Measuring and predicting competitiveness of Indian firms in Pharmaceutical Industry

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Abstract
The Indian Pharmaceuticals sector has come a long way, being almost non-existing during 1970, to a prominent provider of health care products, meeting almost 95% of country's pharmaceutical needs. The domestic pharmaceutical output has increased at a compound growth rate (CAGR) of 13.7% per annum. As the Indian Pharmaceutical firms are opening up to compete at global level, there is an immediate need to devise strategies to measure and enhance competitiveness for global competition. This paper suggests a tool, a mathematical model for measuring competitiveness using nine quantifiable, though non-exhaustive, parameters under assets, process, and performance with reference to the APP framework. Model intakes data of 25 pharmaceutical firms (including the top 10 firms in the world), runs a simulation in MATLAB using a 3-D vector system giving strategic measures to enhance competitiveness.

Key words: Indian Pharmaceutical sector, Mathematical modelling, APP framework, Measuring and enhancing competitiveness.

Introduction
In the process of industrialization, pharmaceuticals have been a very important and favourite sector for policy makers in the developed as well in many developing countries, including India. This special policy preference has been due to the criticality of the pharmaceutical products for the health security of the masses as well as for developing strategic advantages in the knowledge-based economy. However, not all developing countries succeeded in enhancing local capabilities in the sector. The growth of the pharmaceutical industry in the developing region is largely confined to a few countries like India, China, Singapore, Korea, the Czech Republic, Brazil, and Argentina. Among these countries, the Indian pharmaceutical industry is most often projected as the most successful case of a developing country scaling up the indigenous capabilities.

The Indian pharmaceutical industry, which had little technological capabilities to manufacture modern drugs locally in the 1950s, has emerged technologically as the most dynamic manufacturing segment in the Indian economy in the 1990s and is now in the front rank of India's science-based industries. It achieved a significant scale and level of technological capability for manufacturing modern drugs indigenously and cost efficiently to emerge as a major developing country competitor in the world market. It indigenously meets up to 70 per cent of the domestic requirement of bulk drugs and almost all the demands for formulations, thus, restricting imports from developed countries into India. Besides, it generates rising trade surpluses in pharmaceutical products by exporting to over 65 countries, therefore, significantly competing with developed countries for global market share. It produces life saving drugs belonging to all major therapeutic groups at a fraction of prices existing in the world market. Thus, it has been seen as ensuring health security of the poorer countries. The industry today possesses the largest number of US Food & Drug Administration (FDA) approved manufacturing facilities outside the US and has filed 126 Drug Master Files (DMFs) with the US FDA for drug exports to the US, which is higher than that filed by Spain, Italy, China and Israel taken together.

This highly organized sector is estimated to be worth $ 8 billion. The domestic pharmaceutical output has increased at a compound growth rate (CAGR) of 13.7% per annum. It ranks very high in the third world, in terms of technology, quality and range of medicines manufactured. Globally, the Indian industry ranks 4th in terms of volume and 13th in terms of value. Indian pharmaceuticals industry has over 20,000 units. Around 260 of which constitute the organized sector, while others exist in the small scale sector. From simple headache pills to sophisticated antibiotics and complex cardiac compounds, almost every type of medicine is now made indigenously.

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The exports constitute almost 40% of the total production of pharmaceuticals in India. India's pharmaceutical exports are to the tune of $3.5bn currently, of which formulations contribute nearly 55% and the rest 45% comes from bulk drugs. The export revenue now contributes almost half of the total revenue for the top 3 pharma majors: Dr Reddy's, Ranbaxy and Cipla. The other major exporters are Wockhardt Limited, Sun Pharmaceutical Industries Ltd. and Lupin Laboratories. The formulations and exports are largely to developing nations in CIS, South East Asia, Africa, and Latin America. In the last 3 years generic exports to developed countries have picked up.

Exports of Drugs, Pharmaceuticals and fine chemicals

1999-2000	2000-2001	2001-2002	2002-03	2003-04
Rs.7230.16cr ($1.60 bn)	Rs.8757.47cr ($1.95 bn)	Rs.9834.7cr ($2.18 bn)	Rs.11925.4cr ($ 2.65 bn)	Rs.14100.00cr ($3.13 bn)

Growth of pharmaceutical exports

1999-2000	2000-2001	2001-2002	2002-03	2003-04
15.57%	20.73%	11.13%	21.2%	18.24%

The phenomenal progress made by the industry over the last three decades has instilled a strong belief in the government and the pharmaceutical companies in India that the country has a competitive strength and it should be enhanced by suitable policy measures and firm specific actions with regard to export, innovation, strategic alliances and investment. The Pharmaceutical Policy 2004-05 echoes the same sentiment and has shifted the focus of the policy from self-reliance in drugs manufacturing to the objective of enhancing global competitiveness.

Against the above backdrop of increasing attention of the policy makers on global competitiveness of the Indian pharmaceutical sector, the present study shall make an attempt to put the performance of the sector in a global setting. Most of the recent studies on Indian pharmaceutical industry deal with the impact of economic liberalization and new global intellectual property rights (IPR) regime on industry performance like R&D and patenting, foreign investment, exports, and drugs prices and public health (e.g., Watal, 1996; Lanjouw, 1998; Pradhan, 2002, 2006; Fink, 2000; Lalitha, 2002; Kumar and Pradhan, 2003; are few to mention). However, the issue of global competitiveness of the industry is still not rigorously addressed. How does the Indian pharmaceutical industry perform in a global setting? This issue, in turn, involves a comparative analysis of the Indian pharmaceutical industry in a cross-country setting and exploring its growth, productivity, technology and performance vis-à-vis global peers in the sector and an analysis of how firms stand in terms of strategic muscle put in three different spheres of assets, processes and productivity (taking reference from the APP framework model, discussed in detail later).

The scope for expansion and development in the pharmaceutical sector in different divisions with the given possibilities would have competition from firms around the world. The advantages that Indian firms enjoy like having a pool of low-cost and highly skilled medical professionals, manufacturing facilities of international standards and quick absorption of new technology by the set-up surely gives India the advantage. But as it has been observed, that in the market selling product with cutting price is not an ever lasting strategy to be competitive in the market. The Indian firms need to strategies a directional move to reach among the top and to head its journey of competitiveness on the global scenario.

The present scenario in the pharmaceutical Industry offers opportunity in two fields for Indian firms. One field is of the existing generic drugs segment, and the other field is the race for new product development, i.e. R&D in drug discovery. We stand at the position where the question would be on the delicacy of where to invest and how much to invest. India is a country of not a very strong R&D base but with the product patent regime that would be a factor in which we had to be strong. The other part of the investments is in the generic drug sector, but the issue is that

the profit margin is very less in the making of generic drugs. With a number of drugs going off patent, the deal would be up for the taking, and with the present trend the race for producing the generic drugs and capturing markets in Europe and America would be crucial. With India and China clearly having some advantages the question is would it be possible for India to cut a share in the pie or would it be the dragon (China) wiping it off.

Thus, strategising division of strengths and creating a vision for travelling the journey of competitiveness holds prime importance. Thus in this paper we would place some of the Indian firms on Global scenario and would understand and quantify the parameters of competitiveness. For the purpose of this quantification we propose a mathematical model to measure and predict enhancing factors for competitiveness.

It is an approach to bring down different firms of an industry to a common platform to make feasible, the measurement and analysis of firm level competitiveness using APP framework. The model is based on the assumption that the top most companies in a sector are most competitive and other companies should follow the same strategic weightages to enhance there own competitive facets and factors. The model would benchmark a firm with respect to all other firms in the industry to give a broader image of positioning of the competitiveness. The model calculations will give a direction and required magnitude for a firm to formulate strategies on the aspects of where and how much to stress on different parameters of competitiveness. For 2005, the top ten companies taken for model are : Pfizer, Bristol Myers, GSK, Sanofi Aventis, Novartis, Hoffman la roche, Merck, Astra Zeneca, Abott, J&J and the rest 15 firms taken are : Eli lily, Bayer, Amgen, Takeda, Astellas Pharma, Eisai, Genentech, Taisho Pharma, Mitsubishi Pharma, Teva, Ranbaxy, Cipla, Dr. Reddy, Aurobindo Pharma, Sun Pharma

METHOD

The mathematical model presented in this paper attempts to investigate the APP framework of global pharmaceutical companies using a 3-D vector system. Each company's competitiveness is quantified as nine quantifiable, though non-exhaustive, parameters clumped as groups of three under assets, process, and performance. The investigated parameters are

ASSETS	PROCESSES	PERFORMANCE
Number of employees	R&D as % of sales	Net sales
Investment in R&D	Productivity	P/E ratio
Total assets	Growth rate	Return on assets

The data values for 25 firms for the above mentioned facets were scaled down to 1000, reducing them to a comparable scale. The modelling was then done with a two-step process. In the first step, the sub-factors of the given facet (say f_1, f_2 and f_3) were taken to be the three components of a vector and the vectors ($f_1i + f_2j + f_3k$) for different companies were plotted. The following procedure was followed to determine a company X's performance in a specific facet F:

1) A simulation was run using MATLAB to assign each sub-factor a specific weightage, w_i (changing the vectors into $w_1f_1i + w_2f_2j + w_3f_3k$) so that the vectors of the top ten companies of the field came as close together as possible. This procedure was adopted to find out a common denominator for the top companies so that a more effective way of comparing the competitiveness of other companies in relation to these could be found.
2) The average vector (say V_{avg}) of the top ten companies was then calculated and assumed to be the ideal ratio of f_1, f_2 and f_3 that a company should strive to achieve. The merit of taking weightages in order to clump the vectors close together lies in increasing the relevance of the average vector as an ideal level of competitiveness.
3) The vectors for other pharmaceutical companies were then plotted and their distance (M) from V_{avg} was calculated. This was taken as the magnitude of change a company needs to bring about in order to reach globally competitive levels of that facet. Similarly, the angle between V_{avg} and a company's vector (Φ) was taken as a measure of the deviation of a

company's sub-factor ratios from ideality. M vs Φ plots were then drawn to give an overall picture of a company's state of competitiveness in a specific facet (assets, process or performance).

4) The length of the weighted vector obtained for each company in a facet was taken as its strength in that field and was used to create an overall vector with components representing the three fields of assets, process and performance. As before, an averaging procedure was followed for the top ten companies, but this time a spherical region marking the standard deviation of the top ten companies from their average was drawn. This spherical region was assumed to be the region of competitiveness and the efforts required by a company in the future to attain global competitiveness were measured as the shortest path a company could take to reach the surface of the sphere.

RESULTS

1. The open source data from annual reports and literature survey along with their scaled down values on 1000 are shown in table 1, table 2 and table 3.

	ASSETS			Scaled down values		
	No. of Employees	R&D Inv.(m$)	Total assets (m$)	No. of Employees	R&D Inv.(m$)	Total assets (m$)
Pfizer	106000	7438	117565	1000	1000	1000
Bristol Myers	42,000	2746	28138	396.2264151	369.185265	239.33994
GSK	100000	5801.6	27,198	943.3962264	779.994622	231.34436
Sanofi Aventis	88,483	5200	112655	834.745283	699.112665	958.23587
Novartis	90,924	4,846	57732	857.7735849	651.519226	491.06452
Hoffman la roche	48,049	4146	46352	453.2924528	557.407905	394.267
Merck	61,500	3848	44845	580.1886792	517.343372	381.44856
Astra Zeneca	65,000	3379	24,840	613.2075472	454.288787	211.28737
Abott	59,735	1,821	12,727	563.5377358	244.823877	108.25501
J&J	54,523	4,515	58,864	514.3679245	607.018016	500.69323
Eli lily	42,600	3025	24,580	401.8867925	406.695348	209.07583
Bayer	93,700	2,452	47738.6	883.9622642	329.631621	406.06133
Amgen	30,050	2,314	27,297	283.490566	311.105136	232.18645
Takeda	14,510	1,230	18,134	136.8867925	165.367034	154.24659
Astellas Pharma	11,060	1,192	8537	104.3396226	160.258134	72.615149
Eisai	8000	680	5756	75.47169811	91.4224254	48.96015
Genentech	9563	1,262	12147	90.21698113	169.669266	103.32157
Taisho Pharma	5339	201	5337	50.36792453	27.0233934	45.396164
Mitsubishi Pharma	5917	439	2527	55.82075472	59.0212423	21.494492
Teva	14698	369	10387	138.6603774	49.6101102	88.351125
Ranbaxy	7174	112.33	1386.34	67.67924528	15.102178	11.792115
Cipla	5500	26.66	408.36	51.88679245	3.58429685	3.4734828
Dr. Reddy	7525	62	650.84	70.99056604	8.33557408	5.5360014
Aurobindo Pharma	4200	21	379.68	39.62264151	2.82333961	3.2295326
Sun Pharma	4520	25.636	800.86	42.64150943	3.44662544	6.8120614

Table 1: Assets data with their scaled down values for 25 firms for the year 2005.

2. Figure 1(a), M vs Φ plot for the facet ASSETS, showing the positioning of all the 25 firms, with the firm nearest to the ideal position of origin (0, 0) being most competitive. For any firm on the plot, the value on abscissa (x-axis) represents the offset in direction from ideality and the value on ordinate represents the magnitude of distance which the firm would have to travel in its journey of competitiveness. Figure 2(a) and Figure 3(a) represents similar plots of M vs Φ for facets PROCESS and PERFORMANCE respectively.

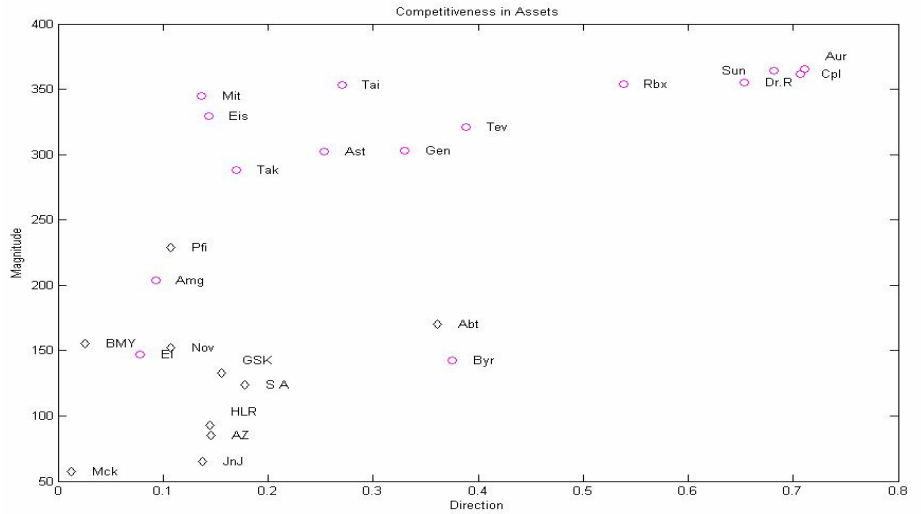


Figure 1(a): M vs Φ plot for ASSETS

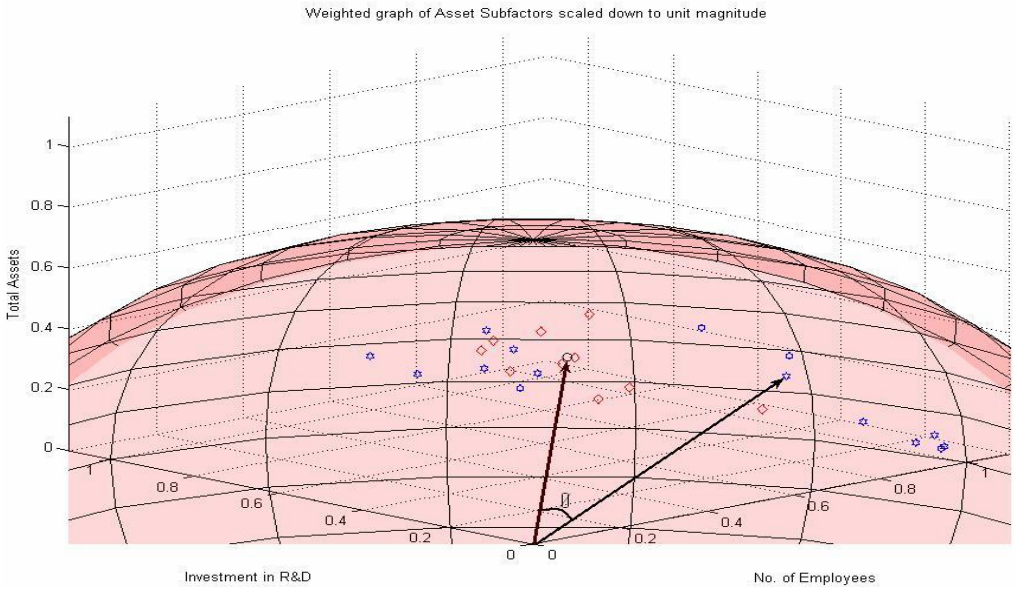


Figure 1(b): Wighted graph of Assets subfactors scaled down to unit magnitude.

3. Figure 1(b) represents a three dimensional plot Assets sub-factors scaled down to unit magnitude. The point shown by black circle represents the resultant average vector (V_{avg}) of the vectors of top 10 firms and Φ is the offset or deviation of any of the rest of the firms from the ideal vector $V_{avg.}$ Figure 2(b) and Figure 2(c) represents similar 3-D plot for sub-factors of PROCESS and PERFORMANCE respectively.

	PROCESSES			Scaled down values		
	R&D as % of sales	Productivity	Growth Rate (%)	R&D as % of sales	Productivity	Growth Rate (%)
Pfizer	14.5	0.4839434	7	672.8538283	664.4009385	160.9195
Bristol myers	14.3	0.45730952	1.47	663.5730858	627.8355675	33.7931
GSK	8.3	0.4007285	14.47	385.1508121	550.1560586	332.6437
Sanofi aventis	14.8	0.27783209	9.3	686.774942	381.432829	213.7931
Novartis	15.04	0.3542739	14	697.9118329	486.3790122	321.8391
Hoffman la roche	18.28	0.4719349	25	848.2598608	647.9145966	574.7126
Merck	17.48	0.35790244	0.1	811.136891	491.3605976	2.298851
Astra zeneca	14.1	0.36846154	10	654.2923434	505.8570772	229.8851
Abott	8.15	0.37393488	13.5	378.1902552	513.3713705	310.3448
J&J	20.22	0.40940521	0.876	938.2830626	562.0682184	20.13793
Eli lily	20.7	0.34377934	6	960.5568445	471.9711431	137.931
Bayer	6.88	0.37990395	17.6	319.2575406	521.5662453	404.5977
Amgen	19.24	0.40006656	20.49	892.8074246	549.2472821	471.0345
Takeda	12.59	0.67291523	3.4	584.2227378	923.8384373	78.16092
Astellas Pharma	14.5	0.7283906	5.21	672.8538283	999.9999996	119.7701
Eisai	14.7	0.57925	6.6	682.1345708	795.2463999	151.7241
Genentech	19	0.69361	43.5	881.6705336	952.2500741	1000
Taisho Pharma	8.3	0.45495	0.1	385.1508121	624.5962014	2.298851
Mitsubishi Pharma	21.55	0.3442	0.1	1000	472.5486592	2.298851
Teva	7.02	0.3571914	9.39	325.7540603	490.3844194	215.8621
Ranbaxy	9.53	0.16420407	27.6	442.2273782	225.4340884	634.4828
Cipla	4	0.12	28	185.6148492	164.7467725	643.6782
Dr. Reddy	14.58	0.05647	5.2	676.5661253	77.52708538	119.5402
Aurobindo Pharma	6.67	0.07495	0.1	309.512761	102.8980883	2.298851
Sun pharma	11.6	0.0488938	46	538.2830626	67.12579789	1057.471

Table 2: Process data with their scaled down values for 25 firms for the year 2005

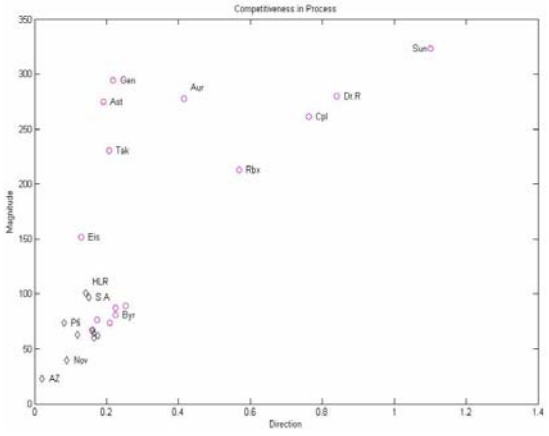


Figure 2(a): M vs Φ plot for PROCESS

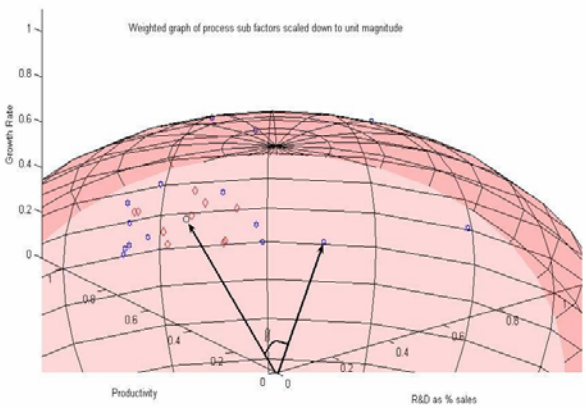
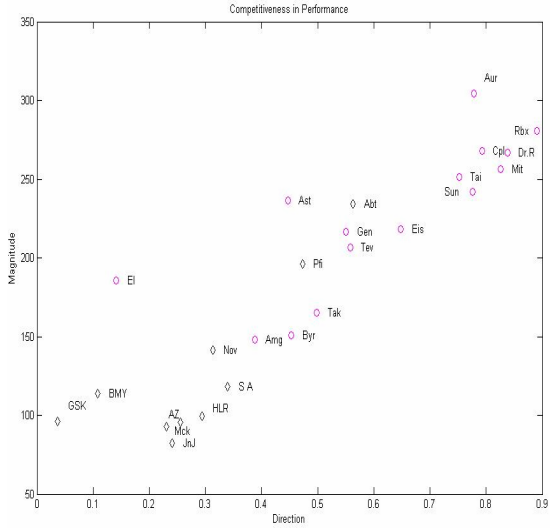


Figure 2(b): Wighted graph of Process subfactors

	PERFORMANCE				Scaled down values		
	net sales (m $)	P/E	E/P	ROA	net sales (m $)	E/P	ROA
Pfizer	51,298	27.1	0.03690037	6.877047	1000	458.071019	259.562
Bristol myers	19,207	32.67974	0.0306	10.66174	374.4200554	379.8599732	402.408
GSK	40072.85	16.64469	0.06007921	17.70718	781.1776288	745.8067422	668.325
Sanofi aventis	35100	12.87926	0.07764423	7.713079	684.2372022	963.8540986	291.116
Novartis	32,212	21.8327	0.04580286	10.63708	627.9387111	568.5840427	401.477
Hoffman la roche	22,676	12.41379	0.08055556	12.02781	442.0445242	999.9944828	453.968
Merck	22,011	15.2381	0.065625	10.32668	429.0810558	814.6506778	389.762
Astra zeneca	23,950	17.18213	0.0582	19.01771	466.8798004	722.4787725	717.789
Abott	22,337	297.3333	0.00336323	26.49485	435.4360794	41.75019489	1000
J&J	22,322	17.78107	0.0562396	17.09024	435.1436703	698.1429151	645.04
Eli lily	14,645	32.93413	0.03036364	5.451587	285.488713	376.9258201	205.76
Bayer	35,597	16.1117	0.06206671	4.348682	693.9256891	770.479049	164.133
Amgen	12,022	24.64375	0.04057824	13.45935	234.3561152	503.7270957	507.999
Takeda	9,764	15.98162	0.06257189	14.29359	190.3388046	776.7501944	539.486
Astellas Pharma	8056	27.08333	0.03692308	3.689821	157.0431596	458.3529088	139.266
Eisai	4,634	16.64671	0.06007194	8.7	90.33490584	745.7165505	328.366
Genentech	6,633	78.38983	0.01275676	10.52935	129.3032867	158.3588653	397.411
Taisho Pharma	2,429	19.19192	0.05210526	5.8	47.35077391	646.8203878	218.91
Mitsubishi Pharma	2,037	15.55556	0.06428571	5.8	39.70720106	798.0251538	218.91
Teva	5250	24.27746	0.04119048	10.32059	102.3431713	511.3272281	389.532
Ranbaxy	1178	21.60584	0.04628378	3.226481	22.96385824	574.554146	121.778
Cipla	660	24.52416	0.04077612	22.28916	12.86599867	506.1835171	841.264
Dr. Reddy	425	20.48023	0.04882759	5.562043	8.284923389	606.1322087	209.929
Aurobindo Pharma	314.82	57.88712	0.017275	2.510799	6.137081368	214.4470927	94.7655
Sun pharma	221	30.12048	0.0332	12.79874	4.308160162	412.1356572	483.065

Table 3: Performance data with their scaled down values for 25 firms for the year 2005



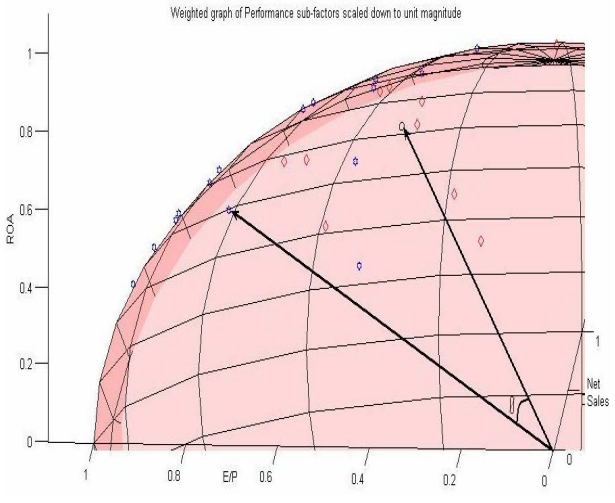


Figure 3(a): M vs Φ plot for PERFORMANCE
Figure 3(b): Wighted graph of Performance subfactors

4. Table 4 shows final optimized weightages (w_i), for subfactors of all Assets, Process and Performance. These are obtained after more than 1 lakh iterations done by the simulation program run in MATLAB as explained in methodology. Table 5, thus shows the optimized scaled down values of Assets, Process and Performance for all the 25 firms.

Optimized Weightages from model								
Assets			Process			Performance		
Number of Employees	Investment in R&D	Total Assets	R&D as % sales	Productivity	Growth Rate	Net Sales	E/P	ROA
0.4	0.4	0.2	0.2	0.6	0.2	0.4	0.2	0.4

Table 4: Optimized Weightages from model for subfactors of APP

Optimized Final Values of scaled down parameters			
COMPANIES	ASSETS	PROCESSES	PERFORMANCE
Pfizer	990.0505	489.4817	617.906
Bristol myers	392.0574	477.7911	274.587
GSK	933.6025	316.6114	539.867
Sanofi aventis	825.6896	454.59	431.752
Novartis	848.4833	474.5027	585.669
Hoffman la roche	448.5046	585.4229	320.042
Merck	574.2233	542.267	300.664
Astra zeneca	606.887	452.4084	393.815
Abott	557.3753	304.53	463.477
J&J	508.8962	626.4576	361.294
Eli lily	397.0108	629.4069	190.543
Bayer	874.1762	278.4766	427.368
Amgen	280.1873	597.5457	239.829
Takeda	134.6501	501.9902	235.466
Astellas Pharma	102.9724	562.2577	109.466
Eisai	74.2556	520.7033	136.399
Genentech	89.116	657.367	170.157
Taisho Pharma	49.5007	334.8673	87.8986
Mitsubishi Pharma	54.4532	653.7577	86.557
Teva	136.6209	273.4817	160.462
Ranbaxy	66.3302	290.6381	48.2411
Cipla	50.49	131.4	319.704
Dr. Reddy	69.3	426.8319	79.8002
Aurobindo Pharma	38.61	198.2945	35.9707
Sun pharma	41.58	339.8454	183.602

Table 5: Optimized scaled down values of APP for all the 25 firms.

5. Figure 4 shows a 3 dimensional plot of optimized scaled down values of Asset, Process and Performance where the sphere is constructed with the resultant average vector Vavg as center and standard deviation as radius. For every firm, it gives a competitiveness enhancing vector which is calculated by subtracting firm vector from Vavg. . The competitiveness enhancing vector represent changes in asset, process and performance which a firm should adopt in future for enhancing their competitiveness. For example, for the case of five Indian Pharmaceutical firms taken for this model are given in Table 6.

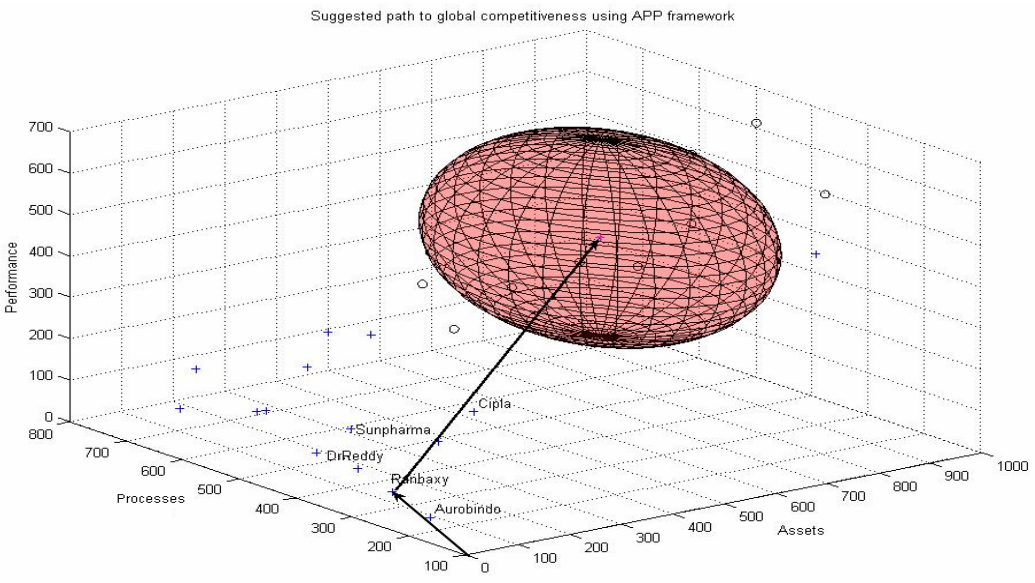


Figure 4: Three dimensional plot of optimized scaled down values of APP for all the firms.

Firm	ASSETS	PROCESS	PERFORMANCE
Ranbaxy	408.3101	123.2348	258.0833
Cipla	413.2048	227.9702	73.0049
DrReddy	395.1228	30.0487	230.1777
Aurobindo	441.4995	192.1056	275.3816
Sun Pharma	410.6471	86.8198	160.6606

Table 6: Values of Competitiveness Enhancing Vector

Discussion

The Mathematical model has helped to benchmark any firm with top firms of the industry by positioning them on M vs Φ plots of assets, process and performance. As seen from figure 1(a), 2 (a) and 3(a), the top pharmaceutical firms like Merck, Pfizer, Glaxo Smith Kline etc lie very close to ideal positioning i.e. the origin, whereas Indian firms like Ranbaxy, Dr. Reddy, Cipla etc. lie far away from origin in both the axes conveying that there is a need of strategic change required in both direction and magnitude. Also, it suggests the values of this change required in terms of where and how to reorganize their strategic weightages given to sub-factors of assets, process and performance to enhance their competitiveness in global scenario.

Figure 4 compiles up all the optimized values of the mathematical model and gives us a comprehensive vectorial picture of all 25 firms put together on a three dimensional plot with axes of assets, process and performance. Thus satisfying the present need to measure and predict the path of enhancing competitiveness which is clearly shown as the competitiveness enhancing vector on the plot. Taking example of Ranbaxy where the competitiveness enhancing vector is (408i + 123j+ 258k) which means that now Ranbaxy should redistribute their strategic intents in the ratio,

Assets : Process : Performance :: 408 : 123 : 258.

The advantage of this mathematical model approach is that it can be applied to any industry and to any number of firms. More factors can be added and the dimension of the vectors can be increased further to get better estimates. It also gives exact ratios of sub-factors that need to be

stressed and facets that need to be strengthened. On the other hand, the limitations of this approach are that the model's effectiveness is strongly dependent on the quality of data and can only be used on quantifiable data. Thus we may miss out on non-quantifiable important factors affecting competitiveness. However this idea of modelling can be further developed to achieve higher accuracy.

References

Momaya, Kirankumar & Ambastha , Ajitabh (2004). Competitiveness of Firms: Review of theory, Frameworks & Models. *Singapore Management Review*, volume 26, No.1, First Half, 2004. Pg-45-61.

Lalitha, N (2002), 'Indian Pharmaceutical Industry in WTO Regime, A SWOT Analysis',
Economic *and Political Weekly*, Vol.XXXVIII, No.34.

Business World (2004), 'PHARMA M&AS: What□s the big deal?', June 28

FICCI report for NMCC (2005) : Competitiveness of the Indian pharmaceutical industry in the new product patent regim.

Business World (2006), 'Sun Pharma: Mr Conservative gets it right', January 30.

Pfizer , *Annual Report 2004–05*.
Bristol myers, *Annual Report 2004–05*.
GSK, *Annual Report 2004–05*.
Sanofi aventis, *Annual Report 2004–05*.
Novartis, *Annual Report 2004–05*.
Hoffman la roche, *Annual Report 2004–05*.
Merck, *Annual Report 2004–05*.
Astra zeneca, *Annual Report 2004–05*.
Abott, *Annual Report 2004–05*.
J&J, *Annual Report 2004–05*.
Eli lily, *Annual Report 2004–05*.
Bayer , *Annual Report 2004–05*.
Amgen, *Annual Report 2004–05*.
Takeda, *Annual Report 2004–05*.
Astellas Pharma, *Annual Report 2004–05*.
Eisai, *Annual Report 2004–05*.
Genentech, *Annual Report 2004–05*.
Taisho Pharma, *Annual Report 2004–05*.
Mitsubishi Pharma, *Annual Report 2004–05*.
Teva, *Annual Report 2004–05*.
Ranbaxy, *Annual Report 2004–05*.
Cipla, *Annual Report 2004–05*.
Dr. reddy, *Annual Report 2004–05*.
Aurobindo Pharma, *Annual Report 2004–05*.
Sun pharma, *Annual Report 2004–05*.

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