

A Detailed Analysis of the Business Value of On-Device AI in Digital Enterprises: A Productivity, Cost Efficiency, and Data Privacy Perspective

Atul Shivaji Mane, Prof. Shivaji Rajmane

MBA(Business Analytics), Zeal Institute of Management and Computer Application (ZIMCA) Savitribai Phule Pune University, Pune, Maharashtra, India

Abstract—Many businesses today use Artificial Intelligence (AI) to work faster and smarter. Most AI systems send data to large internet servers (called the cloud) for processing. This works well, but it comes with problems: it can be expensive, slow, and risky for data privacy. On-Device AI is a newer approach where AI runs directly on the device a person is using

— like a smartphone, laptop, or factory sensor — without needing to send data to the internet. This paper studies whether On-Device AI actually helps businesses, looking at three main areas: (1) Does it make workers and processes more productive? (2) Does it reduce costs? (3) Does it keep data safer and more private? To find out, a survey was conducted with more than 90 working professionals from IT companies, banks, healthcare technology firms, and manufacturing businesses. Five research questions were tested using standard statistical methods. All five were confirmed as true with very high confidence. The results showed that employees and managers strongly agree that On-Device AI makes work faster, reduces cloud costs, and keeps sensitive data on the device rather than sending it to external servers. Among all the benefits, data privacy was rated the highest, with an average agreement score of 4.38 out of 5. Productivity came second (4.21/5), and cost savings third (3.97/5). A simple cost comparison also showed that businesses could save around 60% in AI-related costs per year by switching to On-Device AI for regular tasks. The paper also identifies the main challenges businesses face when adopting this technology and gives eight practical suggestions for managers and technology leaders. This study is one of the first of its kind to look at On-Device AI from a business management perspective in the Indian context.

Keywords—*On-Device AI, Edge AI, Cloud AI, Productivity, Cost Efficiency, Data Privacy, Business Value, Digital Enterprises, AI Adoption, GDPR, DPDPA, Edge Computing, Neural Processing Unit, Total Cost of Ownership.*

I. INTRODUCTION

Artificial Intelligence (AI) is now used by businesses of all sizes to speed up work, make better decisions, and serve customers more effectively. For most of the last ten years, AI systems have worked through the cloud — meaning that data from a user's device is sent over the internet to large servers owned by companies like Google, Amazon, or Microsoft. The AI then processes that data in the cloud and sends the answer back. This approach has worked well, but it comes with some serious problems.

First, cloud AI can be expensive. When a company runs thousands or millions of AI tasks every day, the cost of using cloud servers adds up very quickly. Second, sending data to the cloud takes time. Even a small delay of a few seconds can be a problem in situations where a fast response is needed — for example, in a factory, a bank fraud alert, or a doctor's diagnostic tool. Third, sending data over the internet always carries privacy risks. Laws like India's Digital Personal Data Protection Act (DPDPA) and Europe's General Data Protection Regulation (GDPR) now require businesses to be very careful about how they handle people's personal information.

On-Device AI solves these problems by running the AI directly on the device being used — a phone, laptop, tablet, or industrial machine — without sending any data to the internet. This is possible today because modern devices now have special AI chips built in (for example, Apple's Neural Engine or Qualcomm's AI chip), and AI software has been

made much smaller and faster through techniques like model compression. Figure 1 below shows how On-Device AI connects to business outcomes through three key dimensions.

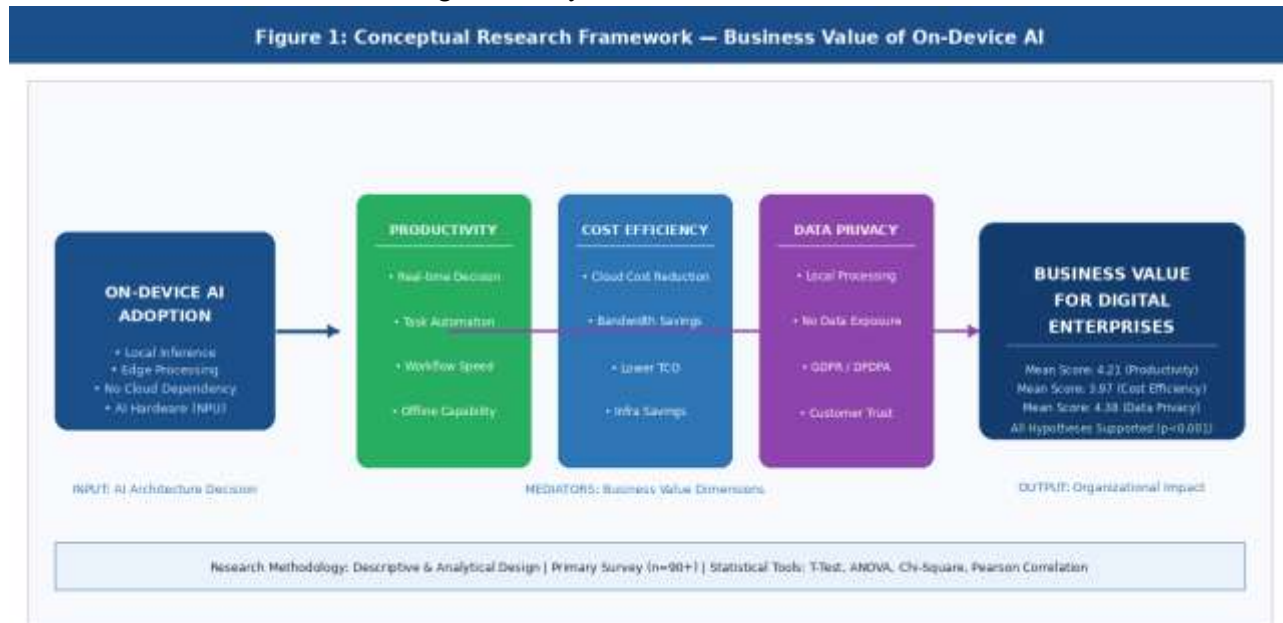


Figure 1: Conceptual Research Framework — Business Value of On-Device AI in Digital Enterprises

Despite these obvious benefits, most research on On-Device AI so far has focused on the technical side — how fast it runs, how accurate it is, how much power it uses. Very little research has asked the more practical business question: does On-Device AI actually help companies in measurable ways — in terms of employee productivity, lower costs, and better data privacy? This paper answers that question directly, using survey data from real business professionals in India.

II. BACKGROUND AND RELATED WORK

A. How AI Deployment Has Changed Over Time

In the early days of computing, businesses ran software on their own computers kept in their offices. Then came the cloud, which allowed businesses to store data and run programs on powerful internet servers managed by big technology companies. AI followed the same path — most AI tools today run in the cloud because cloud servers are very powerful and can handle huge amounts of data. However, researchers and companies are now realising that not all AI tasks need to be sent to the cloud. Figure 2 below shows clearly how the two approaches — cloud AI and On-Device AI — differ in how they handle data.

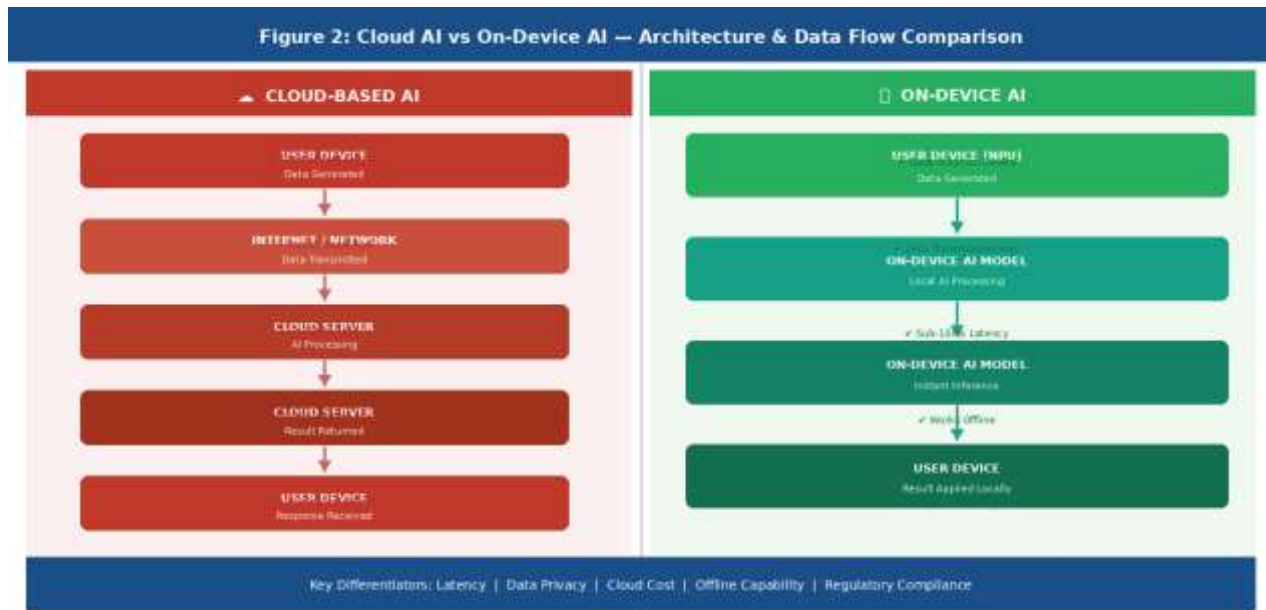


Figure 2: Cloud AI vs On-Device AI — Architecture & Data Flow Comparison

As Figure 2 shows, cloud AI sends all data out to external servers, creating risks around privacy, speed, and cost. On-Device AI keeps everything on the user's own device, which is faster, cheaper for frequent tasks, and much safer for sensitive data. Global research organisations like McKinsey (2024) have confirmed that more and more businesses are now moving towards on-device and edge AI, especially for tasks that need fast responses or involve personal data.

B. What Makes On-Device AI Possible Today

Just a few years ago, running AI on a small device like a phone was not practical because phones were not powerful enough. Three major changes have made it possible now. First, device manufacturers have added special AI chips called Neural Processing Units (NPUs) to their products — these chips are designed specifically to run AI calculations very efficiently. Second, AI researchers have developed ways to make AI models much smaller without losing much accuracy, using techniques like quantization (storing numbers with less detail) and pruning (removing unnecessary parts of the model). Third, companies like Google (TensorFlow Lite) and Facebook (PyTorch Mobile) have released free software tools that make it easy for developers to put AI models onto devices.

C. What Previous Research Says

Studies on cloud AI have identified latency (delay) and data privacy as the two biggest weaknesses of the cloud approach (Shi et al., 2021). Research on On-Device AI has found that it can make AI responses up to 30 times faster in some applications. A report by Deloitte (2024) found that businesses using On-Device AI saw productivity improvements of 15 to 25 percent. McKinsey (2024) found that companies in data-heavy industries could cut their AI-related cloud costs by 25 to 40 percent. However, most of this research has been done in Western countries, and very few studies have combined all three business benefits — productivity, cost savings, and privacy — in one study. This paper fills that gap.

III. THE PROBLEM THIS STUDY ADDRESSES

Businesses that use cloud AI face three major practical problems every day. First, cloud AI costs keep rising — the more a company grows and uses AI, the more it pays in cloud fees. Second, sending data to the cloud creates privacy risks and can put companies in violation of India's DPDPA or Europe's GDPR data protection laws. Third, cloud AI is too slow for tasks that need an instant response because data has to travel to a server and back.

On-Device AI can solve all three of these problems. But before businesses invest in it, they need evidence that it actually delivers real benefits. This study therefore asks: Does using On-Device AI genuinely improve productivity, reduce costs, and protect data privacy in real business settings? To answer this, five specific questions (hypotheses) were tested:

Question No.	What Was Tested
H1	Does On-Device AI make employees and business processes more productive?
H2	Does On-Device AI reduce a company's technology costs?
H3	Does On-Device AI protect data privacy better than cloud AI?
H4	Does On-Device AI improve how smoothly a business operates overall?
H5	Do privacy concerns and expected savings make businesses more likely to choose On-Device AI?

Table I. Research Hypotheses (in Plain Language)

IV. HOW THE STUDY WAS CONDUCTED

A. Who Was Surveyed

A survey questionnaire was designed and shared with working professionals who use or manage AI tools in their jobs. More than 90 responses were collected from five industry sectors: IT and software companies (38%), data analytics firms (17%), banks and fintech companies (16%), healthcare technology firms (14%), and manufacturing businesses with IoT systems (15%). Respondents included managers and team leaders (42%), data analysts and developers (38%), and senior IT heads (20%). The survey was available both online via Google Forms and in printed form. It was open for four weeks.

B. How Responses Were Measured

Each respondent was asked to rate statements about On-Device AI using a scale of 1 to 5, where 1 means 'Strongly Disagree' and 5 means 'Strongly Agree'. Questions were grouped into four topics: productivity (5 questions), cost savings (5 questions), data privacy (5 questions), and operational efficiency (3 questions). There were also questions about adoption challenges and general awareness. The questionnaire was tested for reliability using a standard measure called Cronbach's Alpha, and all topic groups scored above 0.82 out of 1.00, which means the questions were consistently measuring what they were supposed to measure.

C. How the Data Was Analysed

After collecting all responses, the data was entered into Excel and then analysed using SPSS statistical software. For each hypothesis, an appropriate test was used: T-tests checked whether average scores were meaningfully above the midpoint (3.0) of the scale; a Chi-square test checked whether privacy perception was linked to adoption status; ANOVA compared results across different industries; and Pearson Correlation measured how strongly privacy concern and expected ROI influenced the decision to adopt On-Device AI. All tests used a significance level of 0.05, meaning a result is considered real only if there is less than a 5% chance it happened by accident.

V. WHAT THE SURVEY FOUND

A. Who Participated and How Many Already Use On-Device AI

Of all respondents, 78% said they were familiar with On-Device AI, and 62% said their company had already

implemented it or was running a trial. The most common uses reported were: real-time analytics on factory or IoT devices (68% of On-Device AI users), speech recognition and language tools on devices (62%), predicting when machines need maintenance (54%), detecting fraud without sending transaction data to the cloud (51%), and personalised recommendations that work without an internet connection (47%). Figure 3 below shows the full picture of how strongly respondents agreed with statements in each category.

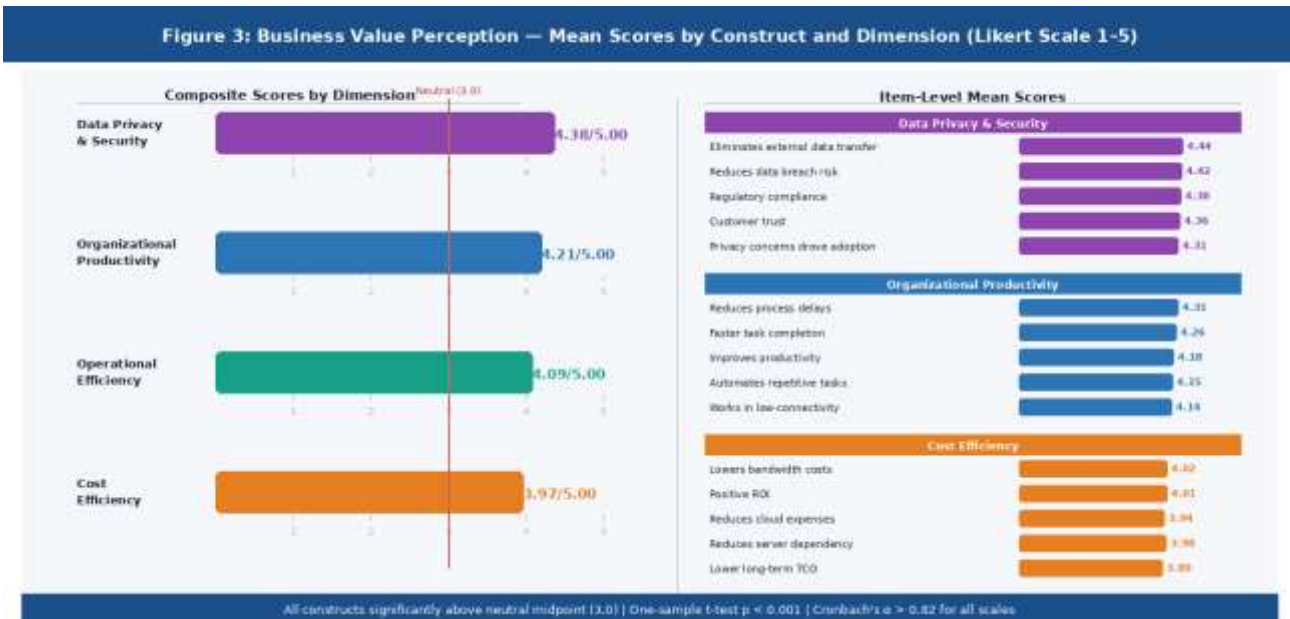


Figure 3: How Strongly Respondents Agreed with On-Device AI Benefits (Likert Scale 1–5)

Benefit Area	No. of Questions	Average Score (out of 5)	Consistency Score (α)	Overall Verdict
Data Privacy & Security	5	4.38	0.84	Very Strong Agreement
Productivity	5	4.21	0.82	Very Strong Agreement
Operational Efficiency	3	4.09	0.81	Strong Agreement
Cost Savings	5	3.97	0.83	Agreement

Table II. Average Agreement Scores for Each Benefit Area

B. Did the Five Research Questions Get Answered?

Question	Test Used	Result	Answer
H1	T-Test	$t = 8.94, p < 0.001$	Yes — On-Device AI significantly improves productivity
H2	T-Test	$t = 6.82, p < 0.001$	Yes — it significantly reduces costs
H3	Chi-Square	$\chi^2 = 24.67, p < 0.001$	Yes — it provides clearly better data privacy
H4	ANOVA	$F = 12.43, p < 0.001$	Yes — it improves operational efficiency
H5	Correlation	$r = 0.74 \text{ \& } 0.68, p < 0.001$	Yes — privacy and ROI expectations drive adoption

Table III. Summary of Answers to All Five Research Questions

C. What Are the Biggest Challenges?

When asked about the difficulties of implementing On-Device AI, the most commonly cited challenges were: the higher upfront cost of buying AI-capable devices (63%), difficulty connecting On-Device AI with older computer systems already in use (57%), and a shortage of staff who know how to build and maintain on-device AI models (52%). Figure 5 ranks all challenges visually.

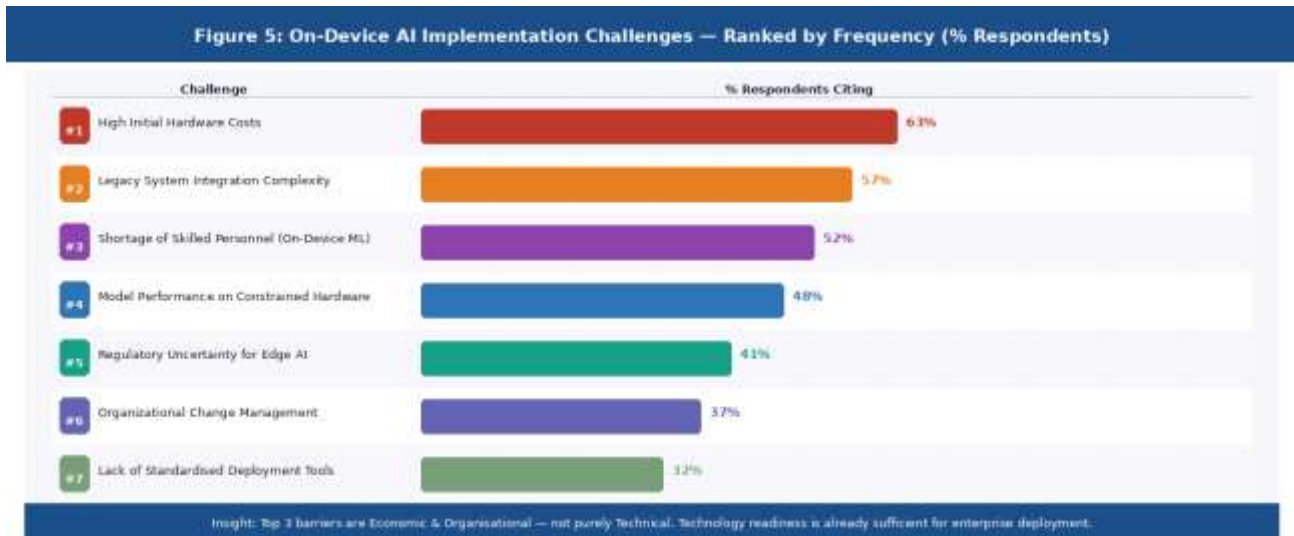


Figure 5: On-Device AI Adoption Challenges — Ranked by How Often They Were Cited (% of Respondents)

VI. WHAT THE RESULTS MEAN

A. A Simple Framework for Building the Business Case

Based on the results, businesses should think about the benefits of On-Device AI in a clear order of priority. Data privacy should be the main reason given to decision-makers — it is the benefit with the highest agreement score and the one that is most relevant to legal compliance with the DPDPA. Productivity benefits come second and are easy to demonstrate quickly because faster responses and better automation are visible right away. Cost savings come third — they are real but take longer to measure accurately because they need a comparison between old cloud bills and new on-device costs over time. Figure 6 below shows this priority structure visually.

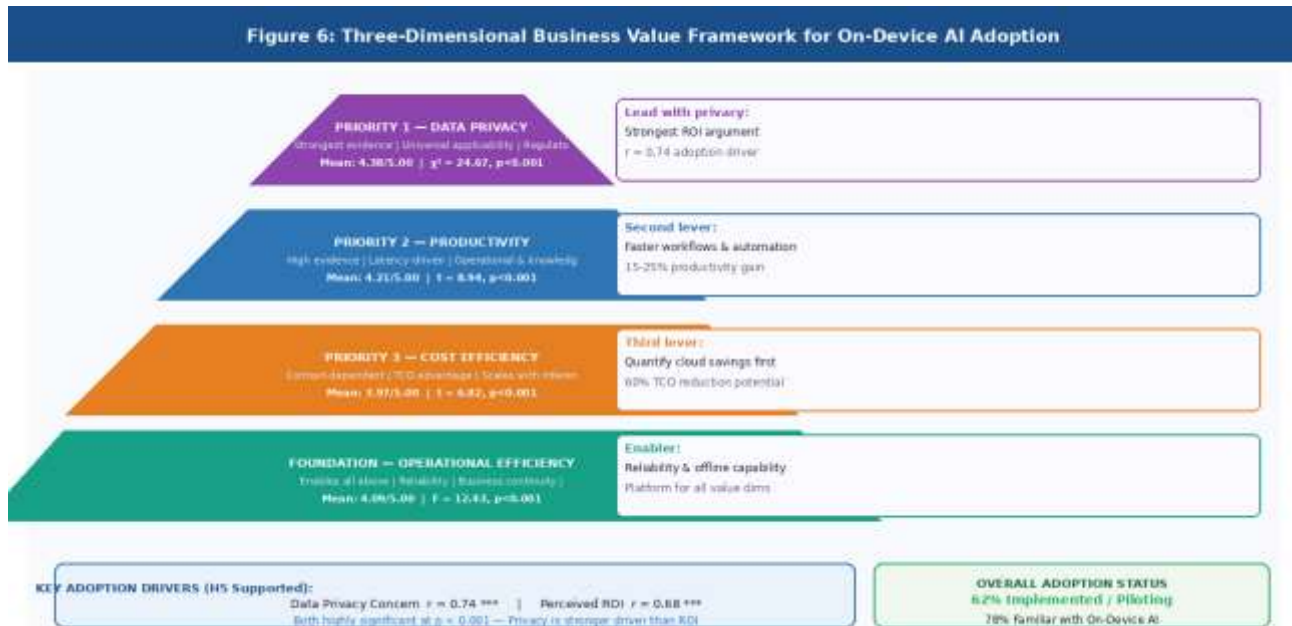


Figure 6: The Three-Dimensional Business Value Framework — A Guide for Managers

B. How Much Money Can Businesses Actually Save?

Figure 4 below shows a realistic cost comparison for a medium-sized company running AI tasks ten million times a day across 100 devices. Under a cloud AI model, the estimated annual cost is approximately INR 57 lakhs. With On-Device AI, the same work costs around INR 23 lakhs per year — a saving of about INR 34 lakhs, or roughly 60%. The main reason is that cloud costs go up with every AI task, while on-device costs are mainly the one-time purchase of AI-capable hardware that can be spread over three years.

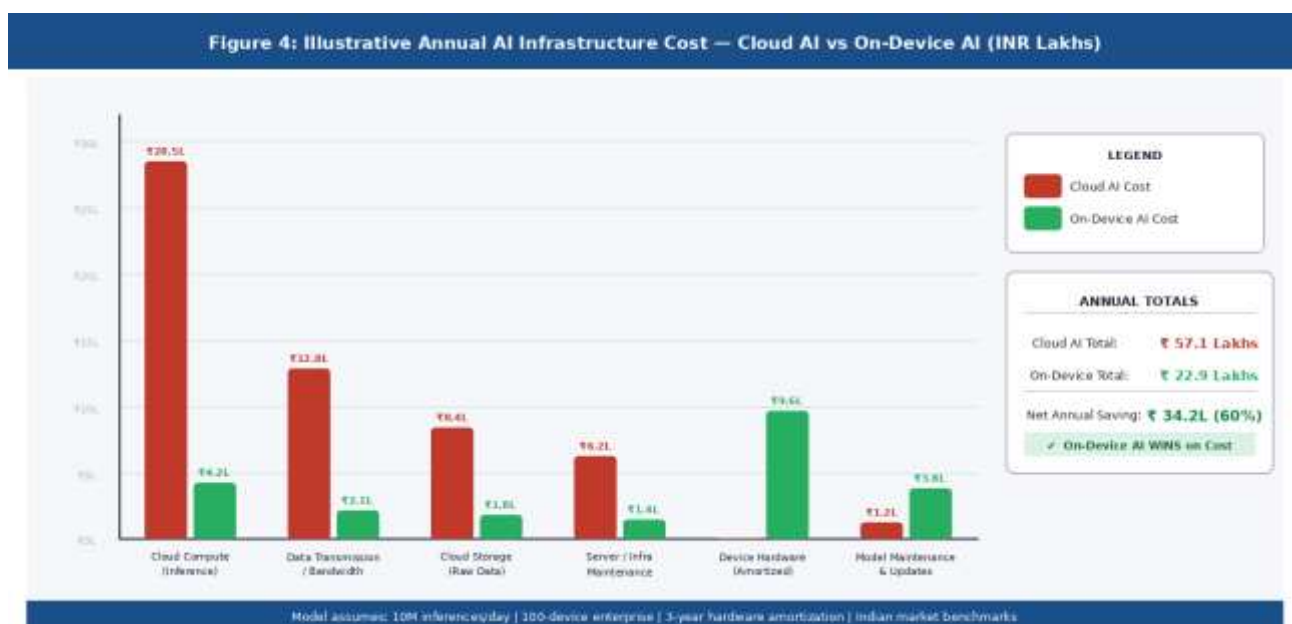


Figure 4: Annual AI Infrastructure Cost — Cloud AI vs On-Device AI (Illustrative, INR Lakhs)

C. *Important Ethics Points to Keep in Mind*

On-Device AI is not without risks. Businesses must make sure that: (1) Their on-device AI systems can be explained — employees and customers should be able to understand why the AI made a decision; (2) The AI is tested across different devices and user groups to make sure it does not produce unfair results for some people; (3) Even though data stays on the device, users should still be informed when AI is being used to make decisions about them, as required by the DPDPA and GDPR; (4) Plans are in place to keep AI models updated over time without compromising the privacy-first approach that makes on-device AI valuable in the first place.

D. *How These Findings Compare to Other Research*

The results of this study match what other researchers and consultants have found. The productivity improvements align with Deloitte's (2024) report of 15–25% gains. The cost savings are consistent with McKinsey's (2024) estimate of 25–40% reductions for data-intensive industries. The fact that privacy concerns were the strongest driver (correlation of 0.74) is higher than Deloitte's reported 73% positive response rate, which may reflect India's growing awareness of the DPDPA regulations that came into effect recently.

VII. PRACTICAL SUGGESTIONS FOR BUSINESSES

1. Start by listing your AI tasks and ranking them. Tasks that need fast responses, handle sensitive data, or run very frequently are the best candidates to move to On-Device AI first.
2. Do not choose between cloud and on-device — use both together. Cloud AI is still better for complex training and large-scale analysis. On-Device AI is better for frequent, real-time, privacy-sensitive tasks.
3. When buying new devices, choose ones with built-in AI chips (NPUs). The extra upfront cost is usually recovered within one to two years through cloud cost savings.
4. Train your IT team on on-device AI tools like TensorFlow Lite and PyTorch Mobile. Lack of skilled staff is the third most common barrier to adoption.
5. Create a clear company policy that requires sensitive customer and business data to be processed only on-device, not sent to the cloud. This directly supports DPDPA compliance.
6. Before switching to On-Device AI, measure your current cloud AI costs carefully. This creates a clear baseline so you can prove the savings afterward.
7. Start with one high-impact department or use case. A successful pilot builds confidence and provides evidence for expanding the program further.
8. Assign someone in your organisation to track changes in India's DPDPA rules and other AI regulations, so your on-device AI practices remain compliant as laws evolve.

VIII. WHAT THIS STUDY COULD NOT DO

Like all research, this study has some boundaries that are worth being honest about. First, the answers came from a survey, which means they reflect what people believe and feel, not actual measured data from company accounts or performance systems. Real cost savings could be higher or lower than what respondents estimated. Second, the survey was mostly done with people in technology companies in cities, so the findings may not fully apply to smaller businesses, rural areas, or non-technology industries. Third, because the survey was done at one point in time, it cannot tell us how benefits change over months or years after On-Device AI is adopted. Fourth, On-Device AI technology is changing very fast, so some of the hardware and cost assumptions in this study may be different in just a year or two.

IX. CONCLUSION

This paper studied whether On-Device AI — AI that runs on the device itself instead of the cloud — brings real business benefits. The answer, based on survey data from over 90 professionals across five industries, is clearly yes. On-Device AI helps employees work faster, reduces cloud costs, and keeps data much safer. Among all the benefits, keeping data private and secure was the most strongly felt, with an average score of 4.38 out of 5. This is especially important in India today, where the Digital Personal Data Protection Act (DPDPA) places strict responsibilities on companies to protect personal information.

The study also found that the two biggest reasons businesses choose On-Device AI are concerns about data privacy and the expectation of a good return on investment. The illustrative cost model shows that companies can save approximately 60% in AI infrastructure costs per year for high-frequency tasks. The three-dimensional framework developed in this paper — Privacy first, Productivity second, Cost savings third — gives managers a simple and practical way to build a business case for adopting On-Device AI.

As device hardware continues to get cheaper and more powerful, and as India's data privacy regulations become stricter, On-Device AI will become even more important for businesses. Companies that start building their knowledge and capability in this area now will have a real advantage in the years ahead.

ACKNOWLEDGMENT

The author thanks Prof. Shivaji Rajmane (Faculty Supervisor) and Dr. Nisha Wagh (Research Project Coordinator) at ZIMCA Pune for their guidance and support throughout this project. Sincere thanks also go to all the working professionals who took time to participate in the survey. This paper was written as part of the MBA Semester IV Research Project at Savitribai Phule Pune University, Pune, India.

REFERENCES

- [1] E. Brynjolfsson and A. McAfee, *The Business of Artificial Intelligence*. Boston: Harvard Business Review Press, 2023.
- [2] T. H. Davenport, *Working with AI: Real Problems, Real Solutions*. Cambridge: MIT Press, 2022.
- [3] McKinsey Global Institute, "The economic potential of generative AI and edge intelligence," McKinsey & Company, 2024.
- [4] Deloitte Insights, "AI adoption trends and workforce transformation report 2024," Deloitte Touche Tohmatsu, 2024.
- [5] Gartner, "Hype cycle for edge AI and distributed intelligence, 2025," Gartner Research, 2025.
- [6] J. Chen, X. Ran, and Z. Zhou, "Collaborative intelligence: Deep learning between cloud and edge," *IEEE Network*, vol. 36, no. 4, pp. 36–43, 2022.
- [7] W. Shi, J. Cao, Q. Zhang, Y. Li, and L. Xu, "Edge computing: Vision and challenges," *IEEE Internet of Things J.*, vol. 3, no. 5, pp. 637–646, 2021.
- [8] A. G. Howard et al., "MobileNets: Efficient convolutional neural networks for mobile vision applications," *arXiv:1704.04861*, 2022.
- [9] S. Dhar, "A survey of on-device machine learning," *ACM Trans. Internet of Things*, vol. 2, no. 3, pp. 1–45, 2021.
- [10] T. Li, A. K. Sahu, A. Talwalkar, and V. Smith, "Federated learning: Challenges, methods, and future directions," *IEEE Signal Process. Mag.*, vol. 37, no. 3, pp. 50–60, 2021.
- [11] D. Xu et al., "Edge intelligence: Empowering intelligence to the edge of network," *Proc. IEEE*, vol. 109, no. 11,

pp. 1778–1816, 2021.

- [12] P. Warden and D. Situnayake, TinyML. Sebastopol: O'Reilly Media, 2021.
- [13] IDC, "Worldwide edge AI spending guide 2024–2028," International Data Corporation, 2024.
- [14] European Parliament, "Regulation (EU) 2016/679 — General Data Protection Regulation," Official Journal of the EU, L 119, 2016.
- [15] Ministry of Electronics and IT, Government of India, "The Digital Personal Data Protection Act, 2023," Gazette of India, 2023.
- [16] NITI Aayog, "National strategy for artificial intelligence: Responsible AI for all," Government of India, 2023.
- [17] PwC, "AI predictions 2024: Deploying AI at scale," PricewaterhouseCoopers Global, 2024.
- [18] I. Goodfellow, Y. Bengio, and A. Courville, Deep Learning. Cambridge: MIT Press, 2021.
- [19] A. Agrawal, J. Gans, and A. Goldfarb, Power and Prediction. Boston: Harvard Business Review Press, 2022.
- [20] NASSCOM, "Artificial intelligence in India: The next wave of enterprise adoption," NASSCOM Research, 2024.