TECHNICAL ALLIANCES AS A STRATEGY TO CREATE KNOWLEDGE: ANALYSIS OF PATTERNS ACROSS INDIAN PHARMACEUTICAL FIRMS

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It is widely acknowledged that knowledge creation is the major driver of firms' growth and lies at the very heart of the competitive process. Technical alliances are increasingly adopted as a strategy to create knowledge creation and improve the performance of firms as firms often do not possess all the knowledge required to innovate. It has brought to the fore, the need to mobilize not only internal resources, but also external actors. This paper examines some relevant cases from the Indian Pharmaceutical sector, which enables us to compare different strategies adopted across firms and what drives the selection of strategies.

Keywords: *Firms, Knowledge Creation, Patents, Technical Alliances*

JEL classification: L16, L65, O3, D23

1. Introduction

Knowledge creation and absorption has become one of the most important strategies for organizations for value creation, competition and a steady growth. Knowledge is considered as the main engine of economic growth and development (Romer, 1990; Rosenberg, 2004). This discussion has increased dramatically in both the popular and scholarly literature. By new knowledge creation, we mean that a producer produces "other things", or "same things differently" (Schumpeter, 1934)[2]. By creating and acquiring knowledge, individuals or organizations transcend the boundary of the old into a new self. Knowledge is considered (Prusak, 1997) as a strategy to compete and rather a critical basis for competition. The higher a firm's rate of new product development, the more likely the firm is to achieve and maintain the first-mover advantages (Deeds & Hill, 1996). Innovations and new product & process development has almost become a focal point of competition. To survive in this turbulent environment, new knowledge has to be created and absorbed by the firms on a continuous basis.

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[2] New creation according to Schumpeter is carried out of new combinations. It covers 5 cases (i) A new good which consumers are not familiar with or a new quality of good. (ii) A new method of production, which is yet not tested by any manufacturer.(iii)pening of a new market which may not have existed before.(iv)Conquest of a new source of supply whether it already existed or it is newly found.(v)New organization of the industry like a new market structure.

Alternative mechanisms are used to enhance the knowledge creation by the firms. Earlier, firms mainly relied on internal R&D capabilities. However, often firms do not possess the knowledge required to innovate and are limited in their ability to produce knowledge purely through internal R&D. Hence, Strategic organizational changes, which can take many forms, are often considered as a necessity for firms. Besides knowledge creation through internal R&D departments, developing knowledge & sharing with other firms, and also transfer from knowledge institutions such as public and private research centers are popularly increasing as substitute mechanisms to increase innovativeness by the firms. Hence, many firms are turning to collaborative activities such as strategic technology alliances, research joint ventures, mergers and acquisitions, licensing, royalties and corporate venture capital investments (Inkpen and Dinur, 1998; Dyer and Singh, 1998; Loof and Heshmati 2001; Hagedoorn and Schakenraad, 1994). These strategies are needed to create and develop resource base and organizational knowledge base. Intense competition and rapid technological change are often mentioned as primary motives for firms to adapt to new strategies. Increasingly and interestingly, even the largest companies worldwide are obliged to use external sources of technology (Nooteboom et.al, 2007).

India is also moving on the same track. Many industries such as Pharmaceuticals, information technology, petrochemicals, automobiles, machinery etc. are employing this strategy especially for knowledge creation and sharing. It almost started when Suzuki Motor Corp. first entered the Indian market in 1982, and it started a joint venture with Maruti Udyog Ltd., an Indian state-owned firm. Many more alliances in many high-technology industries[3] followed. Wipro has many successful alliances with other leading technology companies which include alliances with Agiliance, Amazon, Cisco, Google, Magnasoft, Oracle and many more leading names. In the pharmaceutical sector, India's top firms like Jubilant, Panacea, Dr Reddy's etc have fostered many research and development alliances with foreign and domestic Pharma companies to co-develop new drugs and processes. There is a big surge in the number of alliances in every high technology field and many of them have achieved their goals.

In this paper, we examine the rationale of the increasing use of technical alliances and its trend in the Indian industries. It will be followed by some interesting comparative case

3According to the World Bank, high-technology industries are industries with high R&D intensity, such as aerospace, computers, pharmaceuticals, scientific instruments, and electrical machinery. (www.worldbank.org)

studies of the Indian Pharmaceutical firms, which would put a greater light on the link between the growth trajectory aimed by the firm, strategies employed by them, and their innovation pattern.

2. Technical Alliances: Why the need arises?

A technical alliance can be defined as a strategic partnership that is formed between two or more firms from same/different countries for the purpose of pursuing mutual interests through sharing their knowledge resources and capabilities (Cherian et al., 2008). Various motives have been identified by experts to enter into such alliance (Gulati, 1998; Kogut, 1988). It brings in competitive advantage such as risk reduction and access to new technologies, low cost resources and entry to new markets. Alliances take different forms, from equity joint ventures to non-equity contractual arrangements.

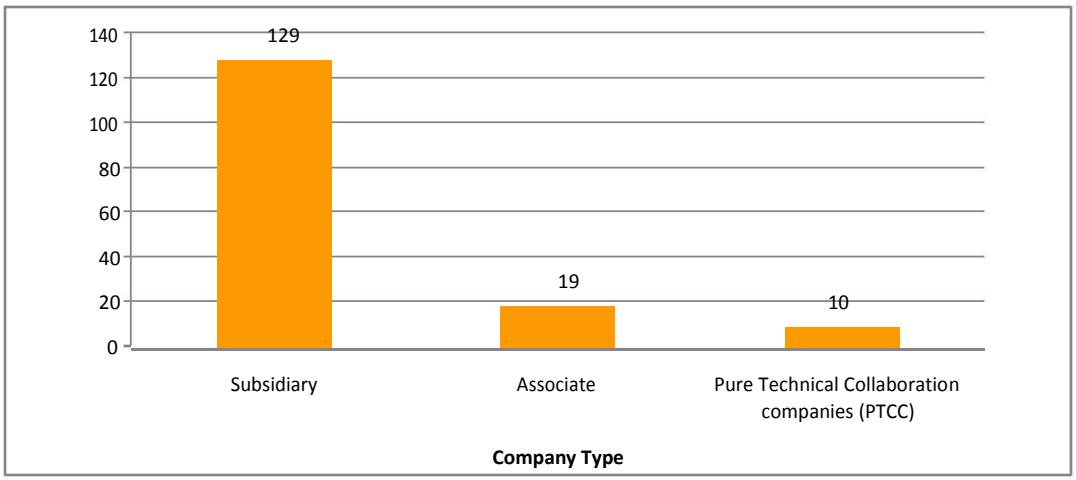
Most importantly, technical alliances are primarily seen as a means of reducing capital investment by individual firms. By bringing their transactions under a common co-operation structure, it is easier to reduce costs. In this global competition and increasing development costs, firms look for economies of scale in order to remain profitable and to survive in the longer term. Alliances also help to improve a firm's competitive position in the terms of profitability and market share. Moreover, firms are not self sufficient and hence they must engage in exchange relationship with other organizations in order to obtain knowledge and resources in which they lack. Alliances are generally seen as increasingly important instruments for learning (Delios, Inkpen and Ross, 2004). The process of learning in alliances basically boils down to the exchange of technological knowledge and capabilities. Deeds and Hill (1996), showed in their study that technical alliances enhance the new product development and thereby improves overall productivity along with economic performance.

The motives for inter-firm technology transfer through technical alliances can vary from basic and applied research and some general characteristics of technological development, minimizing and sharing of cost and uncertainty in R&D, access to scientific knowledge or to complementary technology to motive related to concrete innovation processes, development of new technologies for future, shortening of product life cycle, reducing the period between invention and market introduction and technological leapfrogging. Technical alliances have become an increasingly popular strategy for organizations to complement and supplement their internal R&D efforts. It has tremendous effect on the performance of the firm.

3. Technical alliances: The Indian scenario

There is a surge of alliances in the Indian economy as well. There have been many technical as well as non technical alliances which are being formed and giving successful results (Basant, 2004). The Reserve Bank of India published a report[4] in 2013 which captured comprehensive information relating to pattern and operations of Indian companies (both private and public) having technical collaboration with foreign companies valid during the period April 2007 to March 2010. Out of the 836 Indian companies (which responded to RBI survey) which had entered into foreign technical collaboration and /or non-technical collaboration in terms of equity participation as on end March 2007-2010, 672 were subsidiaries[5], 111 were associates[6] and 53 were other Pure Technical Collabration Company (PTCC) category companies. Out of these 836 companies that responded to the survey, 158 companies reported 160 foreign technical collaboration agreements. Out of these 158 companies, which had entered into foreign technical collaboration agreements during the period 2007-08 to 2009-10, 129 were subsidiaries, 19 were associates having equity participation and 10 were PTCC (Refer to Figure1). Also, Table 1 shows the industry wise distribution of technical agreements in the manufacturing sector for the period 1995-2012.

Figure 1: Number of Companies having Technical Collaboration during 2007-2010



Source: Survey on Foreign Collaboration in Indian Industry: 2007-2010, www. rbi.org.in

[4] Survey on Foreign Collaboration in Indian Industry: 2007-2010, rbi.org.in
[5] Subsidiary is defined as a company controlled by a holding company
[6] Associate is defined as a company whose parent company possesses only a minority stake in the ownership of the corporation. An associate company is partly owned by another company or group of companies.

Table 1: Industry-Distribution of Agreements of Foreign Collaborator Companies

S. No	Industry	Seventh survey 1995 to 2001		Eighth Survey 2007-2010		Ninth survey 2010-2012	
		number	% share	Number	%share	Number	%share
A	Primary (P)	7	1.1	2	1.3	1	0.3
B	Manufacturing (M)	468	72.4	110	68.8	234	70.1
B.1	Textile and clothing (TC)	14	2.2	4	2.5	0	0
B.2	Wood & wood products (WWP)	1	0.16	1	0.06	0	0
B.3	Leather & related products (LRP)	7	1.1	1	0.06	4	1.2
B.4	Coke and refined petroleum products (CRP)	10	1.6	1	0.06	4	1.2
B.5	Chemicals and chemical products (CCP)	91	14.6	6	3.8	19	5.7
B.6	Pharmaceuticals, Medicinal chemical and botanical Products (PMBP)	-	-	7	4.4	5	1.5
B.7	Rubber and plastic products (RPP)	33	5.3	5	3.1	8	2.4
B.8	Metal and metal products (MMP)	31	5.2	0	0	7	2.1
B.9	Machinery and equipment (ME)	118	19	15	9.4	40	12
B.10	Electrical Equipment (EE)	105	16.9	3	5	10	3
B.11	Computer, electronics and optical products (CEOP)	-	-	5	3.1	1	0.3
B.12	Transport equipment (TE)	58	9.3	3	1.9	10	3
B.13	Other manufacturing (OM)	-	-	55	38.8	73	22
B.14	Construction (C)	-	-	7	4.4	5	1.5
B.1	Water supply and sewer management (WSSM)	-	-	0	0	2	0.6

5							
B.16	Food, beverages and tobacco (FBT)	13	2.05	2	1.2	-	-
C	Services (S)	45	7.2	41	25.6	90	26.9
D	Others	108	17.3	9	5.6	36	10.8
E	Total	628	100	162	100	361	100

Source: RBI report on foreign collaborations in Indian Industry, 1995-2001, 2007-2010 & 2010-2012, www.rbi.org.in

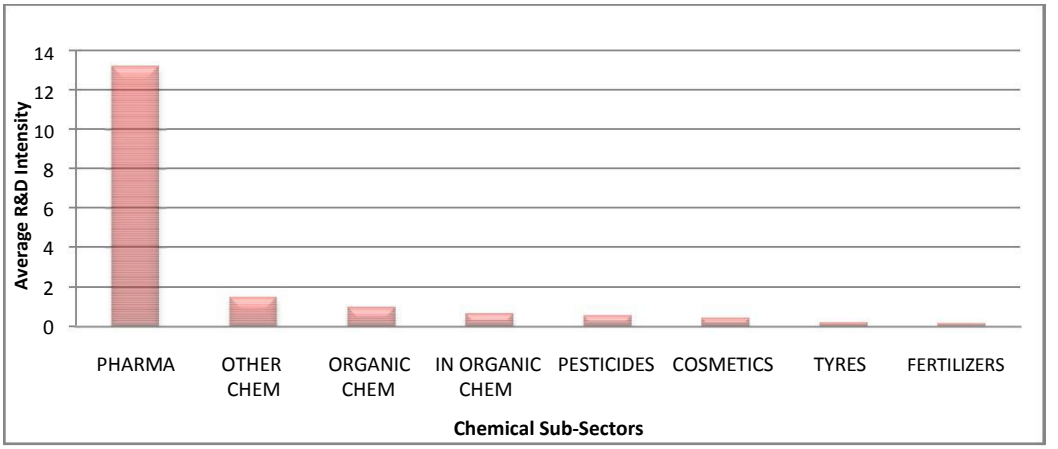
We observe that manufacturing sector had the maximum number of agreements in both time periods though the number declined by a huge amount from 1990s to 2000s We also observe that within the manufacturing sector, the frontrunner is machinery and equipments, electrical machinery followed by chemical products(non-pharmaceuticals) and pharmaceutical industry.

3.1 The Indian Pharmaceutical Sector

In the present paper, we have chosen to analyse the Indian pharmaceutical sector because it has the highest R&D intensity[7] among the high technology industries in India (referring to year 2013-14)[8]. Among the ten industries in the manufacturing sector, Transport tops the list of percentage of firms incurring R&D expenditure, followed by chemical sector (of which pharmaceutical sector is a part) and machinery[9]. Out of these top 3 sectors, chemical sector has the highest R&D intensity[10]. Within the chemical sector, pharmaceutical sector has the highest R&D intensity (Figure 2). Hence, we selected the pharmaceutical sector for our analysis.

[7] R&D intensity is defined as the ratio of R&D expenditure to total sales of a firm.
[8] Data source: Prowess database
[9] See Appendix 1
[10] See appendix 1

Figure 2: Average R&D Intensity of Top 50 Firms in the Chemical Industry Sub-Sectors (2013-14)



Source: Compiled from Prowess 4.1 database

We explore, with the help of few case studies from the pharmaceutical sector, the role of strategic alliances between pharmaceutical firms with other organizations with a purpose of sharing and developing knowledge in influencing their respective innovative performance as well as economic performance. For the case studies, quantitative as well as qualitative data is used, which is gathered through primary and secondary sources. Secondary sources involved Prowess 4.1 database along with companies' annual reports, press releases and public announcements. It provided the financial and non financial data such as sales, profit, investments, R&D expenditure, number of technical alliances, acquisitions, number of employees, new products introduced every year and many more, relevant for the study. For the qualitative information missing in these sources, a detailed questionnaire method has been used, which answered questions regarding the strategy used by the firm, what factors do they consider while pursuing a strategy, what is the overall experiences of the firm and many more such queries. So a detailed questionnaire[11] with 36 questions was prepared, which covered all the possible questions regarding the strategies used by the firm to increase innovativeness. It was mailed to top 8 Indian firms[12]. Out of 8, 4 firms responded. Simultaneously, personal interviews of the top managers were also conducted to supplement the questionnaire. The information gathered

[11] Questionnaire ….to be attached
[12] Rank calculated according to their market share in 2012-13 and also had atleast 1% R&D intensity

through questionnaire was combined with secondary data from the company annual reports and websites to examine the case study of these firms. The criterion of choosing firms was good financial performance domestically and in the rest of the world. The aim of selecting these firms is to look at the factors responsible for their success i.e. do they differ and moreover whether they adopt different strategies to achieve their objective. However, out of these some firms are such which have grown inorganically and have relied on a particular kind of strategy, say alliances or acquisitions or some other strategy and have grown by collaborating with other big firms for innovation or to capture markets.

The final four firms chosen for detailed case studies are: Jubilant Life Sciences Ltd (JUBL), Sun Pharmaceuticals Ltd (SUN), Panacea biotec Ltd (PAN) and Divi's Laboratories (DIVI). JUBL has relied mostly on strategic alliances for knowledge creation whereas SUN has mostly relied on acquisitions of potentially profitable companies with good knowledge base. Case studies will help us to compare their growth path and the role of these strategies used by them to grow in their field. On the other hand, PAN has also used the strategy of alliance to develop new technology and drugs but they haven't gown as big as JUBL. The last firm DIVI is selected because they have not adopted the strategy of either alliances or acquisitions/mergers and still they are very profitable.

Table 2: Profile of companies selected for Case Study

Name of the firm	**Jubilant Life Sciences Ltd**	**Sun Pharmaceuticals**	**Panacea Biotec Ltd**	**Divi's Laboratories**
Year of Incorporation (Age)	1978 (36)	1983 (31)	1984 (30)	1990 (24)
Headquarters	Noida, Uttar Pradesh	Mumbai, Maharashtra	New Delhi	Hyderabad, Andhra Pradesh
Plant locations	Roorkee, Gajraula (UP); Samlaya&Bgaruch (Gujarat); Ambarnath&Nira (Maharashtra); Najangud, Bengaluru (Karnataka); Samlaya&Bgaruch (Gujarat); Ambarnath&Nira	Silvassa, Halol, Bharuch, Ankleshwar; Vadodara (Gujarat); Kanchipuran (TN); 2 plants in Dadra; Jammu; Sikkim; Ohio, New Jersey ,	Delhi (2 Plants); Lalru (Punjab); Navi Mumbai; Baddi (HP)	Nalgonda (AP); three plants at Vishakhapatnam (AP)

	(Maharashtra); Najangud, (Karnataka); Maryland, Washington (USA); Quebec (Canada)	Michigan, Philadelphia(USA); Gazipur (Bangladesh); Janos, Hungary; Brazil; Mexico; Haifa Bay, Israel		
R&D centers	Noida (UP); Bengaluru (Karnataka); North Carolina, New Jersey (USA)	Baroda, 2 Centres in Vadodara (Gujarat); Mumbai; Haifa Bay, Israel	Delhi, Mohali; Sampann (HP); Mumbai	Sanathnagar, Hyderabad; Nalgonda, (AP); Visakhapatnam (AP)
Market share in 2012-13	3.4%	3.5%	0.87%	2.3%
Total sales in 2012-13 (Rs. Million)	51,610	112,999	5304 (Losses for the 1st time)	21239
Growth rate of Sales (from the previous year)	21%	70%	-22%	15%
Exports as a share of total sales (2012-13)	74%	65%	46%	90%
Export Destinations	North America, Europe, Japan, China, India	USA, Canada,whole of Europe, South Korea, Japan, Africa	North America, Europe, Asia (major share is of Japan), Africa, Australia, Latin America	America(42%); Europe (34%); India(10%); Asia (7%); ROW(8%)
Number of employees	6223	13000	3300	2220
Areas of specialization within pharmaceutical sector (with % share in sales)	Generics including APIs (26%); specialty pharmaceuticals (21%); DDDS (4%); Life science ingredients (49%)	US generics (54%); Indian Branded generics (26%); International branded generics (13%); APIs (7%)	Vaccines (33%); Formulations(67%)- Including chronic Care, Anti-Cancer; organ transplant immune suppressive;	Custom Manufacturing of generics (APIs and advanced intermediates); Contract Research (including process design and validation); Nutraceuticals
Basic strategy used for growth	**Alliances/Collaborations For knowledge creation**	**Believe in Inorganic Growth**	**Various alliances/ partnerships with**	**Specialize in custom**

and expansion	**and market expansion**	**(Acquisitions of potentially growing firms which are in trouble)**	**various Pharma firms, research organizations and universities**	**manufacturing of generics which includes APIs and advanced intermediates; also do Contract research**
Number of Alliances	**33**	**1**	**23**	**0**
Number of Acquisitions	**11**	**14**	**1**	**0**

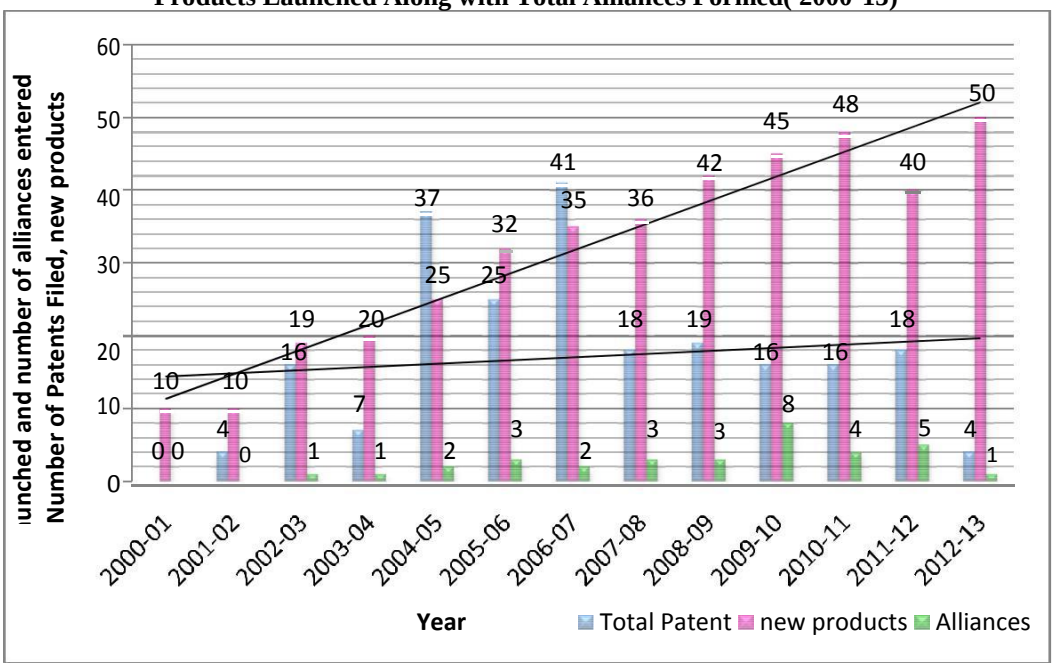
Table 3: Financial Progress of the 4 pharmaceutical companies in the last decade in the period 2000-13

Variables	**Jubilant Life Sciences**			**Sun Pharmaceuticals**			**Panacea Biotec**			**Divi's Laboratories**		
	2000-01	**2006-07**	**2012-13**	**2000-01**	**2006-07**	**2012-13**	**2000-01**	**2006-07**	**2012-13**	**2000-01**	**2006-07**	**2012-13**
Sales (Rs Million)	8460	18097	32663.5	6148	23745	80145	2309	8429.4	5953.5	1966.6	10475	21444.3
Profit after Tax (Rs Million)	133.6	2280	1327	1352	8402	29831	228.8	1468.1	-2301	262.8	3535	6114
Earning Per share (Rs)	19.95	16.17	24	27.8	41.7	28.8	52.2	23.7	-37	30	29.91	46
Current assets (Rs Million)	1900.7	6289.7	14514.1	2525.2	21542.7	86618	1140.4	4609.2	3171.6	783	3919.4	14068.2
R&D expenditure(Rs Million)	41.4	525	1437	250	1536	7042	62	410.6	1048.7	22.8	102.8	240
R&D expenditure as % of sales	0.6	2	2.7	4	8	8	2	4	17	1.1	0.9	1
Exports as a share of total sales (%)	11.63	38	74	23	29	60	6	19	24	85.67	92	90
Market share (%)	3.07	2.87	2.69	2.23	3.77	6.60	0.83	1.3	0.49	0.71	1.66	1.76

3.1.1 CASE STUDY 1- Jubilant Life Sciences

Jubilant Life Sciences Limited, is an integrated Pharmaceutical & Life Sciences company, started in 1978 as a bulk producer of chemicals. It is constantly engaged in delivering new products globally through innovative technologies, products and services and has become India's one of the largest Custom Research and Manufacturing Services (CRAMS) player and one of the leading Drug Discovery and Development firm. Their business model is underpinned by innovation. They continuously introduce new products and in last 3-4 years, they have introduced more than 50 products.

Figure 3: Trends of Innovation And Collaborations By Jubilant: Total Patents & New Products Launched Along with Total Alliances Formed(2000-13)



Source: Compiled from Contollor General of Patents, Designs & Trademarks and Company's annual Reports

The R&D expenditure has been increasing almost every year except for 1 or 2 years (Figure 4). Also, they have large number of R&D employees forming a pool of knowledge base and new ideas which lead to new innovations. Regarding the intellectual property, acquisition and collaboration strategy for businesses has led to growth of intellectual properties over the years. In the period 2000-13, 225 patents have been filed in India, US and Europe and 412 new products have been launched in the market worldwide. They have been launching new products consistently, so there is a rising

trend in the same. Whereas, the number patents filed were positively impacted immediately after the change in the patent regime.

This figure also shows the number of technical collaborations signed by Jubilant in the period 2012-13. Barring 2 years, they have signed agreements almost in every year. This definitely has an impact on the level of technical know-how and capability of the company, which in turn has an impact on the innovative performance of the firm which is seen in the form of intellectual property and new products.

The strategies adopted by jubilant in order to grow in their fried, they have adopted extensive and numerous collaborations with other pharmaceutical giants and research organizations. This has been one of the important strategies of Jubilant to acquire and improve their capabilities, quality of production, rate of new product development and performance. In order to know more fine points about this firm and how their minds work before taking a decision regarding a collaboration with another pharmaceutical company, a visit was made to the company's office 'Jubilant Life Sciences' in Noida, Sector 59 and a meeting was held with Research and Development head who is also the head of regulatory affairs. He was asked what factors you have in mind while looking for a partner to form a knowledge sharing alliance/R&D alliance. According to him, a potential partner should be a big brand with a sound infrastructure and a good reputation; should have at least some special skills with a big pool of trained R&D employees; should be a pioneer in at least in one or two processes or products or technologies, and no compliance issues.

We will look at the partnerships and acquisitions within India and abroad which took place since the year 2000 as given in Table 9.4.

Table 4: Alliances of Jubilant Life Sciences Ltd for the Period 2000-13

Name of the partner	**Purpose of the Alliance**	**Your contribution To the alliance**	**Year of alliance**	**Result of the alliance (successful/in process/ failure)**
Forest Laboratories Limited (US)	Drug Discovery Partnership	Conduct the drug discovery work	2007	In process
Amgen Incorporation (Californian pharmaceutical company)	Develop a portfolio of novel drugs	Pre-Clinical Trials	2008	Successful
Eli Lilly US based)	Joint venture	Financial Resources	2008	Successful

BioLeap, LLC, (USA based)	Drug discovery and development	Highly competitive preclinical drug development platform	2009	Successful
Orion, (Finland based)	Drug development	R&D Skills and technology	2009	In process
Table 9.4 continued…				
Table 9.4 continued…				
	Purpose of the Alliance	**Your contribution To the alliance**	**Year of alliance**	**Result of the alliance (successful/in process/ failure)**
AstraZeneca (US Based)	a research collaboration agreement	Drug discovery programs	2009	In process
Guerbet (France based)	Marketing agreement	Market entry and contacts	2009	Successfully implemented
Endo Pharmaceuticals, (US-based)	Drug development for Oncology	Joint development of drug and pre-clinical trials	2009	Milestone achieved
Duke University (US)	Research and drug development alliance	Aimed at translation of discoveries by Duke scientists into clinical therapies	2010	In process
University of Alabama at Birmingham (US)	Drug development alliance	Developing new drugs based on molecules developed by the university scientists	2009	Successful
Janssen Pharmaceutica N.V., (Beerse, Belgium based)	Drug discovery partnership	Pre-clinical trials	2011	Successful
SEKAB BioFuels& Chemicals AB (Europe based)	Marketing alliance		2011	Implemented
Norgine (Europe based)	Technology sharing alliance	Pre-clinical trials	2011	Successful
Mnemosyne Pharmaceutical Inc, (Rhode Island, US)	R&D alliance	Developing subunit selective NMDA receptor modulators	2012	In process

Source: Compiled from Company's Various Annual Reports

Table 5: Acquisitions by Jubilant Life Sciences in 2000-13

Name of the company acquired	Year	Aim
Pharmaceuticals Services Incorporated (PSI) - Belgium based	2004	To enter the European Continent and moving up the value chain from APIs to formulations
Hollister - Stier Laboratories (LLC) - US based	2007	Strengthening Jubilant's Global CRAMS business via entry into the high barrier Injectables segment
Draxis Health of America - US Based	2008	To enter the attractive, regulated, high margin & high growth radiopharmaceutical business.

Specialty Molecules Pvt. Ltd - Indian Company	2008	To improve the ability to provide comprehensive offering of pyridine derivatives to the customers in life science industry

Source: Compiled from Company's Various Annual Reports

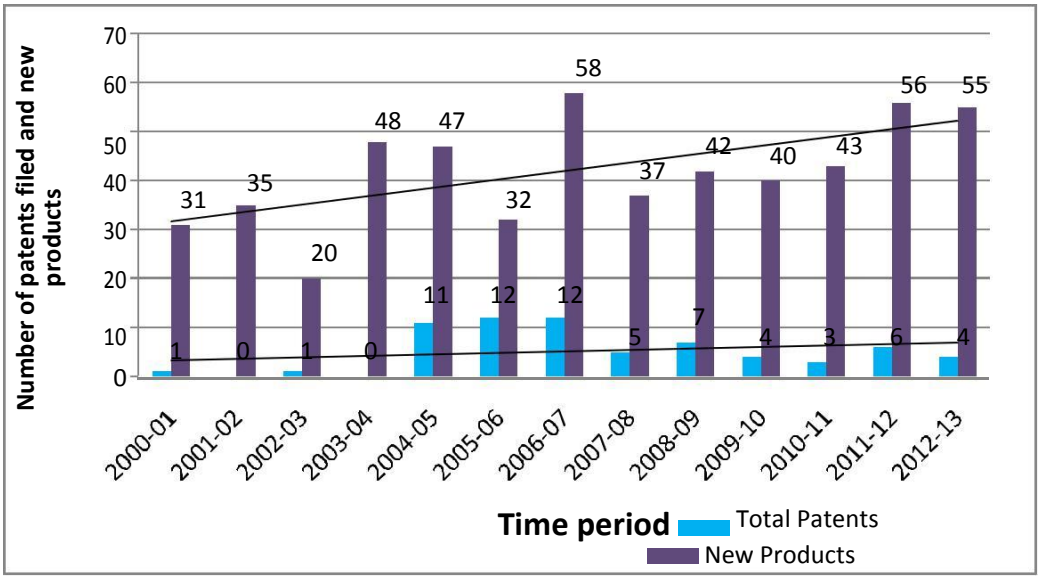
Despite these uncertain economic environment since last few years, Jubilant continues to perform quite well as their business model is underpinned by innovation, which has led to continuous improvement in their products and processes has resulted in increase in yield and process time reduction resulting in increased competitiveness in the market place.

3.1.2 CASE STUDY 2- Sun Pharmaceuticals Private Limited

They started with a small manufacturing facility in Vapi, Gujarat. Slowly they established themselves and in four years, they were selling nationwide. Today they are listed by Forbes at 38th amongst the world's 50 most innovative companies. The generics market remains a major growth area for sun pharmaceuticals. It has a good financial performance and has been investing heavily into R&D. their basis business model is to acquire other pharmaceutical firms which are not performing well but has a strong base. With an acquisition, they are able to acquire the acquired firms' pool of patents and technology.

On R&D front, the R&D expenditure has drastically increased in the last decade and has been consistently rising. Talking about innovation by sun pharmaceuticals, we look at the trend of patents filed by the firm as well as the new products developed since the year 2000 (Figure 9.8). Total patents filed in this period are 66 and new products introduced are 544. Rest of the patents are collected through various acquisitions. The rate of patent filings is very less but the number of products launched by the firms is very high. The manager, corporate affairs of Delhi office of sun Pharmaceuticals agreed to interact and divulged some interesting facts about the company's strategy. He revealed that the firm believes in acquiring patents which gives them readymade formulas, drugs and processes. Instead they are more interested in commercializing new products developed from improving their already existing drugs.

Figure 4: Patents filed and New Products Introduced by Sun Pharmaceuticals in the Period 2000-13



Source: Compiled from Prowess Database and company's Various Annual Reports

He said that the Company seeks to achieve this through its vertical integration capabilities and focus on optimizing operational expenses. Moreover, company believes to grow inorganically by acquiring other promising firms, which has good product pipeline but they are slow on profits or are going into losses.

Table 6: Acquisitions by Sun Pharmaceuticals till 2013

Name of the company acquired	**Year**	**Aim**
Knoll Pharmaceuticals (Ahmadabad, India)	1996	To capture its strong R&D base. Sensibly priced acquisition
MJ Pharma's dosage plant (Halol, India)	1996	To capture its strong pipeline. Reasonably priced acquisition

Nadu Dadha Pharmaceuticals Limited (TDPL) (Chennai, India)	1997	mainly for their extensive gynecology and oncology brands and strong R&D base
Caraco Pharmaceuticals, (Detroit, USA)	1997	To foray into the lucrative US market
Natco Pharmaceuticals, India	1998	A basket of brands in the respiratory/chest therapy area as also brands in gastroenterology, orthopedics, anti-infectives and pediatrics were acquired
Gujarat Lyka Organics Limited (Ankleshwar, India)	1999	The company was not viable on a stand-alone basis but had good potential
Pradeep Drug Company (Chennai, India)	2001	To enter into specialty bulk actives exports to non-regulated markets and freeing up of capacity at their then existing plants for the regulated markets
Phlox Pharmaceuticals ltd. (Gujarat, India)	2004	To use Phlox as its vehicle to re-enter the cephalosporin market, which it had exited and also to enter Europe
Two brands from Women's First Healthcare (US based)	2004	brands are the gynaecological Ortho-Est (estropipate), and the antimigraine preparation Midrin (isometheptene, acetaminophen, dichloralphenazone).
Two Plants from Valeant Pharmaceuticals	2005	1st plant was one of the few sites globally that is authorized to make controlled substance APIs 2nd plant was bought for the manufacture of liquids, creams and ointments in order to file for interesting products in this area.
Able Labs	2005	To obtain specifically designed areas to handle the manufacture of controlled substance dosage forms along with their Intellectual property rights
Taro Pharmaceutical Industries Ltd (Israel)	2007	Intended to build on Taro's expertise in dermatology and pediatrics, along with specialty and generic pharmaceuticals, over-the-counter products and a strong R&D base
DUSA	2012	To utilize technical capabilities of DUSA in dynamic skin treatments, with USFDA approved manufacturing with good growth opportunities
Next big Acquisition on the way: Ranbaxy Laboratories	2014	Strong global footprint, leading to significant value creation opportunities along with many patents

Source: Compiled from Company's Various Annual Reports

Table 7: Alliances of sun Pharmaceuticals till 2013

Name of the partner	**Purpose of the Alliance**	**Your contribution To the alliance**	**Year of alliance**	**Result of the alliance (successful/in process/ failure)**
Merck (Us and Canada)	Joint Venture	To provide innovative drugs around the world with the help of Merck	2011	In process

Source: Compiled from Company's Various Annual Reports

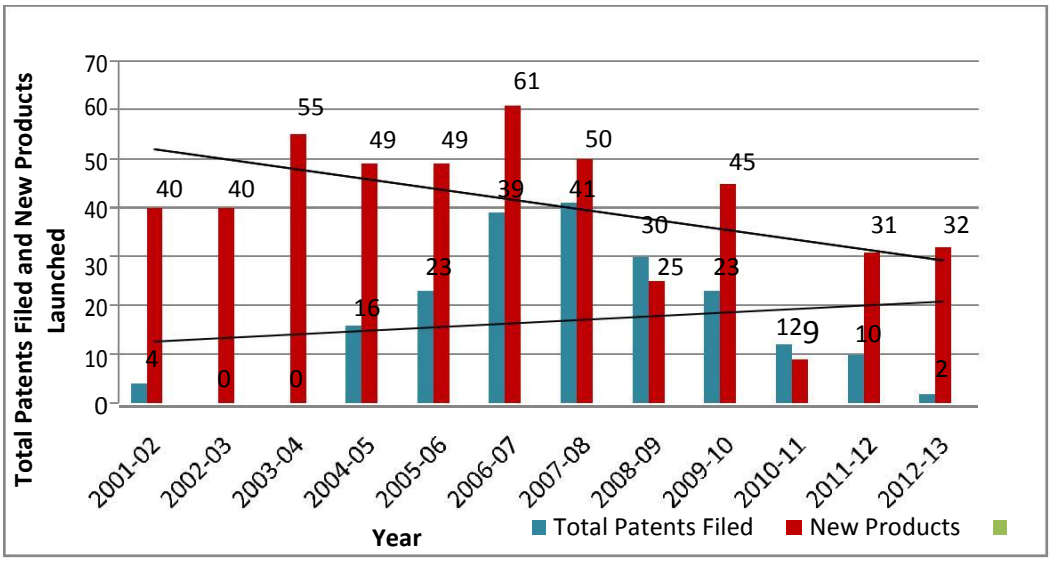
They are today the 5th largest pharmaceutical company in India, the largest Indian pharmaceutical company in the US generics space based on a model of acquisitions with very few alliances.

3.1.3 CASE STUDY 3- Panacea Biotec Ltd

Panacea biotec is one of India's highly progressive Pharma firms and they mainly deal with vaccines and have been trying to develop and supply these all over the world. They have concentrated more on the Indian market, trying to capture the vaccine market segments and generics. However, they are slowly capturing the world markets and now they are getting 50% of the revenue from exports. Panacea Biotec has played a key role in Global Polio Eradication Initiative by supplying around 10 billion doses of OPV to Govt. of India and UN Agencies leading to reduction in number of polio cases in India from over 25,000 in 1989 to zero since 2011 enabling India to become a Polio free nation. The model of Panacea is built on collaborations with various pharmaceutical firms, academic institutions and research organizations. Their final aim is innovation- the knowledge creation and be the first movers.

If we look at the innovations by the firm, we find that they introduce new products in the market every year. It was an upward trend till 2007-08 and after that though it is positive, the number of new products launched have reduced (Figure 6).

Figure 6: Total Patents filed, new products launched and alliances by Panacea Biotec in the period 2000-13



Source: Compiled from the annual reports and various official patent sites

Patents which are filed by Panacea also caught pace around the change in the patent regime but it also slowed down and in this current decade the number of patents filed are quite less.

Because of this falling trend of innovative products and process, they have been entering into new partnerships with various pharmaceutical firms and research organizations so that they are able to create new knowledge and develop new products and processes.

Collaboration is one of the most important strategies used by Panacea to expand their knowledge as well as markets. A meeting was held with the GM who is also the company Secretary of the firm[13] on June 26th, 2015 and a detailed discussion took place on the working and strategies adopted by the firm. He revealed some interesting aspects on the firm's strategy during the interview. He said that most Indian companies rely on the patents who are about to expire which are later on allowed to be produced generically. But the companies with popular patents are smarter and they are adopting a practice of "evergreening" i.e. when a patent is about to expire, firms make some incremental modifications and get it patented thereby restricting the entry of generic companies from India and other developing countries. In this scenario, forging alliances with the right partners with complementary skills and strength for capturing new markets is of paramount importance for achieving quick growth. , they try to have an alliance with a

[13] On June 26th 2014 in Panacea's Delhi's Head Office

company which has a good market share and has a standing into many regulated markets. Besides the motive of expanding operations, they aim at alliances which can get them latest technologies and best world class practices.

Table: 8: List of the alliances Panacea Biotec has entered into in the last 15 years

Name of the partner	**Purpose of the Alliance**	**Panacea's contribution To the alliance**	**Year of alliance**	**Result of the alliance (successful/in process/ failure)**
AIIMS, Maulana Azad Medical College	Drug development and testing Partnership	Testing and carrying out clinical/ pharmacological research of drugs developed by these medical students	Before 2000	Successful
Heber Biotec Ltd (HBL) (Cuba based)	Joint venture- Develop and produce Hepatitis B drugs	Manufacturing of the medicine	2000	By 2003, drug was ready for commercial launch
National Research Development Corporation	The development of the know-how for an improved formulation for ocular delivery using nanotechnology	Assist in developing and launching in the market Collaboration extended for Jaundice in 2001	2000	Successful
biotechnology consortium of India	Drug Development	manufacture and market the anti-anthrax vaccine developed in JNU- Providing Technology expertise	2001	Successful
Chiron corporation (UK based)	a research collaboration agreement	To provide vaccine for infectious pediatric diseases.	2003	Successful
Netherlands Vaccines Institute (NVI) (Netherland based)	Drug development alliance	To develop the in –activated polio vaccine into a ready to use vaccine	2006	Successful
National Research Development Corporation (India)	Technology sharing alliance	To obtain the foot and mouth disease vaccine technology from NRDC and produce it	2006	Successful
PT. Bio Farma, Indonesia	Drug development and marketing for measles vaccine	To procure the bulk Vaccine from & formulate it into a finished product.	2006	Successful
Table 9.8 continued…				
Table 9.8 continued…				
Name of the partner	**Purpose of the Alliance**	**Panacea's contribution To the alliance**	**Year of alliance**	**Result of the alliance**

				(successful/in process/ failure)
Cambridge Biostability Limited	Technology sharing and drug development alliance	To capture CBL's temperature stable liquid vaccines technology and develop for global markets	2006	Successful
Family Vaccines, Philippines	Marketing alliance	To enter immunization market in Philippines	2007	Successfully implemented
Panjab University, India	Drug development alliance	To get chemical and biological information on molecules for psychiatric diseases and further development and providing facilities for clinical trials.	2007	Successful
with PharmAthene, Inc., Annapolis, MD,US	Drug development and marketing alliance	Development, manufacturing and marketing of certainPharmAthene biodefense products	2008	Successful
National Institute for Public Health and the Environment (RIVM), (Netherlands based)	Technology sharing alliance	To test the quality of Polio vaccine and help in commercialization	2011	Successful
Binnopharm (Russia based)	Technology transfer agreement	supply of Company's finished product, viz. Hib Conjugate Vaccine and for transfer of technology thereof	2011	Successful
Laboratories Clausen S.A, (Uruguay based)	Marketing alliance	To enter European and Latin American markets	2011	Successful

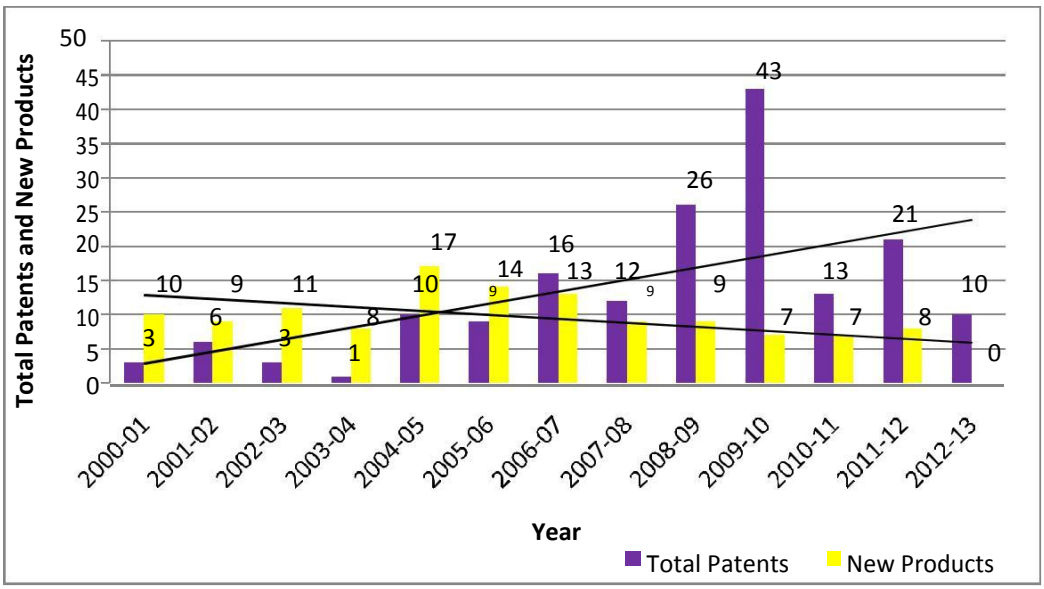
Source: Compiled from Company's Various Annual Reports

Panacea's expansion and growth is driven on collaborations, be it technical or marketing collaboration. It is the power of innovation and collaborations that drives Panacea. They believe that working together is critical to harnessing innovative science and hence seeks strong, long-term collaborations that fit their goals of ushering global presence.

3.1.4 CASE STUDY 4: Divi's Laboratories

Divi's laboratories was established in the year 1990, with Research & Development as its prime fundamental aim. Divi's Laboratories focused on developing new processes for the production of Active Pharma Ingredients (APIs) & Intermediates. A very big proportion of sales come from exports. This is because the strategy or the business model used by Divi's since their inception is that of providing custom and contract manufacturing. Divi's is not into hardcore innovation as they undertake manufacturing already developed APIs and drugs for the market. They basically rely on in-house research and development and hence never have entered into an alliance for development of a product.

Figure 7: Trends of innovation by Divi's: Total patents filed and new products launched in the period 2000-13



Source: Compiled from data collected from various Patent office's Company's Various Annual Reports

Divi's does not have any alliance or any merger/acquisition. They have developed their expertise in generics and plan to continue in this field without entering into hard core innovation. Their R&D aims at incremental innovations which help in improving the processes of producing the drugs for other companies.

3.1.5 A Comparative Analysis of the four Companies

Table: 9: Comparison of performance variables of the four firms

VARIABLES	JUBILANT	SUN	PANACEA	DIVI'S
GROWTH OF SALES FROM 2000 TO 2013 (CAGR)[14]	18.2%	27.2%	8.4%	21%
GROWTH OF PROFITS FROM 2000 TO 2013 (CAGR)	20%	28.9%	15%	29%
TOTAL PATENTS FILED DURING 2000-13	221	66	212	173
TOTAL NEW PRODUCTS LAUNCHED DURING 2000-13	412	544	523	122
ALLIANCE DURING 2000-13	14	1	15	0
ACQUISITIONS DURING 2000-13	4	14	0	0

From Table 8, we can clearly make out the two firms Jubilant and Panacea who have adopted alliances as a strategy for sharing and developing knowledge and creating new ideas in order to develop new drugs have more patents filed in India, Europe and US and also have launched more new products. This shows that innovation is enhanced if a firm collaborates and shares its technology and ideas. Of course there are many other factors which play a role in improving the innovative performance of a firm but alliances do play a prominent role in escalating the knowledge creation of a firm.

In case of Sun, the number of patents is very low though new non patented products are quite high. Their strategy is to acquire firms with good R&D base and automatically all the patents the acquired firm also become a part of Sun. In a way, they have bought the patents instead of developing new products and processes on their own. On the other hand, Divi's have reasonable amount of patents as well as new products and they rely basically on their own R&D efforts. Their patents are more process patents rather than products patents, which we have observed during data collection and from answers in the questionnaire as they are basically into contract manufacturing which requires efficient processes to produce APIs and intermediates.

In respect of financial progress, all these 4 firms have been performing well though their rate of growth and market share differs. Jubilant and Sun are big firms with significant

[14] CAGR is compound annual growth rate

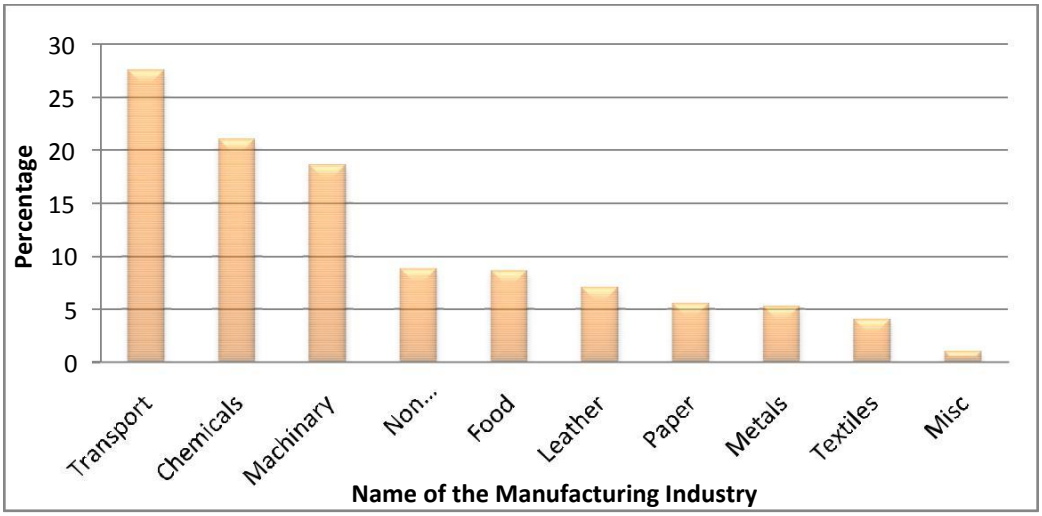
market share as compared to Panacea and Divi's but all these have grown at a good rate. Jubilant and panacea have adopted the collaboration strategy but jubilant has grown much faster than Panacea, whereas Divi's without any external collaboration has shown impressive performance. This clearly shows that collaboration plays an important role in enhancing knowledge base which influences the financial performance but there are many other factors which play a role in affecting the firm's standing and profits; some of them being, the firms' growth opportunities and its long term goal; other growth strategies (besides collaboration); the strength of strategy and its execution; the segment in which they have expertise; and the level of commitment the firm has to achieve their goal.

4. Concluding remarks

Overall, after analyzing many Indian pharmaceutical firms, and particularly these 4 firms, it is found that the Indian pharmaceutical firms are increasingly entering into technical alliances as well as acquisitions in the areas of drug discovery, development, technology development and clinical trials. This indicates a new development in the pharmaceutical industry. Not only cooperation among firms, but co-operation between firms and academic institutions is of major importance now. In totality, this entire analysis demonstrated the role of technical alliances in improving the innovation propensity, which in turn influences the extent to which high profit outcomes persist over time. The firms have realized the need to mobilize not only internal resources, but also external actors.

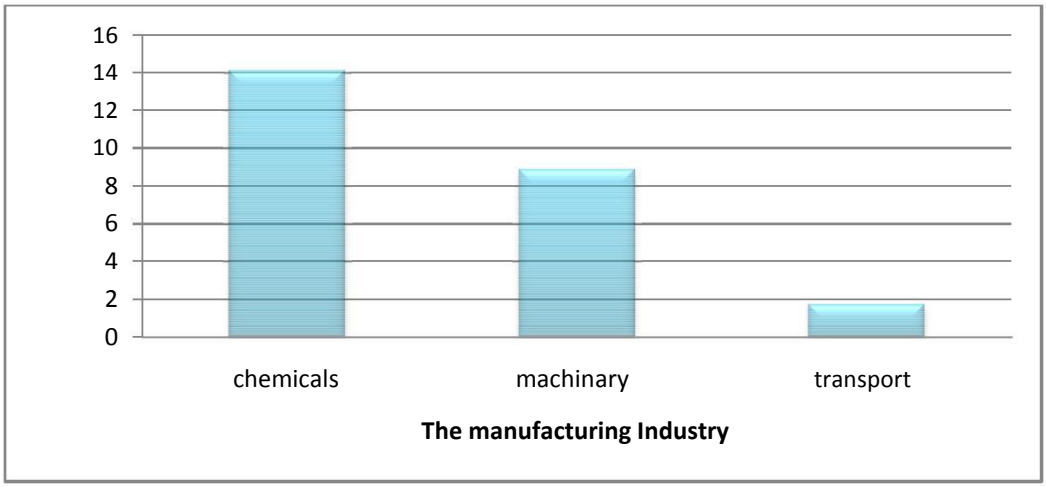
Appendix 1

Figure 1.1: Percentage of firms incurring R&D expenditure in each broad industrial group in the Indian manufacturing sector



Source: Prowess 4.12 Database

Figure 1.2: Average R&D Intensity of Top 50 Firms in the Indian Manufacturing Sector



Source: Prowess 4.12 Database

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