Volume 13 Issue 9
Originally issued as E5

Global Journal of Management and Business Research
Marketing
Volume 13 Issue 5 Version 1.0 Year 2013
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals Inc. (USA)
Online ISSN: 2249-4588 & Print ISSN: 0975-5853

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GJMBR-E Classification : *JEL Code: M31*



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Evaluating Significance of Marketing in Indian IT Companies using DEA

Mr. Omdeep Gupta [α], Dr. P. C. Kavidayal [σ] & Dr. R.C. Mishra [ρ]

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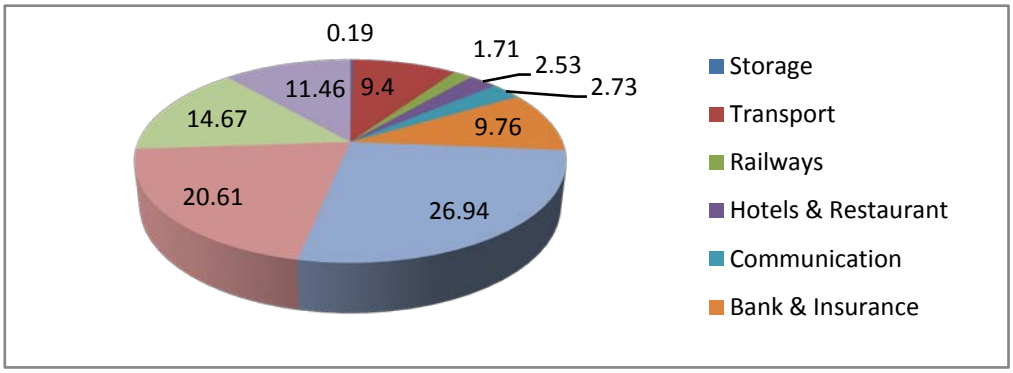
This paper evaluates the relative efficiencies of various Indian IT Companies with the use of Data Envelopment Analysis (DEA) in the presence of different factors of marketing (Total Income & sales as output and Selling and Distribution expenses & Communication expenses as Input). The top 10 and bottom 10 companies are selected and two sample t-tests is applied to evaluate the role of no. of branch offices, no. of strategic partners and no. of vertical industries served in the future. Data envelopment analysis (DEA) is receiving increasing importance as a tool for evaluating and improving the performance of manufacturing and service operations. This paper aims to use DEA to categorize the Decision Making Units (DMUs) to two classes of efficient and inefficient units with two input factors and two output factors.

Keywords : software industry, strategic partner, marketing, DEA.

I. Introduction

a) Service Sector in Indian Economy

The contribution of the services sector to the Indian economy has been manifold: a 60 per cent share in gross domestic product (GDP), growing by 10 percent annually, contributing to about a quarter of total employment, accounting for a high share in foreign direct investment (FDI) inflows and over one-third of total exports, and recording very fast (27.4 per cent) export growth through the first half of 2010-11. It is also a significant employment generator. Service sector encompasses a variety like tourism, rail freight, logistics, hotel industry; healthcare, financial services like insurance and banking have been growing at 28% over the last 5 years, which is remarkably higher than the GDP growth of 7%. India ranks fifteenth in the services output and it provides employment to around 23% of the total workforce in the country. The various sectors under the Services Sector in India are construction, trade, hotels, transport, restaurant, communication and storage, social and personal services, community, insurance, financing, business services, and real estate.



Source : Indian Central Statistical organization 2011.

Figure 1 : Contribution of different service sectors

The importance of the services sector can be gauged by looking at its contributions to different aspects of the economy.

b) Services GDP

The share of services in India's GDP at factor cost (at current prices) increased rapidly: from 30.5 per cent in 1950-51 to 55.2 per cent in 2009-10. If construction is also included, then the share increases to 63.4 per cent in 2009-10. The ratcheting up of the overall growth rate (compound annual growth rate [CAGR]) of the Indian economy from 5.7 per cent in the 1990s to 8.6 per cent during the period 2004-05 to 2009 - 10 was to a large measure due to the acceleration

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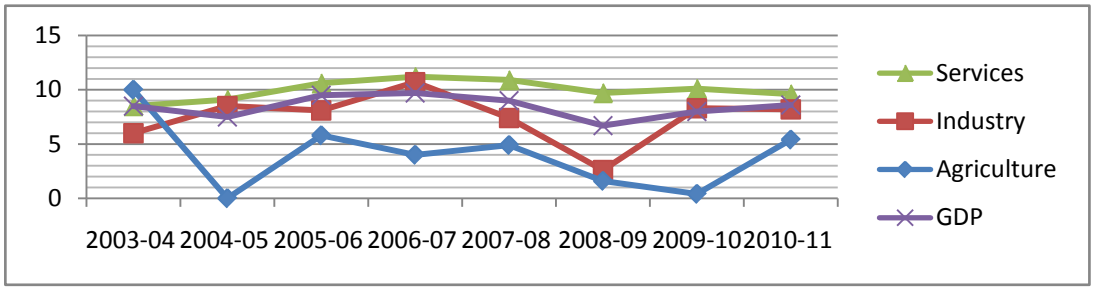
of the growth rate (CAGR) in the services sector from 7.5 per cent in the 1990s to 10.3 per cent in 2004- 05 to 2009-10. The services sector growth was significantly faster than the 8.7 per cent for the combined agriculture and industry sectors annual output growth during the same period. In 2009-10, services growth was 9.6 per cent and in 2010-11.



Source : Indian Central Statistical organization 2011.

Figure 2 : Growth Rate of GDP and Services, Industry, Agriculture Sector GDP

c) Overview of IT Sector in India

Information technology is a collective term used to describe developments in the mode used for the acquisition, processing, analysis, storage, retrieval, dissemination and application of information. Recent developments in the field of IT have revolutionized programmer capabilities and application. The impact of these developments affects increased computer speed, smaller hardware size, lower hardware and software costs, improved reliability, compatibility and interconnectivity. India is one of the world's fastest growing economies and is emerging as a global Information Technology powerhouse. India offers high quality IT and IT-enabled Services at low cost, using state-of-the-art technology. Convergence has led to lowering of tariffs, plentiful availability of bandwidth at increasingly lower cost, competition and growth in technology, especially fiber optics and wireless technology.

The Indian Information Technology sector has shown remarkable resilience in the year 2007. Industry performance was marked by sustained double-digit revenue growth, steady expansion into newer service-lines and increased geographic penetration, and an unprecedented rise in investments by Multinational Corporations (MNCs) - in spite of lingering concerns about gaps in talent and infrastructure impacting India's cost competitiveness.

The Indian software and services exports including ITES-BPO are estimated at US$ 40.3 billion in 2007-08, as compared to US$ 31.4 billion in 2006-07, an increase of 28.3 per cent. The Indian IT sector has built a strong reputation for its high standards of service quality and information security - which has been acknowledged globally and has helped enhance buyer confidence. While the larger players continue to lead growth, gradually increasing their share in the industry aggregate; several high-performing Small and Medium Enterprises (SMEs) also stand out.

The total IT Software and Services employment is expected to reach 2.0 million mark in 2007-08 (Manpower demand for IT software and hardware sector in 2008 is projected as over 9 million), as against 1.63 million in 2006-07, a growth of 22.7 per cent year-on-year. This represents a net addition of 375,000 professionals to the industry employee base, this year. The indirect employment attributed by the sector is estimated to about 8.0 million in year 2007-08. This translates to the creation of about 10 million job opportunities attributed to the growth of this sector. The outlook for Indian IT remains bright, and the sector is well on track to achieve its aspired target of US$ 60 billion in export revenues and US$ 73 - 75 billion in overall software and services revenues by 2010.

II. Computer Software Industry in India

The importance of the software industry can be judged by the fact that its contribution to the country's GDP will increase from 1.4 per cent (2001) to about 7 per cent (2008). More importantly, it is expected to contribute nearly 20 per cent of incremental GDP growth between 2001 and 2008. The industry, which employed 0.8 million people in 2001, is expected to employ over 2 million people directly and create direct employment opportunities for at least an additional 2 million people by 2008 (Nasscom, 2002). The industry's contribution to India's total exports has been rising. Realizing the potential of the industry, the captains of the industry speak very highly about the firms. Many professionals and policy makers have called India the software super power of the world.

The immense enthusiasm surrounding the industry is understandable as hardly any other Indian industry matches its growth rates in the last decade. Yet, it is useful to put a little global perspective on India's ambitions in this area. The global software market is estimated to be about US$550 billion (2002), and has

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been growing at about 15 per cent per annum (five-year, trend rate) (ESC Data, 2003). India's share in this market is 1.5 per cent (2000) and is estimated to rise to less than 5 per cent (2008).

The Indian success story has, been a combination of resource endowments, a mixture of benign neglect and active encouragement from a normally intrusive government, and good timing. By the late 1980s, India was graduating approximately 150,000 English-speaking engineers and science graduates, with only a limited demand for their services from the rest of the economy. By the late 1980s as well, India's economic liberalization was also well under way.

Around this time, the information technology revolution in the developed world had begun to take root and shortages of skilled programmers and IT professionals were beginning to develop. By this time a number of Indians were working in very substantial numbers in US firms. Some of them played an important, although as yet undocumented role, in bridging the gap and matching the buyers in the US with the suppliers in India. Responding quickly to the growing demand, a number of Indian firms arose in quick time. The State encouraged this growth by considerably simplifying the process for obtaining the numerous clearances and permits that any firm in the organized sector in India typically needs.

FY 2006-07 witnessed a revalidation of the Indian Information Technology –Business Process Outsourcing (IT-BPO) growth story, driven by a maturing appreciation of India's role and growing importance in global services trade. Industry performance was marked by sustained double-digit revenue growth, steady expansion into newer service-lines and increased geographic penetration, and an unprecedented rise in investments by Multi-national Corporations (MNCs) – in spite of lingering concerns about gaps in talent and infrastructure impacting India's cost competitiveness. The sector looks set to close the year at record levels, with the revenue aggregate growing by nearly ten times over the past ten years.

Positive market indicators including large unaddressed white-spaces and the unbundling of IT-BPO mega-deals with increasing shares of global delivery, strongly support the optimism of the industry in achieving its aspired target of USD 60 billion in exports by 2010.

While India is uniquely advantaged to best address these opportunities, they are not lost to others. Timely, coherent and continued action is needed to ensure that India makes the most of these opportunities and maintains its lead.

III. Characteristics of the Indian Software Industry

The Indian software sector displays many unusual features from an Indian perspective. The most obvious one is its export orientation, accounting for 65% of the total software revenue. There are important qualitative differences between the export market and the domestic markets. The domestic market has a higher proportion of revenues from the sale of software packages and products. Whereas products accounted for nearly 40% of the domestic market5, they account for a little fewer than 10% of exports. Over 80% of exports are software services including custom software development, consultancy and professional services. For domestic clients the industry provides a wider range of services that usually spans the entire lifecycle of software development.

a) Domestic

A large fraction of the domestic software industry consists of resale of software packages developed by foreign, principally US, firms, thus overstating the extent of software written for the domestic market. On the other hand, there is a great deal of in-house software written by users, especially large Indian firms that are not being captured by any figures. A number of Indian software firms have also developed software packages aimed at the domestic market.

b) Exports

Indian software exports consist primarily of software services. The activities carried out by most firms in India are essentially maintenance tasks for applications on legacy systems such as IBM mainframe computers, development of small applications and enhancements for existing systems, migration to client-server systems, often referred to as porting or re-engineering.

c) Marketing of Software Industries

To certain extent managing services are more complicated then managing products, products can be standardized, to standardize a service is far more difficult as there are more input factors i.e. people, physical evidence, process to manage then with a product.

Characteristics of a service

- Lack of ownership
- Intangibility
- Inseparability
- Perish ability
- Heterogeneity.

The Service marketing mix involves analyzing the 7'p of marketing involving, Product, Price, Place, Promotion, Physical Evidence, Process and People.

i. *Product*

The term "product" refers to tangible, physical products as well as services. Product decisions includes aspects such as Brand name, Functionality, Styling, Quality, Safety, Packaging, Repairs and Support, Warranty, Accessories and services.

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ii. *Price*

Pricing decisions should take into account profit margins and the probable pricing response of competitors. Pricing includes not only the list price, but also discounts, financing, and other options such as leasing, pricing strategy (skim, penetration, etc.).

iii. *Place*

Distribution is about getting the products to the customer. Distribution decisions include, Distribution channels, Market coverage (inclusive, selective, or exclusive distribution), Specific channel members, Inventory management, Warehousing, Distribution centers, Order processing, Transportation & Reverse logistics.

iv. *Promotion*

In the context of the marketing mix, promotion represents the various aspects of marketing communication, that is, the communication of information about the product with the goal of generating a positive customer response through Advertising, Personal selling & sales force, Sales promotions, Public relations & publicity, Marketing communications budget.

v. *People*

An essential ingredient to any service provision is the use of appropriate staff and people. Recruiting the right staff and training them appropriately in the delivery of their service is essential if the organization wants to obtain a form of competitive advantage. Consumers make judgments and deliver perceptions of the service based on the employees they interact with.

vi. *Process*

Refers to the systems used to assist the organization in delivering the service.

vii. *Physical Evidence*

Physical evidence is an essential ingredient of the service mix; consumers will make perceptions based on their sight of the service provision which will have an impact on the organizations perceptual plan of the service.

d) Literature Review

i. *High –Tech Products*

High-tech products are characterized by a short product life cycle curve (Rosenau, 1988). Such products typically go through the life-cycle stages in shorter periods of time). To target each customer segment in the diffusion of innovation curve, a different marketing approach becomes necessary (Moore, 1991). According to Utterback (1994), a dominant design is the one that wins the allegiance of the market place, the one that competitors and innovators should adhere to if they hope to command significant market share. Bierstedt, in a general context, has aptly summarized the role of power in any system: "Power supports the fundamental order of society and the social organizations within it, whenever there is order. Power stands behind every association and sustains its structure. Without power there is no order". The study of power must be, therefore, an important part of the study of distribution channel behavior and will have important implications for the study of physical distribution management.

In a general context, Emery and Trist have pointed out that the type of environment increasingly facing organizations of all kinds is such that no longer can individual organizations cope effectively by themselves. One aspect of this is the situation of the organizations comprising a distribution channel. The rise of consumerism and the increasing concern being given to man's effects on his natural environment create problems with which individual organizations cannot cope alone. Partly, these problems can be met by better co-operation and co-ordination between organizations in distribution channels. However, these environmental changes also suggest the need for some degree of co-operation and co-ordination between whole channels.

e) Data Envelopment Analysis

Researchers have used DEA to measure the performance of firms, especially in the banking (Jackson and Fethi, 2000; Mukherjee, et al., 2002; Mostafa, 2007; Delis and Papanikolaou, 2009) and health care sectors (Chilingerian, 1995, Luoma, et al., 1998, Akazili, et al., 2008; Kirigia et al., 2008). Some researchers have studied the pharmaceutical industry also (Feroz, et al., 2008; Hashimoto and Haneda, 2008; Saranga and Phani, 2009). Besides comparing individual firms, DEA has been used to compare efficiencies of nations too (Tan, et al., 2007; Sharma and Thomas, 2008).

Feroz, et al. (2008) have demonstrated the usefulness of DEA in performance measurement in the US pharmaceutical industry and have shown the applicability of DEA in arriving at an unbiased account of relative performance in a set of companies. Applying DEA, Hashimoto and Haneda (2008) observed that the R&D efficiency of Japanese pharmaceutical industry has worsened throughout the decade 1983-92. In the Indian context, after controlling for firm size and initial efficiency levels, Saranga and Phani (2009) found that in the era prior to the introduction of the product patent regime, higher R&D investments in pharmaceutical firms translated into higher efficiencies.

Manandhar and Tang (2002) incorporated intangible aspects, e.g. the internal service quality, into DEA. They considered internal service quality, operating efficiency and profitability as dimensions of performance. Portela and Thanassoulis (2007) analyzed the three dimensions of branch performance: Usage of new transaction channels, efficiency in increasing sales and customer base and generating profits. Relations between operational and profit efficiencies and also transactional and operational efficiencies were identified. Comparison of different dimensions allows us to

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see superior and inferior branches. They found positive links between operational and profit efficiency and also between transactional and operational efficiency. Service quality is positively related with operational and profit efficiency.

f) Research Objectives

The main research objective of this paper is to understand the importance of marketing and marketing efforts undertaken by various Software companies and their influence on the overall performance of the companies.

Marketing and marketing efforts are evaluated by following five factors (two initial factors and three extended factors):

i. *Input Factors*

a. *Initial Factors*

- Selling and distribution expenses
- Communication expenses.

b. *Extended Factors*

- Number of Branch office's
- Number of Strategic Partners
- Number of vertical industries served

ii. *Output Factors*

Overall performance of the companies was judged using following two factors:

- Total income
- Total Sales

IV. Research Methodology

a) Population and Sample

The count of companies operating in Indian I.T. sector runs in thousands, and considering all of them is a tedious task for this particular research. So the target population was the companies available in CMIE database. Finally 139 companies with complete data qualified for the research analysis.

In second stage top 10 and bottom 10 companies were selected on the basis of their efficiencies and data for extended factors was collection from individual company's website.

- Sampling technique: judgmental sampling
- Sampling unit: Individual I.T. Company

Tools and Techniques: This research uses two statistical techniques.

i. Data Envelopment Analysis, and

ii. Paired t-test

i. *Data Envelopment Analysis*

Notably, DEA has been widely adopted in recent years to assess the performance of a group of units. These measured units are called decision making units (DMUs). Based on the concept of an efficiency frontier, Charnes et al. first modeled DEA through mathematical programming. Thus, DEA can measure the relative efficiency of DMUs with multiple inputs and outputs. The DEA model introduced by Charnes et al.(1978) is called the CCR model. The CCR model utilizes a virtual multiplier to integrate multiple inputs and outputs into a single index. The virtual multiplier _ generated as the sum of weighted outputs divided by the sum of weighted inputs _ is utilized to represent the efficiency of each DMU. The CCR model selects the input and output weights that maximize relative efficiency of each measured DMU. The relative efficiency of the DMU analyzed by the CCR model is obtained by

$$\max \frac{\sum_{k=1}^{s} v_k y_{kp}}{\sum_{j=1}^{m} u_j x_{jp}} \qquad s.t. \quad \frac{\sum_{k=1}^{s} v_k y_{ki}}{\sum_{j=1}^{m} u_j x_{ji}} \le 1 \forall\, i \qquad v_k, u_j \ge 0 \;\forall\, k, j$$

Where,

$k = 1$ to s,

$j = 1$ to m,

$i = 1$ to n,

y_{ki} = amount of output k produced by DMU i,

x_{ji} = amount of input j utilized by DMU i,

v_k = weight given to output k,

u_j = weight given to input j.

Each DMU selects input and output weights that maximize its efficiency score. In general, a DMU is considered to be efficient if it obtains a score of 1 and a score of less than 1 implies that it is inefficient.

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ii. *Paired T-Test*

Paired sample t-test is used in 'before-after' studies, or when the samples are the matched pairs, or the case is a control study. The paired sample t-test is used in this research to statistically conclude whether or not extended input factors have improved the efficiency of the companies.

V. Analysis and Findings

- *Stage (I)*

The efficiency of 139 companies using DEA with two initial factors (Selling & Distribution expense) & two output factors (Total Income & Total Sales). Top ten and bottom ten companies on the basis of efficiencies were selected for further evaluation. Detail in Annexure 1.

- *Stage (II)*

The performance of top & bottom 10 companies was re-evaluated using the same two initial and output factors. There evaluated efficiencies were used as 'before' sample for t-test. Detail in Annexure 2.

- *Stage (III)*

Now three more extended factors along with two initial factors i.e. total five factors as input and the same two output factors were used to calculate the efficiencies of top 10 and bottom 10 companies to be further used for t-test as 'after' sample.

- *Stage (IV)*

The paired t-test was applied to evaluate the significance of extended factors in enhancing the company's performance. The top ten com-panies showed significant difference between the two factors while the bottom ten companies showed insignificant difference between initial factors and extended factors.

a) T- Test Statistics

i. Top 10 companies

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Before	.312763	10	.2597928	.0821537
	After	.795562	10	.2693932	.0851896

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 Before - After	-4.8279890E-1	.2918025	.0922760	-.6915418	-.2740560	-5.232	9	.001

ii. Bottom 10 companies

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Before	.815836	10	.2377586	.0751859
	After	.940483	10	.1142789	.0361382

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 Before - After	-1.2464640E-1	.2334436	.0738213	-.2916419	.0423491	-1.688	9	.126

VI. Conclusion and Managerial Implications

The study shows that the extended factor taken in the research i.e. number of branches, strategic partners and number of vertical industry served have a considerable contribution to the comparative efficiencies of the higher efficient companies, at the same time it is also observed that these factors do not contribute to the efficiencies of the lower efficient companies. Hence it

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can be considered that these factors have some implication on the overall competitiveness of the companies in this sector. Indian Software companies should, apart from developing technical competitive advantage, should also give importance to other marketing related efforts in order to be more competitively efficient.

a) Limitation

The numbers of companies were limited and were dependent on the availability of data as per CMIE database.

The detailed information about the three factors (i.e. no. pf branches, no. of strategic partners and no. of vertical industries served) was based on the data available on the respective company site on the day and date of access, and hence was dependent on the updated ness of the respective websites.

Limited factors as a measure of efficiency were used in evaluating the performance of various companies.

Top 10 companies were redefined due to unavailability of data on extended factors.

b) Future Scope

This study can be conducted using larger factor base for more insight understanding of the software sector.

More number of companies can be incurporated in sample for research purpose. Geographical advantage brought by strategic partners can further be researched.

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Annexure 1 : DEA of 139 Companies

NO	DMU	Score	Benchmark(Lambda)
1	Unisys Softwares & Holding Inds. Ltd.	1	Unisys Softwares & Holding Inds. Ltd.(1.000000)
2	Dhanus Technologies Ltd.	0.896723	Unisys Softwares & Holding Inds. Ltd.(0.896723)
3	Tera Software Ltd.	0.472377	Unisys Softwares & Holding Inds. Ltd.(0.944753)
4	Taksheel Solutions Ltd.	0.372069	Unisys Softwares & Holding Inds. Ltd.(0.372069)
5	B L S Infotech Ltd.	0.357637	Unisys Softwares & Holding Inds. Ltd.(0.715274)
6	Mascon Global Ltd.	0.267115	Unisys Softwares & Holding Inds. Ltd.(2.671152)
7	Bharatiya Global Infomedia Ltd.	0.266799	Unisys Softwares & Holding Inds. Ltd.(0.533599)
8	Vakrangee Softwares Ltd.	0.246409	Unisys Softwares & Holding Inds. Ltd.(6.406645)
9	Birla Shloka Edutech Ltd.	0.232512	Unisys Softwares & Holding Inds. Ltd.(1.395069)
10	Sankhya Infotech Ltd.	0.195881	Unisys Softwares & Holding Inds. Ltd.(0.391762)
11	Kanika Infrastructure & Power Ltd.	0.164161	Unisys Softwares & Holding Inds. Ltd.(0.164161)
12	Tata Consultancy Services Ltd.	0.14156	Unisys Softwares & Holding Inds. Ltd.(222.673503)
13	Aftek Ltd.	0.140817	Unisys Softwares & Holding Inds. Ltd.(1.267350)
14	Vaishnavi Gold Ltd.	0.135166	Unisys Softwares & Holding Inds. Ltd.(1.081329)
15	Vedavaag Systems Ltd.	0.12966	Unisys Softwares & Holding Inds. Ltd.(0.129660)
16	I C S A (India) Ltd.	0.128892	Unisys Softwares & Holding Inds. Ltd.(10.569152)
17	Spanco Ltd.	0.113405	Unisys Softwares & Holding Inds. Ltd.(9.185837)
18	Valuemart Info Technologies Ltd.	0.111094	Unisys Softwares & Holding Inds. Ltd.(0.111094)
19	M Y M Technologies Ltd.	0.097934	Unisys Softwares & Holding Inds. Ltd.(0.097934)
20	Agnite Education Ltd.	0.093355	Unisys Softwares & Holding Inds. Ltd.(3.080728)
21	Bartronics India Ltd.	0.088891	Unisys Softwares & Holding Inds. Ltd.(4.533437)
22	Svam Softwares Ltd.	0.085377	Unisys Softwares & Holding Inds. Ltd.(0.085377)
23	Acropetal Technologies Ltd.	0.076051	Unisys Softwares & Holding Inds. Ltd.(1.064717)
24	Interworld Digital Ltd.	0.072234	Unisys Softwares & Holding Inds. Ltd.(0.072234)
25	Prithvi Information Solutions Ltd.	0.071726	Unisys Softwares & Holding Inds. Ltd.(11.978229)
26	Prism Informatics Ltd.	0.062639	Unisys Softwares & Holding Inds. Ltd.(0.125279)
27	I K F Technologies Ltd.	0.057995	Unisys Softwares & Holding Inds. Ltd.(0.463962)
28	Teledata Marine Solutions Ltd.	0.057834	Unisys Softwares & Holding Inds. Ltd.(1.561525)
29	Powersoft Global Solutions Ltd.	0.053856	Unisys Softwares & Holding Inds. Ltd.(0.107712)

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30	Ranklin Solutions Ltd.	0.051739	Unisys Softwares & Holding Inds. Ltd.(0.310433)
31	Softech Infinium Solution Ltd.	0.050511	Unisys Softwares & Holding Inds. Ltd.(0.050511)
32	Core Education & Technologies Ltd.	0.049212	Unisys Softwares & Holding Inds. Ltd.(3.936989)
33	Glodyne Technoserve Ltd.	0.048573	Unisys Softwares & Holding Inds. Ltd.(7.383118)
34	Geometric Ltd.	0.04311	Unisys Softwares & Holding Inds. Ltd.(1.983058)
35	Megasoft Ltd.	0.042509	Unisys Softwares & Holding Inds. Ltd.(0.510106)
36	L G S Global Ltd.	0.041573	Unisys Softwares & Holding Inds. Ltd.(2.244964)
37	Silverline Technologies Ltd.	0.038685	Unisys Softwares & Holding Inds. Ltd.(0.232111)
38	Northgate Technologies Ltd.	0.035815	Unisys Softwares & Holding Inds. Ltd.(0.035815)
39	Nimbus Foods Inds. Ltd.	0.035704	Unisys Softwares & Holding Inds. Ltd.(0.071407)
40	Micro Technologies (India) Ltd.	0.034733	Unisys Softwares & Holding Inds. Ltd.(2.813364)
41	Financial Technologies (India) Ltd.	0.033888	Unisys Softwares & Holding Inds. Ltd.(4.269951)
42	Oracle Financial Services Software Ltd.	0.033236	Unisys Softwares & Holding Inds. Ltd.(18.745207)
43	Ram Informatics Ltd.	0.032917	Unisys Softwares & Holding Inds. Ltd.(0.032917)
44	Teledata Technology Solutions Ltd.	0.032137	Unisys Softwares & Holding Inds. Ltd.(0.064274)
45	Elnet Technologies Ltd.	0.031914	Unisys Softwares & Holding Inds. Ltd.(0.127656)
46	Saksoft Ltd.	0.031899	Unisys Softwares & Holding Inds. Ltd.(0.318992)
47	Hexaware Technologies Ltd.	0.031044	Unisys Softwares & Holding Inds. Ltd.(4.066726)
48	L C C Infotech Ltd.	0.030216	Unisys Softwares & Holding Inds. Ltd.(0.151082)
49	Geodesic Ltd.	0.030041	Unisys Softwares & Holding Inds. Ltd.(5.046828)
50	Sonata Software Ltd.	0.027885	Unisys Softwares & Holding Inds. Ltd.(2.258657)
51	Tech Mahindra Ltd.	0.02738	Unisys Softwares & Holding Inds. Ltd.(38.057661)
52	Zylog Systems Ltd.	0.027211	Unisys Softwares & Holding Inds. Ltd.(6.884321)
53	Saven Technologies Ltd.	0.027196	Unisys Softwares & Holding Inds. Ltd.(0.027196)
54	3I Infotech Ltd.	0.026029	Unisys Softwares & Holding Inds. Ltd.(6.819587)
55	A S M Technologies Ltd.	0.026028	Unisys Softwares & Holding Inds. Ltd.(0.468506)
56	Omnitech Infosolutions Ltd.	0.025846	Unisys Softwares & Holding Inds. Ltd.(2.377856)
57	Sanraa Media Ltd.	0.02516	Unisys Softwares & Holding Inds. Ltd.(0.503195)
58	T Spiritual World Ltd.	0.02399	Unisys Softwares & Holding Inds. Ltd.(0.143942)
59	California Software Co. Ltd.	0.023641	Unisys Softwares & Holding Inds. Ltd.(0.567395)

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60	Patni Computer Systems Ltd.	0.023583	Unisys Softwares & Holding Inds. Ltd.(15.659013)
61	Mastek Ltd.	0.023142	Unisys Softwares & Holding Inds. Ltd.(3.147273)
62	A B M Knowledgeware Ltd.	0.023054	Unisys Softwares & Holding Inds. Ltd.(0.438029)
63	K L G Systel Ltd.	0.02265	Unisys Softwares & Holding Inds. Ltd.(0.770100)
64	I T People (India) Ltd.	0.022273	Unisys Softwares & Holding Inds. Ltd.(0.089092)
65	Cura Technologies Ltd.	0.02223	Unisys Softwares & Holding Inds. Ltd.(0.133378)
66	H C L Technologies Ltd.	0.022228	Unisys Softwares & Holding Inds. Ltd.(51.724253)
67	Allied Digital Services Ltd.	0.022202	Unisys Softwares & Holding Inds. Ltd.(3.929782)
68	7Seas Entertainment Ltd.	0.021748	Unisys Softwares & Holding Inds. Ltd.(0.065244)
69	Softsol India Ltd.	0.02123	Unisys Softwares & Holding Inds. Ltd.(0.148610)
70	Subex Ltd.	0.020095	Unisys Softwares & Holding Inds. Ltd.(2.451627)
71	Kernex Microsystems (India) Ltd.	0.020041	Unisys Softwares & Holding Inds. Ltd.(0.340690)
72	Infotech Enterprises Ltd.	0.019963	Unisys Softwares & Holding Inds. Ltd.(5.050676)
73	Compucom Software Ltd.	0.019341	Unisys Softwares & Holding Inds. Ltd.(0.541537)
74	C M C Ltd.	0.018993	Unisys Softwares & Holding Inds. Ltd.(6.020880)
75	Moschip Semiconductor Technology Ltd.	0.018626	Unisys Softwares & Holding Inds. Ltd.(0.186260)
76	Firstobject Technologies Ltd.	0.018532	Unisys Softwares & Holding Inds. Ltd.(0.185317)
77	Infosys Ltd.	0.018254	Unisys Softwares & Holding Inds. Ltd.(197.146679)
78	H O V Services Ltd.	0.017529	Unisys Softwares & Holding Inds. Ltd.(0.192822)
79	Educomp Solutions Ltd.	0.017244	Unisys Softwares & Holding Inds. Ltd.(7.949621)
80	N I I T Technologies Ltd.	0.016588	Unisys Softwares & Holding Inds. Ltd.(5.590058)
81	Visu International Ltd.	0.016386	Unisys Softwares & Holding Inds. Ltd.(0.131088)
82	Everonn Education Ltd.	0.015934	Unisys Softwares & Holding Inds. Ltd.(2.310373)
83	Ajel Ltd.	0.015567	Unisys Softwares & Holding Inds. Ltd.(0.031134)
84	Cat Technologies Ltd.	0.015381	Unisys Softwares & Holding Inds. Ltd.(0.061525)
85	Crazy Infotech Ltd.	0.015083	Unisys Softwares & Holding Inds. Ltd.(0.045250)
86	Panoramic Universal Ltd.	0.014593	Unisys Softwares & Holding Inds. Ltd.(0.642072)
87	Sasken Communication Technologies Ltd.	0.014561	Unisys Softwares & Holding Inds. Ltd.(3.087011)
88	Polaris Financial Technology Ltd.	0.014111	Unisys Softwares & Holding Inds. Ltd.(10.766830)
89	V J I L Consulting Ltd.	0.013895	Unisys Softwares & Holding Inds. Ltd.(0.013895)

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90	C S S Technergy Ltd.	0.013389	Unisys Softwares & Holding Inds. Ltd.(0.107111)
91	Intense Technologies Ltd.	0.012097	Unisys Softwares & Holding Inds. Ltd.(0.120969)
92	Helios & Matheson Information Technology Ltd.	0.012059	Unisys Softwares & Holding Inds. Ltd.(1.712439)
93	Datamatics Global Services Ltd.	0.011598	Unisys Softwares & Holding Inds. Ltd.(1.148165)
94	Tutis Technologies Ltd.	0.011444	Unisys Softwares & Holding Inds. Ltd.(0.091551)
95	K P I T Cummins Infosystems Ltd.	0.01141	Unisys Softwares & Holding Inds. Ltd.(4.050528)
96	Take Solutions Ltd.	0.011263	Unisys Softwares & Holding Inds. Ltd.(0.473027)
97	Nucleus Software Exports Ltd.	0.011106	Unisys Softwares & Holding Inds. Ltd.(1.710284)
98	G S S Infotech Ltd.	0.010922	Unisys Softwares & Holding Inds. Ltd.(0.360418)
99	Infinite Computer Solutions (India) Ltd.	0.010792	Unisys Softwares & Holding Inds. Ltd.(1.705082)
100	Persistent Systems Ltd.	0.010704	Unisys Softwares & Holding Inds. Ltd.(4.795586)
101	Tanla Solutions Ltd.	0.01035	Unisys Softwares & Holding Inds. Ltd.(0.217343)
102	Mindtree Ltd.	0.010324	Unisys Softwares & Holding Inds. Ltd.(11.563382)
103	Kaashyap Technologies Ltd.	0.010214	Unisys Softwares & Holding Inds. Ltd.(0.439191)
104	Zensar Technologies Ltd.	0.010156	Unisys Softwares & Holding Inds. Ltd.(4.397533)
105	Wipro Ltd.	0.009337	Unisys Softwares & Holding Inds. Ltd.(201.671125)
106	R Systems International Ltd.	0.008948	Unisys Softwares & Holding Inds. Ltd.(1.395898)
107	F C S Software Solutions Ltd.	0.008894	Unisys Softwares & Holding Inds. Ltd.(0.925026)
108	Satyam Computer Services Ltd.	0.008742	Unisys Softwares & Holding Inds. Ltd.(38.726408)
109	Onward Technologies Ltd.	0.008541	Unisys Softwares & Holding Inds. Ltd.(0.350201)
110	Tata Elxsi Ltd.	0.008534	Unisys Softwares & Holding Inds. Ltd.(3.089372)
111	Comp-U-Learn Tech India Ltd.	0.008245	Unisys Softwares & Holding Inds. Ltd.(0.107186)
112	Quintegra Solutions Ltd.	0.008029	Unisys Softwares & Holding Inds. Ltd.(0.128458)
113	Usha Martin Education & Solutions Ltd.	0.008021	Unisys Softwares & Holding Inds. Ltd.(0.136350)
114	R S Software (India) Ltd.	0.007567	Unisys Softwares & Holding Inds. Ltd.(1.415063)
115	Trigyn Technologies Ltd.	0.00751	Unisys Softwares & Holding Inds. Ltd.(0.217789)
116	Virinchi Technologies Ltd.	0.007462	Unisys Softwares & Holding Inds. Ltd.(0.283549)
117	N I I T Ltd.	0.007422	Unisys Softwares & Holding Inds. Ltd.(5.188289)
118	I E C Education Ltd.	0.007143	Unisys Softwares & Holding Inds. Ltd.(0.057141)
119	Logix Microsystems Ltd.	0.007056	Unisys Softwares & Holding Inds. Ltd.(0.317506)

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120	Info-Drive Software Ltd.	0.006894	Unisys Softwares & Holding Inds. Ltd.(0.158567)
121	Thinksoft Global Services Ltd.	0.006888	Unisys Softwares & Holding Inds. Ltd.(0.475256)
122	Ramco Systems Ltd.	0.00666	Unisys Softwares & Holding Inds. Ltd.(1.172091)
123	Zen Technologies Ltd.	0.006658	Unisys Softwares & Holding Inds. Ltd.(0.186432)
124	Datanet Systems Ltd.	0.005989	Unisys Softwares & Holding Inds. Ltd.(0.257542)
125	Nexxoft Infotel Ltd.	0.005845	Unisys Softwares & Holding Inds. Ltd.(0.099369)
126	Goldstone Technologies Ltd.	0.005624	Unisys Softwares & Holding Inds. Ltd.(0.179967)
127	Kale Consultants Ltd.	0.00555	Unisys Softwares & Holding Inds. Ltd.(1.326423)
128	Mphasis Ltd.	0.005231	Unisys Softwares & Holding Inds. Ltd.(28.841878)
129	Cigniti Technologies Ltd.	0.005186	Unisys Softwares & Holding Inds. Ltd.(0.057051)
130	Four Soft Ltd.	0.005116	Unisys Softwares & Holding Inds. Ltd.(0.199510)
131	Accel Transmatic Ltd.	0.004566	Unisys Softwares & Holding Inds. Ltd.(0.150691)
132	Netlink Solutions (India) Ltd.	0.004458	Unisys Softwares & Holding Inds. Ltd.(0.004458)
133	Onmobile Global Ltd.	0.004242	Unisys Softwares & Holding Inds. Ltd.(3.728637)
134	S Q L Star International Ltd.	0.004083	Unisys Softwares & Holding Inds. Ltd.(0.155149)
135	Intellvisions Software Ltd.	0.003708	Unisys Softwares & Holding Inds. Ltd.(0.155744)
136	Lee & Nee Softwares (Exports) Ltd.	0.003121	Unisys Softwares & Holding Inds. Ltd.(0.009362)
137	Software Technology Group International Ltd.	0.003047	Unisys Softwares & Holding Inds. Ltd.(0.051791)
138	Indo -City Infotech Ltd.	0.002564	Unisys Softwares & Holding Inds. Ltd.(0.005127)
139	Zenith Infotech Ltd.	0.001007	Unisys Softwares & Holding Inds. Ltd.(2.177541)

Annexure 2 : A

NO	DMU/ TOP COMPANIES	Before	After
1	Aftek Ltd.	0.140817	0.591889
2	Bharatiya Global Infomedia Ltd.	0.266799	0.515192
3	Birla Shloka Edutech Ltd.	0.232512	1
4	Kanika Infrastructure & Power Ltd.	0.164161	0.366916
5	Mascon Global Ltd.	0.267115	1
6	Sankhya Infotech Ltd.	0.195881	0.481623
7	Tata Consultancy Services Ltd.	0.14156	1
8	Tera Software Ltd.	0.472377	1
9	Unisys Softwares & Holding Inds. Ltd.	1	1
10	Vakrangee Softwares Ltd.	0.246409	1

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Annexure 2 : B

NO	DMU/BOTTOM COMPANIES	Before	After
1	Accel Transmatic Ltd.	1	1
2	Four Soft Ltd.	1	1
3	Indo-City Infotech Ltd.	0.619281	0.691404
4	Intellvisions Software Ltd.	0.903571	0.947997
5	Lee & Nee Softwares (Exports) Ltd.	0.765428	0.765428
6	Netlink Solutions (India) Ltd.	0.871508	1
7	Onmobile Global Ltd.	1	1
8	S Q L Star International Ltd.	1	1
9	Software Technology Group International Ltd.	0.744972	1
10	Zenith Infotech Ltd.	0.253605	1

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