

# EFFICIENCY DECOMPOSITION OF INDIAN ADVERTISERS

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## ABSTRACT

*During past few years there is a constant increase in the advertising expenditure by the Indian firms and India is becoming a good market for advertisers. In 2018, according to the report of Pitch Madison Advertising Report (PMAR), the expected growth rate for Indian advertising market was 12.03% but the market takes off with 14.6%, therefore it becomes essential to evaluate this expenditure incurred by the different Indian firms in advertising. The present endeavour evaluates the spending on advertising of top 50 Indian advertisers (rank is based for the year 2017) for the time period of 2013 to 2017. This study aims at identifying the efficiency of top Indian advertising spending firms by using a non-parametric analytical tool i.e., data envelopment analysis technique. This technique is an analytical tool which can be used to evaluate the efficiencies in terms of Organization Efficiency (OE), Managerial Level Efficiency (MLE) and Scale Efficiency (SE) for each firm in different time periods under consideration. DEA is a tool which is capable of handling more than one input and output at once and builds an efficient frontier for benchmarking. Present study deals with advertising expenditure as an input variable and corresponding sales of a company as an output variable. The data related to top 50 advertisers has been obtained from PMAR, while facts and figures related to input and output variables were obtained from prowess software data base maintained by CMIE (Centre for Monitoring Indian Economy). From 50 firms, present study took a sample of 36 firms for the analysis, as the data related to advertising expenditure and corresponding sales was not available for those firms which are eliminated from the present study. Further, the study considered a time period of five years from 2013 to 2017. The study reveals that on an average only 3% (approx) companies in terms of OE and only 8% (approx) in terms of ME are efficiently managing their advertising budget with their corresponding sales. Empirical results of this study also indicate that the firms need to reduce their advertising expenditure by almost 60% (approx) in order to become efficient while maintain same level of output.*

**Keywords:** DEA, Advertising Spending, Efficiency, Non-Parametric.

## INTRODUCTION

For the past few years, advertising cost by advertisers has been raised sharply irrespective of declining in cost of production (Sheth et al., 1995). Large percentages of advertisement are directed towards the consumer directly therefore, amount spent on such advertising can be referring as Direct to Consumer Advertising Expenditure (DCAE). It's needless to say that advertising expenditure holds centric issue of marketing strategy for any organization. Efficient management of advertising budget not only aid in providing competitive edge for an organization but equally contributes towards profitability (Tsai et al., 2006), while the inefficient DCAE accompanied with lower sales (Luo & Donth, 2005). Though, marketers always felt for the urge of DCAE because of several reasons such as advertising is the best way to create mass communication, imparting knowledge about

products, creating awareness and keep consumer informed about newly available product. Moreover, recent development in the advertising channel like digital media which reduces the consumer reaction time and make advertising more personalized and a two way communication.

In a dense competitive market DCAE not only helps in profitability and sales boost but also results in brand differentiating and brand recognition Malhotra et al., (2015), especially in case of a long run (Boulding, et al., 1994; Jedidi, et al., 1999). However, every increase in advertising expenditure is not likely to enhance the sales in same ratio, many literatures have tried to establish cause and effect relationship between advertising expenditure and sales but literature is still non-conclusive (Malhotra et al., 2018).

Present study considers the top 50 advertiser spenders in 2018 as per the data provided in the report. According to the pitch madison report, advertising market grew at a high pace as it was estimated. According to the report there was constant increase in the share of various advertising media mix with every passing year, as stated that TV media will grow at 18% while the print, radio and digital platform will also have upstream trend with 32%, 14% and 26% respectively in 2020.

Company allocates huge budget for DCAE in lieu of corresponding increasing in sales for their products. Hence the question which arises here is that, are organizations spending effectively on DCAE because if they are not, that could results in lower profitability and losing market shares. Therefore, it becomes necessary for firms to measure their [in]efficiency in DCAPE, as it may leads to possible source inefficiency in key area and helps in reducing the cost. Efficiency in advertising is the amount of output gained from per unit of input (Coelli et al., 1998). There were research which stated that sales influences the media spending of the companies, while some studies have proven the casual relationship between the advertising and sales volume. Therefore a company has to advertise first in those areas where they are getting maximum return on investment (ROI) and then shifted to other places (Aaker & Carman 1982; Mesak, 1999). Further Danaher & Hust (1994), have pointed out that a firm can achieve optimum level of media spending by maximizing advertising efficiency.

Present endeavour used non-parametric test i.e. Data Envelopment Analysis to estimating the frontier line by considering various inputs (advertising expenditure by a firm) and outputs (corresponding sales of a firm). Considering DEA for estimating frontier line (also known as efficiency frontier line) have several advantages- DEA can handle multiple amount of inputs and outputs (however in this literature there is only one input and output), it provides a frontier line and distance from the frontier line denotes as proxy for inefficiency, many of previous literature used DEA for estimating efficiency in different sector (apart from advertising efficiency) and lastly the DEA score can be used as a regressor for further statistical analysis.

## Literature Review

Gaining efficiency in advertising means to decline the cost of input variables associated with advertising such as media content, media space, effective media mix along with the maximizing corresponding output variables such as sales of product, profitability, awareness about product etc. (Cheong et al., 2014; Luo & Donthu, 2005; Pergelova et al., 2010). According to a company spending on advertising gives a sign that company is anticipating equivalent amount of increase in percentage of sales as well. Few literatures also establish direct relationship between the advertising spending and rate of return, rate of equity and return on investment (Luo & Donthu, 2005; Malhotra et al, 2015; Aaker & Carman 1982; Briggs & Stuart, 2006). Advertising efficiency can also be understood as a ratio of amount of output gained with the amount of input invested (Pergelova et al., 2010). Thus, for enhancing

efficiency in advertising there are two ways available for firms- first, reduces the cost of input variables in advertising or second, maintain the same level of input but increases their sales noted that advertising efficiency influences the customer loyalty, based on the data related to Turkish banks.

There are also studies which used DEA as a technique for estimating best efficient frontier line for firms under consideration. Pergelova et al. (2010) specify that inefficiency in spending on advertisement can be reduced with proper investing in media mix with internet as a must investment for advertising. It also had shown how a firm can achieve efficiency in spending on advertisement by including internet marketing in their advertising mix. Findings of the study was based on the Spanish car dealers in 2007, by considering sales revenue as output variable whereas input variables includes all those expenditure made by the Spanish car dealers in different advertising media mix measures the advertising media efficiency for FMCG companies in India by considering sales revenue as an output while advertising expenditure consider as an input. The study reveals that majority of the firms are performed under the efficient frontier line. Cheong et al. (2014), performed research among the top US advertiser for a time period from 1985 to 2102. The study noted that more than 60% advertisers are over spending dollars from their advertising budget. Therefore, there is a huge scope for improving advertising expenditure. This study also revealed that internet could be a good medium for improving the overall efficiency of firms. Rahman et al. (2019), noted that direct to consumer (DTC) advertising have direct relationship with the profitability of firms. Further, this literature robust the advertising efficiency with other proxy variable of profitability such as returns on asset (ROA) and return on equity (ROE) and found positive relation of advertising efficiency with these proxy variables.. Malhotra et al. (2018), evaluates the impact of advertising efficiency on sales and profitability for sixteen apparel industry. As findings, this study revealed about the positive relationship between the expenditure on advertising with that of profitability, ROA, ROE and return in investment (ROI). This study consider DEA tool for measuring efficiency by considering various ratio as an input like advertisement to sales ratio, advertising to margin ratio and advertising growth percentage while return on asset, return on equity and return on investment as output variables. Buschken (2007), noted about how German car industry is inefficient in brand advertising by considering 35 car brands of Germany. This study used DEA for estimating best frontier line and revealed that 8% of the brand advertising is wasted. Brown & Cheong (2013), used DEA as a tool for estimating the efficiency of top 50 sports advertiser of 2009 by considering expenditures on different media advertising such as magazines, outdoor, TV etc while gross profit and brand value as output variables, findings of this study states that majority of firms are inefficient in their advertising expenditure and can reduce their spending on advertisement by 20% while maintain same level of output. Fare et al. (2004) performed DEA analysis for beer industry in US for time period of 10 years and revealed that most firms are performing under the best frontier line and firms need to improve their choice of media mix for reaching to frontier line. Lohita et al. (2006) presented DEA approached for estimating the efficiency of banner advertisements on internet and found that most advertisement are efficient therefore this study also performed the super efficiency analysis for knowing the best practice firm under banner advertisement.

## RESEARCH METHODOLOGY

### Design of Research

Present study considers non-parametric tool i.e. data envelopment analysis (DEA) for estimating the best practice line among the top 50 advertisers spenders in India. DEA is a

common and most popular tool for analysing efficiency in different sets of sample. The main advantage of DEA is that it can handle multiple inputs and outputs at the same time and based on such a combination gives a best frontier line.

### **Data Source and Sampling**

The data collection process for this study was done in two stages. First, the data related to the rank wise list of Indian firms in correspondence to their spending on advertisement has to be obtained. For this sole purpose, present endeavour considers the pitch madison report, for drawing samples for this research. Pitch maidson report, provides the data of advertising expenditure incurred by the various Indian companies. Therefore, this report ranking is good for obtaining our sample companies. The sample so obtained from the report is a mix of several types of firms like FMCG, Online retailer, Auto Mobile, Baby care products, electronics etc.

Further, in the second stage of data collection, data related to advertising expenses and corresponding sales for top 50 advertiser's spenders was collected from the Prowess database which was handle by Centre for Monitoring Indian Economy. The prowess software is widely used method for collecting various sets of data related to Indian firms. The data was collected for time period of 5 years i.e. from 2014 to 2018.

Out of the top 50 firms only 36 firms were included in the sample as the data related advertng expenses and its corresponding sales were not available for other 14 firms. Therefore the research was carried out on the 36 firms

### **Research Model**

Data envelopment analysis is the non parametric tool which is used for estimating the most efficient firm out of those which are under consideration. DEA is an extension of linear programming which was developed by Charnes & Cooper (1978) though the concept was originates by Farell (1957). DEA provides the efficiency score to every firm under consideration and compare the score of one firm with that of others (Emrouznejad et al., 2008; Stolyarova & Rialp, 2014). DEA model considers decision making units (DMUs), DMUs are those units (or firms) which are under consideration DEA analysis. DMU could be any financial or non financial unit, educational unit, health care sector etc. In this study DMUs are the top 50 advertiser who ranked among as top spender on advertising. Further the DEA model includes CCR DEA model (Charnes et al., 1978) and BCC DEA model. The CCR model considers constant return on scale whereas the BCC model considers variable return to scale. DEA analysis is based on two orientation- Input oriented DEA model and Output oriented DEA model. Output oriented method considers various input variables as constant and suggest that with same amount of input how much output can be achieved in order to reach frontier line. On the other side, input model consider that output is fixed and suggest that the same amount of output can be achieved by reducing a certain percentage of inputs. As long as present study concern, it uses input oriented method. The reason for choosing input oriented method over the output oriented method is that a firm can control the input variables i.e. increasing or decreasing the amount of inputs is purely in the hands of firms while the output is not firm directed i.e. it cannot be controlled by the firm (Cheong et al., 2014). Thus input oriented method will suggest about how much amount of input a firm should reduce for generating same amount of output.

This technique is an analytical tool which can be use to evaluate the efficiencies in terms of Organization Efficiency (OE), Managerial Level Efficiency (MLE) and Scale efficiency (SE) for each firm in different time periods under consideration. The CCR DEA

model provides the efficiency score in OE whereas BCC DEA model gives the MLE score and SE is a ratio between OE and MLE. For developing DEA model for present study, variables are defined as follows-

$j = 1, 2, 3, \dots, n$  (number of DMU under consideration)

$i = 1, 2, 3, \dots, m$  (inputs variable)

$r = 1, 2, 3, \dots, s$  (outputs variable)

Therefore, each DMU<sub>j</sub>,  $j = 1, 2, 3, \dots, n$ , uses the following variable factors:

$X_{ij}$  (amount of input “i” for the unit “j”),  $i = 1, 2, 3, \dots, m$  and  $j = 1, 2, 3, \dots, n$

$Y_{rj}$  (amount of output “r” for the unit “j”)  $r = 1, 2, 3, \dots, s$  and  $j = 1, 2, 3, \dots, n$

Thus the efficiency of DMU can be calculated as follows

$$DMU \text{ efficiency} = \frac{\sum_{j=1}^n Y_{rj}}{\sum_{j=1}^n X_{ij}}$$

$\Theta^* = \min \Theta$

Subject to

$$\sum_{j=1}^n \lambda_j X_{ij} \leq \Theta X_{i0}$$

$$\sum_{j=1}^n \lambda_j Y_{rj} \geq Y_{r0}$$

$$\lambda_j \geq 0$$

$\lambda$  represents the constant,  $\Theta^*$  represents the efficiency score of 1,  $\Theta$  represents the DMU<sub>j</sub> efficiency score, any DMU is consider efficient only if the value of  $\Theta$  is 1 otherwise if the value of any DMU<sub>j</sub> is less than 1 than it is not efficient.

**Result and Discussions**

The descriptive statistics for the input and output variables are presented in table 1. The table shows mean value of Advertising expenditure (AdEx) and Sales revenue for the time period 2014 to 2018. Amount is expressed in millions of rupees. Every year provides average expenditure by top advertisers on advertisement in compiled form of different media and corresponding sales for that particular year. The mean analysis suggested that with every passing year the advertising expenditure was increases from 2014 to 2018 from 5106.78 million to 6494.33 million while on the different side sales revenue also increase with every year from 2014 to 2018 from 143418.3917 million to 180284.0306. However the interesting fact in mean analysis is that during the year 2017 to 2018 the advertising expenditure was increase from 5749.0833 million to 6494.33 million but its corresponding sales revenue actually show decline trend from 2017 to 2018 from 182833.025 million to 180284.0306 million. This mean analysis clearly state that the company are not spending efficiently on advertising budget. Thus it implies that every rupee spent on advertising not necessary results in increase in sales revenue, thus indicates about the inefficiency resides with in.

<b>Table 1</b>
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<b>DESCRIPTIVE STATISTICS FOR INPUTS AND OUTPUTS VARIABLES 2014-2018</b>				
Year	<b>Advertising Expense (AdEx)</b>		<b>Sales Revenue</b>	
	Mean	Standard Deviation	Mean	Standard Deviation
2014	5106.78	6106.0	143418.39	151476.45
2015	5502.50	6686.58	158108.05	160594.69
2016	5525.49	6221.73	169808.07	179313.23
2017	5749.08	6794.56	182833.02	198277.87
2018	6494.33	8400.73	180284.03	195812.84

**Source:** Author Calculation

Before applying DEA analysis it is essential to check correlation between the input and output variables. As it is required, that for an effective DEA model inputs and outputs must be correlated. For this reason, this study run a karl pearson correlation on input variable (advertising expenditure) and output variable (Sales revenue). The result shows that both of the variables are positively correlated even at 1% level of significance. Table 2 shows the result for correlation between the input and output variables.

<b>Table 2</b>			
<b>CORRELATIONS BETWEEN INPUT AND OUTPUT VARIABLES</b>			
		SALES	ADVEX
SALES	Pearson Correlation	1	.432**
ADVEX	Pearson Correlation	0.432**	1

\*\*Correlation is significant at the 0.01 level (2-tailed).

Source Author Calculation

The DEA analysis is carried out on a DEAP 2.1 version of software. The result are compile in three sections OE, MLE and SE. Table 3 shows the year wise result of OE, MLE and SE. The table 3 also shows the overall mean score of efficiency under all three sections. The various efficiency scores across the table 3 shows an increase in the efficiency with every passing year except MLE. OE and SE both are showing incline results with every year unlike the MLE efficiency score which was showing increasing trend during initial years and thereafter it starts declining. This suggest that managerial decision making on advertising budget is not good and instead of considering efficiency while allocating the advertising budget they have considers other variables such as competitive budget or other considerations.

<b>Table 3</b>							
<b>EFFICIENCY OF TOP 50 INDIAN ADVERTISERS, 2014-2018</b>							
Year	Number of Firms	OE		MLE		SE	
		Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
2013	36	0.0310	0.16615	0.2229	0.31637	0.1670	0.27643
2014	36	0.0324	0.16594	0.2582	0.32784	0.1770	0.28154
2015	36	0.0368	0.16548	0.2936	0.35609	0.2324	0.30192
2016	36	0.0418	0.16473	0.2843	0.33878	0.3196	0.35208
2017	36	0.0448	0.16457	0.2553	0.32615	0.398	0.38749
Combined		0.0374	0.1654	0.2629	0.3330	0.2588	0.3199

**Source** Author Calculation

Table 4 represents the total number of efficient DMU across the whole year as per OE and MLE. According to the CRS DEA model, only 3% out of all firms under consideration are present on the efficient frontier rest all 97% firms are inefficient. In comparison to VRS

DEA model, only 8% firms are likely to be on efficient frontier and rest 93% are inefficient. Thus it is clear from the DEA analysis that top Indian advertisers are not efficiently utilizes their advertising budget and there is lot of improvement required by the Indian firms on their decision making to spent amount on advertising.

<b>Table 4</b>				
<b>NUMBER OF EFFICIENT FIRMS, 2014-2018</b>				
<b>Year</b>	<b>OE</b>	<b>Percent</b>	<b>MLE</b>	<b>Percent</b>
2013	1	2.77	3	8.33
2014	1	2.77	4	11.11
2015	1	2.77	3	8.33
2016	1	2.77	2	5.55
2017	1	2.77	2	5.55
Average		2.77		7.77
<b>Source</b> Author Calculation				

## Conclusion

With the use of DEA analysis present study compares the year wise efficiency scores of top Indian advertisers against each other efficiency score by considering one input variable i.e. advertising expenditure and one output variable i.e. sales revenue. The study reveals that majority of Indian firms are not spending their advertising budget efficiently and need to rethink an effective strategy for better determination of advertising budget. The study also reveals that managerial level decision making needs to improved for spending advertising budget more efficiently. Moreover, change in the media mix may also results in improving the efficiency especially more investment in digital media (Fare et al., 2004). In general, analysis of this study revealed that top Indian advertisers need to make effective strategy while allocating advertising budget and their choice of media mix.

## Limitations

The limitations of this study are that it considers only the top 50 Indian advertisers and not going for industry specific analysis. Further there was a data restriction as this study didn't get the data especially for different media mix such as print, TV, radio, digital etc. Thus future studies can consider all these aspects.

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