Innovations

The Effect of Organizational Environment on Innovativeness, Diversification and Research and Development – A Study of the Indian Pharmaceutical Industry

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Abstract

*Problem: The paper explores whether the organizational environment of pharmaceutical companies in India have encouraged innovativeness, have helped in diversification and identification of product areas with growth potential, and whether have supported it with allocation of funds for Research and Development for sustained growth. **Methodology:** Text mining is used to derive frequency of key words from annual reports of Indian Pharmaceutical companies for different years. The key words represent innovativeness, research and development and organizational environment. The latter is represented by factors like leadership, market orientation, technology orientation, human resource management and customer orientation. Suitable metrics are defined and applied for the analysis.**Findings:** The sample consists of 37 Indian pharmaceutical companies that are listed on the stock exchanges. Our analysis shows that companies with high organizational score have encouraged innovativeness. There is a weak positive relationship between innovation orientation and expenditure on R & D. Not all companies are interested in diversifying or experimenting in new areas.**Conclusion:** The paper will be useful to policy makers, as before embarking on designing incentive structures and investments in centralized R & D facilities, they should also understand the mind-set of the companies, their abilities and their eagerness to experiment with new ideas. Otherwise, these facilities will remain underutilized. The paper will be useful to companies to understand their organizational environment and points of intervention for future sustained growth.*

Key words: Organizational Environment, Innovativeness, Research and Development, Revealed Innovation Advantage Index, Revealed R & D Advantage Index, Revealed Innovation Conversion Index

1. Introduction

The three factors that can drive growth of a company are a) identification of product areas and markets where future growth prospects are bright, b) allocation of funds for exploration and development of these products and markets and c) designing an organizational environment that is conducive for driving such growth. This is of particular relevance for pharmaceutical companies as it requires awareness of diseases and their variants, monitoring the changing landscape of drugs going off patent, adopting different approaches to bring improved drugs to the market, providing expenditure required for research and development and also creating supportive organizational environment. In the literature, contributions by

Drucker (1985) and Peters & Waterman (1982) have laid emphasis on product areas and markets and Collins & Porras (1994), Porter (1995), Kim & Mauborgne (2005), Cameron and Quinn (2006) and Govindarajan (2016) have dealt extensively with the importance of strategy and role of organizational environment on firm performance.

As observed by McKinsey (2020), the Indian pharmaceutical industry will grow manifold in the coming years driven by strong GDP growth, population growth, extensive health insurance coverage and increased government spending on healthcare. The areas of growth will be mass therapeutic areas such as respiratory and gastro-intestinal, older therapies in chronic indications such as diabetes, hypertension and epilepsy and super-specialty therapeutic areas such as oncology, urologyand nephrology.

With respect to the future direction of the Indian pharmaceutical industry, Federation of Indian Chambers of Commerce & Ernst and Young (FICCI) (2021) emphasize on the "importance of an innovation ecosystem, a robust infrastructure for production of drugs and pharmaceuticals and the need to constantly build a huge talent pool of scientists, researchers and technologists who can be the arrowheads for the future". According to this study by FICCI (2021),strengthening manufacturing and supply base in domestic and global markets, accelerating research andinnovation, improving access to medicines and achieving equitable and sustainablehealthcare are the four factors that can drive the industry in India forward.

There is a rich literature on the effects of organizational environment on firm performance, innovativeness and growth. Some of the papers in this area are Ceausu et al. (2017), Naranjo-Valencia et al. (2016), Ha et al. (2020), Carvalho and Madeira (2020), Tapanainen et al. (2022), Robb et al. (2022) and Sommer and Bhandari (2022).

In this paper, we try to establish our propositions through text mining of annual reports of companies. Text mining has been applied in different fields of research. Kumar and Ravi (2016) and Gupta et al (2020) cover the literature on application of text mining in finance. Research papers by Adler et al (2022)and Senave et al (2023) demonstrate how text mining of annual reports of companies can reveal important findings from unstructured data. Annual reports provide an account of the performance of a company during the year and also its future plans, both short term and long term. It apprises the shareholders about the functioning of the company such that they stay invested and participate in future expansion plans. Annual reports also provide an idea about whether companies are adjusting to the changing environment, are equipped to cope with existing and upcoming challenges and also whether they are in a position to exploit the opportunities that the environment provides. We attempt to derive insights from such unstructured data through appropriate choice of key words

We use ten factors namely innovativeness and innovation orientation (IO), inward looking organisational emphasis (ILOE), customer interface (CI), competition driven organisational culture (CDOE), organisational mindset (OM), digitisation, digitalisation, digital transformation (DDT), organisational environment (OE), leadership (LE), emphasis on human resources (HRs) and technology orientation (TO) for measuring organizational environment. We choose key words from the literature for each of these factors. We combine this with data on expenditure on research and development (R & D).

The plan of the paper is as follows. The objectives of the study are stated in Section 2. Section 3 to is devoted to an understanding of the extent to which Indian pharmaceutical companies have been able to identify opportunities for growth and diversification. A literature survey is presented in Section 4 and the methodology is elaborated in Section 5. Data analysis and results are presented in Section 6 and Section 7 discusses the findings of the paper. Section 8 concludes the paper.

2. Objectives

In the context of the pharmaceutical industry in India, the objectives of this paper are to

a. analyse the extent to which these companies have adjusted to the dynamics of the industry and have identified opportunities for growth.

b. examine whether companies with high organizational score encourage exploration of new areas/ideas and are innovative;

c. check whether innovative companies focus on R & D.In this paper we focus on product and process innovation which requires R & D.

d. examine whether companies that encourage exploration of new areas/ideas, support it with R & D funding;

Our sample consists of thirty seven (37) Indian pharmaceutical companies that are listed on the stock exchanges.

3. Identification of Opportunities

To understand whether Indian pharmaceutical companies are aware of the changing landscape and are poised to take advantage of the emerging opportunities, we choose key words like generics, USFDA, contractual, regulation, safety, clinical trials, sustainability, biosimilars, patent and licensing which are related to the growth areas of the pharmaceutical industry and the regulatory environment. The following provides a brief description of the specific words/areas studied in the paper.

A generic drug is a pharmaceutical drug that has the same chemical composition of the drug that was originally protected by patents. Generic drugs can be sold after the patents on the original drugs expire.USFDA approval of a drug means that the US authorities have reviewed the beneficial effects of the drug and has certified its use on humans. Production of a drug under contractual arrangements means either the company manufactures a pre-formulated drug or performs everything from pre-formulation and formulation development to clinical trials and production.Clinical trials of drugs take place in stages, where finally the effects of the drugs on humans are assessed and new treatments and interventions are studied. Biosimilar drugs are made from living organisms and may be made in different ways and of slightly different substances. They are identical to the original product made by a different company.

The frequencies of these words have been collated from the annual report of these companies, many of whom have production and research facilities abroad and also sell their products in a large number of countries.

3.1 Aggregative Awareness

Figure 1 shows the sum of the frequencies of the key words related to areas of opportunities discussed above, for the sample set of companies, and their movement over time. It indicates aggregative awareness of opportunities, company-wise, over three time periods 2014-15, 2017-18 and 2019-20.Certain interesting observations can be made from the figure and are independent of the amount of money actually spent on research and development.

1.   The level of awareness among Indian pharmaceutical companies of the changing landscape and opportunities, has increased over the time.

2.   Companies like Astra Zeneca, Biocon, Cipla, Jubilant, Pfizer, Sun Pharma, Zydus, Lupin and Dr. Reddy's are way above others in their level of awareness and consequent action;

3.   Companies like Orchid Pharma and Panacea Biotech have shown increasing awareness;

4.   Companies like Abbot, Bal Pharma, Alembic and Alkem have remained stagnant in their efforts towards diversification and probably R & D efforts;

5.   Relatively small companies like Granules, Dishman and Syngeneindicate increased awareness.

Figure 1: Awareness of Indian pharma companies of opportunities over three time periods
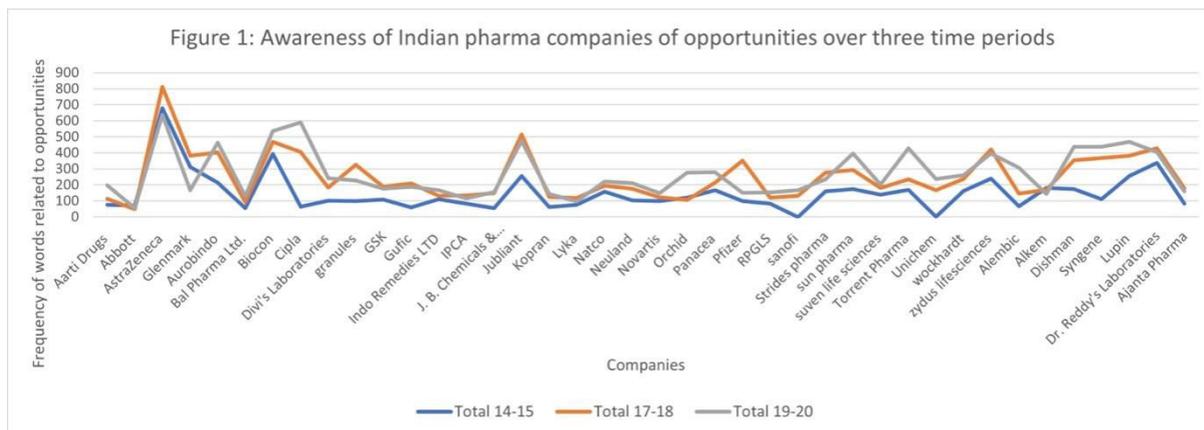
3.2 Generics

Figure 2 shows the changing emphasis in production of generics. Companies like Dr. Reddy's, Jubilant, Sun Pharma, Glenmark, Biocon, Aurobindo Pharma have maintained or increased their emphasis on production of generics. This is one area where Indian companies have done really well.

Figure 2: Emphasis on Generics over the years
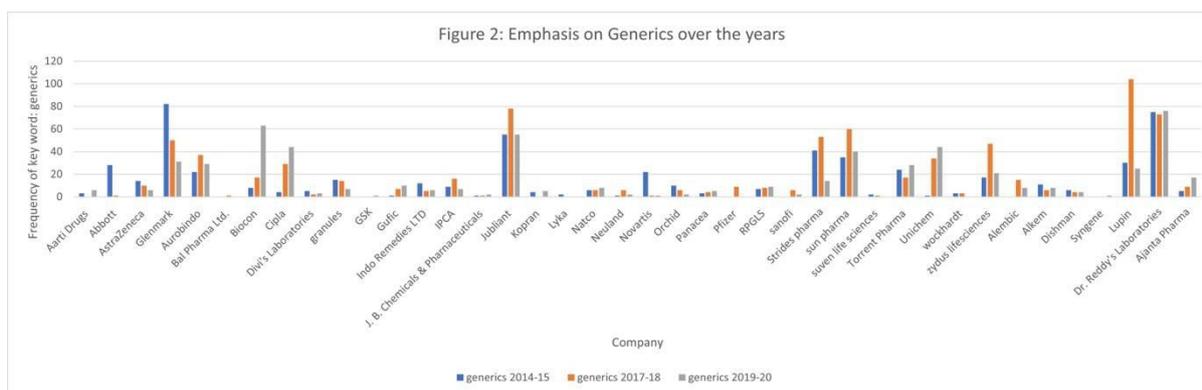
3.3 Contractual Production

Figure 3 shows that all the companies in the sample have emphasized on production under contractual agreements in their annual reports and all of them have increasingly moved towards such production arrangements. We can infer that Indian pharma companies have improved and upgraded their production facilities, which has generated confidence among global pharma players.

Figure 3: Emphasis on contractual production over time
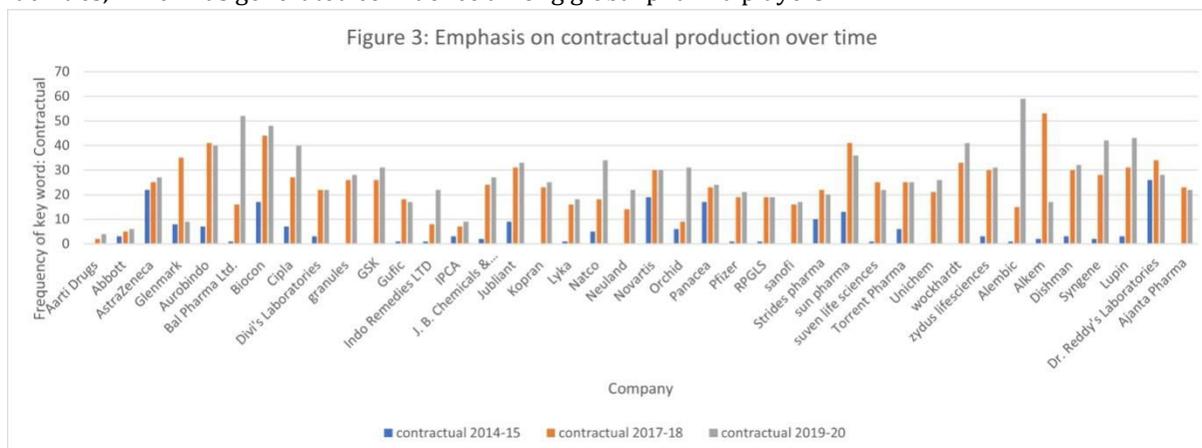
3.4 Clinical Trials

If we follow this up with the state with respect to clinical trials, Figure 4 paints a promising picture. A number of companies like Astra Zeneca, Glenmark, Aurobindo Pharma, Suven Life Sciences, Zydus Life Sciences, Biocon and Syngenehave increased their participation in clinical trials. Companies like Dishman, Panacea, Granules, Jubilant and Abbot have recently shown increased interest.


Figure 4: Companies getting involved in clinical trials over time
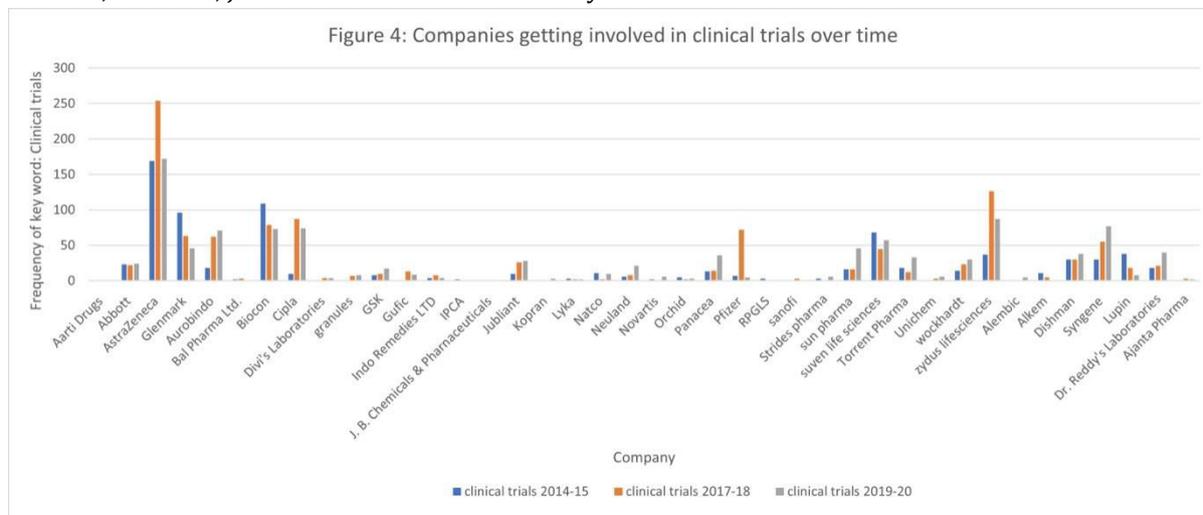
3.5 USFDA Approvals

Indian pharma exports have increased over the years, and having USFDA approvals are important for the US market. Figure 5identifies the leading players in India who have placed a lot of importance on seeking USFDA approvals and a reading of their annual reports will indicate that they have significant exports to the US. This approval also helps in entering other foreign markets. Companies that have emphasized on USFDA approvals are Jubilant, Panacea,Dr. Reddy's, Zydus Life Sciences, Torrent Pharma, Sun Pharma and Indo Remedies.

Figure 5: Companies that have shown interest in USFDA approvals
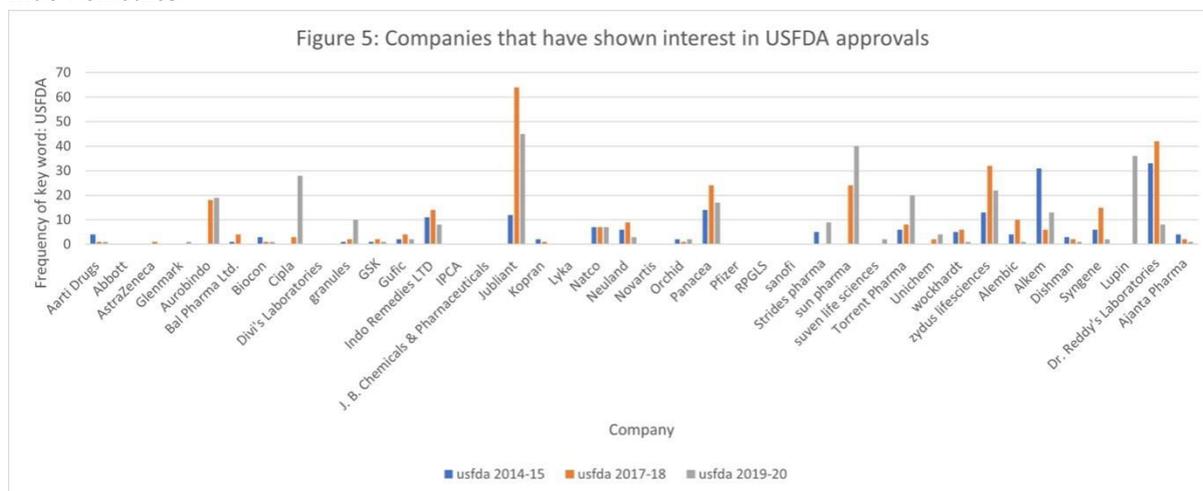
3.6 Biosimilars

As mentioned in the introduction, biosimilars is an area that will drive future growth. Biocon, the leading biotechnology company in India, lays heavy emphasis on biosimilars, followed by Lupin, Zydys Life Sciences, Pfizer and Dr. Reddy's. It is interesting that some other companies like Alembic, Dishman, Cipla, Astra Zeneca and Wockhardt have mentioned biosimilars and forayed in such areas.

Figure 6: Companies engaged in production of Biosimilars
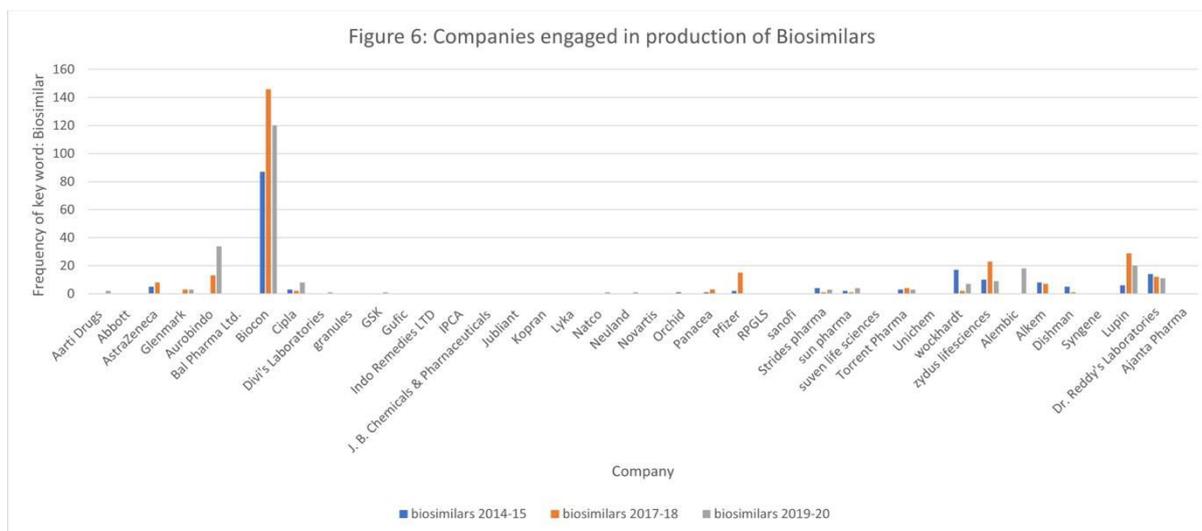
3.7 Patents

Figure 7 indicates the importance attached to patents by the companies and awareness of the legal environment. The figure does not generate confidence about extensive patent related efforts of Indian pharma companies.

Figure 7: Companies mentioning patents in their annual reports
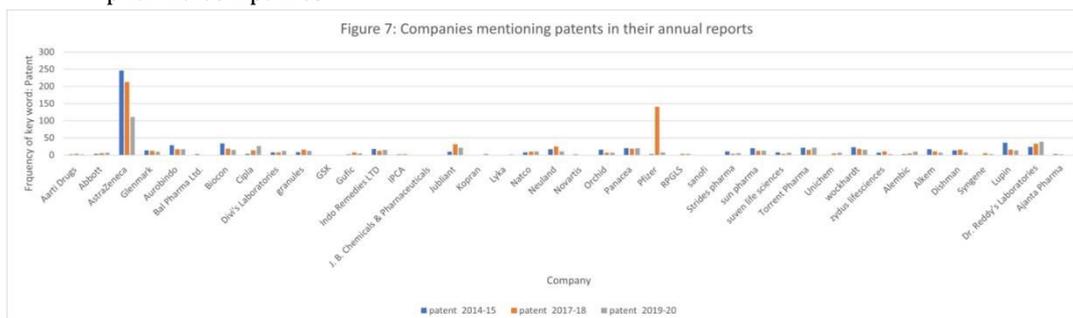
3.8 Licensing

Figure 8 indicates that a large number of Indian pharmaceutical companies produce drugs under licensing agreements, and this is a method for expansion and profitability for these companies. Interestingly, there are some companies like IPCA and Lykawho do not mention licensing at all, and are operating on their own in a limited sphere within a small range of traditional products. Some companies have lately shown interest like Unichem, Alembic, Guific and Aurobindo.

Figure 8: Companies involved production under licensing agreements

The above figures and the discussion reveal that not all Indian pharma companies are geared up with

respect to the opportunities and are probably comfortable with their existing operations. This concern was expressed byFederation of Indian Chambers of Commerce & Ernst and Young (2021).

4. Literature Survey

The focus of this research paper is on the impact of organizational environment on innovativeness and research and development for pharmaceutical companies in India. It is based on text mining of annual reports of companies and identification of key words is of fundamental importance. The following presents a brief description of some of the relevant papers in this area, from where the key words were drawn. Some papers discussed here present results on the relation between organizational environment and innovativeness in the context of pharmaceutical companies in other countries. Further, the papers included in this survey also covers research work which relates organizational culture with innovativeness.

Ceausu et al. (2017) relate organizational culture and innovativeness of companies. They conclude that innovation depends on the ability of people to generate knowledge and ideas and it is necessary to design organizational structures for cultivating talent and motivating them for innovative thinking. Similarly, Bendak et al. (2020) propose an innovative culture enhancement framework (ICEF) based on an organizational culture assessment instrument (OCAI) and a community innovation survey (CIS). Their approach identifies some determining factors for innovation outcome. Our choice of keywords covers the factors considered in ICEF and OCAI.

Naranjo-Valencia et al. (2016) use the framework of Cameron and Quinn (2006) and apply it for a sample of Spanish firms. They find that organizational culture can be an obstacle for innovation, which can affect firm performance. They identify four kinds of culture namely clan, hierarchy, adhocracy and market, and analyze their effect on innovation and firm performance. Our choice of key words reflects the characteristics of these four cultures.

Ha et al. (2020) analyse the relationship between innovativeness and financial performance of Japanese firms in Vietnam. Their analysis is based on four aspects of the balanced score card namely customers, finance, internal processes, employee learning and growth. Tapanainen et al. (2022) examine various factors that can be linked to the performance of a firm through a model involving entrepreneurial orientation, adaptive capability, innovativeness, and marketing capability for SMEs. These key words feature in our analysis.

Štreimikienė et al. (2021) focus on the impact of leadership team work and relationships with clients. Through an empirical study of pharmaceutical companies of Lithuania, they found that transformational leadership is the most effective factor for sustainable organizational culture. On the basis of a literature survey and the authors' experience in the pharmaceutical industry, Robb et al. (2022) propose recommendations that include empowerment of employees to engage in innovation. It highlights the importance of innovation and the role of organizational environment in bringing about a structure that is conducive for innovation.

Through a 30-year study (1991–2020) of University-Industry Collaborative Research & Development, Ma et al. (2022) find thatcollaboration between university and companies is beneficial for pharmaceutical research and development, and this can accelerate the pharmaceutical innovation process.We did not find evidence of such collaboration in India.

Thong & Lotta (2015) focused on the need for changes in the hierarchical management structure, inward looking mindset, product pipelines, functional silos, as well R&D for improvement in productivity in the pharmaceutical industry. They recommended comprehensive organizational transformation to build up R&D oriented culture to enable the pharma industry to thrive and evolve. Our study is also an investigation into the R & D orientation of Indian pharma companies.

Sommer and Bhandari (2022) analysed the effect of internationalization of R&D on innovation performance with longitudinal dataset of global pharma companies. Their study showed that there is an S-shaped relationship between internationalization of R&D and innovation performance. Using Mann-Whitney U test, Mete and Belgin (2022) found that there is an impact of knowledge management on the

efficiency of R&D firms and manufacturing units in Turkey.Factors like knowledge creation, knowledge culture, information system infrastructure, knowledge worker productivity were found to increase efficiency of R&D firms. Kang et al (2022) showed that quality and product development performance (PDP) can be enhanced by the combined effort of manufacturing R&D and organisational culture. Many of these words feature in our text mining exercise.

Schuhmacher et al (2022) observed that open innovation is the integral part of R&D models in pharmaceutical companies. These are typically used in research collaborations, innovation incubators, academic centres of excellence, public-private partnerships (PPP), mergers & acquisitions and licensing. Although some Indian pharmaceutical companies have innovation incubators, we did not find mention of interactions between industry and academic institutions in the annual reports that we studied.

Rahman and Howlader (2022) found that expenditure on R&D has a significant positive impact on financial performance and firm value. Their study indicated the need for increased attention of entrepreneurs, policy makers, investors and managers towards the investment in R&D, which is conducive for sustainable growth. From a dynamic panel threshold model, Wang et all (2022) observed that independent R&D of China's pharmaceutical manufacturing companies promoted innovation performance. Xia et al (2023) found that government innovation subsidy and tax rebate have positive significant impact on R&D outcome of pharmaceutical enterprises.Muthuveloo et al. (2021) analyse the effect of marketing capability, technology capability, innovation capability, dynamic capability, information technology capability, learning capability knowledge and management capability on firm performance.Our key words incorporate these factors.

Through a bibliometric study, Reis and Veríssimo(2022) discuss the literature on the relationship between organizational culture, corporate social responsibility and organizational performance.Obei and Gorkov (2023) propose a new model of strategic orientation of the firm and its effect on sustainable development of the firm. The proposed model is based on relationship of a firm with its stakeholders who are suppliers of key strategic resources. Our research work tries to identify strategic orientation of pharmaceutical companies in India and supply chain appears as a key word in the discussion.

5. Methodology

Our sample consists of thirty-seven listed Indian pharmaceutical companies. The text mining exercise is carried out using Voyant Tools, an open-source software, on annual reports of the companies for the years 2014-15, 2017-18 and 2019-20. This enabled determining the frequency with which the key words appear in the annual reports. As explained in the introduction, we have defined ten categories for estimating organizational environment and we have identified keywords representing each of these categories. It is expected that the frequency in which words are used in annual reports reflects the importance management attaches to the categories. Some of the key words are presented in Table 1. For detailed list of words, the reader can refer to Modak and Datta Chaudhuri (2023). However, since we are studying pharma companies, under innovativeness, some additional key words are used. These are generics, USFDA, contractual, regulation, safety, clinical trials, sustainability, biosimilars, patent and licensing. These last ten additional words, along with the word Research and Development, constitute an additional category, RD. Horizontal addition of the keyword frequencies in the categories gives the total organizational score (TOS) of each company. To examine the extent of funding support provided by the companies for Research and Development (R & D), we compute the values of R & D expenditure as percentage of sales from the profit and loss account. We thus have two indicators of R & D. One is frequency of RD. The other is actual expenditure on research and development, R & DE. To achieve our objectives, we define the following metrics.

Revealed Innovation Advantage Index (RIAI)= $[IO_i/\sum IO_i]/[TOS_i/\sum TOS_i]$ (1)

Revealed R & D Advantage Index (RIAI RD)= $[RD_i/IO_i]/[IO_i/TOS_i]$ (2)

Revealed Innovation Conversion Index (RICI) =$[R\&DE_i/Y_i]/[IO_i/TOS_i]$(3a)

Or alternatively,

$$[R\&DE_i/Y_i]/[RD_i/IO_i] \text{ (3b)}$$

where, for the ith company, Y is Sales, TOS is Total Organizational Score, IO is Innovativeness and Innovation Orientation, RD is Research Orientation and R&DE is expenditure on research and development. Metric (1) measures innovation orientation. If the value is greater than one, it indicates that the company is relatively more inclined towards innovation as compared to other units in the sample. Metric (2) measures the inclination towards Research and Development for companies relative to their overall innovativeness. The third metric looks at innovation orientation being backed up by expenditure on R & D. 3a defines R & D expenditure as percentage of sales relative to innovativeness. Companies that relatively emphasize more on innovativeness in their organizational environment, should also spend relatively more on R & D. 3b is an alternative definition of conversion where we emphasize that companies that talk about research and development in their annual reports, should also invest in R & D.

Table 1: Category-wise list of keywords

Category	Keywords
Innovativeness, Innovation Orientation	Research and Development, Brainstorming, Innovation, Training and Development, New products, Knowledge, Employee Quality, New markets, Creativity, Idea Management, Competence, Intelligence, Skill, Reward, Autonomy, Science and Technology.
Inward Looking Organizational Emphasis	Competence building, Incubation, Interaction, Skill building, Commitment, Learning, Reward, Autonomy, Adapt, Involvement.
Customer Interface	Customer Needs, Age group, Income group, Tastes and Preferences, Product Variety, Demand Forecasting, Customer feedback.
Competition Driven Organizational Culture	Marketing expenses, Advertising, Supply chain, Alternative Material, Efficiency, Effectiveness, Sustainability, Competition, Customer feedback, Quality, Price, Variety, Markets.
Organizational Mindset	Organizational structure, Doing, Using, Interacting, Technological collaboration, Vision, Mission, Strategy, Empathy, Leadership, Promotion, Cost Management.
Digitization, Digitalization, Digital Transformation	IOT, Artificial Intelligence, Data analytics, Information Technology, Quality Control, Big data, Digitization, Digitalization, Digital Transformation, IT infrastructure, Software, Hardware.
Organizational Environment	New Things, Action-oriented, Diverse perspectives, New opportunities, Encourage, Innovative efforts, Flexible, Long-term strategy, Deliberate, Comprehensive, Disciplined, Learning, Empathy.
Leadership	Vision, Think and act, Innovative, Coach, Support, Adversity, Persist, Risk taking.
Emphasis on Human Resources	Unconventional Ideas, Conventional Ideas, Opinions, Freely voice, Proactive, Initiative, Responsibility, Own action, Avoid blaming, Internal talent, HR systems, Generate ideas, Participation, People's competencies, New initiatives, Motivation, Human capital, New knowledge, Nurturing, Activating, Alienation, Incentivisation, Coordination, Teams based.
Technology Orientation	Technologies, Internal process, Speed, Reliability, Information Management, Computer spending, Reconfiguration capabilities, Systems, Organizational Intelligence.

Source: Authors' own construction

6. Data Analysis and Results

In section 2, we have discussed in detail the first objective. In this section, with the aid of the metrics defined in Section 3, we examine whether the data supports the remaining objectives the study.

Figure 9 shows companies with a value of RIAI greater than one and are relatively more innovative than the others. Companies like Astra Zeneca, Biocon, Jubilant and Sanofi fall in that category. There are some companies whose values of RIAI has remained lower than unity over the five-year period.

Figure 9: Revealed Innovation Advantage Index (RIAI) of companies, year-wise
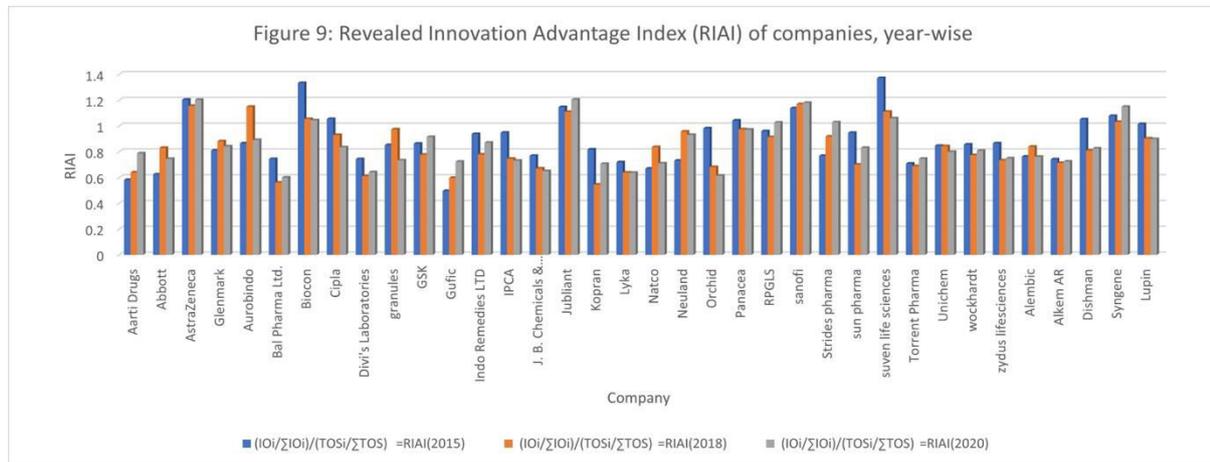
Figure 10 shows that in overall innovativeness, inclination towards R & D increased in the year 2018 as against that of 2015 for most of the companies. However, we observe a perceptible decline in 2020. This could be the effect of the beginning of the Covid pandemic where there was a general environment of fear, uncertainty and hopelessness.
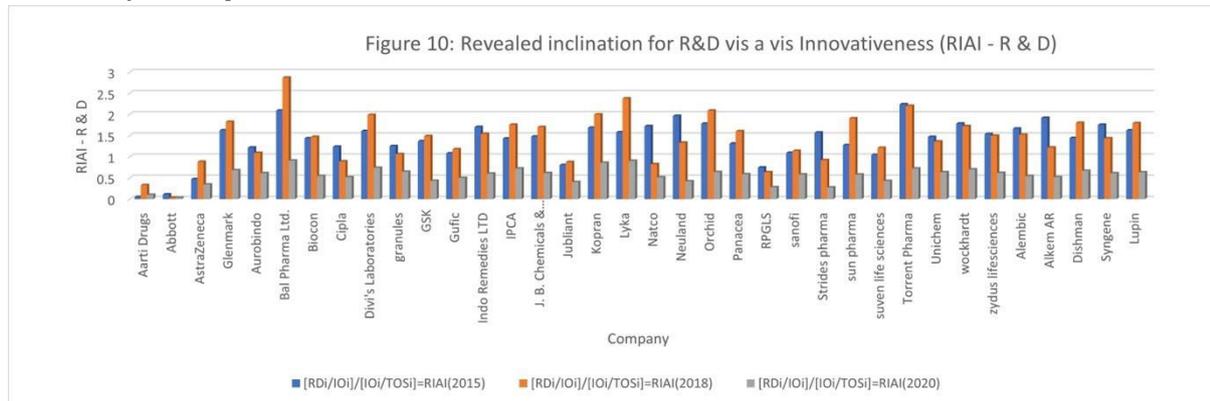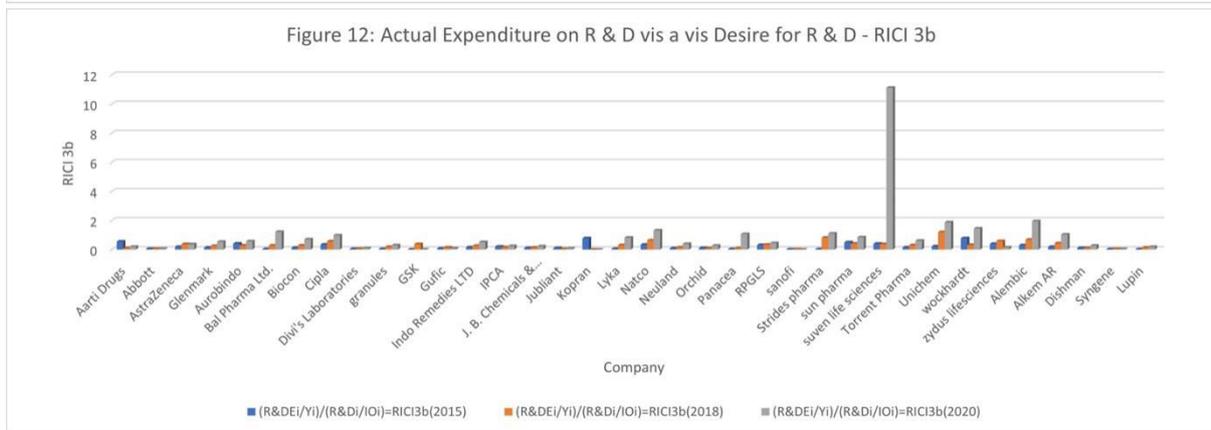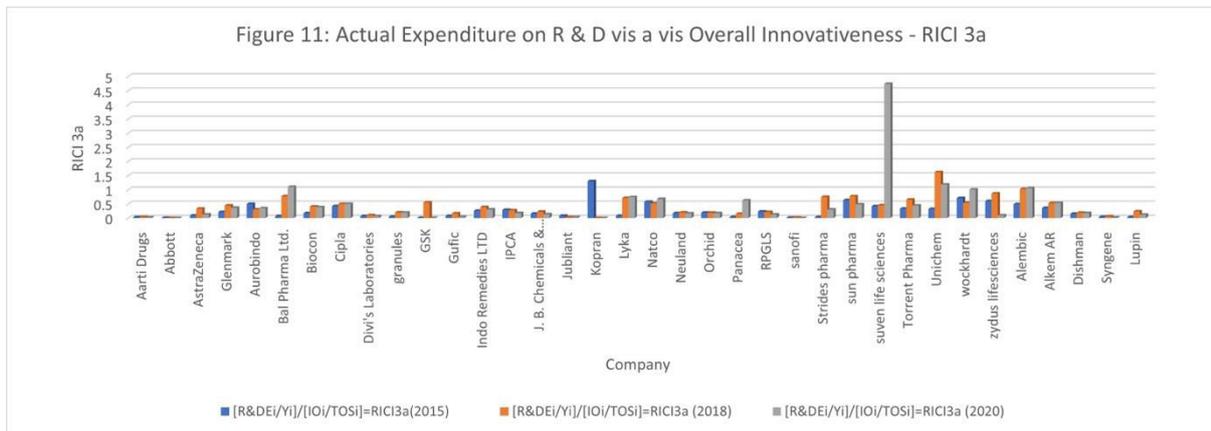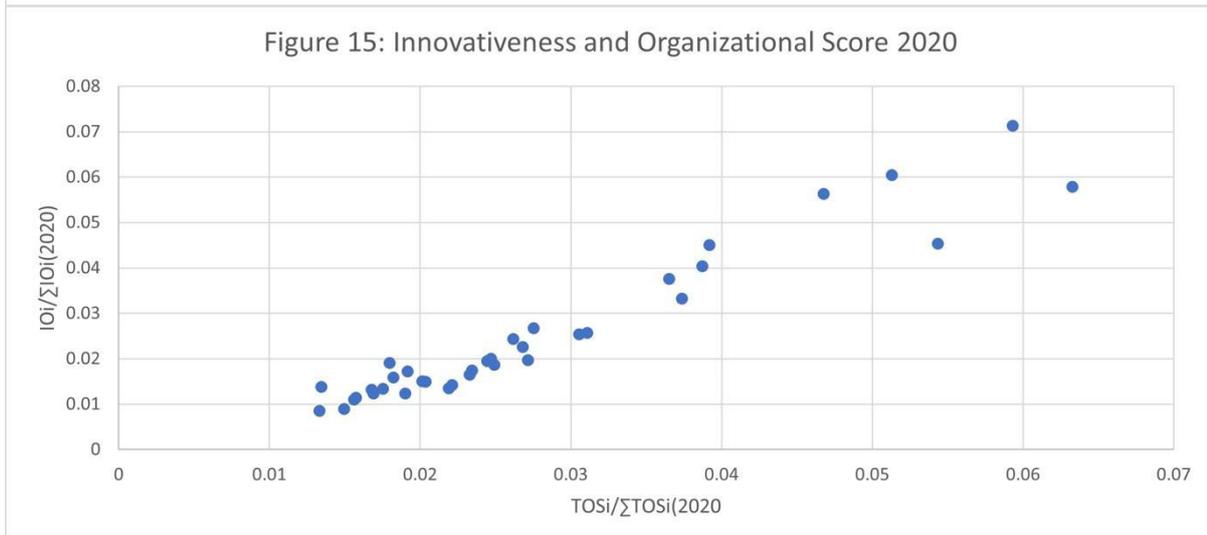

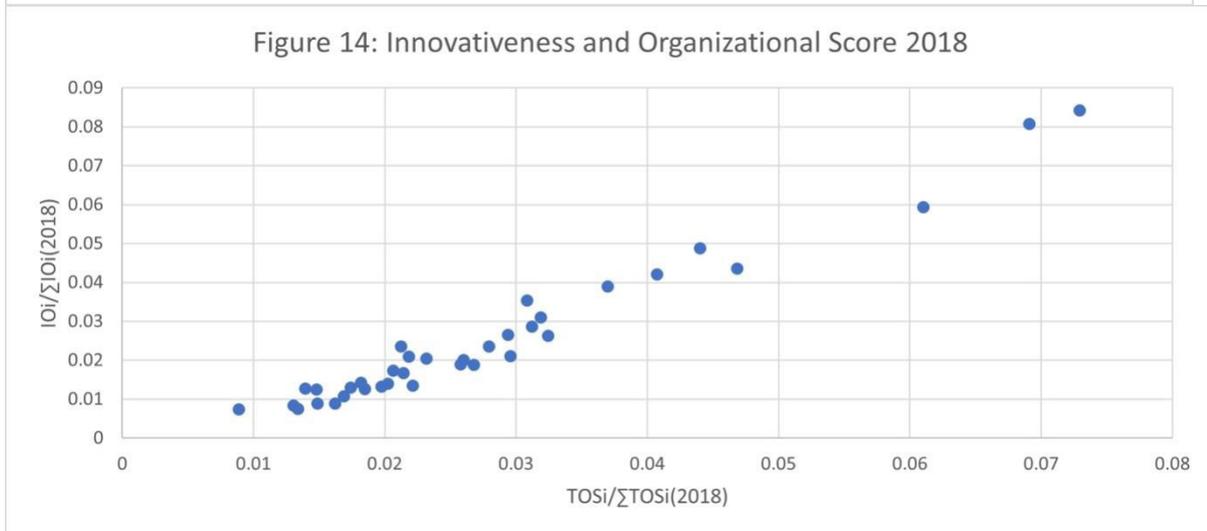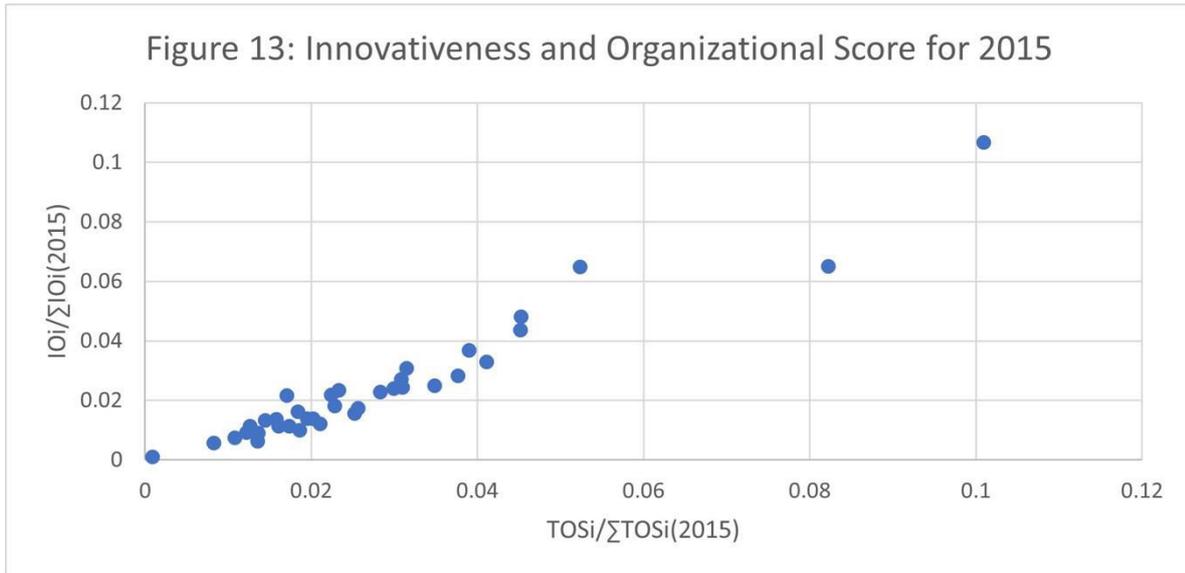Figure 10: Revealed inclination for R&D vis a vis Innovativeness (RIAI - R & D)

Figure 11and 12 indicate that the enthusiasm expressed by the pharma companies in their desire for being innovative, driven by organizational culture, is not revealed in their actual R & D expenditure as percentage of sales. Companies like Glenmark, Aurobindo, Biocon, Cipla Natco, Sun Pharma and Wockhardt have been consistent without much variation. Other companies like Alembic and Unichem have spent relatively more on research and development without emphasizing so much in their annual reports.

Figure 11: Actual Expenditure on R & D vis a vis Overall Innovativeness - RICI 3a

■ [R&DEi/Yi]/[IOi/TOSi]=RICI3a(2015)   ■ [R&DEi/Yi]/[IOi/TOSi]=RICI3a (2018)   ■ [R&DEi/Yi]/[IOi/TOSi]=RICI3a (2020)

Figure 12: Actual Expenditure on R & D vis a vis Desire for R & D - RICI 3b

■ (R&DEi/Yi)/(R&Di/IOi)=RICI3b(2015)   ■ (R&DEi/Yi)/(R&Di/IOi)=RICI3b(2018)   ■ (R&DEi/Yi)/(R&Di/IOi)=RICI3b(2020)

Figures 9 to 12 indicate three things. First, some companies were indeed relatively more innovative, and some of them improved on their index of innovativeness over time. Second, there was decline in inclination for R & D in the year 2020 over previous years caused probably by the shock of the pandemic. Third, the desire for innovation did not get converted significantly into actual expenditure on R & D. The shareholders probably did not share the same enthusiasm asthe management.

We now examine whether companies with high organizational score have encouraged exploration of new areas/ideas and are innovative, whether innovative companies have focussed on R & D, and whether companies that encouraged exploration of new areas/ideas, supported it with R & D funding.

Figures 13, 14 and 15indicate that companies with higher organizational score have encouraged innovativeness, and this is true for all the three years. Thus, the effect of organizational environment on innovativeness, overall, is positive.

Figure 13: Innovativeness and Organizational Score for 2015

Figure 14: Innovativeness and Organizational Score 2018

Figure 15: Innovativeness and Organizational Score 2020

Figures 16, 17 and 18 do not reveal any consistent pattern with respect to emphasis on research and development in the context of overall innovativeness. This is also observed in section 2 where not many companies had laid emphasis on patents, contractual production, clinical trials etc.

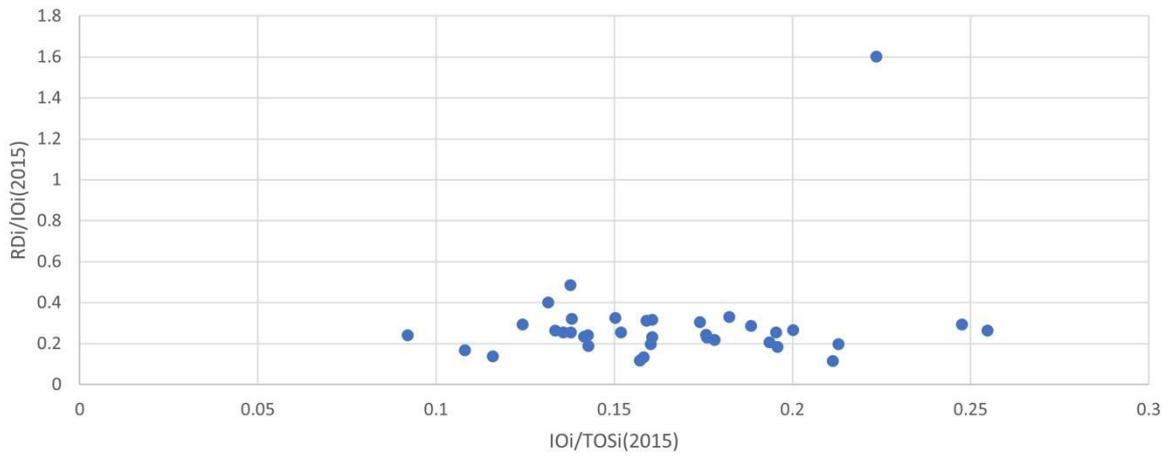Figure 16: Emphasis on R & D in overall Innovativeness 2015

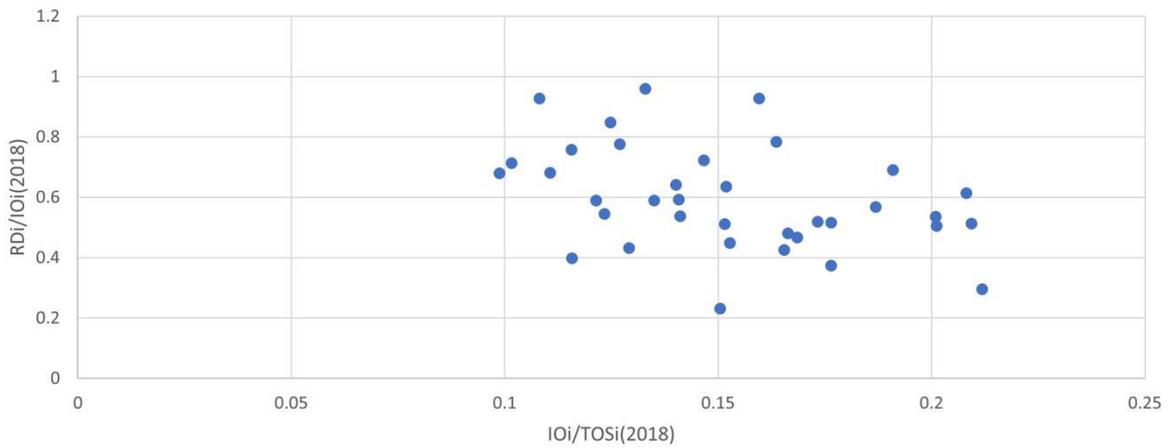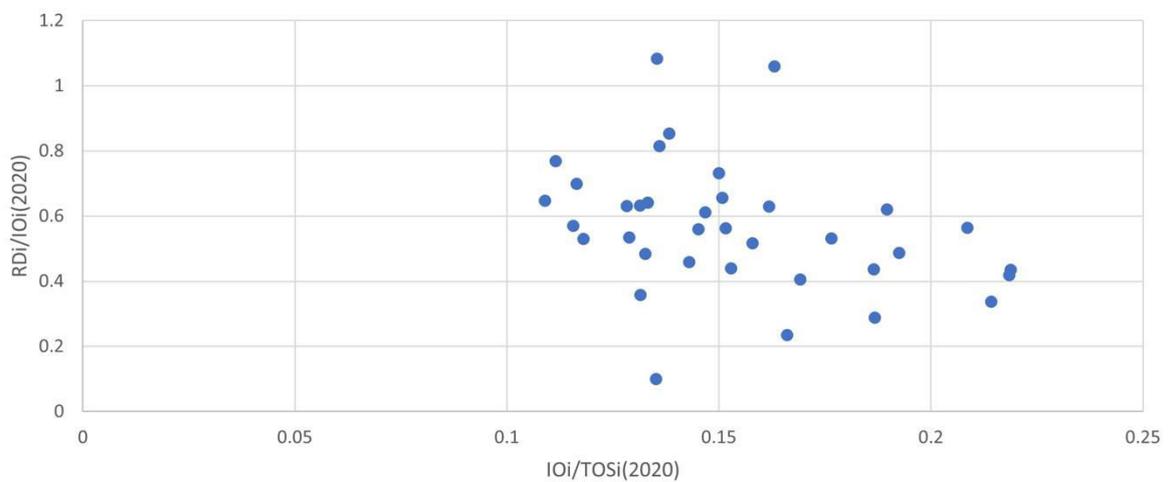Figure 17: Emphasis on R & D in overall Innovativeness 2018

Figure 18: Emphasis on R & D in overall Innovativeness 2020

Figures 19 and 20 reveal a weakpositive relationship between innovation orientation and expenditure on R & D.That is,companies that emphasized on more on innovativeness, also followed it up by actual spending on R & D. This is an encouraging finding. However, as already stated, the pandemic subdued this relationship in 2020 as shown in Figure 21.

Figure 19: Expenditure on R & D and Innovation Orientation 2015

Figure 20: Innovation Orientation and Expenditure on R & D 2018

Figure 21: Innovation Orientation and Expenditure on R & D
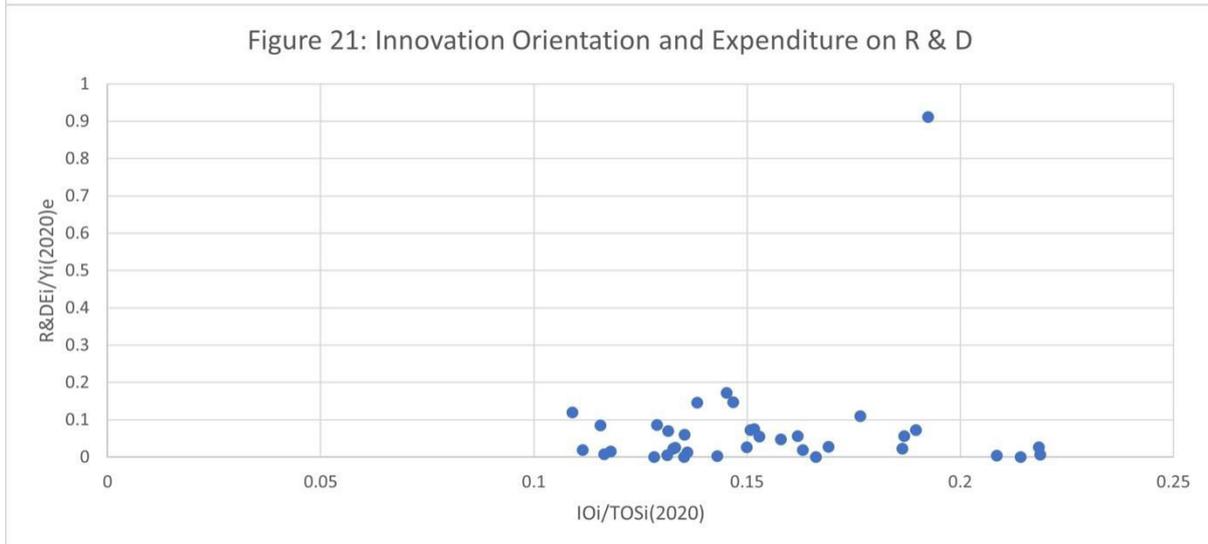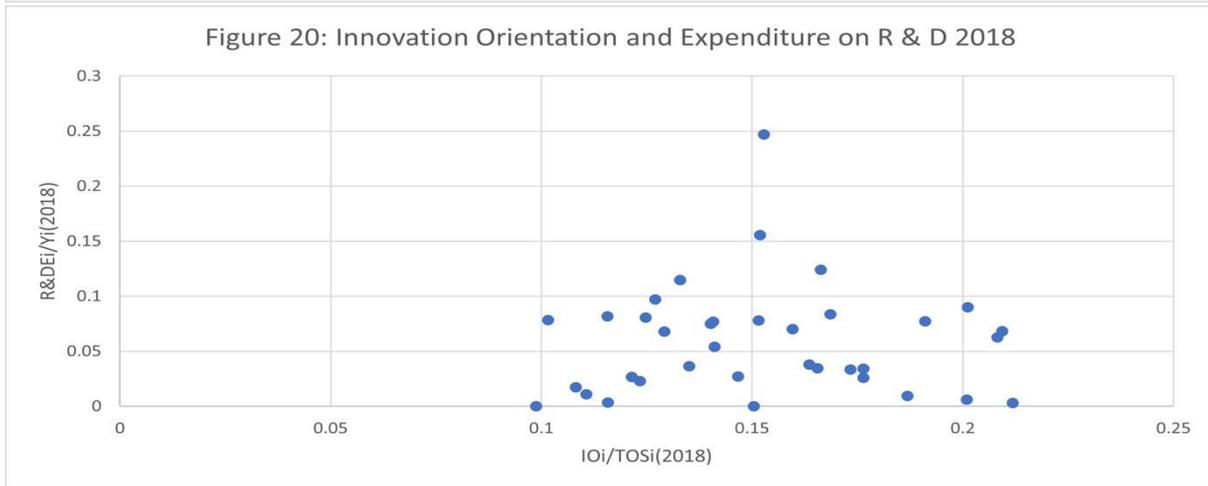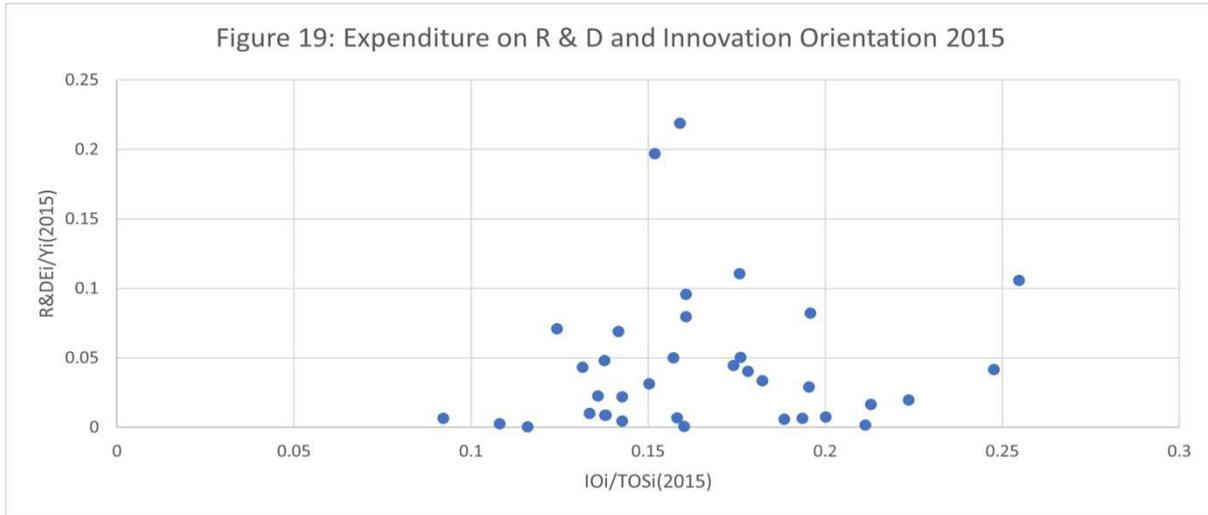
7. Discussion

The data and the analysis reveals that the level of awareness among Indian pharmaceutical companies of the changing landscape and opportunities, has increased over time. While they have maintained their emphasis on production of generics, many of them have diversified towards contractual production and clinical trials. Increased emphasis on USFDA approvals indicates intent for upgradation of facilities and R & D. Some pharma companies specialize in biosimilars and some have entered this market for diversification. The data also indicates that Indian pharmaceutical companies are not extensively into filing of patents and collaborations.

Overall innovativeness and inclination towards R & D increased in the year 2018 as against that of 2015 for most of the companies. However, the enthusiasm expressed by the pharma companies in their desire for being innovative, driven by organizational culture, is not revealed in their actual R & D expenditure as percentage of sales. The effect of organizational environment on innovativeness, overall, is positive.

Share market sentiment and investors get influenced by numbers presented in the balance sheet and profit and loss accounts, and often do not consider soft information available in the text of annual reports. Our study shows that textual information in the annual reports can provide valuable information on the organizational environment.These factors, along with financial parameters, can help investors in portfolio formation.

8. Conclusion

The paper explores whether the organizational environment of pharmaceutical companies in India has encouraged innovativeness, has helped in diversification and identification of product areas with growth potential, and whether the management has supported these companies with allocation of funds for Research and Development for sustained growth. To estimate organizational environment, ten factors/categories were identified, and frequency of each key word in the categories was tabulated with the help of a text mining software applied on annual reports of these companies. This way data was generated on qualitative variables like marketing orientation, customer orientation, leadership and inward-looking organizational emphasis. Similarly, the same software was used to generate the frequency of the key words associated with innovativeness and also the intent of the companies to explore new areas for growth. The sum of the frequencies of the key words in each category reflected the importance attached by a company to that variable and values of metrics like Revealed Innovation Advantage Index, Revealed R & D Advantage Index and Revealed Innovation Conversion Index were derived. This enabled studying relationships between the variables and observing their change over time.

Our study suggest that these companies have adapted well to the changing landscape and is participating in clinical trials, pursuing collaborations, encouraging contractual production and is increasingly looking for USFDA approvals. Further, a positive effect of organizational environment on innovativeness is observed. The different categories and their frequencies provide enough information on areas for improvement to the companies. It is interesting to note how study of annual reports can provide rich information on organizational environment and our use of the text mining software is justified.

Expenditure requirement for R & D of pharmaceutical companies is huge and is beyond the reach of many pharma companies.However, policy makers, before embarking on designing incentive structures and investments in centralized R & D facilities, should understand the mind-set of the companies, their abilities and their eagerness to experiment with new ideas. Otherwise, these facilities will remain underutilized. In this paper, we have provided a method for proceeding in this regard. We have not discussed our findings in areas like marketing orientation, HR issues and technology orientation in this paper, but used them to arrive at the total organizational score. We will explore these issues in detail in our future work.

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ADC- conceptual framework,design of the study, choice and identification of keywords,first draft preparation.
AB- text mining, data collection and arrangement, result generation, literature survey.
TDC- Interpretation of results, data analysis, discussion, final paaper preparation.