

Exploring the Influence of Artificial Intelligence on the Evolving IT Landscape: An Industry-Specific Study of Tata Consultancy Services, HCL Tech. and Tech Mahindra (FY 2020-2024)

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Abstract:

Artificial intelligence (AI) has emerged as a transformative force within the global information technology (IT) sector, with Indian IT companies increasingly embracing it to enhance efficiency, drive innovation and sustain competitiveness. This study examines the impact of AI adoption on the performance and strategic direction of three major Indian IT firms—Tata Consultancy Services (TCS), Tech Mahindra, and HCL Technologies — over the financial years 2020–21 to 2023–24. The primary aim is to analyze the relationship between AI integration and key operational metrics. Relying on secondary data, the research draws insights from official publications by agencies such as NITI Aayog, industry reports by NASSCOM, and corporate annual reports. Quantitative indicators, including AI-related textual references, employee numbers, operating profits, and research and development (R&D) spending, were compiled using spreadsheets and analyzed using Python-based tools in Google Colab. Benchmarks like the BSE SENSEX 100 supported financial evaluations. In addition, qualitative content from an industry report was examined to identify AI-related themes using Python libraries such as Pandas and PyPDF2. The results indicate a clear trend: an increased emphasis on AI is accompanied by higher R&D investments, a growing workforce with AI skills, and enhanced profitability. Thematic analysis further highlights key focus areas, including automation, digital innovation, and the need for upskilling. While the integration of AI presents vast potential for advancement, it also poses challenges related to workforce transition and capability gaps. The study highlights the importance of forward-looking strategies and institutional preparedness in ensuring the inclusive and sustainable adoption of AI in the Indian IT landscape.

Keywords: Artificial Intelligence (AI), IT landscape, trend analysis, content analysis and impact

1.Introduction

Technological advancements have consistently driven structural transformations across industries by enhancing productivity, innovation, and strategic adaptability. Among these

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technologies, Artificial Intelligence (AI) has emerged as a cornerstone of the Fourth Industrial Revolution, reshaping traditional business models, automating complex processes, and redefining value creation across economic sectors (Brynjolfsson & McAfee, 2017). The integration of AI into core business functions—particularly research and development (R&D) and operational processes—has positioned it as a key enabler of digital transformation. In India, a country recognized for its robust Information Technology (IT) industry, AI adoption is rapidly evolving from experimental implementation to strategic deployment.

India's socio-economic context—characterized by a growing middle-class, expanding internet penetration, and a supportive digital ecosystem—has fueled the demand for technology-driven services. This trend is reinforced by India's improving innovation capacity. According to the **Global Innovation Index (GII) 2023**, India ranks 40th globally, demonstrating a growing emphasis on science, technology, and innovation (World Intellectual Property Organisation [WIPO], 2023). AI adoption in India has reportedly reached 48% across major industries in FY 2023–24, with estimates suggesting a 5–7% rise in FY 2024–25 (India Brand Equity Foundation [IBEF], 2024). This highlights AI's growing penetration into enterprise-level decision-making and operational optimization.

From a **theoretical perspective**, this study is grounded in the **Technology-Organization-Environment (TOE) Framework**, which explains how technological innovations are adopted within firms based on three dimensions: technological readiness, organizational capabilities, and external environmental pressures (Tornatzky & Fleischer, 1990). Applying this framework to the Indian IT sector enables an evaluation of how AI technologies are integrated within organizations and how firms respond to competitive pressures, internal resources, and government-led innovation agendas.

The Indian government has also intensified its role as an enabler of AI adoption. A notable allocation of ₹16,361 crore (US\$1.99 billion) was made in the Union Budget 2023–24 to the Department of Science and Technology, aimed at fostering innovation-driven growth (Ministry of Finance, 2023). Complementary to this, initiatives like **"Future Skills PRIME"**, led by the Ministry of Electronics and Information Technology, seek to upskill the digital workforce in AI and related technologies such as blockchain, robotics, and big data analytics (Ministry of Labour & Employment, 2024).

Although India's AI market is relatively small in global terms—estimated at US\$7–10 billion in 2023—it is expected to grow to US\$17–22 billion by 2027, signifying a compound annual growth rate (CAGR) of approximately 25–35% (Department of Science and Technology, 2023). In comparison, the global AI market is projected to grow from US\$110–130 billion in 2023 to US\$320–380 billion by 2027, driven by automation, machine learning, and AI-enhanced applications (Statista, 2024). Despite India's smaller market share, its digital-first approach and export-driven IT services position the country to make a strategic leap toward becoming a global AI hub.

Therefore, this study aims to investigate how the adoption of AI is influencing the business performance and innovation strategies of leading Indian IT firms. By examining trends in workforce composition, R&D expenditure, AI-related reporting, and financial performance, the study provides a structured understanding of how AI is transforming India's IT sector from being AI-ready to AI-first.

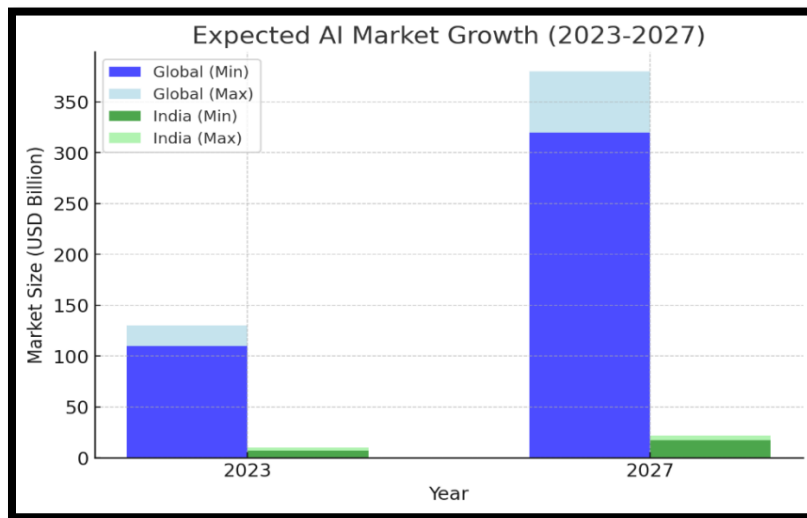


Figure 1

Source: Nasscom's 2024 AI Adoption Index 2.0 AI-Adoption-Index-2.0_copy.pdf

2. Literature Review

- George (2024) provides a study of India's distinct advantages and its path to becoming a leader in AI research, development, and application. With more than 5 million programmers and a robust pool of AI and data science experts, India is drawing significant interest from major tech companies like Google and Microsoft, in addition to large government initiatives, such as a \$175 million fund for interest-free loans in tech education.
- Rao et al. (2024) examine the NIFTY Bank Index to conduct a qualitative and quantitative analysis of the importance of artificial intelligence on the financial performance of the Indian banking sector. The influence of AI on the Return on Equity (RoE) of 12 Indian banks in the NIFTY Bank Index over a five-year period is examined using an evolving panel data model. Additionally, a content analysis of bank annual reports was conducted to examine transparency and disclosure related to AI. Furthermore, the study highlights that the financial performance of a sample of Indian banks is significantly influenced by the incorporation of artificial intelligence (AI). The use of AI had a favorable impact on the particular metric known as return on equity. Improved operational efficiency and fewer errors have a favorable effect on banks' profitability. The content study of the banks' annual reports reveals varying approaches to AI disclosure, with some institutions providing comprehensive details and others lacking transparency regarding AI activities. Higher transparency may boost the trust of all parties involved, according to the research.
- Hammer & Karmakar (2021) critically examine the National Strategy on AI, which was promoted by NITI Aayog in collaboration with the Indian Government and leading industry players, through a sectoral analysis. Employment of new technologies and the work culture has two implications; first, it emphasizes the importance of qualitative workplace studies that look at the relationship between

technology and the future of work; second, it emphasizes the necessity of situated analyses of the social and material relations of work in the formulation and evaluation of strategies and policies. According to the sectoral evaluation, due to labor costs and infrastructure limitations, high technologies will be adopted in specialized organized manufacturing and service sectors. Financial, legal, and IT services, as well as capital-intensive industries like autos, have a lot of room for automation. However, since most workers are employed in the informal economy and agriculture, the total impact on employment will be skewed and restricted.

- Surya (2019) examines the current application of AI in the U.S. public sector, focusing on the obstacles related to Artificial Intelligence, including the need for capacity building, ethical application, and its impact on the labor force. The findings indicate that the cost of adopting AI is high and contributes to a trend of job reductions as a cost-cutting measure. However, the contribution of AI and Machine Learning (ML) is undeniable in establishing us as a global pioneer in advanced technology, enhancing decision-making, improving performance, optimizing duties and advancing algorithms in research.

3. Objectives of the Study

- To identify emerging trends and themes related to AI adoption and its implications for the IT sector based on industry reports and expert analysis.
- To examine the impact of AI on key performance indicators (KPIs) of leading Indian IT companies (TCS, Tech Mahindra, and HCL Ltd.) from FY 2020 to FY 2024.

4. Research Methodology

This study employs a secondary data analysis approach to examine the impact of Artificial Intelligence (AI) on the Indian IT sector, with a particular focus on the post-pandemic era (FY 2020–2024)—a period marked by a significant acceleration in AI adoption across industries globally. The timeframe is specifically chosen because the pandemic triggered a digital transformation wave, prompting companies to adopt automation, remote operations, and AI integration on an unprecedented scale.

4.1. Data Collection and Analysis

Relevant documents are gathered from credible sources, including the official websites of the selected companies, government agencies (e.g., NITI Aayog), and industry associations (e.g., NASSCOM). Due to the non-disclosure of granular AI investment data by Indian IT companies (TCS, HCL Tech, Tech Mahindra), particularly on a year-wise or functional basis, NASSCOM's 'AI Adoption Index 2.0' report was selected as a credible and comprehensive source. It offers:

- Sectoral analysis of AI implementation across India's digital economy,
- Consolidated insights from both government and private stakeholders,
- A qualitative description of industry transformation supported by evidence.

While triangulating from multiple sources was desirable, this NASSCOM report provided the most structured, consolidated, and relevant content suitable for natural language processing and keyword frequency analysis.

Annual reports of TCS, Tech Mahindra, and HCL Ltd. are scrutinized to extract data on key performance indicators (KPIs) such as AI text count, workforce size, operating profit, and research and development (R&D) expenditure.

These quantitative data are compiled and organized using spreadsheet software for further analysis.

4.2. Trend Analysis

To identify trends and patterns in AI adoption and its impact on the IT sector, trend analysis is conducted using the Python programming language within the Google Colab environment. Based on the Market Indices of BSE SENSEX 100 and NASSCOM Reports, three leading IT giants are considered for the Case Study analysis. These are: TCS, Tech Mahindra, and HCL Ltd. Financial Years 2020-2021, 2021-2022, 2022-2023, and 2023-2024 are taken into consideration.

4.3. Content Analysis

In addition to quantitative data analysis, content analysis is utilized to examine qualitative information related to AI and its implications for the IT industry. A recent industry report focusing on AI in the IT sector is selected for this purpose. Python code is developed to extract relevant sentences containing the keyword “AI” from the report. These sentences are analyzed to identify emerging themes and trends, understand the overall sentiment surrounding AI adoption, and gain insights into potential challenges and opportunities.

4.4. Tools and Technologies

Various tools and technologies are utilized to facilitate data analysis. Google Colab, a cloud-based platform, is employed for Python programming and data visualization. Libraries such as Pandas, PyPDF2, and RE (regular expressions) are instrumental in data processing and text extraction. Spreadsheet software is used for organizing and text mining protocols and tools.

4.5. Used

Text mining was conducted using Python in the Google Colab environment. The protocol involved:

- Extraction of raw text from the NASSCOM PDF using the PyPDF2 library.
- Cleaning and pre-processing using RE (regular expressions) to remove stop words, non-alphabetic characters, and repetitive whitespaces.
- Keyword frequency analysis using collections to identify the most frequently occurring terms.
- Contextual sentence extraction, focusing on high-frequency keywords like “AI”, “skills”, “innovation”, and “transformation”, to study the impact of narrative.
- Visualizations using matplotlib and seaborn to display trends in keyword occurrence and theme emphasis.
- Analyzing quantitative data. Different charts and tables are incorporated for illustrative analysis.

5. Data Analysis and Findings

5.1. Content Analysis on Overall IT Sector in India

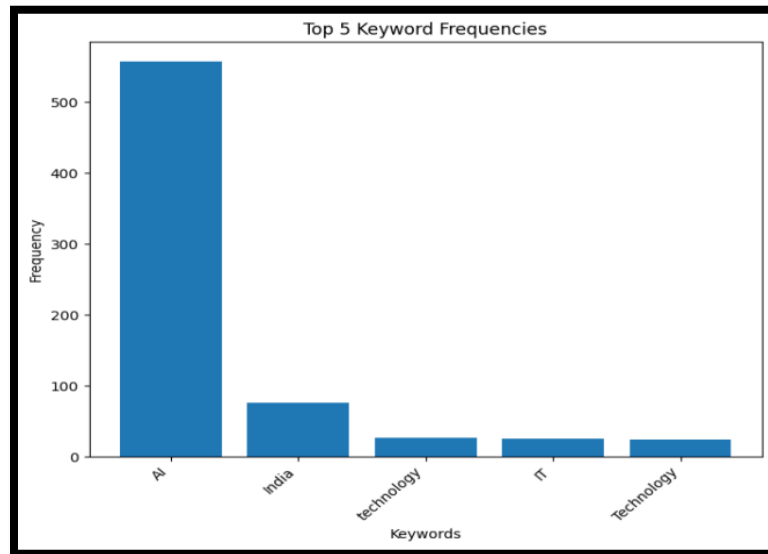


Figure 2

Source: "Generated Using Python Code (ipython-input-22-bec28109f06a) with Data Extracted from 'AI-Adoption-Index-2.0_copy.pdf'."

The keyword "frequency analysis" highlights the dominance of the keyword "AI" in the discussion, with a count of 557, making it the central theme of the analyzed text. This suggests that AI is the most extensively discussed topic in the context of India's IT sector.

The keyword "India" appears 76 times, indicating that AI discussions are significantly focused on its relevance and impact within the country. The presence of "technology" (27 times), "IT" (25 times), and "Technology" (24 times) further reinforces the idea that AI is closely linked to technological advancements and IT industry transformation.

The significant gap between "AI" and other keywords suggests that while AI adoption is a dominant topic, discussions on its broader implications for the IT sector and technological ecosystem in India may require deeper exploration. This insight emphasizes AI's critical role in shaping the future of India's IT industry.

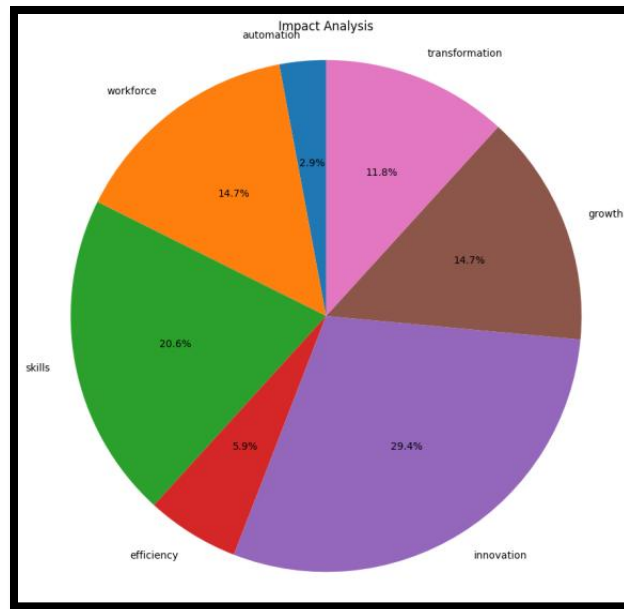


Figure 3

Source: "Generated Using Python Code (Ipython-Input-22-Bec28109f06a) with Data Extracted from 'AI-Adoption-Index-2.0_Copy.Pdf'."

5.2. Interpretation of Keyword Frequencies

- **High Frequency of "AI":** The most frequent keyword is "AI" (557 occurrences), indicating the document's primary focus on Artificial Intelligence.
- **Focus on India's IT Sector:** The keyword "India" (76 occurrences) is also prominent, suggesting the analysis is centered on AI's impact on the Indian IT industry.
- **Other Relevant Terms:** Other keywords like "technology," "digital," "innovation," and "growth" appear frequently, reflecting the broader context of technological advancement and its influence on the IT sector.
- **Limited Mentions of Specifics:** Keywords like "outsourcing," "disruption," and "competition" have lower frequencies, suggesting these aspects might be less emphasized in the document.

5.3. Interpretation of Impact Analysis

- **Skills and Innovation:** The impact analysis reveals that "skills" (7 occurrences) and "innovation" (10 occurrences) are the most prominent areas affected by AI in the Indian IT sector. This implies that the document highlights AI's role in enhancing workforce skills and driving innovation within the industry.
- **Workforce Transformation:** Keywords "workforce" (5 occurrences), "growth" (5 occurrences), and "transformation" (4 occurrences) also appear frequently, suggesting a significant focus on how AI is changing the IT workforce and its overall growth trajectory.
- **Limited Emphasis on Automation and Jobs:** Notably, keywords "automation" (1 occurrence) and "jobs" (0 occurrences) have lower counts, indicating that while

automation might be discussed, the document might not extensively analyze its direct impact on employment.

- **Lack of Focus on Specific Areas:** Keywords such as “IT sector” and “tech industry” have zero occurrences in the impact analysis, suggesting that the document may not provide detailed insights into these specific sub-sectors within the broader IT landscape.

5.4. Key Industrial Parameters Related to IT

Based on the keyword frequencies and impact analysis, here are some key industrial parameters that are likely relevant to the Indian IT sector in the context of AI:

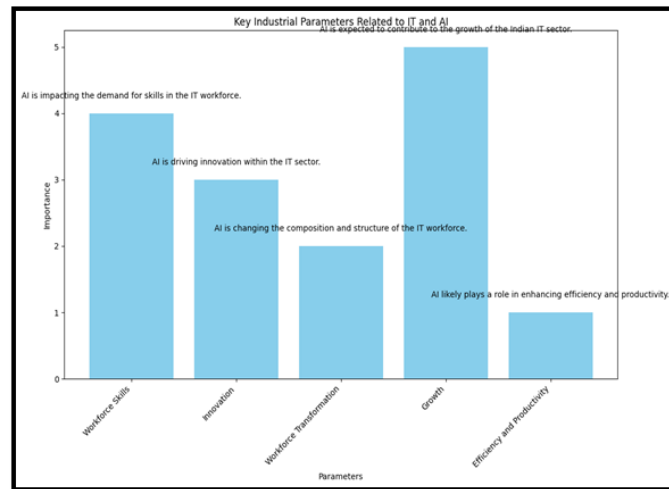


Figure 4

Source: Generated Using Python Code

- **Workforce Skills:** AI is impacting the demand for skills in the IT workforce. Upskilling and reskilling will be crucial to adapt to changing job roles and requirements.
- **Innovation:** AI is driving innovation within the IT sector, leading to the development of new products, services, and business models.
- **Workforce Transformation:** AI is changing the composition and structure of the IT workforce, potentially through automation and the emergence of new job roles.
- **Growth:** AI is expected to contribute to the growth of the Indian IT sector by enabling increased efficiency, productivity, and new opportunities.
- **Efficiency and Productivity:** Though not as prominent in the analysis, AI likely plays a role in enhancing efficiency and productivity within IT operations.

5.5. Additional Considerations

- **Data Limitations:** The analysis is based on a specific document and the selected keywords. A broader analysis of multiple sources can provide a more comprehensive view of AI's impact on the Indian IT sector.

- **Contextual Interpretation:** The interpretation should consider the overall context of the document and its specific focus areas.
- **Dynamic Landscape:** The impact of AI on the IT industry is continuously evolving. Therefore, ongoing monitoring and analysis are essential to stay informed about emerging trends and implications.

6. Case Study-Based Trend Analysis

6.1. Tata Consultancy Services (TCS)

In the field of artificial intelligence, where rapid advancements and intricate challenges can be overwhelming, TCS advocates for a cooperative strategy. Organizations empower their business and technology teams to concentrate on their primary strengths and long-term goals. Instead of managing AI deployment entirely on its own, TCS is exploring collaborations and utilizing external expertise when necessary (TCS, 2024).

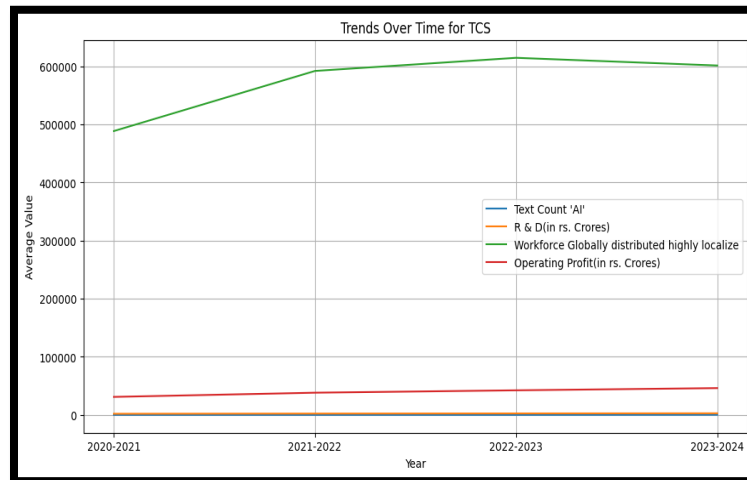


Figure 5

Source: Generated Using Python Code with Data Extracted from TCS Annual Reports (FY 2020-21, 2021-22, 2022-23 & 2023-24)

The line graph presents trends over time across multiple variables from 2020-2021 to 2023-2024. The key observations are:

- **Workforce Distribution (Green Line)** shows a steady increase in the globally distributed workforce, indicating that companies are expanding their workforce distribution strategies. A sharp rise between 2020-2021 and 2021-2022 is noticeable, after which the increase slows down.
- **Operating Profit (Red Line)** indicates a slight increase from 2020-2021 to 2022-2023. However, in 2023-2024, there was a decline, suggesting possible operational inefficiencies or increased costs that are affecting profitability.

- R&D Investment (Orange Line) remains relatively stable across the years, showing minor fluctuations. This indicates that companies are maintaining their focus on research and innovation without significant changes in expenditure.
- Text Count 'AI' (Blue Line — barely visible) represents the number of AI mentions or references; it might indicate a growing discourse around AI, though it is not visually prominent in the graph.

6.2. HCL Tech

HCLTech's innovative CloudSMART approach provides businesses with a comprehensive and high-impact cloud advisory and implementation framework. Leveraging its engineering expertise and collaborations with top cloud service providers, this strategy was developed as a flexible suite of solutions that drive ongoing transformation, enhance adaptability, and optimize operational performance (HCLTech, 2024).

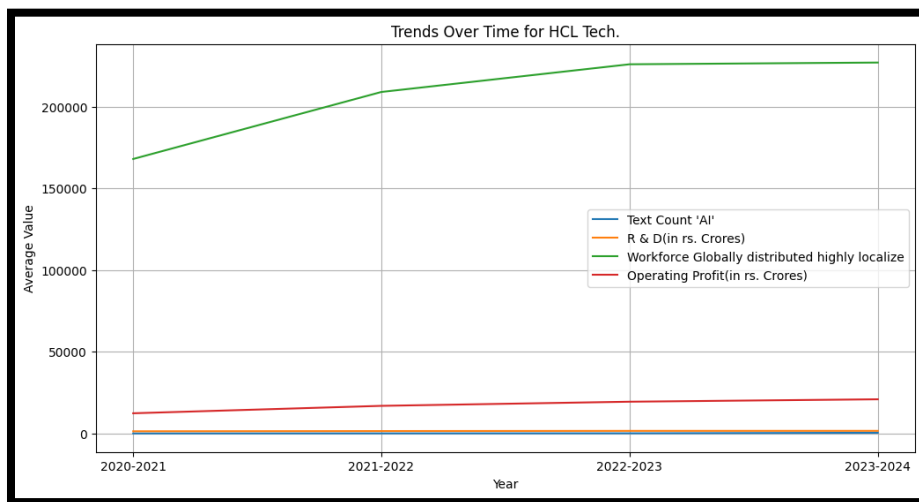


Figure 6

Source: Generated Using Python Code with Data Extracted from HCL Tech.
Annual Reports (FY 2020-21, 2021-22, 2022-23 & 2023-24)

The line graph presents trends over time across multiple variables from 2020-2021 to 2023-2024. The key observations are:

- Workforce Distribution (Green Line — Strong Upward Trend) shows a significant increase between 2020-2021 and 2021-2022, suggesting a shift in employment patterns, possibly driven by AI-driven automation or outsourcing strategies. The growth slows down between 2021 and 2023, but the overall trend remains positive.
- Operating Profit (Red Line — Initial Growth, Then Decline) illustrates a moderate increase from 2020-2021 to 2022-2023, possibly due to improved business performance, cost-cutting strategies, or automation benefits. However, in 2023-2024, there was a decline in profit, suggesting increasing operational costs, economic downturns, or competition affecting profitability. This also suggests that initial

investments in AI and workforce restructuring have not yet yielded sustained financial benefits.

- R&D Investment (Orange Line — Stable, Slight Variations) remains consistent over time, with minor fluctuations. A stable R&D budget indicates a long-term focus on technological advancements rather than short-term changes.
- AI Mentions (Blue Line — Not Prominent in Visualization) refer to the frequency of “AI” in discussions, publications, or corporate strategies, which is not clearly visible, implying a less significant variation over time. However, its inclusion in the dataset suggests that AI remains a key theme in research, development, and corporate discussions.

6.3. Tech Mahindra

Tech Mahindra (NSE: TECHM) delivers digital transformation and technology advisory services to enterprises worldwide, driving innovation at exceptional speed. With a workforce of over 145,000 professionals across more than 90 nations, serving 1,100+ clients, the company offers a comprehensive range of solutions, including IT services, enterprise software, business operations support, engineering, networking, customer engagement, AI-driven insights, and cloud infrastructure management (HFS Research & Tech Mahindra, 2024).

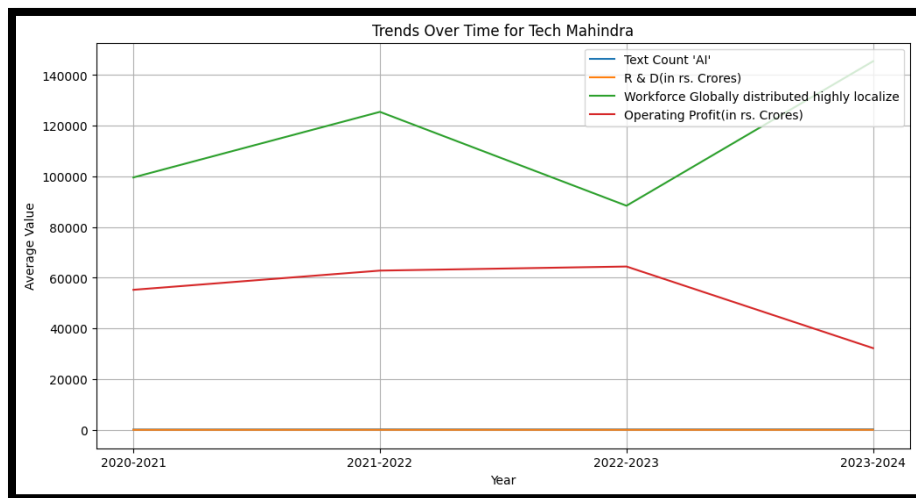


Figure 7

Source: Generated Using Python Code with Data Extracted from Tech Mahindra Annual Reports (FY 2020-21, 2021-22, 2022-23 & 2023-24)

The line graph presents trends over time across multiple variables from 2020-2021 to 2023-2024. The main observations are:

- Workforce Distribution (Green Line — Continuous Growth) indicates a steady increase in global workforce distribution, suggesting companies are adopting more decentralized and flexible work models. The sharpest rise was observed from 2020-2021 to 2021-2022, possibly due to post-pandemic remote work trends or the

adoption of AI-driven automation. The slight slowdown in growth after 2022-2023 suggests that, while the globalization of the workforce continues, the rate of expansion is stabilizing.

- Operating Profit (Red Line — Rise and Fall) improves from 2020-2021 to 2022-2023, possibly due to cost-cutting measures, AI integration, or increased efficiency. However, profits declined in 2023-2024, possibly due to rising operational costs, market saturation, or potential inefficiencies in new workforce models. This fluctuation may indicate that initial gains from AI-driven efficiencies are being counterbalanced by other economic or structural challenges.
- R&D Investment (Orange Line — Consistently Low, Minor Fluctuations) remains relatively stable, indicating that companies are committed to innovation but not scaling up investments aggressively.
- AI Mentions (Blue Line — Not Clearly Visible) represent references to AI in corporate strategies or discussions; it is not a dominant trend in this visualization. However, given the rise in workforce globalization, AI can be an underlying factor shaping labor market dynamics and operational strategies.

7. Findings

7.1. From Keyword Frequency Analysis

- The high frequency of “AI” (557 mentions) indicates that AI is the central focus in discussions about India’s IT sector, underscoring its transformative impact.
- The keyword “India,” appearing 76 times, highlights that AI discussions are primarily contextualized within the Indian landscape, emphasizing its national significance.
- Keywords such as “technology” (27 times), “IT” (25 times), and “Technology” (24 times) suggest that AI is deeply intertwined with technological progress and advancements in the IT sector.
- The substantial gap between “AI” and other keywords suggests that while AI adoption is a major concern, discussions on its broader effects on the IT ecosystem may require further exploration.
- The dominance of AI in keyword frequency reinforces its position as a key driver of change, signaling its critical influence on the evolution of India’s IT industry.

7.2. From Impact Analysis

- The prominence of “skills” (7 occurrences) and “innovation” (10 occurrences) highlights AI’s contribution to workforce upskilling and technological advancements.
- Keywords such as “workforce” (5 occurrences), “growth” (5 occurrences), and “transformation” (4 occurrences) indicate a notable shift in job roles and career trajectories within the IT sector.
- The absence of “jobs” and only one mention of “automation” implies that the document does not extensively cover concerns about job losses or displacement due to AI.

- The lack of mentions of “IT sector” and “tech industry” indicates a potential gap in sector-specific insights, requiring deeper exploration of AI’s effect on different IT sub-sectors.
- AI is portrayed as a catalyst for innovation, with frequent mentions of related terms, suggesting its role in driving new developments within the industry.
- The focus on “growth” and “transformation” rather than “disruption” suggests that AI is largely viewed as an enabler of positive change rather than a threat.
- The minimal mention of “automation” indicates that its role in process efficiency and workforce restructuring may need further discussion.
- The emphasis on skills and transformation points to the necessity for continuous workforce adaptation to AI-driven changes in the IT industry.

7.3. From Case-Based Trend Analysis

- The operating profit (red line) of TCS exhibits a consistent upward trend over time.
- The workforce size (green line) of TCS has expanded significantly, reaching its peak in 2022-2023.
- TCS’s Limited R&D Investment — R&D expenditure (orange line) remains relatively low compared to other metrics.
- TCS’s Stable AI Mentions — “AI” text count (blue line) appears to have minimal fluctuations over the years.
- Operating profit (red line) of HCL Tech. has shown consistent growth over the years.
- Expanding Workforce (green line) of HCL Tech. has increased significantly, stabilizing in 2023-2024.
- HCL Tech’s R&D investment (orange line) remains relatively low compared to other metrics.
- “AI” text count (blue line) exhibits minimal variation over time.
- Tech Mahindra’s Fluctuating Workforce (green line) peaked in 2021-2022, declined in 2022-2023, and rebounded in 2023-2024.
- Operating profit (red line) showed steady growth until 2022-2023 but dropped significantly in 2023-2024.
- R&D expenditure (orange line) of Tech Mahindra remains consistently low across all years.
- Stable AI Mentions — “AI” text count (blue line) of Tech Mahindra exhibits slight variation over time.

8. Conclusion and Recommendations

8.1. Conclusion

The analysis of AI in the Indian IT sector reveals that AI is a dominant theme, deeply linked to skills development, workforce transformation, and innovation. However, discussions on automation and job displacement remain limited, highlighting a gap in assessing AI’s broader implications. The trend analysis of TCS, HCL Tech, and Tech Mahindra further reinforces AI’s growing role, with companies expanding their workforce and maintaining stable AI mentions.

While operating profits have generally increased, Tech Mahindra experienced a recent decline, showing that AI adoption alone does not guarantee financial growth. Additionally, all three firms exhibit consistently low R&D investments, indicating a lack of significant focus on AI-driven innovation.

8.2. Recommendations

To maximize AI's potential, IT firms should increase R&D spending to foster innovation and drive AI-led advancements. Workforce management strategies should focus on stability and adaptability, ensuring AI-driven transformations do not lead to employment uncertainties. Companies must also analyze AI's direct impact on job roles, automation, and long-term profitability to develop sustainable business models. Additionally, greater emphasis on AI-driven automation can enhance operational efficiency while maintaining a balanced approach to workforce development.

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