

An Empirical Analysis of Research & Development Expenses in Selected Indian Manufacturing Companies

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ABSTRACT

The current research study proposes to concentrate on the research and development expenditures and its analysis in the selected manufacturing industry like IT sector, automobile sector and defense sector of India. For this purpose, empirical analysis is made on the three selected Indian manufacturing companies like Infosys, Maruti Suzuki India Limited and Bharat Electronics Ltd. To study the analysis of research and development expenditures of three Indian manufacturing companies secondary data to be collected for five years from 2017-18 to 2021-22. Empirical analysis is made to measure the relationship between research and development expenditures and profit of the firm. Financial ratio like R & D expenses to sales ratio to be used for the purpose of financial analysis. Further, it is to be studied that whether there is positive correlation or negative correlation between research and development expenditures and profit. To analyze the financial data statistical technique like correlation to be employed in the study.

Keywords: Research & development expenditures, sales, net profit, operating expense etc.

INTRODUCTION

Normally innovation is endorsed by research and development activities that are intended at increasing the competitive capability of the manufacturing industry. For this purpose, three companies are selected from different sector like Infosys from IT sector, Maruti Suzuki India Limited from automobile sector and Bharat Electronics Ltd. from defense sector of India. The research study is made to measure the performance of R & D expenditures of the selected manufacturing industry like IT sector, automobile sector and defense sector of India. Further it intends to measure the relationship between research and development expenditure and net profit of the selected companies for the last five years. The research period was taken for five years from 2017-18 to 2021-22. The empirical analysis is made from the financial data of research and development expenditure, sales, net profit and proportion of research and development expenditure as sales during the selected period.

Objectives of the Study:

- To study the research and development expenditures of the selected manufacturing industry of India.
- To measure the performance of R & D expenditures of the selected manufacturing industry like IT sector, automobile sector and defense sector of India.
- To evaluate the financial data of selected three Indian manufacturing companies like Infosys, Maruti Suzuki India Limited and Bharat Electronics Ltd.
- To analyze the relationship between research and development expenditures and profit of the manufacturing companies.

LITERATURE REVIEW

Ward Morehouse (1970) this study explained that there were numerous opportunities and challenges which lie within industry itself. Apart of it, there were several government initiatives to support industrial growth through technological change. Some of them were: Tax incentives for R and D expenditure, the existence of machinery to regulate foreign collaboration within Indian industry and the creation of a chain of government-supported industrial research laboratories.

Rey A. L. Taganas and Vijay Kumar Kaul(2006) it had been studied that Indian IT industry faced difficulties such as insufficient R&D expenditure and industry involvement in research, lower levels of cooperation among innovation actors,

including industry- academia linkages, limited venture capital, and a normally pathetic enterprise customs. It had been also observed that the quality in scientific performance was not matched in the technological and commercial transformation of adequate scientific knowledge into IT products, processes or services capable of catching the attention of market demand. Therefore Indian firms must enlarge their focal point on R&D system in order to grow and sustain growth.

Suri, F. K., & Banerji, A. (2016) in this study certain parameters of internationalization of Indian pharmaceutical firms like causal relationships among the variables and the impact of change in one variable over the other were considered. Data for the period from 2000-01 to 2012-13 had been taken to use vector auto regressive model (VAR) for analysis purpose. This model is suggestive of inter dependencies amongst the parameters. From the analysis of these parameters, it provided results that the parameters specifically pharmaceutical exports, R&D expenditure bifurcated into R&D capital expenditure and R&D current expenditure as well as total revenue separately and cooperatively contributes to the internationalization of Indian pharmaceutical sector. It was found that pharmaceutical exports create R&D jobs in Indian pharmaceutical sector as it was recommended by causal relationships amongst the variables that pharmaceutical exports cause R&D capital expenditure and simultaneously R&D capital expenditure brings about R&D current expenditure. Moreover, impulse response test provided result that Indian pharmaceutical exports are very responsive to a change in R&D capital expenditure but this impact is effectively short only up to one year. While R&D current expenditure slightly affects Indian pharmaceutical exports. Furthermore, variance decomposition test gave the outcome that neither of the parameters was considerably affected by the stage of same variable in the last year. Therefore, continuous investment in R&D is necessary for widening international foot print and maintaining growth in exports.

Ramakrushna Mishra(2018) studies that there is a significant relationship between R&D cost and profitability of Indian pharmaceutical companies. For this purpose, he had used the Karl Pearson's coefficient of correlation analysis and linear regression analysis by taking sample of 41 Indian pharmaceutical companies for the period from 2007-2012. The coefficient of correlation between R&D cost and profitability in pharmaceutical sector of India was calculated to be 0.714. It indicated that there is positive relationship between R&D cost and profitability. Moreover, the impact of R & D cost over profitability was determined by regression analysis. Linear regression analysis discovered that a 100 percent change in R & D cost brought about 83 percent change in profitability in pharmaceutical sector of India.

George Paily (2018) contributed to the literature on innovation development and technological progress in developing economies concentrating on more than 6000 manufacturing units in India by using the data obtained from World Bank Enterprises Survey conducted for India (2013-14). It concluded that two elements like tertiary education of the labour force and number of years of experience of the manager in that particular industry are found to be highly significant for product and process innovation. Moreover, it observed that larger firms be inclined to be more concerned with process innovations than product innovations as process innovations are a long term process and occupy higher risk. Further it also studied that for development of new products firm age is positively correlated as larger firms grow faster compared to small firms both in terms of sales and productivity. Both product and process innovation united together influence the productivity growth of the firm.

Richa Shukla (2020) this study checked the role of market structure and entry barrier factor on firm-level R&D activity of selected 353 electronics firms in India. For this purpose data had been taken for the period of 16 years from 2000 to 2015. By using pooled cross-sectional analysis, it gave result that lower levels of industry concentration and high set-up cost encourage firm-level R&D activity. Moreover, for R&D activities related decisions, this research endeavor highlights the role of industry size in which the firms operate. **Jaisinghani, D. (2016)** it studied the nature of profit diligence in the Indian pharmaceutical industry and the linear and non-linear impact of R&D expenditure on profitability. For the analysis purpose, dynamic panel data regression methodology and GMM technique had been used to estimate the impact of various firms' definite factors on profitability. The sample of the data consists of 55 publicly listed companies operating in Indian pharmaceutical industry for the period of 10 years from 2005 to 2014. It results the positive impact of R&D for the Indian pharmaceutical firms. Besides, the squared term of R&D is brought into being to be negative and significant. It specifies a possible non-linear relationship between R&D and profitability.

Empirical Analysis of Research and Development Expenses:

Empirical Analysis is made on R & D expenses of selected three Indian manufacturing companies like Infosys from IT industry, Maruti Suzuki India Limited from automobile industry and Bharat Electronics Ltd. from defense sector to measure the relationship between R & D expenses and net profit of the firm. Moreover, the ratio of R & D expenses to sales to be found out to evaluate the level of R & D expenses during a year. Financial analysis is to be made for five years from 2017-18 to 2021-22. The followings are the financial analysis of these three companies:

Maruti Suzuki India Limited:

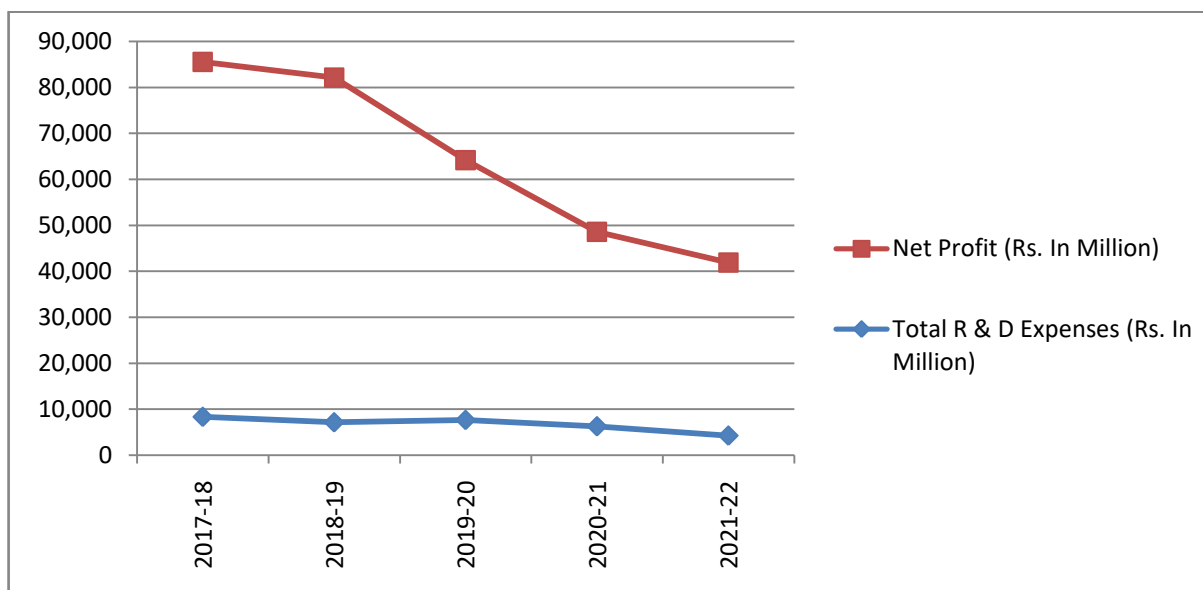
The following table shows the details of R & D expenses, sales, R & D expenses as % of sales and net profit from the year 2017-18 to 2021-22.

Year	Total R & D Expenses (Rs. In Million)	Net sales(Rs. Net Sales (Rs.In Million)	R & D Expenses as % of Sales	Net Profit (Rs. In Million)
2017-18	8,316	803,365	1.035%	77,218
2018-19	7,128	830,265	0.8585%	75,006
2019-20	7,639	716,904	1.0655%	56,506
2020-21	6,259	665,621	0.9403%	42,297
2021-22	4,233	837,981	0.5051%	37,663

(Source: <https://www.marutisuzuki.com/>. Annual report from 2017-18 to 2021-22)

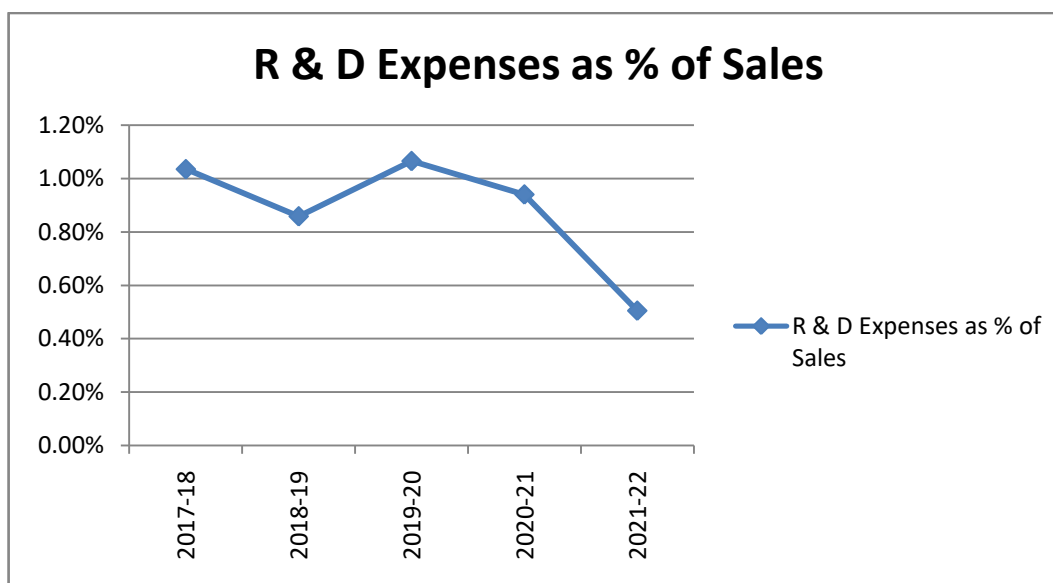
The above data shows that when research and development expenditures of a company decrease from Rs.8316 to Rs.7128 million in the year 2018-19, net profit of the company also decreases from Rs.77218 to Rs.75006 million in the same year. Moreover, when research and development expenditures of a company decrease from Rs.7639 in 2019-20 to Rs.6259 million in the year 2020-21, net sales of the company also decreases from Rs.716904 in 2019-20 to Rs.665621 million in the year 2020-21. Thus, there is direct relationship between research and development expenditures and net profit of the company up to some extent. On an average when research and development expenditures as % of sales decrease, net profit of the company also decreases.

Year	Total R & D Expenses (Rs. In Million)	Net Profit (Rs. In Million)
2017-18	8,316	77,218
2018-19	7,128	75,006
2019-20	7,639	56,506
2020-21	6,259	42,297
2021-22	4,233	37,663



R & D Expenses to Sales Ratio:

Year	R & D Expenses as % of Sales
2017-18	1.035%
2018-19	0.8585%
2019-20	1.0655%
2020-21	0.9403%
2021-22	0.5051%



Infosys:

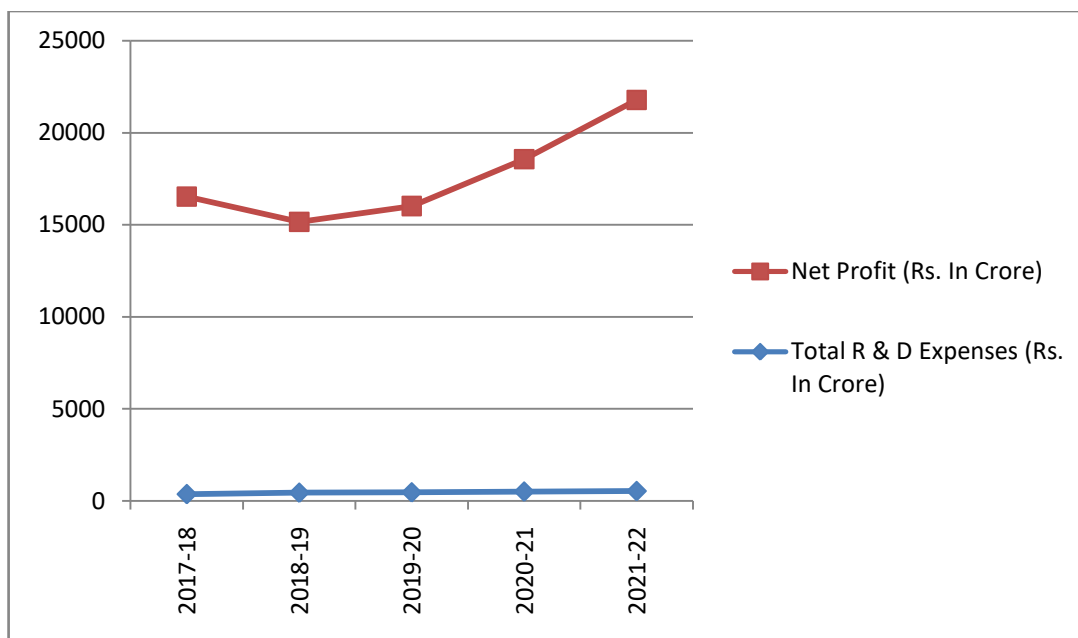
The following table shows the details of R & D expenses, sales, R & D expenses as % of sales and net profit from the year 2017-18 to 2021-22.

Year	Total R & D Expenses (Rs. In Crore)	Net sales(Rs. In Crore)	R & D Expenses as % of Sales	Net Profit (Rs. In Crore)
2017-18	374	61,941	0.6038%	16,155
2018-19	451	73,107	0.6169%	14,702
2019-20	470	79,047	0.5945%	15,543
2020-21	512	85,912	0.5959%	18,048
2021-22	541	103,940	0.5204%	21,235

(Source: <https://www.infosys.com/investors/reports-filings/annual-report/annual-reports.html>)

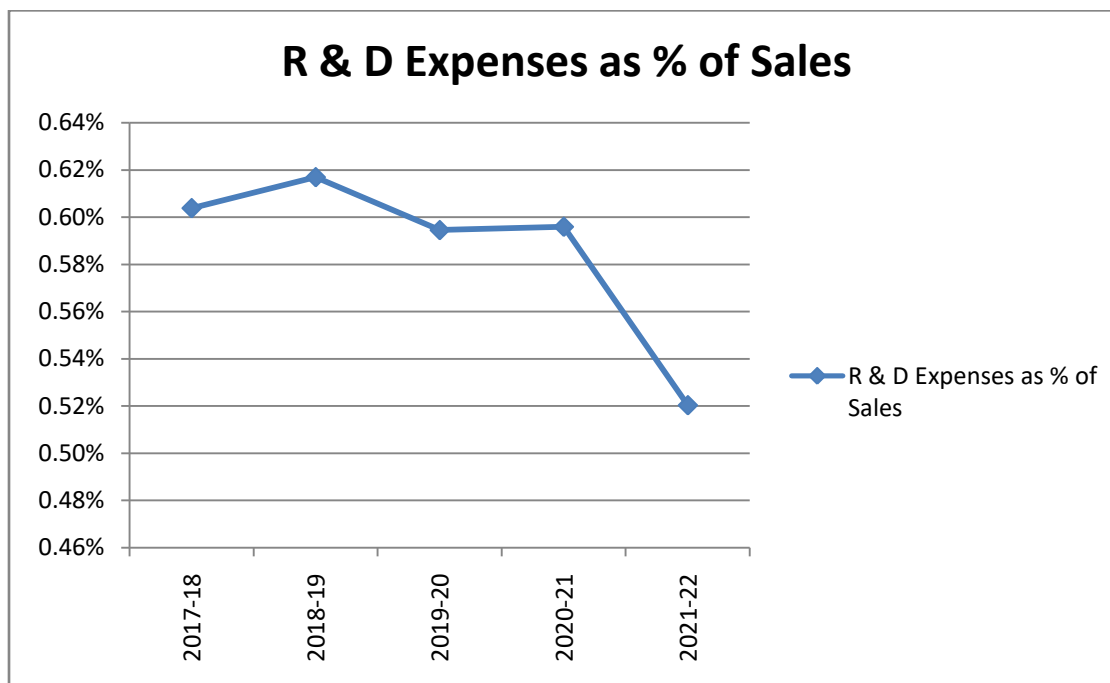
The above data shows that when research and development expenditures of a company increase from Rs.374 in 2017-18 to Rs.451 crore in the year 2018-19, net sales of the company also increases from Rs.61947 in 2017-18 to Rs.73107 crore in the year 2018-19. Moreover, when research and development expenditures of a company increase from Rs.451 in 2018-19 to Rs.470 crore in the year 2019-20, net profit of the company also increases from Rs.14702 in 2018-19 to Rs.15543 crore in the year 2019-20. Thus, there is direct relationship between research and development expenditures and net profit of the company up to some extent.

Year	Total R & D Expenses (Rs. In Crore)	Net Profit (Rs. In Crore)
2017-18	374	16,155
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2019-20	470	15,543
2020-21	512	18,048
2021-22	541	21,235



R & D Expenses to Sales Ratio:

Year	R & D Expenses as % of Sales
2017-18	0.6038%
2018-19	0.6169%
2019-20	0.5945%
2020-21	0.5959%
2021-22	0.5204%



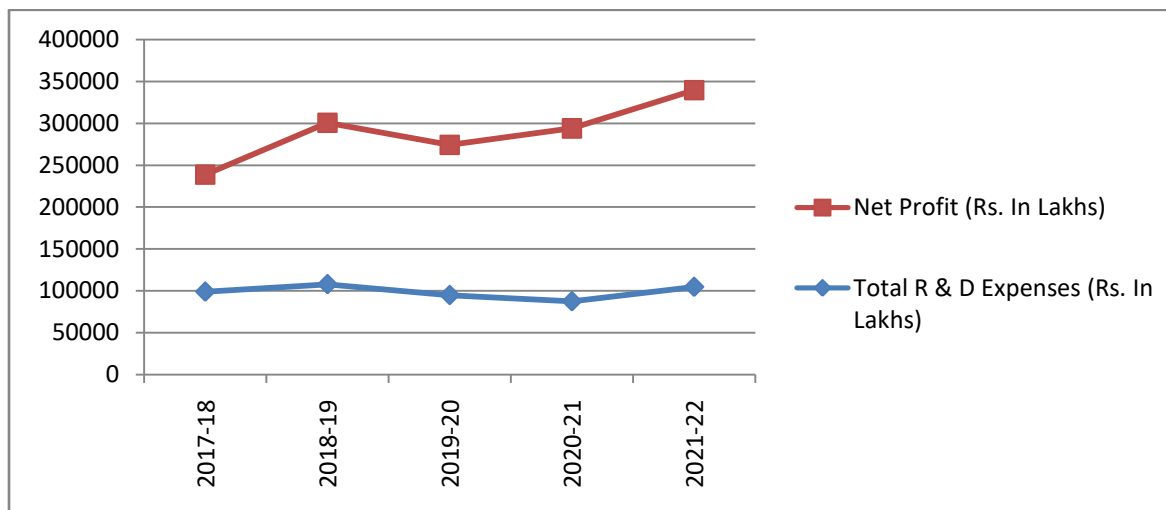
Bharat Electronics Ltd.:

The following table shows the details of R & D expenses, sales, R & D expenses as % of sales and net profit from the year 2017-18 to 2021-22.

Year	Total R & D Expenses (Rs. In Lakhs)	Net sales(Rs. In Lakhs)	R & D Expenses as % of Sales	Net Profit (Rs. In Lakhs)
2017-18	98800	1,008,484	9.7968%	139,929
2018-19	107700	11,78,922	9.1354%	1,92,729
2019-20	94700	12,60,776	7.5112%	1,79,383
2020-21	87300	13,81,816	6.3177%	2,06,542
2021-22	104500	15,04,367	6.9464%	2,34,893

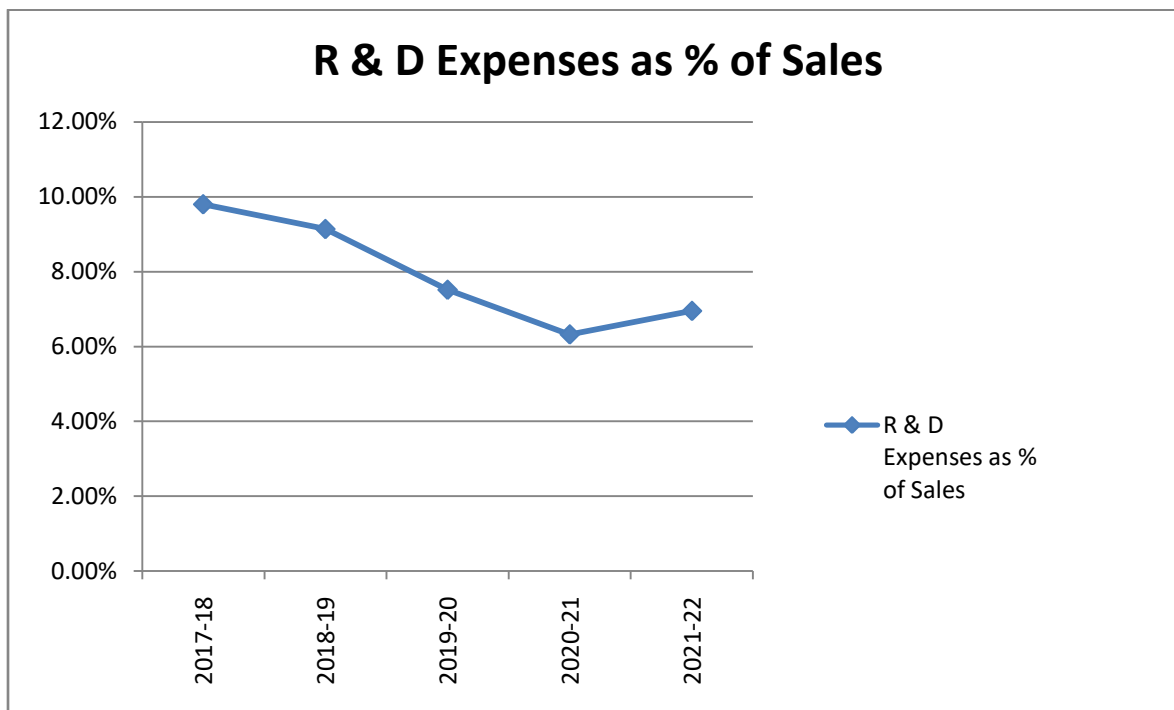
The above data shows that when research and development expenditures of a company increase from Rs.98800 lakhs in 2017-18 to Rs.107700 lakhs in the year 2018-19, net sales of the company also increases from Rs.1008484 lakhs in 2017-18 to Rs.1178922 lakhs in the year 2018-19. Moreover, when research and development expenditures of a company decrease from Rs.107700 lakhs in 2018-19 to Rs.94700 lakhs in the year 2019-20, net profit of the company also decreases from Rs.192729 in 2018-19 to Rs.179383 lakhs in the year 2019-20. Thus, there is direct relationship between research and development expenditures and net profit of the company up to some extent.

Year	Total R & D Expenses (Rs. In Lakhs)	Net Profit (Rs. In Lakhs)
2017-18	98800	139,929
2018-19	107700	1,92,729
2019-20	94700	1,79,383
2020-21	87300	2,06,542
2021-22	104500	2,34,893



R & D Expenses to Sales Ratio:

Year	R & D Expenses as % of Sales
2017-18	9.80%
2018-19	9.14%
2019-20	7.51%
2020-21	6.32%
2021-22	6.95%



Correlation:

Maruti Suzuki India Limited:

	R & D Expenses	Net Profit
R & D Expenses	1	0.82
Net Profit	0.82	1

Infosys:

	R & D Expenses	Net Profit
R & D Expenses	1	0.70
Net Profit	0.70	1

Bharat Electronics Ltd.:

	R & D Expenses	Net Profit
R & D Expenses	1	0.11
Net Profit	0.11	1

CONCLUSION

From the empirical analysis of Research and Development (R&D) expenditure of three different manufacturing companies it was found that there is positive correlation between Research and Development (R&D) expenditure and net profit of the firm. In addition, there was conclusion that when R & D expenditure of Infosys increases, net profit of the company also increases. And when R & D expenditure of Maruti Suzuki India Limited decreases, net profit of the company also decreases. Moreover, it was also concluded that when R & D expenditure of Bharat Electronics Ltd. fluctuates, net profit

of the company also fluctuates. Thus, there is positive correlation between Research and Development (R&D) expenditure and net profit of the manufacturing company.

REFERENCES

- [1]. Ward Morehouse (1970), R and D and India's Industrial Future, *Economic and Political Weekly*, Vol. 5, No. 48 (Nov. 28, 1970), pp. M137+M139-M142
- [2]. Rey A. L. Taganas and Vijay Kumar Kaul(2006), Innovation Systems in India's IT Industry: An Empirical Investigation, *Economic and Political Weekly*, Vol. 41, No. 39 (Sep. 30 - Oct. 6, 2006), pp. 4178-4186
- [3]. Suri, F. K., & Banerji, A. (2016). A Study of Disaggregated R&D Expenditure on Indian Pharmaceutical Exports. *Journal of Developing Areas*, 50(3), 167–190.
- [4]. Ramakrushna Mishra(2018). Influence of Research and Development (R&D) Cost on Profitability: A Study of Indian Pharmaceutical Sector. *IOSR Journal of Economics and Finance (IOSR-JEF)*, Volume 9, Issue 2 Ver. II , PP 63-68
- [5]. George Paily, (2018) "Innovation Strategies, Outcomes and Firm Performance: An Analysis of Firm Behaviour in India's Manufacturing Sector", *Economics Bulletin*, Volume 38, Issue 4, pages 1769-1786
- [6]. Richa Shukla, Market Structure, Entry Barriers, and Firms' R&D Intensity: Panel Data Evidence from Electronics Goods Sector in India, *Journal of Industry, Competition and Trade* (2020) **20**, 115–137 (2020)
- [7]. Jaisinghani, D. (2016). Impact of R&D on profitability in the pharma sector: An empirical study from India. *Journal of Asia Business Studies*, 10(2), 194-210. doi:<http://dx.doi.org/10.1108/JABS-03-2015-0031>
- [8]. <https://www.marutisuzuki.com/01-11-2022/2.16pm>
- [9]. <https://trendlyne.com/fundamentals/documents-annual-reports/175/BEL/bharat-electronics-ltd/25-10-2022/5.19pm>
- [10]. <https://www.infosys.com/investors/reports-filings/annual-report/annual-reports.html/28-10-2022/8.16pm>