Profitability Analysis of Selected IT Companies in India using Data Envelopment Analysis (DEA): A Comprehensive Study

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Abstract

The IT sector in India plays a vital role in driving the country's economy, contributing significantly to its growth and employment landscape. As of 2023, it constitutes around 8% of India's total GDP, employing over 4.5 million professionals directly and supporting an estimated 10 million indirect jobs. With export revenue reaching approximately $194 billion, the IT sector stands as one of the largest contributors to India's foreign exchange reserves.

This sector has experienced robust growth, with a projected annual growth rate of 7-9%. This growth can be attributed to its relentless focus on digitalization, innovation, and technology-driven solutions, enabling it to foster economic development, attract investments, and drive digital transformation across various industries.

Conducting a profitability analysis of IT companies in India holds significant importance. It provides valuable insights into their financial performance and viability, assisting stakeholders in making informed decisions. Investors and policymakers can assess the efficiency and effectiveness of these companies in generating profits and maximizing returns on investments. Profitability analysis also aids in resource allocation, risk management, and policy formulation to create an enabling environment for IT sector growth.

Additionally, profitability analysis allows companies to benchmark their performance, identify areas for improvement, and enhance competitiveness. By evaluating financial indicators, stakeholders can make informed decisions regarding expansion, diversification, and strategic partnerships. Ultimately, profitability analysis serves as a crucial tool for decision-making, resource allocation, and sustainable growth within the IT sector.

Therefore, this study aims to analyze the profitability of six selected IT companies in India from 2008-09 to 2021-22 using the Data Envelopment Analysis (DEA) technique. By employing DEA, the study aims to provide valuable insights into the financial performance of these companies and contribute to the existing understanding of profitability dynamics within the Indian IT sector.

Keywords: Profitability analysis, efficiency, Performance evaluation, financial data, inputs.

Introduction

India, as one of the most populous nations, grapples with formidable challenges like poverty and unemployment, posing significant obstacles to achieving sustainable development. Over the years, the composition of the economy has undergone a remarkable transformation. In 1950–51, agriculture and related sectors accounted for 51.81% of the allocation, while industries and services represented 14.16% and 33.25%, respectively. Fast forward to 2011-12, agriculture's share dwindled to 16.38%, while industries and services expanded to 29.34% and 54.27%, respectively. Notably, in 2022–23, agriculture and related industries experienced a notable decline of 18.30% in their contribution to GDP (source: Ministry of Agriculture & Farmers Welfare). Concurrently, the service industry surged impressively to 57.03%, and the industry sector showed substantial growth, now standing at 24.77%, a significant advancement compared to 1950-51.

The IT sector in India has emerged as a transformative force, playing a pivotal role in driving economic growth and development. With its prominence in the service sector, the IT industry contributes more than 50% of India's Gross Domestic Product (GDP), making it a key driver of the nation's prosperity. Despite the challenges posed by poverty and unemployment, the IT sector has showcased remarkable resilience, consistently increasing its share in the GDP. Not only does the IT sector empower other industries with cutting-edge technologies, but it also attracts foreign investments, creates employment opportunities, fosters innovation, and elevates living standards. This dynamic industry's global reach and skilled workforce position India as a powerhouse in the world of technology, shaping a more inclusive and prosperous future for the country. In light of the IT sector's substantial contribution to the Indian economy, it becomes essential to analyze the financial performance and profitability of IT companies operating in India. A company's profitability or earning potential serves as a meter to assess how effectively it operates. In reality, the company's policies and judgments are ultimately reflected in profitability. Profitability is therefore the primary indicator of a company's overall performance. The activity of entrepreneurs increases with profitability. Greater profitability leads to greater capital accumulation, greater profitability leads to more technological advancements, and greater technological advancements lead to greater economic growth. Financial ratios are frequently used to assess an organization's profitability. These profitability measures can be divided into two categories: profitability ratios related to sales revenue (such as gross profit ratio, operating profit ratio, and net profit ratio), and profitability ratios related to investment (i.e. return on capital employed, return on net worth). The most common metric for determining profitability is ROCE. It is worried about the connection between operating profit and long-term capital spent in the business. It shows the company's entire income potential. The efficiency of using long-term capital invested in the company increases with ROCE. The current study examines the top six Indian IT businesses' profitability using Technical Efficiency Scores (TESs). Using the DEA (Data Envelopment Analysis) approach, the TES were generated.

Research gap

The review of the significant studies so far made on the issue addressed in the present study reveals that these studies were mainly concerned with the financial performance analysis of selected IT companies in India during the post liberalization period and some studies were associated with the financial performance analysis of IT companies during the pre-liberalization and post-liberalization periods. However, the outcomes derived from these studies were contradictory in nature and therefore, these studies failed to provide any definite conclusion. Moreover, no comprehensive study was carried out to

deal with the matter relating to the profitability performance of the IT companies in India in the recent times considering all the major factors and determinants of profitability. Only a very few studies on this topic were conducted in the recent past in which any one or two dimensions of profitability performance of the companies under study were taken into consideration. Further, the Data Envelopment Analysis (DEA) was not used in these studies relating to the IT except a very few. No significant study in which profitability of the 'IT' companies was analyzed considering all the major determinants of profitability was carried out by applying DEA. So in order to bridge the gap an attempt was made in the present study to analyze the profitability of selected India companies belongs to IT sector applying DEA along with the conventional ratio analysis technique.

Objectives of the study

1. To measure the profitability performance of selected the IT companies under study using Technical Efficiency Scores (TES).
2. To ascertain the status of the profitability of the sample companies under study based on composite ranks of TES.
3. To identify the trends in the profitability of the selected IT companies in terms of TES over the study period.
4. To analyze the major factors which influence profitability of the selected IT companies.
5. To make suggestions for enhancing profitability of the IT companies.

Methodology of the study

Initially, we identified the top six IT companies by their market capitalization as of August 1, 2023. Our study relies on secondary data spanning from 2008-2009 to 2021-2022, which was collected from reputable sources such as the Capitaline corporate database, CMIE ProwessIQ, and moneycontrol.com. In addition to these sources, we also incorporated information from various printed materials such as books, magazines, journals, articles, newspapers, published annual reports of the companies being examined, and research reports, among others. The companies which have been taken under the study are as follows:

1. Tata Consultancy Service
2. Infosys
3. Wipro
4. HCL Technologies
5. Tech Mahindra
6. L& T InfoTech

The key contributing factors to profitability, such as effective fixed asset management, effective inventory management, effective debtor management, and effective cash management, were considered while analyzing the profitability of the study organizations. In this study, the ROCE was applied to measure the companies' profitability. The efficiency of the organizations' fixed asset management, inventory management, debtor's management, and cash management was evaluated using the fixed assets turnover ratio (FATR), inventory turnover ratio (ITR), debtor's turnover ratio (DTR), and cash turnover ratio (CTR), respectively. So, the earning capability of the firm largely depends on the efficiency with which fixed assets as well as working capital are managed (Sur and Panja, 2014; Sur and Yadav, 2014). Inventory, debtors, and cash are a company's main sources of working capital. FATR,

ITR, DTR, and CTR were therefore regarded in this study as the factors that determine profitability. Technical efficiency is measured as the ratio between the observed output and the maximum output, under the assumption of fixed input, or alternatively, as the ratio between the observed input and the minimum input under the assumption of fixed output. There are two main methodologies for measuring technical efficiency; one is the parametric approach, and the other is non- parametric approach. Here non- parametric approach based on Data Envelopment Analysis (DEA) will be applied in ascertaining the efficiency related to profitability performance of the selected Indian IT companies. TES will be computed by considering only those factors as input which will be influenced and controlled by the functioning of the selected companies.

Results and discussions

From Table 1, it can be depicted that TCS has the greatest efficiency score based on ROCE was 1.00 in 2009-2010, 2010-2011,2011-2012, 2012-2013,2013-2014, 2014-2015, 2015-2016, 2016-2017, 2017-2018, 2018-2019, 2019-2020, 2020-2021 and 2021-2022 while it was least (0.896) in 2008-2009.On an average, it was 0.993. The efficiency score of Infosys varied between 0.767 (2013-2014) and 1.00 (2008-2009, 2009-2010, 2010-2011, 2011-2012, 2012-2013, 2014-2015, 2015-2016, 2016-2017, 2017-2018, 2018-2019, 2019-2020, 2020-2021 and 2021-2022).The average TES of the company was 0.983. The TES of the Wipro was 0.698 (2008-2009) and 1.00 (2009-2010, 2010-2011, 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016, 2016-2017, 2017-2018, 2018-2019, 2019-2020,2020-2021 and 2021-2022). The average value of TES achieved by Wipro was 0.978. The TES of HCL Technology fluctuates between 0.769 (2010-2011) to 1.00 (2008-2009, 2009-2010, 2011-2012, 2012-2013, 2013-2014, 2014-2015, 2015-2016, 2016-2017, 2017-2018, 2018-2019, 2019-2020, 2020-2021 and 2021-2022). On an average, it was 0.984. The TES of Tech Mahindra lies between .0.358 (2011-2012) to 1.00 (2008-2009 and 2018-2019). On an average TES was 0.775 in Tech Mahindra. The TES of L&T Infotech was 1.00 in the year 2008-2009, 2009-2010, 2010-2011, 2012-2013, 2013-2014, 2014-2015, 2015-2016, 2016-2017, 2017-2018, 2018-2019, 2019-2020, 2020-2021 and 2021-2022 while it was the least (0.672) in the year 2011-2012. The mean TES of L&T Infotech was 0.977 during the study period. The consistency coefficients (C.C) of TES of Selected IT Companies (as disclosed in Table 2) were 35.710 (TCS), 15.791 (Infosys), 12.121 (Wipro), 15.930 (HCL Technology), 4.096 (Tech Mahindra), 11.140 (Larsen & Toubro). Based on average TES, TCS captured the highest rank, followed by HCL Technology, Infosys, Wipro, L&T Infotech, and Tech Mahindra respectively in that order while in respect of the consistency scores of TES same result as average rank i.e. TCS established itself as the most consistent performer, followed by HCL Technology, Infosys, Wipro, Larsen & Toubro, and Tech Mahindra respectively in that order during the period under study.

Table 1 highlights that TCS, Infosys, Wipro, HCL Technology, and L&T Infotech achieved their highest Total Efficiency Scores (TES) in a span of thirteen years within the study period, while Tech Mahindra obtained the highest efficiency score for two specific years, namely 2008-2009 and 2018-2019. This indicates that, for a majority of the fourteen-year study period, TCS, Infosys, Wipro, HCL Technology, and L&T Infotech maintained a consistent 100 percent efficiency.

The study revealed significant variations in efficiency scores among the selected IT companies over time and throughout the research period. Higher average efficiency ratings were indicative of companies effectively harnessing their diverse assets to generate returns. TCS consistently exhibited the highest

average efficiency score among the chosen IT companies during the study, while Tech Mahindra consistently recorded the lowest average efficiency score.

Analysis of the data from the table suggests that TCS managed to enhance its capacity for generating returns by maintaining lower turnover ratios for the majority of the research years. In contrast, Tech Mahindra struggled to increase its return-generation capacity despite employing higher turnover ratios.

Analysis of Rank with respect to Return on Capital Employed

To more accurately determine the level of profitability of Selected IT Companies, a composite rank analysis was performed in Table 2 considering both the average and consistency of TES based on the ROCE of the companies throughout the study period. In this analysis, a process of composite ranking was used for arriving at a more comprehensive measure of profit earning capability in which the values of average efficiency and consistency of TES were combined in a composite score. The ultimate return-generating capability ranking, based on the sum of scores of each company's separate individual ranking under the mean efficiency and consistency of TES, was made on the principle that the lower the composite score, the higher the return-generating capability.

Table 2 discloses that based on the combined score, TCS captured the top-most position in respect of return generating capability followed by HCL Technology, Infosys, Wipro, L&T Infotech , and Tech Mahindra respectively in that order.

Analysis of Trend of TES

Table 3 disclosed that out of the six selected IT companies, Infosys and L & T Infotech had a declining trend in TES over the study period under study, which was found to be statistically significant. Technical efficiency and time are negatively correlated, as shown by the negative values of the slope of the trend lines, while technical efficiency and time are positively correlated, as shown by the noticeable positive value of the slope of the equations. However, the insignificant negative values of slopes of trend lines were observed in TCS, Wipro, HCL Technology, and Tech Mahindra which implies that no definite trend in the TES of these IT Companies was observed during the period under study.

Conclusion

In this study, we investigate the profit-generating capacity, specifically focusing on the Return on Capital Employed (ROCE), from a technical efficiency standpoint within the context of Indian IT companies. Our analysis reveals a significant variance in Technical Efficiency Scores (TES) among these companies during the research period.

Among the companies studied, TCS emerged as the top performer in terms of average return-generating capacity, as evidenced by the highest average TES over the study period. On the other hand, Tech Mahindra occupied the lowest position in this regard during the same time frame.

Moreover, TCS not only exhibited the highest return generation but also displayed remarkable consistency in doing so, as indicated by its high consistency coefficient of TES. In contrast, Tech Mahindra was found to be the least reliable performer in terms of return generation.

TCS demonstrated the highest return-generating capability among the IT companies analyzed during the study period. Conversely, Tech Mahindra ranked at the bottom in terms of performance during the same period. These conclusions are based on the composite scores derived from an analysis that considers both the average and consistency aspects of TES for the IT companies under investigation.

In this study, a significant decline in return-generating ability, as indicated by the TES, was observed in only 33 percent of cases. Conversely, the remaining 67 percent of cases did not exhibit any noticeable trend in return generation throughout the study period. In summary, our empirical analysis suggests that 67 percent of the selected IT companies in India displayed managerial inefficiency in their ability to generate returns during the study period.

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Table: 1

Company- wise Technical Efficiency Scores (TES) based on the Return on Capital Employed (ROCE) of Selected IT Companies

Companies / Year	TCS	Infosys	Wipro	HCL Technologies	Tech Mahindra	L&T Infotech
2008-09	0.896	1.000	0.698	1.000	1.000	1.000
2009-10	1.000	1.000	1.000	1.000	0.826	1.000
2010-11	1.000	1.000	1.000	0.769	0.515	1.000
2011-12	1.000	1.000	1.000	1.000	0.358	0.672
2012-13	1.000	1.000	1.000	1.000	0.575	1.000
2013-14	1.000	0.767	1.000	1.000	0.963	1.000
2014-15	1.000	1.000	1.000	1.000	0.751	1.000
2015-16	1.000	1.000	1.000	1.000	0.915	1.000
2016-17	1.000	1.000	1.000	1.000	0.792	1.000

2017-18	1.000	1.000	1.000	1.000	0.904	1.000
2018-19	1.000	1.000	1.000	1.000	1.000	1.000
2019-20	1.000	1.000	1.000	1.000	0.705	1.000
2020-21	1.000	1.000	1.000	1.000	0.737	1.000
2021-22	1.000	1.000	1.000	1.000	0.808	1.000
Mean	0.993	0.983	0.978	0.984	0.775	0.977
Maximum	1.000	1.000	1.000	1.000	1.000	1.000
Minimum	0.896	0.767	0.698	0.769	0.358	0.672
SD	0.028	0.062	0.081	0.062	0.189	0.088
Consistency Coefficient (C.C)	35.710	15.791	12.122	15.930	4.096	11.140

Source: Authors calculation

Table: 2

Company–wise Composite Rank of Profitability of Selected IT Companies based on TES

Company	Mean Value	Rank	Consistency Coefficient	Rank	Sum of Rank	Ultimate Rank
TCS	0.993	1	35.710	1	2	1
Infosys	0.983	3	15.791	3	6	3
Wipro	0.978	4	12.122	4	8	4
HCL Technologies	0.984	2	15.930	2	4	2
Tech Mahindra	0.775	6	4.096	6	12	6
L&T Infotech	0.977	5	11.140	5	10	5

Source: Authors calculation

Table: 3

Company –wise Trends in Profitability of Selected IT Companies

Company	Constant	|t| value	Coefficient	|t| value	R	F	R-Square
TCS	48.046**	12.615	0.423	0.946	0.263	0.895	0.069
Infosys	40.494**	20.441	-0.64*	-2.75	0.622	7.561	0.387
Wipro	25.959**	13.659	-0.224	-1.002	0.278	1.003	0.077
HCL Technologies	34.624**	7.076	-0.024	-0.042	0.012	0.002	0
Tech Mahindra	36.575**	5.096	-1.293	-1.534	0.405	2.354	0.164
L&T Infotech	24.886**	20.457	-1.003**	-7.023	0.897	49.327	0.804
Figures in the parentheses indicate | t |values ** Significant at 1 percent level. * Significant at 5 percent level.							

Source: Authors calculation