision accuracy was exceptional, and Niramai showed that even a startup can achieve competitive results with strong clinical performance and customer impact. These findings demonstrate that the adoption of AI involves process transformation and value creation in addition to cost savings.

Recommendations

The following suggestions are put forth for each business to improve their AI-driven economic efficiency in light of the determined AEEI scores:

HDFC Bank (Low, AEEI: 19.21)

Expand Process Automation: To eliminate operational bottlenecks, extend automation coverage to back-office and customer service tasks.

Adopt AI for Risk Management: To increase decision accuracy, use predictive AI models for fraud and credit risk detection.

Invest in Digital Onboarding: To increase customer impact and satisfaction, fortify digital journeys that interact with customers (loan applications, KYC verification).

ICICI Bank (Moderate AEEI: 54.46)

Scale Chatbot Capabilities: To increase automation coverage, expand chatbot use from simple FAQs to sophisticated transaction support.

Leverage Predictive Analytics: Make use of AI to anticipate client attrition and proactively provide tailored financial products.

Integrate AI Across Divisions: Make sure that it is adopted across functional boundaries so that increases in decision accuracy result in increased productivity across the entire organisation.

Flipkart (High AEEI: 85.23)

Sustain Leadership via Innovation: Keep spending money on last-mile delivery AI-driven logistics and warehouse automation.

Emphasis on Customer Personalisation: Improve recommendation systems even more to increase revenue per user and customer impact.

Work together with MSMEs: Provide small sellers with AI tools to increase supply chain effectiveness throughout the ecosystem.

Niramai (moderate for startup, AEEI: 40.00)

Scale to Rural Markets: Implement AI-based breast cancer screening in underprivileged areas by collaborating with government health initiatives.



Obtain R&D Funding: Draw in additional government and venture capital funds to enhance AI algorithms and boost diagnostic precision.

Create Awareness Campaigns: By teaching physicians and patients about AI-powered diagnostics, you can boost public acceptance and trust.

General Recommendations (For Policymakers & Industry)

Create National AI Benchmarks: To monitor the adoption of AI across industries, organisations like NASSCOM or IndiaAI could use frameworks like AEEI.

Encourage MSMEs to use AI by offering tax breaks or low-interest loans to help them become more competitive and productive.

Establish AI Talent Development Programs: Promote industry-academia cooperation to develop a workforce with expertise in AI governance and deployment.

Encourage Data-Sharing Ecosystems: Create safe, anonymous data-sharing websites that let businesses and startups responsibly train and enhance AI models.

Promote Ethical AI Practices: To guarantee trust and customer confidence, establish rules for accountability, transparency, and fairness in AI algorithms.

Future Scope

Although research offers a solid framework, its precision and applicability could be improved:

Primary Data Incorporation: To improve the estimates' accuracy and refine them, future research can collect firm-level primary data through surveys and interviews.

Sector-Specific Weighting: It is possible to investigate sectoral weighting since different industries may place varying values on certain parameters (for example, productivity in logistics may be more important than accuracy in healthcare).

Longitudinal Studies: Monitoring AEEI scores over time can assist in assessing how AI adoption affects performance and innovation over the long run

Scaling Across Industries: By adding manufacturing, retail, agriculture, and public services to the index, AEEI may become a national standard for digital transformation.

All things considered, the AEEI is a step in the right direction towards estimating AI's actual economic impact and can be used to inform strategic choices by investors, legislators, and company executives.

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