BRIDGING ACADEMIA-INDUSTRY GAP TO ACHIEVE SELF-RELIANCE FOR NIPER INSTITUTIONS IN INDIA

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Executive Summary

The objective of the study is to understand the industry-academia gap between NIPER institutions and pharmaceutical industries in India. In order to understand the problem, a questionnaire was developed for different stakeholders, including students, alumni, faculty of the NIPER institutions, and industry experts in the country. The questionnaires were shared, and timelines were provided for completing the survey. The questionnaire was designed to understand both perceptions and practice sides of the different perspectives in the industry-academia gap. Let's now discuss some of the major findings and outcomes that reflect the industry-academia gap in the NIPER institutions and how to make these institutions self-reliant and sustainable.

1) Respondents in the survey were nearly equally distributed between males and females, so there is the least chance of gender bias in the responses received. Students, alumni, and faculty were asked about their perceptions regarding institutional facilities, institutional curriculum, career prospects, and the entrepreneurial environment in their respective institutions.
2) The perception of the students is that the academic environment is very positive and warm, and there are possibilities for great industry-academia interactions. These questions received a very positive response; however, when questions related to their individual performance and contributions to projects, IPR, start-up, and technology advancement were asked, the reactions and reflections are reflected in the executive summary below and the whole report.
3) The data suggest that faculty have been part of projects and events throughout all the NIPERs surveyed; however, only a relevant chunk of students are aware of various facilities and projects being run by their

respective institutions. The knowledge gap limits student's exposure to practical research being done at their respective institutions.

4) The results also found that a limited number of students participated in a conference or presented a research paper at the same time. Conferences have great value in the enhancement of research endeavours and help build networks and understanding of new research areas. There is a need to increase the number of conferences and workshops being attended and conducted by the institutions in this field. Participation will help minimise the industry-academia gap in various ways.
5) The study indicates that the majority of the students are well aware of entrepreneurship, start-up, and related terms. Entrepreneurship has been taught to students in various institutions as a course or delivered through an entrepreneurship awareness program. Despite positive responses and understanding of the subject, the number of start-ups is very low, which can be due to academic engagement, life goals and interest in building a start-up.
6) Students should be encouraged to take entrepreneurship as a career choice and make elaborate attempts in this line. Boot camps, venture programs, awareness programs, incubation centres, and many other initiatives can help build an ecosystem for students and alumni so that they are encouraged to do the same. Institutions can have a pitching platform for their student start-up ideas.
7) The individual-level revelations show that there is a need to increase student engagement in research and relevant activities. Results also show that there is enough scope for improvement, and students should be encouraged to participate in projects and events so that they gain experience and exposure from the field and industry.
8) While students are familiar with existing opportunities through placement cells, NIPER institutions should increase outreach and work for more access to pharmaceutical industries and increase placement support

and related activities. Institutions can help by increasing training activities and related workshops and experiential learning for students.

9) The results show that the majority of the students are interested in jobs, but they are also looking for start-up ideas, higher education and research options in their respective institutions or outside. Many students are also interested in doing a PhD in their respective fields to contribute to the research and innovation.
10) Students and alumni also confirm the vitality of industry experience for students to emerge as industry professionals and work on the right needs of the industry. It is also suggested that institutions should collaborate with industries and create knowledge zones in their respective institutions, which disseminate a similar kind of industry knowledge required in the pharmaceutical sector.
11) The establishment of collaborative initiatives between industry and institutions is proposed to facilitate the conduction of research and address the requirements. In this context, it is imperative for institutions to prioritise practical research and experiential learning opportunities in order to foster increased academic-industry collaborations. Additionally, fostering collaboration between academic institutions and pharmaceutical firms in research initiatives has the potential to positively impact the educational development of both students and alumni.
12) Students know about incubation and start-up ecosystems in the country. Respondents suggest that students should be encouraged to take entrepreneurship and start-up as a career choice, and institutions should play a key role in bringing all the required facilities for them to the institute. All this highlights the role incubation centres can play in vitalizing the relevance of start-ups in the country.

Chapter 1

Introduction

1.1. Overview

India is the fifth largest economy in the world, according to estimates from the World GDP ranking for 2024. India holds the third rank globally in pharmaceutical production by volume and is known for its generic medicines and low-cost vaccines. India represents ample growth opportunities for everyone. The country has been the primary supplier of drugs to emerging nations and provided hope to millions during the Covid-19 crisis. The pharmaceutical sector of India contributed 1.32 per cent to the country's gross value added (at 2011-12 constant prices) in 2020-21.

India is considered the "pharmacy of the world" due to the popularity of its low-cost, high-quality drugs. Major segments include generic drugs, OTC medicines, bulk drugs, vaccines, contract research and manufacturing, biosimilars, and biologics. The country retains the global leadership position in the supply of DPT, BCG, and Measles vaccines. India contributes approximately 8% of the world's API production, which is contributed by more than 500 manufacturers. Access to affordable HIV treatment in India is one of medicine's most outstanding achievements.

The Indian Pharmaceutical Industry is a world leader in producing generic medicines. The Indian pharmaceutical industry is among the most dynamic industries in the world. Great leaders have worked and emerged as the foremost providers of medicine and medical devices in over a hundred countries around the world. To obtain a leadership position in drug discovery and development and to continue to excel in formulations, the government acknowledged that human resources and aptitude are of the utmost importance. The Indian government established the National Institute of Pharmaceutical Education & Research (NIPER) in SAS Nagar, Mohali, as a registered society in accordance with the Society Registered Act of 1860. Subsequently, the 1998 NIPER Act provided NIPER institutions statutory recognition, and it was designated an Institute of National Importance.

The government later established six new NIPERs in Ahmedabad, Guwahati, Rae Bareli, Kolkata, Hajipur, and Hyderabad in India. These institutions were founded with the guidance of NIPER Mohali. All of these institutions are inching closer to realising the goal of establishing a pharmaceutical ecosystem in the country and creating opportunities for collaborations and new pharmaceutical and medical device innovations. NIPER institutions are the next breed of industry-oriented and skill-oriented institutions, creating professionals for the country who can work in the pharmaceutical sector. The study investigates the academic and industry gap between pharmaceutical industries and NIPERs in the country and how to make NIPERs self-reliant. The NIPERs can provide the country with the most professional pharmaceutical working professionals, cutting-edge research ideas, and innovation in the field of pharmaceuticals and medical devices. This study looks into this particular question and tries to build an answer to fill such a gap and make NIPER institutions self-reliant in the possible way forward.

The Market Size of the Indian Pharmaceuticals

According to the Indian Economic Survey 2021-22, the domestic market will multiply over the next decade. In 2021, domestic pharmaceutical sales in India amounted to US$ 42 billion and were projected to reach US$ 65 billion by 2024 and US$ 120-130 billion by the year 2030. Biopharmaceuticals, bio-services, bio-agriculture, bio-industrial, and bio-informatics are all components of India's biotechnology industry. The Indian biotechnology industry was valued at $70.2 billion in 2020 and is expected to reach $150 billion by 2025. In the 2020-21 year, the medical equipment market in India was worth $10.36 billion. The market is anticipated to grow at a CAGR of 37% from 2020 to 2025, reaching $50 billion. The pharmaceutical industry in India is projected to reach $65 billion by 2024 and $130 billion by 2030. The pharmaceutical industry in India is currently valued at $50 billion[1].

India is a prominent pharmaceutical exporter, with exports to more than 200 countries. India supplies nearly fifty per cent of Africa's demand for generics, forty per cent in the United States, and twenty-five per cent of the United

[1] https://www.investindia.gov.in/sector/pharmaceuticals

Kingdom's pharmaceuticals. India is also the leading supplier of DPT, BCG, and measles vaccines, meeting 60% of the global demand. As per the essential Immunisation schedule, India provides 70% of the WHO's vaccinations. The average Index of Industrial Production of Pharmaceuticals, Medicinal Chemicals, and Botanical Products for fiscal year 2021-22 has increased by 1.3%, reaching 221.6. Exports of pharmaceuticals and pharmaceutical products will reach $24.6 billion in 2021-22, up from $24.44 billion in 2020-21. From 2014 to 2022, the pharmaceutical industry in India increased by 103%, from $11.6 billion to $24.6 billion.

Figure 1: India Pharmaceutical sector growth Prospectus

Source: *IBEF*[2]

1.2. Background

The triple helix model of innovation says that institutions, governments, and businesses must work together to improve the country's social and economic growth. NIPER is a step in the same direction, and it is expected that the NIPER institutions will work closely with the industry to make a real and lasting difference in the growth of the country and the drug industry. As self-reliance becomes increasingly crucial for a country's growth and development, it is essential to understand the role of the NIPERs set up by the government, show how they work together, and explain how partnerships and collaborations are made. This change in thinking is evident in developing countries like India, where there is much focus on becoming self-sufficient in

[2] Pharmaceutical Companies in India, Indian Pharma Industry- IBEF

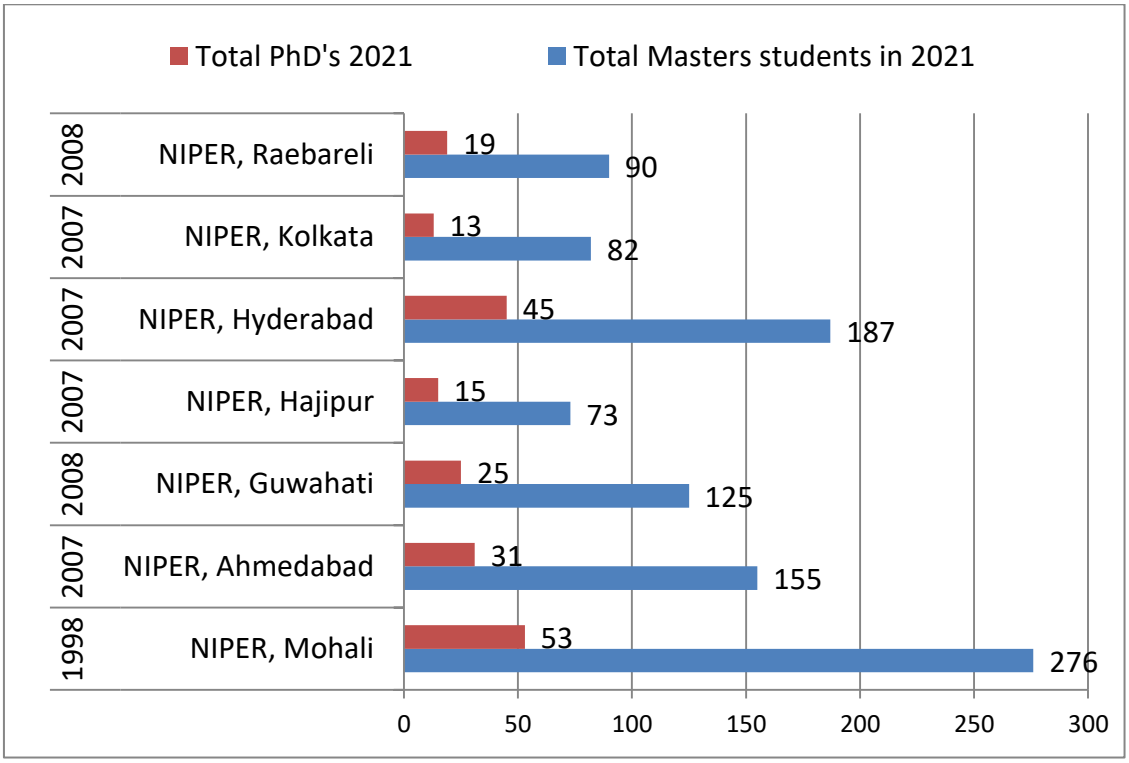
many areas, including pharmaceuticals. India's National Institute of Pharmaceutical Education and Research (NIPER) is a key part of bridging the gap between academia and business and helping the country become self-sufficient in pharmaceuticals. This chapter is an introduction to the thorough research study done to learn about the problems and develop ways to solve them.

Academic institutions are essential to the development of any nation because they produce the future workforce and leaders. However, India's academic institutions have struggled financially due to infrastructure, which has hindered their development. Industry-academia collaboration can address these issues by pairing academic institutions with industries on mutually beneficial initiatives. NIPER is the preeminent pharmaceutical education and research institute in India. NIPER has collaborated actively with the Indian pharmaceutical industry to advance pharmaceutical research and development.

The reports of the previously constituted commissions emphasize the significance of academia-industry collaboration in advancing research, innovation, employability, and productivity. India's industrial and academic research sectors would benefit from a long-term structural plan for continuous development. One method to address these issues is through industry-academia collaboration, in which academic institutions and businesses collaborate on mutually beneficial projects.

NIPERs started admission to PhD and master’s degree programs after their establishment. Figure 2 below shows the total number of students in various programs in the 2021-22 academic year. As most of the NIPER institutions started working 12-13 years ago, the number of courses has mostly stayed the same, and the strength of students is limited also. Except for Mohali, Ahmedabad, and Hyderabad NIPER, they have yet to be able to secure more than 100 admissions. While admissions follow a strict system of eligibility, the students need to be made aware of such courses and the availability of seats. The pharmaceutical sector is a growing area, and students search for such admissions; greater competition will lead to the best enrolment, and that automatically impacts the overall capacity building and human resource development for the country and the industry as a whole.

Figure 2: All NIPER Student Strength (2021-22)



Source: *Compiled from the DOP website*

Industry-Academia collaborations

A number of initiatives for industry-academic linkages in India have produced positive research results over the years. However, because these initiatives are sporadic in nature, India's share of world researchers has remained at about 2 per cent, compared to 20 per cent in the United States and China. The United States invested 3.4 per cent of its GDP in research and development (R&D), compared to Japan's 3.2 per cent and China's 2.40 per cent, but only .66 per cent in India[3].

Significantly, an analysis of the share in R&D reveals that in India, the government contributes between 75 to 80 per cent, the private sector contributes 20 to 25 per cent, and universities contribute 3 per cent, whereas, in OECD countries, the government contributes 10 per cent, the private sector contributes 69 per cent, universities contribute 18 per cent, and non-profit organizations contribute 3 per cent. If double-digit GDP growth is to be attained, India's R&D spending should be at least four per cent. However, India's R&D spending is only about one per cent of GDP. The current global GDP investment in R&D is 2.4 per

[3] *Research and development expenditure (% of GDP) | Data (worldbank.org)*

cent. A significant portion of this investment comes from the private sector through collaborative research with academic institutions. China has 300 research parks, while MIT has over 700 companies collaborating on projects of mutual interest with its faculty[4].

The National Knowledge Commission in 2008, the Kakodkar Committee Report on the Indian Institutes of Technology (IITs) in 2011[5], and the Narayan Murthy Report in 2012 are notable examples of committees that have made numerous recommendations on this subject. These reports highlight the significance of enhancing academia-industry collaboration to increase research, innovation, employability, and productivity through various means. Dr. Pallam Raju, the honorable minister, stated at the outset of the discussion that the current state of industry-academic ties in India is quite immature. He added that a more sustainable and long-term structural plan for continuous development would be mutually advantageous for India's industrial and academic research-driven sector. He added that a more sustainable and long-term structural plan for continuous development would mutually benefit India's industrial sector and academic research-driven sector.

In addition, Dr. Pallam Raju highlighted the following challenges currently facing the technology industry and academia. Even though India has significantly improved its service sector, its manufacturing facilities sector requires serious attention. Despite the excellent work done in academic research labs, there is a significant delay in converting that work into a marketable commodity. There needs to be stronger links between research and development in academic laboratories and the various manufacturing businesses that may use that research.

Academic institutions are essential to the development of any nation because they produce the future workforce and leaders. However, India's academic institutions have long been hampered by financial and infrastructural difficulties, which have impeded their growth and development. One method to address these issues is through industry-academia collaboration, in which academic institutions and businesses collaborate on mutually beneficial projects. Such

[4] *CII Education Summit 2022*
[5] *Final cover-Top-A3-April-17-2... (iiti.ac.in)*

partnerships can help academic institutions become self-sufficient, enhance their research capabilities, and provide students with improved educational opportunities. Collaboration between industry and academia is crucial to nurturing innovation and research in the pharmaceutical and science sectors. These collaborations can expedite the development of new technologies, products, and services by integrating the strengths of both industry and academia. Numerous pharmaceutical and scientific institutions in India have partnered with academic institutions to become self-sufficient.

1.3. Aims and Objectives of NIPER Institutions in India

I. To nurture and promote quality and excellence in pharmaceutical education and research.
II. Concentrate on courses leading to master's degrees, doctoral and post-doctoral courses, and research in pharmaceutical education.
III. To hold examinations and grant degrees.
IV. To confer honorary awards or other distinctions.
V. To cooperate with educational or other institutions having objectives wholly or partly similar to those of the Institute by exchange of faculty members and scholars and generally in such manner as may be conducive to their common objective.
VI. To conduct courses for teachers, pharmaceutical technologies, community and hospital pharmacists, and other professionals.
VII. To collect and maintain world literature on pharmaceutical and related sciences and technology so as to develop an information centre of its kind for other institutions within the country and in the developing world.
VIII. To create a central facility of pharmaceutical instrumentation and analysis for use by the research within and outside the Institute.
IX. To have a centre to experiment and innovate and train teachers and other workers in art, science, or pharmaceutical teaching.
X. To develop a world-level centre for the creation of new knowledge and transmission of existing information in pharmaceutical areas with a focus on national, educational, professional, and industrial commitments.
XI. To develop a multi-disciplinary approach in carrying out research and training of the pharmaceutical workforce so that the larger interests of the

profession, academia, and pharmaceutical industry are better served and a pharmaceutical work culture is evolved which is in tune with the changing world trends and patterns of pharmaceutical education and research.

XII. Organize national or international symposia, seminars, and conferences in selected areas of pharmaceutical education from time to time.

XIII. To arrange courses catering to the special needs of developing countries.

XIV. To act as a nucleus for interaction between academics and industry by encouraging the exchange of scientists and other technical staff between the Institute and the industry and by undertaking sponsored and funded research as well as consultancy projects by the Institute and

XV. To pay due attention to studies on the distribution and usage of drugs by the rural masses, taking into account the socio-economic spectrum in the country[6]

1.4. Research Problem

NIPER institutions are set up in the first place to bridge the gap between academia and industry and provide the pharmaceutical industry with well-trained professionals. The main objective is to train and mentor students, transform them into pharmaceutical professionals and train more people to work in the country's growing pharmaceutical sector. The gap between academia and industry in NIPER institutions makes it hard for India to become self-sufficient in the pharmaceutical field. A thesis study by Nagpur university scholar Gouri Palsonkar reveals that M. Pharma degree students do not find employment in industries, and an academic industry gap exists. Based on five years of work and a sample of 2000 respondents, the study reveals that the majority (84 per cent of industry professionals and 82 per cent of academics believe there is an industry-academia gap based on varied reasons[7]. It is essential to find out what is stopping them from working together and becoming more international. Even though NIPER educational institutions are known for their research and academic excellence, there is a big difference in how well they turn academic knowledge into practical uses that meet industry needs. The main goal of this

[6] *Annual Report 2022-23 -reg. | Department of Pharmaceuticals*
[7] *Big gap between industry & academia in pharma edu: Study | Nagpur News - Times of India (indiatimes.com)*

study is to figure out what causes the gap and offer ways for people to work together to close it.

1.5. Research Objectives

The industry-academia gap is wide, and there is a need to fill the gap with efforts by both academic institutions and the pharmaceutical industry in the country. The study looks at how research, teaching, projects, and intellectual property rights (IPR) help academic institutions and industries work together. The study will also look at ways for the National Institute of Pharmaceutical Education and Research (NIPER) to work together to become self-sufficient. In this study, the following objectives will be fulfilled.

I. To identify the significant challenges and gaps in the industry-academia collaborations.
II. To identify the factors contributing to the gap between academia and industry in NIPER institutions, including institutional academic practices, curriculum design, and research focus.
III. To propose actionable recommendations and strategies to enhance academia-industry collaboration and foster self-reliance in all the NIPER institutions in the country.

1.6. Significance of the Study

This research study is of significant importance to various stakeholders involved in the pharmaceutical industry and academia in India. This study is significant for many reasons, but some important ones are listed below.

Effective collaboration between academia and industry facilitates the transmission of knowledge, skills, and technologies, resulting in the creation of pharmaceutical products on the cutting edge of innovation. Collaboration is always necessary, and this report can aid in its development by identifying the main obstacles and roadblocks.

This study is also significant from an academic standpoint. Because NIPER institutions offer a limited number of courses, the calibre of education meets industry standards. This study also assists us in recognizing the need for more professionals with current credentials and industrial readiness.

As it stands, India is a major player in a variety of pharmaceutical variants. However, there is ample opportunity to build greater collaborations and project-based coordination between NIPER and industries in the country to achieve new heights in the areas where the country is still reliant on imports and finished goods.

In addition to identifying the gaps and significant issues, the study will also provide recommendations for constructing an industry-academia collaborative ecosystem for NIPER institutions in the country.

1.7. Organisation of the Report

The report is organised into nine chapters. The first chapter is an introduction to the report. The second chapter discusses an overview of the pharmaceutical industry and the academic gap. The third chapter discusses the department of pharmaceuticals and its relation with NIPER institutions. The fourth chapter is a portrayal of the methodology being used in this study and highlights the data techniques and questionnaires being served for the collection of data in this study. The fifth, sixth and seventh chapters are based on results from three different surveys conducted by the project officers. The results are reflected in three chapters: student survey, alumni survey, and faculty survey. The eighth chapter is the discussion and suggestion chapter, which reflects upon the findings of the study and provides suggestions that can be useful for the elimination of the industry-academia gap in the country.

In summary, this introductory chapter provides an overview of the research study on bridging the academia-industry gap in NIPER institutions in India. It outlines the background, problem statement, research objectives, and significance of the study. The subsequent chapters delve deeper into that.

Chapter 2

An Overview of the Pharmaceuticals Industry and Academia Gap

India is now among the pharmaceutical leaders because of its commitment to innovation and research-based methods for making new drugs, vaccines, and drug discoveries. The sale value and growing share of pharmaceuticals have made them a significant source of income for the country. The country's environment is suitable for developing and sharing new research in this field, which significantly affects the pharmacy market worldwide. In the pharmaceutical business, India is third in volume and 14th in value worldwide. About 1.72 per cent of the country's GDP comes from the pharmaceutical industry[8].

Generic drug manufacturing, over-the-counter drugs, vaccines, Contract Research & Manufacturing, Biosimilars & Biologics are the mainstays of India's pharmaceutical industry. India has the second-most FDA-approved facilities outside the United States. India is called the world's pharmacy due to the global demand and preference for Indian generic medications. India's market for APIs, medical devices, and other products will reach US$130 billion by 2030, significantly improving from its current position. Pharmaceutical is one of India's ten most attractive industries for foreign investment. India's pharmaceutical exports reach over 200 countries worldwide, including the highly regulated markets of the United States, Western Europe, Japan, and Australia. India exports 3.5% of the world's total drugs and medications. India supplied approximately 45 tonnes and 400 million tablets of hydroxychloroquine to 114 nations worldwide[9].

India has approximately 3,000 pharmaceutical businesses, over 10,500 manufacturing facilities, and a highly skilled labour force. In 60 therapeutic categories, the Indian pharmaceutical industry offers 60,000 generic brands. The

[8] *english Annual Report 2020-21.pdf (pharmaceuticals.gov.in)*
[9] *English Releases (pib.gov.in)*

market is anticipated to reach $65 billion by 2024 and $130 billion by 2030. The production costs are 33% lower than in Western markets. India provides 60% of the world's vaccines and 20% of the world's generic drugs due to the competitive pricing and high quality of its pharmaceutical products[10].

India is the world's largest supplier of generic medications and is renowned for its inexpensive vaccines and generic medicines. Over the past nine years, the Indian pharmaceutical industry has grown at a CAGR of 9.43% to become the world's third-largest pharmaceutical producer by volume. Approximately fifty per cent of the global demand for various vaccines, forty per cent of the generic demand in the United States, and twenty-five per cent of all medications in the United Kingdom are met by the Indian pharmaceutical industry. India occupies a prominent position in the global pharmaceutical industry. In addition, the nation has a large pool of scientists and engineers capable of propelling the industry to greater heights. Indian pharmaceutical companies supply nearly 80% of the antiretroviral drugs used to treat AIDS (Acquired Immune Deficiency Syndrome) worldwide[11].

2.1. Understanding the Academia-Industry Gap

The National Institute of Pharmaceutical Education and Research (NIPER) is essential in pharmaceutical education, research, and innovation in India. These institutes have been responsible for having a practical impact on the pharmaceutical industry in the country and worldwide. The gap between academia and industry inhibits NIPER institutions from developing a professional workforce with extensive industrial exposure and know-how. A significant gap exists between academia and industry in these institutions, limiting their ability to successfully contribute to the nation's self-reliance in the pharmaceutical sector. It is critical to grasp the significant gap between the two, and understanding the nature and underlying reasons for this gap is critical for developing effective measures to bridge it.

2.2. Factors Contributing to the Gap

Lack of Industry-Academia Collaboration

[10] *Domestic pharmaceutical market to reach $130 billion by 2030: Economic Survey - The Hindu*
[11] *80% drugs to combat AIDS supplied by India: JP Nadda (indiatimes.com)*

One of the main reasons for the academia-Industry Gap in NIPER institutions is that education and industry should work together. The traditional educational system tends to put more emphasis on theoretical information and less on practical skills and how they can be used in the real world. This divide makes it harder for students and experts to learn valuable skills in the business world. Also, the lack of joint research projects, jobs, and industry-sponsored curriculum development makes it harder for academics to learn about and understand how industries work.

Study Curriculum

Each department of the NIPER institutions has a committee called DAAC (Departmental academic advisory committee) to recommend updates to the syllabus. The committee includes members of the industry as well. However, a study by Tharappel, Kaur, and Buttar (2014) identifies a significant difference between the syllabus being taught and the industry requirement[12]. There must be a mix of industry-driven topics, new technologies, and cross-disciplinary classes to help students get ready for the workplace. More of this will be found in the results in the upcoming chapters.

Limited Industrial Exposure

A big part of the Academia-Industry Gap is that students need to get more experience in the real world. NIPER institutions should build strong ties with pharmaceutical industries so that students and faculty can work on projects that are useful to the industry. Recently, union minister Mansukh Mandviya, on June 22, 2022, announced in Bihar while inaugurating a laboratory in NIPER Hajipur that all the NIPER students will compulsorily do a one-year internship with pharma industries, and there will be a formal announcement for that as well[13]. Such a move can significantly help and boost the confidence of students and faculty at all the NIPER institutions in India. This will help students understand the industry, and they can talk to industry workers or learn from their real-life experiences.

Entrepreneurial Culture within the institutions

[12] *Microsoft Word - 04. Pharmaceutical_Education_in_India_wsj (pharmainfo.in)*
[13] *'one-yr Internship For Niper Students' | Patna News - Times of India (indiatimes.com)*

The NIPER institution should promote innovation by helping students develop an entrepreneurial mindset and promote start-up incubation in there institutions. Through this encouragement, students and professors can turn their study results into products or services that can be sold. To help NIPERs create an entrepreneurial ecosystem, they should offer programs to help students learn how to be entrepreneurs and receive mentorship and financial support. Various NIPER institutions are running the incubation system in the name of bio-NEST, encouraging students to develop new ideas and create new start-ups.

Industry-Driven Research Focus

In India, business leaders often hesitate to talk to university scientists who have worked in the business world for a few years. Because there isn't a strong link between universities and industry, most faculty members have limited industrial experience or exposure. Practising engineers have few opportunities to update their technology skills through continuing education in universities and institutions. State of the art in industry prevents the flow between organized research in institutions and the development of industrial R&D.

2.3. Benefits of Industry-Academia Collaboration

Industry-academia collaborations are always helpful because they open many avenues for new developments and help institutions and their faculties generate new research perspectives. It gives new opportunities to people working in the ecosystem and students studying in these institutions. Both parties benefit from these joint events and collaboration. Industry-academia collaboration offers numerous benefits, including:

Financial Support: Due to limited government funding, India's academic institutions frequently encounter financial obstacles. By partnering with industries, academic institutions can receive funding for research and development projects, infrastructure development, and other mutually beneficial endeavours. This is not limited to funding only; collaboration goes a long way in creating a better future and drives innovative changes in the field.

- *Research Capabilities:* Collaboration with industry can enhance the research capabilities of academic institutions by providing access to cutting-

edge equipment, technologies, and expertise. Also, to create innovative solutions and products that benefit academia and industry. Joint projects can be a mutual benefit for both parties. Though collaborations, the institute and industry can exchange the knowledge and technologies identified. This will enhance the growth of industry and academia. Research is advanced when multiple parties do it together. Various groups of researchers provide insights that are critical to the overall research environment.

- *Skill Development:* Academic institutions can develop relevant and industry-specific skills in their students through industry collaboration. Skill enhancement, internships, and experience need to be an essential part of the exposure among students. This can help students prepare for the job market and enhance their employability. As per a recent announcement, NIPER institution students will be doing a long-term internship to help them understand the varied perspectives of the pharmaceutical industry in India and abroad.
- *Entrepreneurship:* Entrepreneurship, innovation and creativity are the way forward. Every country needs entrepreneurs, innovators, and a growth-oriented population. India now has the world's third-largest and most sophisticated entrepreneurship ecosystem, and it is very important to harness its benefits. It is only possible when intellectual minds work on new ideas and develop start-ups that can sustain in the market and impact the country's people, society and economy. Collaboration with industry can also help academic institutions encourage students to engage in entrepreneurship. Students can acquire hands-on experience in creating innovative solutions and products by collaborating with industry on joint projects.

2.4. Examples of Industry-Academia Collaborations by NIPER

Most of the NIPERs in India have established relationships with industries, which is visible in the number of MOUs signed between them. These collaborations also need to be worked out so that these benefits reach both parties in the long term. The details shared below highlight the efforts made by NIPER institutions in

India to bridge the academia-industry gap and achieve self-reliance through collaborations, MOUs, and joint research initiatives. Some examples of industry-academia collaborations are listed below:

Collaboration with Pharmaceutical Companies:

NIPER Mohali collaborated with pharmaceutical companies like Biocon, Ranbaxy, and Dr. Reddy's Laboratories for joint research projects, internships, and training programs.

NIPER Hyderabad signed MOUs with companies like Aurobindo Pharma, Dr Reddy's Laboratories, and GVK Biosciences for collaborative research, technology transfer, and industrial training programs.

Academic Collaborations:

NIPER Mohali collaborated with premier academic institutions like the Indian Institutes of Technology (IITs), Indian Institutes of Science Education and Research (IISERs), and the Indian Council of Medical Research (ICMR) for joint research projects and exchange programs.

NIPER Ahmedabad signed MOUs with many universities like IIT Gandhinagar, IIPH Gandhinagar, Kmdhenu University, Gandhinagar, Gujarat Biotechnology Research Centre (GBRC), AIIMS Jodhpur and others for academic collaborations, joint research, and faculty exchange.

Collaboration with Government Organizations:

NIPER Kolkata collaborated with the Central Drug Research Institute (CDRI), a premier research organization under the Council of Scientific and Industrial Research (CSIR), for joint research, training programs, and technology transfer.

NIPER Rae Bareli signed MOUs with organizations like the Department of Biotechnology (DBT) and the Department of Science and Technology (DST) for collaborative research and funding support.

Industry-Academia Partnerships:

NIPER Guwahati collaborated with industries like Sun Pharmaceuticals, Jubilant Generics, and Hikal Ltd. for joint research, development of innovative products, and technology transfer.

NIPER Raebareli signed MOUs with industry partners like Cadila Pharmaceuticals, Cipla, and Lupin Pharmaceuticals for collaborative research, training programs, and skill development.

International Collaborations:

- NIPER Mohali collaborates with international institutions like the University of Michigan, USA, and the University of Nottingham, UK, for joint research projects, faculty exchange, and student internships.
- NIPER Ahmedabad signed MOUs with many foreign universities, like Leicester school of Pharmacy and others for joint research, academic collaborations, and exchange programs.
- Additionally, in 2019, the Department of Biotechnology (DBT) collaborated with Biocon and established a Centre of Excellence in Biopharmaceutical Sciences at the Institute of Chemical Technology, Mumbai. The centre aims to provide state-of-the-art infrastructure and training to researchers and students to develop new drugs and biopharmaceuticals.
- These collaborations have provided NIPER researchers with access to industry expertise, facilities, and resources and opportunities for NIPER students to work on industry projects, which have enhanced their skills and knowledge.
- Overall, the industry collaborations by NIPER with pharma sector companies in India have been instrumental in promoting research and development in the field of pharmaceuticals and are helping NIPERs in India to become self-reliant.

2.5. Existing Initiatives to Bridge the Industry-academia Gap

The gap between academia and industry has been a persistent obstacle for educational institutions around the globe, including the National Institutes of Pharmaceutical Education and Research in India (NIPER). Recognizing the need to bridge this divide, NIPER institutions have implemented several initiatives to foster collaboration, promote knowledge exchange, and enhance the industry-

oriented skills of students and faculty. The points below provide a comprehensive overview of the initiatives undertaken by NIPER institutions in India to bridge the academia and industry gap.

***Industry-Academia Collaborative Projects**:* Through joint research initiatives, NIPER institutions have actively promoted industry-academia collaborations. These initiatives involve NIPER faculty and industry professionals collaborating to address research challenges, develop innovative solutions, and infuse academic settings with industry-relevant knowledge. These collaborative initiatives facilitate the exchange of knowledge, resources, and technology, fostering a relationship between academia and industry that is mutually beneficial.

***Guest Lectures and Workshops**:* NIPER institutions frequently host guest lectures and workshops led by industry professionals to familiarise students and faculty with industry practices and emergent trends. These sessions offer insightful perspectives on the practical aspects of pharmaceutical research, development, and commercialization. By bringing industry professionals to campus, NIPER institutions create networking, knowledge-sharing, and mentoring platforms, allowing students to acquire industry perspectives and cultivate valuable relationships.

***Industrial Training and Internship Programs**:* NIPER institutions know how crucial real training and hands-on learning are for preparing students for jobs in the industry. To help with this, they have set up strong programs for internships and training in the workplace. Students in these programs can work directly with business partners, which lets them put their classroom information to use in the real world. Through internships, students get real-world experience, learn industry-specific skills, and learn more about the pharmaceutical sector.

***Industry Advisory Boards**:* Several institutions have set up industrial advisory boards to ensure that NIPER's curriculum aligns with industry needs and new trends. These boards comprise well-known business leaders, academics, and policymakers who give NIPER institutions strategic advice. They give NIPER institutions useful information about what the industry wants, what

areas of study are on the rise, and what skills are needed. This helps the institutions change their programs to meet the industry's needs better.

***Entrepreneurship and Innovation Cells**:* NIPER institutions have set up entrepreneurship and innovation cells because they know how important it is to encourage people to think like entrepreneurs and support new ideas. These cells help students and professors create and sell their research results by giving them advice, funding opportunities, and infrastructure. By encouraging a culture of innovation and entrepreneurship, NIPER institutions help Students Bridge the gap between academia and industry by turning the results of their study into products or services that can be sold.

***Industry Immersion Programs**:* Institutions in the NIPER network have set up programs that allow students and teachers to spend a certain amount of time in industry settings. These programs give people an immersive experience that helps them learn more about the industry's workings, problems, and the best ways to deal with them. Through immersion in the industry, NIPER stakeholders learn valuable skills useful in the industry, build partnerships, and make strong industry ties, all of which are necessary for the successful integration of academia and industry.

NIPERs in the country are institutions of national importance, highlighting the importance of these institutions for the country. To fulfil the goal and objective of NIPER, as given in the introduction chapter, all the NIPERs need to work in sync, learn from each other, work on a competitive basis, and provide the best research outcomes and results.

In this chapter, we have assessed the existing knowledge related to NIPER institutions and their work in collaboration with industries in the country. In the coming chapter, we shall learn about the outcome of the survey that has been conducted concerning NIPER industry-academia gaps in the system.

Chapter 3

DOP and NIPER Institutions: Research, Outcomes, and Future

NIPER Mohali 1983 was the first of its kind in India, and six new NIPERs were established in 2007-08. NIPER Mohali was the first national-level Institute in pharmaceutical sciences with a proclaimed objective of becoming a centre of excellence for advanced studies and research in pharmaceutical sciences. NIPER Mohali was declared an 'institute of national importance, and later on all the NIPERs were established as institutions of national importance. All the NIPERs operate as autonomous bodies under the aegis of the Department of Pharmaceuticals, Ministry of Chemicals and Fertilizers.

3.1 Introduction to the Department of Pharmaceuticals in India

The Department of Pharmaceuticals (DoP) in India is a crucial regulatory agency that plays a pivotal role in developing and growing the pharmaceutical industry. It operates under the Ministry of Chemicals and Fertilisers and is responsible for formulating and implementing policies and programs to encourage the production, availability, and accessibility of affordable, high-quality pharmaceuticals.

Establishing the Department of Pharmaceuticals in 2008 was a significant step in India's journey to become a global pharmaceutical industry leader. Its primary objective is to foster the growth of a sustainable and competitive pharmaceutical industry that meets the healthcare requirements of the Indian populace and contributes to the nation's economic expansion.

One of the primary responsibilities of the Department of Pharmaceuticals is to develop and implement various policies and programs that promote the expansion of the pharmaceutical industry. It collaborates with other government agencies, industry stakeholders, and research institutions to foster the growth of

both domestic and international pharmaceutical companies. The Department also strives to improve the nation's regulatory framework to guarantee pharmaceutical products' quality, safety, and efficacy. Some of the significant policies of DOP are enlisted below.

***Export Promotion Council for Medical Devices*:** It is a scheme under the Department of Pharmaceuticals that aims to promote and develop the export of medical devices from India. The council provides various services such as market research, trade promotion, and technical assistance to Indian medical device manufacturers. It also organizes trade fairs and exhibitions to showcase Indian medical devices in international markets. The council also works closely with the government to formulate policies that support the growth of the medical device industry in India.

Uniform Code for Medical Device Marketing Practices: It is a voluntary code of ethics for the medical device industry in India. It was developed by the Department of Pharmaceuticals (DoP) in 2017 to promote ethical marketing practices and ensure that medical devices are marketed ethically and transparently. The code is intended to guide medical device manufacturers and distributors on how to market their products in a responsible manner, with a focus on patient safety and ethical business practices. The code covers various topics, including advertising and promotion, interactions with healthcare professionals, and compliance with applicable laws and regulations.

National Medical Device Policy 2023: The aim is to place the medical devices sector on an accelerated path of growth with a patient-centric approach to meet the evolving healthcare needs of patients.

Public Procurement Policy: The policy was approved by the Cabinet in 2013 for five years in respect of 103 medicines manufactured by pharma CPSUs and their subsidiaries. The policy applies to purchases by Central/ State Government departments and their Public Sector Undertakings.

Uniform Code of Pharma Marketing Practices: The Uniform Code of Pharmaceutical Marketing Practices (UCPMP) is a voluntary code issued by the Department of Pharmaceuticals (DoP) relating to marketing practices for Indian

Pharmaceutical Companies and the medical devices industry. The order will cover doctors, chemists, hospitals, and states. The UCPMP guides pharmaceutical companies on what to do and not do while marketing their drugs. It was introduced in March 2012 and was revised in 2014.

National Pharmaceutical Pricing Policy 2012: The National Pharmaceuticals Pricing Policy 2012 seeks to regulate drug prices based on the essentiality of the drug through market-based pricing (MBP) of formulations as opposed to regulating bulk drug prices through cost-based pricing (CBP) of bulk drugs under the Drug Policy of 1994. The policy has been formulated to put in place a regulatory framework for the pricing of drugs to ensure the availability of essential medicines at reasonable prices while providing sufficient opportunity for innovation and competition to support the growth of the pharmaceutical industry.

Some of the significant DOP schemes are listed below.

Assistance to Medical Device Clusters for Common Facilities (AMD-CF): The scheme provides financial assistance of up to 70% of the project cost for developing common facilities in medical device parks. The scheme is aimed at promoting the development of medical device parks in India and increasing the competitiveness of Indian medical devices in the global market.

Scheme for Strengthening the Pharmaceuticals Industry (SPI): The scheme aims to promote the development of small and medium-sized enterprises (SMEs) in the pharmaceutical sector by providing them with financial assistance for capacity building and other activities.

Production Linked Incentive (PLI) scheme for Pharmaceuticals: The scheme aims to promote domestic manufacturing of critical bulk drugs, drug intermediates, and APIs by setting up Greenfield plants and expanding existing units. The scheme is expected to boost domestic manufacturing and reduce the country's import dependence.

Scheme for Promotion of Bulk Drug Parks: The scheme aims to create shared facilities such as solvent recovery plants, distillation plants, power and steam units, and effluent treatment plants, among others, in the parks. The

scheme also provides for a grant-in-aid of up to 70% of the project cost and a maximum limit of Rs. 100 crore per bulk drug park project.

Pradhan Mantri Bhartiya Janaushadhi Pariyojana (PMBJP): The scheme aims to reduce out-of-pocket medical expenses and increase access to quality medicines for all. The scheme also provides a business opportunity for entrepreneurs to open a PMBJK and contribute to the nation's healthcare.

Pharmaceutical Promotion and Development Scheme (PPDS): The scheme aims to promote the export of pharmaceutical products from India by providing financial assistance for export promotion activities. The scheme is expected to boost the growth of the pharmaceutical industry in India and make it more competitive in the global market. The department provides financial support and incentives for research initiatives while encouraging academic and industrial collaboration and supports establishing research and development centres.

The collaboration between the Department of Pharmaceuticals and NIPER institutions is essential for the pharmaceutical industry's cultivation of a skilled labour force. NIPERs are centres of excellence that educate and equip students with the necessary knowledge and skills to excel in the pharmaceutical industry. They facilitate technology transfer and cultivate partnerships between academia, industry, and regulatory agencies.

In addition, NIPER institutions actively contribute to the Department of Pharmaceuticals' research and development efforts. They engage in innovative research, drug discovery, and the creation of novel drug delivery systems, thereby contributing to the development of the Indian pharmaceutical industry.

The Department of Pharmaceuticals in India is instrumental in moulding the country's pharmaceutical landscape. It formulates and implements policies, supports research and development initiatives, and fosters collaborations to ensure the expansion, accessibility, and affordability of pharmaceutical products of high quality. The collaboration between the Department of Pharmaceuticals and NIPER institutions bolsters the industry by cultivating competent professionals and encouraging innovation. Together, they contribute to the growth of the pharmaceutical industry and the prosperity of the Indian people.

3.2. Role and Functions of the Department of Pharmaceuticals in India

One of the main tasks of the DoP is to ensure that India's pharmaceutical business is governed and regulated well. It works closely with other regulatory bodies like the Central Drugs Standard Control Organisation (CDSCO) and the National Pharmaceutical Pricing Authority (NPPA) to set and implement drug approvals, quality control, pricing, and availability rules about drug approvals, quality control, pricing, and availability. The DoP ensures that the pharmaceutical market has high safety, effectiveness, and cost standards.

Another critical task for the Department of Pharmaceuticals is to develop policies and plans that will help the pharmaceutical industry grow and improve. It studies, analyses, and talks with stakeholders to find places that need attention and action. As part of its job, the DoP writes policies about drug prices, intellectual property rights, clinical trials, export marketing, and research in the pharmaceutical industry. It also works with different groups, like business groups and academic institutions, to ensure these policies are implemented well.

Research and development (R&D) is a very important part of the pharmaceutical industry, so the DoP supports and encourages innovation through a number of programs. For example, it helps research institutes like the National Institute of Pharmaceutical Education and Research (NIPER) get started and run, which is a very important part of fostering scientific talent and doing cutting-edge research. The DoP also gives money, grants, and other benefits to encourage research and development, especially in areas that are important to the country, like drug discovery and development, biotechnology, and formulation development.

The DoP works with domestic and foreign stakeholders in the pharmaceutical industry to encourage collaboration and knowledge sharing. It takes part in bilateral and multilateral forums to improve partnerships, find business chances, and ensure that rules are the same everywhere. The Department also works with foreign groups like the World Health Organisation (WHO) and the World Trade Organisation (WTO) to solve global health problems and promote India's interests in the pharmaceutical field.

As per the latest DOP report 2022-23, the Department has significantly extended the number of collaborations and international outreach. The following is the list of events conducted last year.

- India-Tunisia Joint Working Group on Drugs and Pharmaceuticals
- India – Egypt Joint Working Group on Pharmaceuticals
- A New Joint Working Group on Pharmaceuticals with Kazakhstan was constituted on 15.03.2022
- India - Russia Joint Working Group on Pharmaceuticals
- Africa Health ExCon from 5th to 7th June 2022: The Department participated in the first edition of the Africa Health ExCon (Exhibition and Conference)
- Health Forum in Cartagena, Columbia, from 8th to 10th June 2022
- Make in India-related trade and investment events/ seminars in Poland from 22nd – 26th June 2022, in partnership with the Polish Chambers of Commerce and Industry
- 3rd Health Working Group Meeting in Bali under the Indonesian G20 Presidency during 22-24 August 2022
- Visit of Hon'ble Union Minister for Chemicals & Fertilizers to Saudi Arabia
- India-Russia Intergovernmental Commission-Trade, Economic, Scientific, technological and Cultural Cooperation (IRIGC-TEC) on 8 November 2022 in Moscow
- Medica trade fair 14th – 17th November 2022 in Dusseldorf, Germany Trade and Public Health Workshop by WTO in Geneva, Switzerland from 28.11.2022 to 02.12.2022
- India-Australia Economic Cooperation and Trade Agreement (ECTA)
- India-UAE Comprehensive Economic Partnership Agreement (CEPA)

The DoP works on capacity building and human resource development to fill in skill gaps and improve the skills of professionals in the pharmaceutical industry. It helps pay for programs that help people learn new skills, training classes, and conferences. The Department also encourages cooperation between universities and businesses so that knowledge can be shared and a pool of skilled workers with the most up-to-date technical knowledge can be made.

The Department of Pharmaceuticals is an essential part of the development of the Indian pharmaceutical business. Its many jobs include regulating, making policy, promoting research, working with the business, and building people's skills. By working together, the DoP tries to make sure that people can get affordable access to high-quality medicines, encourage innovation, and help India become a global pharmaceutical hub. Collaboration between the Department, pharmaceutical companies, research institutions like NIPER, and other stakeholders is essential for driving sustainable growth in the field and meeting the nation's healthcare needs.

3.3. Significance of NIPER Institutions in India's Pharmaceutical Landscape

India's pharmaceutical industry has experienced remarkable growth over the years, and establishing NIPER institutions has been crucial to supporting and sustaining this growth. NIPERs are renowned centres of distinction in pharmaceutical education and research that foster innovation, skill development, and industry collaboration. Table 1 below highlights glimpses of research and projects being done by NIPER institutions. The data is sourced from the Research Compendium 2023.

Table 1: Projects, research and publication for the year 2022[14]

Sr. No	NIPER	Projects	Research Publications	Book Chapters	Patents
1	Ahmedabad	11	108	34	-
2	Guwahati	35	89	5	6
3	Hajipur	4	43	4	3
4	Hyderabad	58	158	17	6
5	Kolkata	7	81	11	1
6	Rae-bareli	12	81	25	4
7	SAS Nagar	48	134	13	8
	Total	***175***	***694***	***109***	***28***

Source: *NIPER Research Compendium February, 2023*

[14] NIPER_Research_Compendium_2023.pdf (niperhyd.ac.in)

NIPER institutions are committed to providing the country with aspiring pharmaceutical professionals with education and training of the highest calibre. NIPER Institutions offer comprehensive programs in pharmaceutical sciences, medicinal chemistry, pharmacology, pharmacy informatics, and others. NIPERs equip students with the knowledge, skills, and research required to address the dynamic challenges of the pharmaceutical industry.

Table 2: Faculty strength of various NIPER institutions in India

Name of the Institute	Academic staff	Non-Academic staff
NIPER Mohali	29 + Director	118
NIPER Kolkata	14 + Director (Additional charge of Hajipur)	14 Non-Teaching + 16 Non-teaching staff outsourced
NIPER RaeBareli	16+ Director	9 Research and Technical
NIPER Hyderabad	25 + Director	52 (Regular and Contractual)
NIPER Hajipur	10 + Director	13 (10 Regular)
NIPER Guwahati	21 + Director	43
NIPER Ahmedabad	19 + Director	17 + 3 Contractual

Source: *Annual Report 2022-23 Final-3.pdf (pharmaceuticals.gov.in)*

The Indian pharmaceutical industry requires a competent work force armed with the most up-to-date knowledge and skills. By generating a pool of highly trained professionals, NIPER institutions fill this void. Through their rigorous curricula, industry-focused training, and apprenticeships, NIPERs prepare students to enter the workforce, ensuring they possess the necessary skills and an understanding of regulatory frameworks. Consequently, NIPER graduates are in high demand and considerably contribute to the pharmaceutical industry's growth and competitiveness.

Table 3: NIPER Institutions Student Strength

Name of the Institute	**Students (2022-23)** (Masters)	**Total Alumni** (Masters and PhD)
NIPER Mohali	345	4282

NIPER Kolkata	116	
NIPER Ahmedabad	316	856 + 24 Phd
NIPER Hyderabad	1456	496
NIPER RaeBareli	265 (2021-23)	225
NIPER Hajipur	202	492
NIPER Guwahati	264	559 + 28 PhD

Source: *Annual Report 2022-23 Final-3.pdf (pharmaceuticals.gov.in)*

NIPERs actively promote entrepreneurship and innovation by cultivating a hospitable ecosystem for start-ups and incubating pharmaceutical businesses. They provide mentorship, infrastructure, and access to funding opportunities to assist aspiring entrepreneurs in transforming their innovative concepts into viable businesses.

India's Department of Pharmaceuticals (DoP) relies on NIPER institutions for their expertise and advice in formulating pharmaceutical sector-related policies and regulations. NIPERs contribute through research, analysis, and input on a variety of issues, including drug pricing, quality control, intellectual property rights, and pharmaceutical research and development. Their recommendations and contributions shape the policy landscape, ensuring the pharmaceutical industry's robustness and sustainability. As India continues to emerge as a global pharmaceutical superpower, NIPER institutions will continue to play a vital role in fostering talent, fostering innovation, and influencing the pharmaceutical industry's future of the pharmaceutical industry.

NIPER institutes have facilitated the translation of research findings into practical applications, leading to the development of novel drug molecules, drug delivery systems, and biopharmaceuticals through collaborations with industry, academia, and research organizations. The research output of NIPER institutions has been published in prestigious scientific journals and received international recognition, establishing India as a centre of pharmaceutical innovation.

NIPER institutions collaborate with industry stakeholders, regulatory bodies, and international institutions. These collaborations promote the exchange of knowledge and the transmission of technology and facilitate industry-academic ties. Collaboration between NIPERs and prominent pharmaceutical companies,

research organizations, and government agencies has created a symbiotic relationship between academia and industry. These partnerships have facilitated the development of research initiatives, joint publications, and innovative pharmaceutical product commercialization.

NIPER institutions have made substantial contributions to developing and preserving pharmaceutical intellectual property (IP). The institutes actively promote innovation and entrepreneurship through technology incubators, patent facilitation cells, and industry-sponsored research. The success of NIPER researchers in obtaining patents for their inventions has fostered an environment of innovation-driven R&D. The intellectual property generated by NIPERs has not only strengthened the domestic pharmaceutical industry but also attracted foreign investments and partnerships.

NIPER institutions have a significant impact on the Indian pharmaceutical industry. Graduates of NIPER contribute to drug discovery, formulation development, quality assurance, and regulatory affairs to benefit the industry. In addition, collaborative initiatives between NIPERs and industry have resulted in the commercialization of innovative drugs, generating revenue and enhancing the global competitiveness of Indian pharmaceutical companies.

3.4. Collaborative Initiatives between Pharmaceutical Industries and NIPER Institutions

In recent years, the Department of Pharmaceuticals in India has actively encouraged collaboration between pharmaceutical industries and the National Institute of Pharmaceutical Education and Research (NIPER) institutions. These collaborative initiatives have fostered innovation, research, and development in the pharmaceutical industry.

The pharmaceutical industry recognizes the value of academic research and NIPER institutions' expertise. Drug discovery, formulation development, and process optimization have advanced significantly due to collaborative research initiatives between these institutions and industry. These collaborations enable the exchange of knowledge, expertise, and resources, accelerating the

development of new drugs, innovative delivery systems, and pharmaceutical technologies.

Industry-Academia, to promote knowledge exchange and collaboration, NIPER institutions frequently organize conferences, seminars, and workshops with pharmaceutical industries. These events provide industry professionals, scientists, researchers, and students opportunities to exchange ideas, discuss emergent trends, and investigate potential collaborative endeavours. By facilitating interaction between academia and industry, these conferences encourage the practical application of academic research.

The collaborations between pharmaceutical manufacturers and NIPER institutions also include financial support and industry sponsorship. To support the academic and research endeavours of NIPER institutions, many companies provide funding for research initiatives, infrastructure development, and scholarships. This funding enables the investigation of novel research areas, the establishment of cutting-edge laboratories, and the development of an industry-relevant curriculum.

Collaborations between pharmaceutical companies and NIPER institutions have surfaced as crucial growth and innovation drivers for the Indian pharmaceutical industry. These initiatives facilitate exchanging knowledge, expertise, and resources through research collaborations, industrial training programs, conferences, technology transfer, and financial support.

Summary: In India, the NIPER institutions have had a significant impact on pharmaceutical research and development. NIPERs have considerably contributed to the growth and advancement of the Indian pharmaceutical industry through the development of a skilled workforce, research excellence, collaborations, and the creation of intellectual property. The sustained efforts of NIPER institutions in promoting innovation, bridging the gap between academia and industry, and cultivating scientific talent have positioned India as a key player in the global pharmaceutical industry, fostering economic development and enhancing healthcare outcomes.

Chapter 4
Methodology

In this chapter, the methodology adopted for conducting this study is discussed. Starting with a research design, this chapter will highlight an overview of the research design, data collection methods, and the questionnaire used to gather the required data. The chapter will also highlight the varied approaches used to conduct this study. The primary objective of this study is to gather insights from students, alumni, and faculty members through a survey-based quantitative approach.

4.1. Research Design

The study adopted a mix methodology approach to collect both qualitative and quantitative data from primary and secondary sources. In this study, the research team used a survey-based quantitative approach to fulfil the study's objective. Secondary resources, including Government Reports, Statistical Data, Evaluation Reports, Research Papers, Newspaper articles, etc., are also reviewed to understand the dynamics and evolving nature of this entire ecosystem and the path of progress so far. This will be triangulated with the input of the primary survey to bring out holistic insight into the objective of the study.

Under the primary research survey questionnaire, data is collected through online surveys, telephone interviews, and physical interviews. The study aims to collect data from students, alumni, faculty of NIPER institutions and industry experts. The survey design helps researchers collect both qualitative and quantitative data, giving them a complete picture of the topic.

4.2. Data Collection Methods

In order to understand the academic and industry gap holistically, data was collected from all NIPER institutions in India ‘Mohali, Guwahati, Ahmedabad, Hajipur, Raebarelli, Kolkata, and Hyderabad’. As the study was only concerned with NIPER institutions, the data collection was limited to these institutions only. Existing reports from NIPER institutions, press releases, the Department of Pharmaceutical reports, and sources in the public domain helped draw more relevant information regarding the academia-industry gap and the way to self-

reliance in NIPER institutions in India.

4.3. Sample Size

Sample size is drawn from the collective universe based on students, alumni, and faculty in these institutions. Existing reports and ministerial documents have helped us understand the total number of students, faculties, and alumni from these institutions. Based on the information and purposive sampling technique, a survey will be conducted with stakeholders in May 2023. All the groups were informed through email and were sent a questionnaire through email and other means. The questionnaire is based on a Google form developed by the EDII research team. The questionnaire has been active online and allows anyone to fill it out by having access to the link. The questionnaire has been designed with all the objectives and core aims of the study taken into consideration. Separate questionnaires were built for all three groups, and separate questionnaire links were generated for all. The questionnaire has been developed based on the following indicators: industry-academia interactions, intellectual property, technology transfer, start-ups, patents, and placement. The sample distribution for the study can be seen in the below table.

Table 4: Sample size and data collection tool

Sample profile	Student Sample	Alumni Sample	Faculty Sample
NIPER Ahmedabad	10	4	8
NIPER Mohali	138	11	6
NIPER Hyderabad	106	44	6
NIPER Rae-Bareli	0	0	0
NIPER Guwahati	16	9	12
NIPER Kolkata	0	1	0
NIPER Hajipur	1	0	0
Total	271	69	32

4.4. Data Collection Tool and Procedure

The primary survey for the study was conducted with the help of a Google form questionnaire. The questionnaire was shared for a pilot survey with students, alumni, and faculty of NIPER Guwahati. The link was later on emailed to all the NIPER institutions for final data collection after incorporating the changes in the

questionnaire. The questionnaires were sent to the institutional director for their help and support in distributing this questionnaire to all the students, alumni, and faculty of their respective institutes. This sampling strategy aimed to ensure diversity and inclusivity within the sample, providing a more comprehensive understanding of the research topic.

4.6. Data Collection Procedure

A proper system was followed while collecting data. The prepared questionnaires were uploaded, changed into Google Forms, and sent to participants in all NIPER institutions. The responses were small initially, but new reminders were sent, and many respondents filled in the forms. There were clear instructions regarding the confidentiality of the respondents and the voluntary nature of participation. The data collection was completed in one month, during which reminders were sent to non-respondents to maximize the response rate.

Survey Instruments/Tools:

The structured questionnaires could draw qualitative and quantitative information from the survey respondents. The survey was completed with all three categories based on their perception and understanding. Different kinds of questions were used in this questionnaire, including the Likert scale, binomial format and another set of questions needed to provide a point-based answer for discussion purposes.

The questionnaire is attached as Annexures in the report. The beneficiaries were asked to rate their overall experience attending the program conducted by implementing agencies. Before taking the surveys, the beneficiary respondents were provided with information regarding the Likert scale. The Likert scale was explained and cleared that 1 in this rating is ‘very dissatisfied, two is dissatisfied, three is neutral, four is somewhat satisfied, and five is very satisfied. These have been discussed with respondents in case they could not understand the process.

Section 1: Demographic Information

This section aimed to collect demographic data such as age, gender, educational background, and course studied or studying. In the faculty questionnaire, experience and work area were asked as well. These details

were essential to gain a better understanding of the respondents and analyze the data in a meaningful way.

Section 2: Industry-Academia Gap

This section focused on exploring the perceptions and experiences of the participants regarding the existing gap between the pharmaceutical industry and academia. This section included binomial (yes/no) questions and Likert scale questions, allowing respondents to provide their opinions and insights on various aspects of the gap. This section aimed to assess the self-reliance of NIPER institutions by gathering views on factors such as funding, infrastructure, research collaborations, and industry interactions. The questions in this section also utilized a combination of binomial and Likert scale questions.

Section 3: IPR and Patent

This section asked questions to understand the current flow of IPR in the form of patents, copyrights, or any other form in the NIPER institutions in India. The questions covered both filed IPRs and in-progress IPRs of students, alumni groups, and faculty in each section. Questions clearly highlight the various aspects like knowledge of IPR, courses studied, IPR filed, and if you know anyone in your network who has recently or recently got any IPR is asked.

Section 4: Entrepreneurship and Start-up

This section is critical from both the study and survey points of view. In this section, the researchers asked questions about the knowledge of entrepreneurship, innovation, and start-ups between faculty, students, and alumni. It also contains questions regarding students having studied a course on entrepreneurs and whether they know the meaning of start-up, entrepreneurship, and related concepts. This section also highlights questions regarding the number of start-ups done and the interest shown by faculties and students in pursuing pharmaceutical start-ups as a career.

Section 5: Placement Support and career growth with Industry

In this section, researchers have highlighted essential questions about placement opportunities for NIPER students in India. The questions include whether a placement office exists, whether students came for a job only, and whether they got placement support from their respective institutes. The study

highlights the role of institutions in providing jobs to students and existing alumni.

Section 6: Discussion and Suggestions

In this last part of the questionnaire, we tried to understand the overview and impact of NIPER institutions in India. We have put up questions that bring us information regarding the workings of the institute, prospects, academic excellence requirements, industry-academic collaboration requirements, and many other topics covered in this section. Overall, the questionnaire for students and alumni contained similar questions and sections, while the faculty questionnaire contained similar questions with a change of context. Table 5 below provides the indicators used to create questionnaires for the study.

Table 5: List of indicators against their parameter

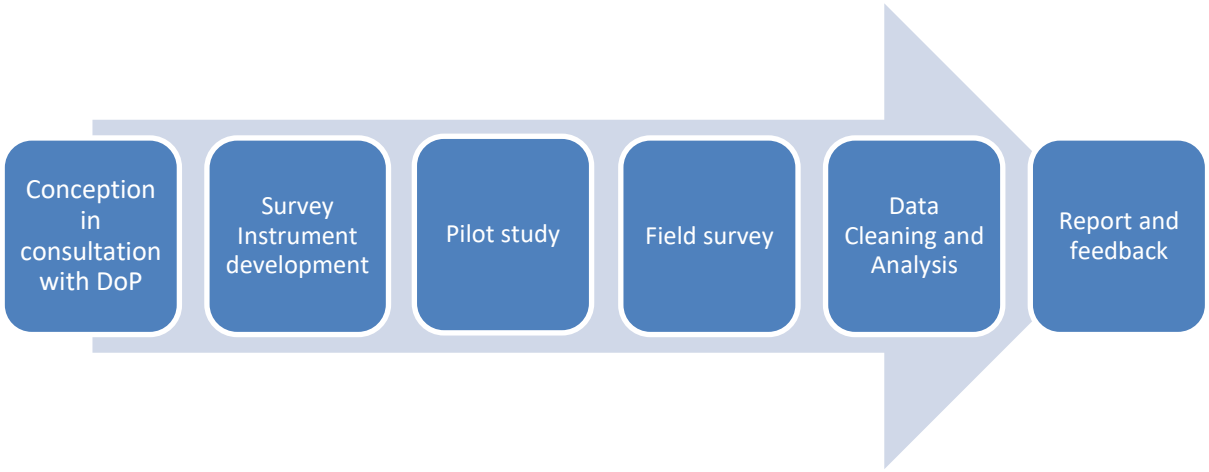
Parameter	Indicators
Industry-academia interactions	• Number of projects • Events • Discussion • Research collaborations • Yearly events • Industry visits • Industrial Projects • Conferences held • Technology transfer
Intellectual property	• Academic collaboration for research and patents • Number of trademarks • Number of patents granted • Any other IPR granted
Technology transfer	• Technology transfer office • Strength of office • Technology transferred • Industry faculty collaborations • Research papers published

Start-ups and Entrepreneurship	• Start-up ideas initiated • Incubated start-ups • Pharmaceutical research-based start-ups • Faculty founders • Entrepreneurship awareness programs • Incubation centre • Start-ups with industrial collaborations
Patents	• Number of patents filled in last five years • Number of patents in last 2 years • Number of patents from faculty, students, and alumni
Placement	• Placed in a company • Placement support • Placed in a pharmaceutical company • Placed within the city

4.9. Primary Data and Survey

After making the initial contact, faculty researchers engaged with the project visited NIPER Ahmedabad physically and discussed the requirements with other institutions over a phone call. The institutions were asked to provide details of the students and alumni so that researchers could survey them within the given timelines. The sampling was random, and a few interviews were done through phone, taking care of the language and time of the call. Diversity in courses studied and work experience has been considered during data collection.

The component of the methodology is explained in the details below:



Data Analysis

The data collection was completed, and the raw data was uploaded to SPSS for clarity and checking. The data was taken through basic checks for accuracy, missing values and related checks. The data is then put to test through analysis with quantitative techniques (*Advanced Excel and SPSS*). There are various formulas to find unwanted and incomplete data points in the data set. These formulas are utilised to clean the data and prepare it for the next step, data aggregation.

As the data collected and aggregated in the Excel file is complete, aggregation brings in all the missing joints in the data set and pulls together all the missing links in the data set. After data aggregation, coding for all the given variables is done. All the variables are renamed as required for the analysis part in this step.

As a final step, data is tested with different analysis techniques, and results are derived in the form of percentages, tables, bars, and figures. This is the most crucial part of the study and needs the utmost care. The study results make a basis for the analysis and discussion of the policy implications to be derived from the study.

Chapter 5

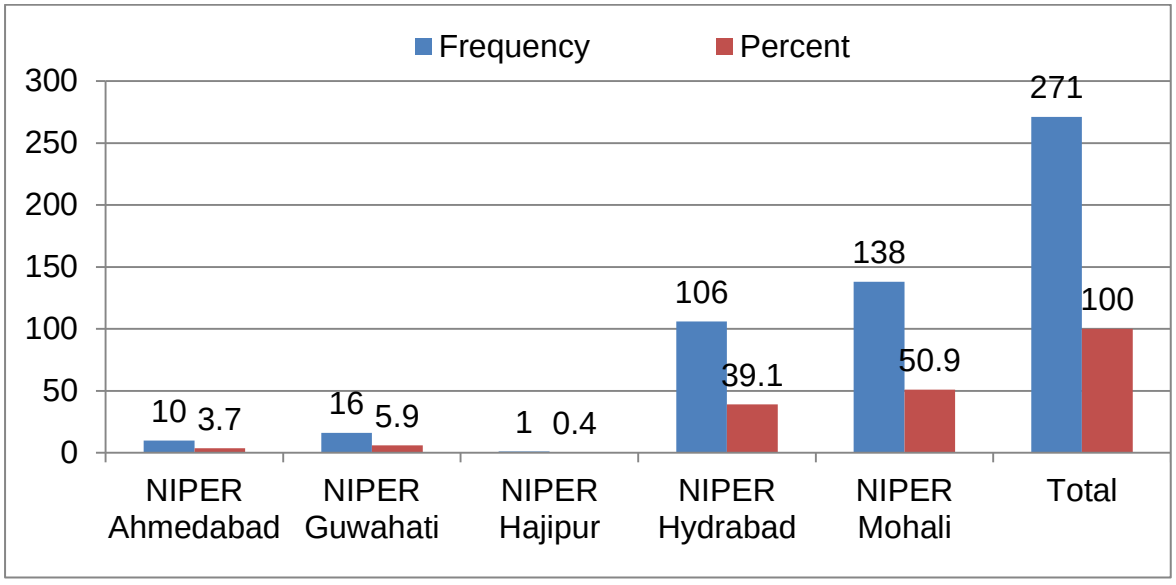
Results and Analysis (Student Survey)

In this chapter, the student survey results are presented with participants from students admitted to the current and previous academic sessions. This analysis is based on student data from different NIPERs in the country. Analysis is based on demographics, technology transfer, IPR, facilities, individual data, entrepreneurship, placements, and research collaboration. Most respondents supported the availability of labs, classrooms, and research avenues. Respondents also reflected upon increasing cooperation with the support of the government and private sector. Faculties have also shown concern about the type of research grants they are receiving and the projects they are doing.

5.1. Demographics and Student Perceptions

Demographics show that most of the students who participated in the survey were from NIPER Mohali, followed by NIPER Hyderabad, NIPER Guwahati and NIPER Ahmedabad. Researchers at EDII have tried to reach out to Institutions for clarification and to remind them about data collection. The majority, or 50 per cent of the students, are from NIPER Mohali, and the remaining is presented in Figure 3 below.

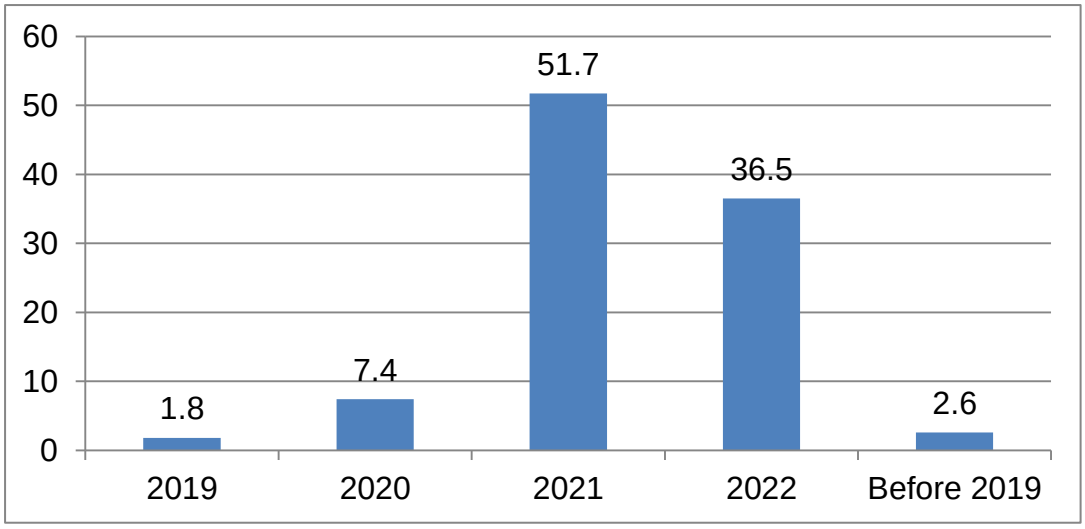
Figure 3: Sample distribution in the survey



Session year and total number of students

In this question, which is related to demographic details, the distribution of academic year of students' strengths is discussed. The data shows that 140 students of the 2021-22 batch participated in this survey, which was the highest of all the participants each year. Another 99 students belong to the latest academic year 2022-23. The lowest number of survey participants belonged to the 2020-21 batch, in which only 20 completed the survey questionnaire. The remaining participants, mainly PhD candidates, were from the 2019 batch.

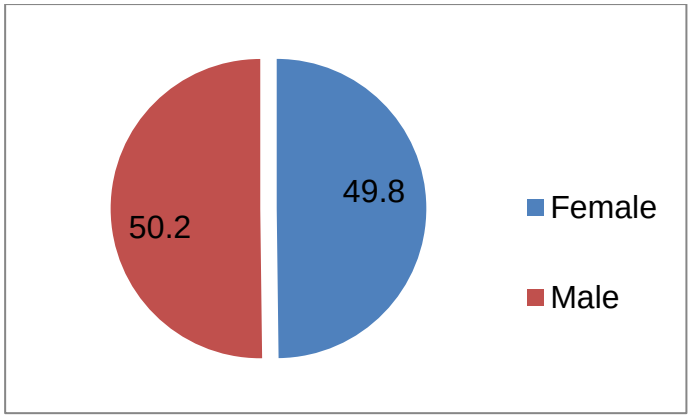
Figure 4: Session Year of Students and total participants in the survey



Gender

Gender is an essential demographic indicator, important from a social as well as economic point of view. The data points in the figure below reveal that boys and girls have almost equal participation in this survey. The data in Figure 5 shows that 135 female students and 136 male students participated in this survey. The results highlight the role of women in pharmaceutical education and research in India. The data also reveals that almost 50 per cent of participants in the survey were male, and 50 per cent were female.

Figure 5: Gender-wise classification of the sample



5.2. Academic and Research Facilities at NIPER

This section discusses the questions related to academic and research facilities and the relevant experiences of students in the NIPER institutions. The data and analysis are holistic and reflect essential revelation about the study.

The first question in the list is, 'How satisfied are you with the quality of research education provided by NIPER institutions'. Among the total participants of the student group, 85.4 per cent felt very satisfied or satisfied with the education and research provided by the NIPER institutions in India. All these data points highlight the role of NIPER institutions in increasing the standard of pharmaceutical education in India. The figure below shows the number of students who have also reflected on these questions.

Figure 6: Quality of Research Education Provided by NIPER

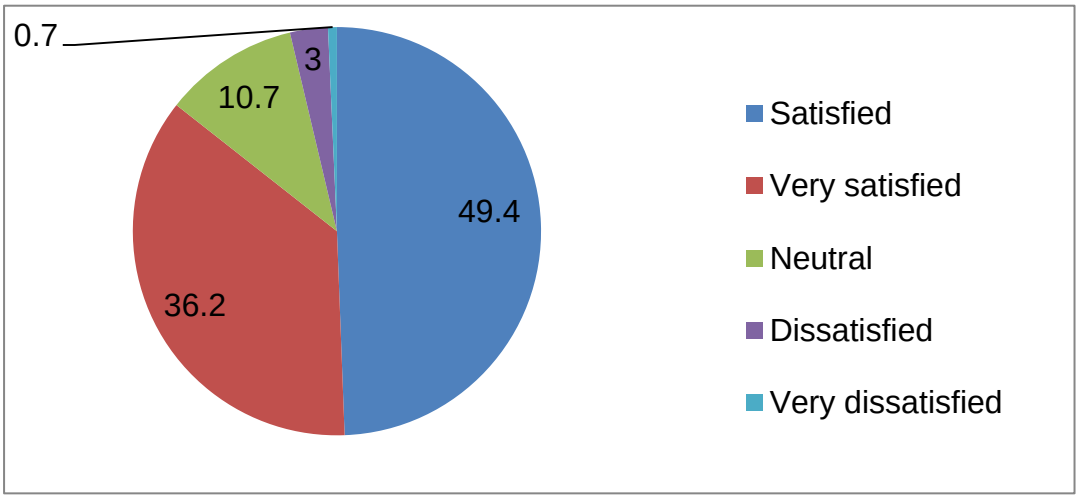
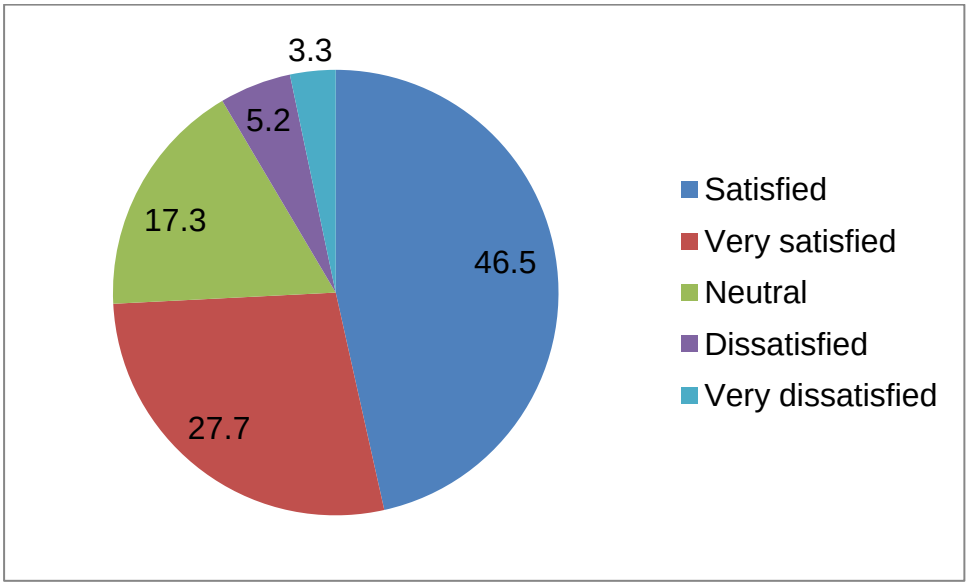


Figure 7 below shows that more than 73 per cent of students feel satisfied or very satisfied with the type of curriculum and course content followed in their

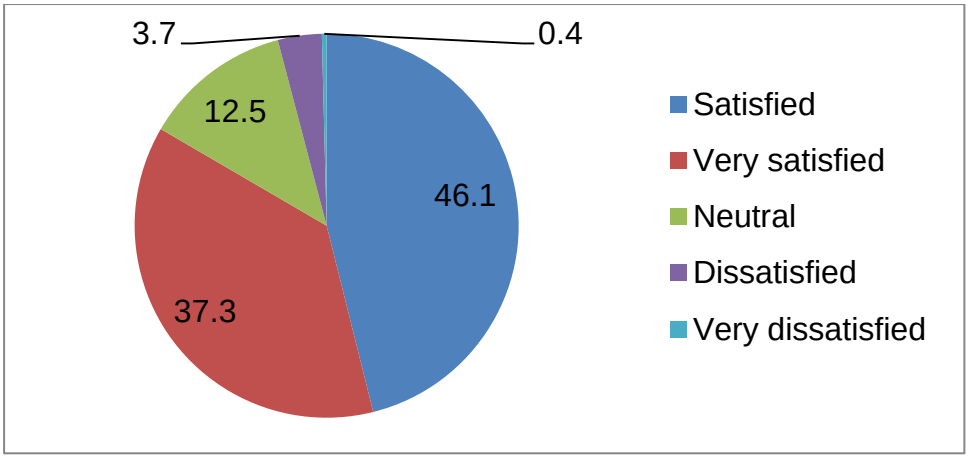
respective institutes. Around 5 per cent feel dissatisfied, and 3 per cent feel very dissatisfied with the current curriculum and content being followed and provided by NIPER institutions in India. The figure below depicts the numbers well and reflects upon the growth possibilities through the current educational curriculum.

Figure 7: Curriculum and Course Content at NIPER and its Alliance with Industry



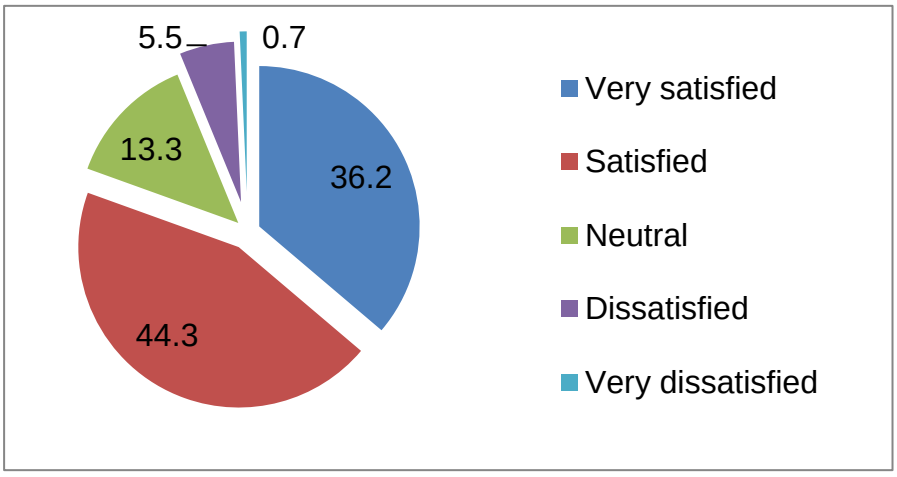
The data in figure 8 highlights the facilities such as classrooms, labs, research instruments, and computer facilities. Among all the students, 84 per cent feel very satisfied or satisfied with the currently available facilities. This highlights the kind of facilities being allocated to these institutions in the country. The results in this section reflect that most of the students are satisfied, and there is a scope for improvement.

Figure 8: Students' perception regarding facilities like labs and classrooms



The fourth question discusses the student's perception of resources and research facilities in their respective institutions. The data shows that 80 per cent of the students feel very satisfied with the institute's existing research opportunities. Research opportunities expose students to new areas of knowledge, and an institutional mentor helps them grasp new areas and use their fresh ideas to develop the field. In contrast, most of the NIPER institutions in the country are newly established. Students are satisfied, which generates positive outcomes because a happy and positive mind full of resources can do wonders in the field.

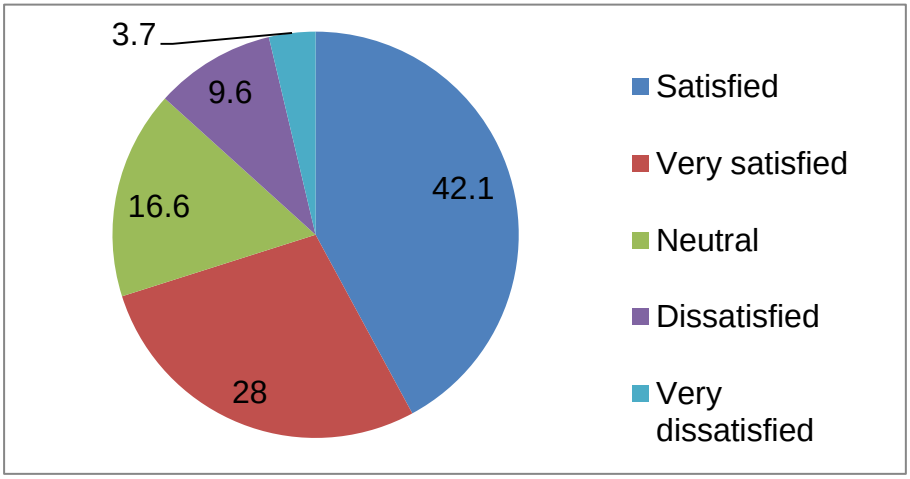
Figure 9: Resource and Research Opportunities in NIPER Institutions



The last question in this Likert-based series of questions is related to student satisfaction with the industry collaborations and placement opportunities provided by NIPER'. Looking at the figure below, 70 per cent of students have felt satisfied or very satisfied with the research opportunities being provided by the NIPER

institutions. About nine per cent of students felt dissatisfied, and more than three per cent felt very dissatisfied with the current opportunities and prospects for research collaboration in the NIPER institute. These results highlight the role of NIPER institutions in shaping the new pharmaceutical professionals in the modern research environment.

Figure 10: Student satisfaction with industry collaboration and placement opportunities

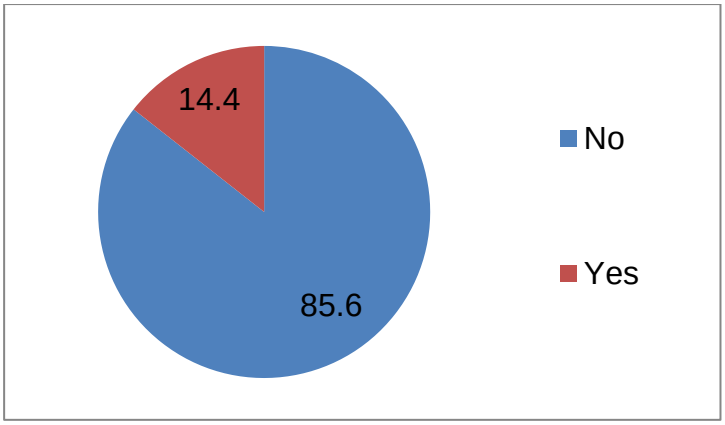


5.3. Industry Academia Interactions

In this list of questions, the researchers wanted to understand students, opinions on the condition of current industry-academia collaborations. We have asked ten different questions to students in this section.

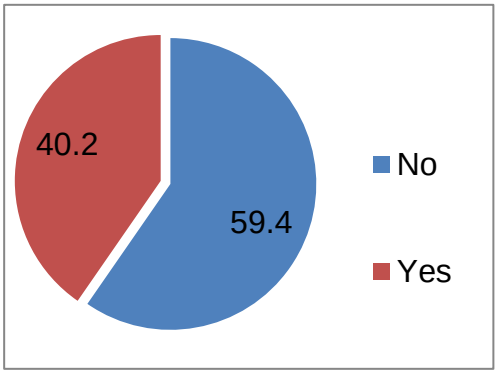
For the first question, the responses show that only 14 per cent have worked, while 85 per cent or more have not participated in any research project during their academic years. The numbers are very minimal compared to students' overall perception of the research environment. This highlights an excellent scope for improvement in this context, and NIPER institutions must work aggressively in this area. The involvement of students will depend on the number of projects received by the institute, which depends on the research capabilities and relation of the institute with the industries and government institutions in the country.

Figure 11: Worked on Research Project



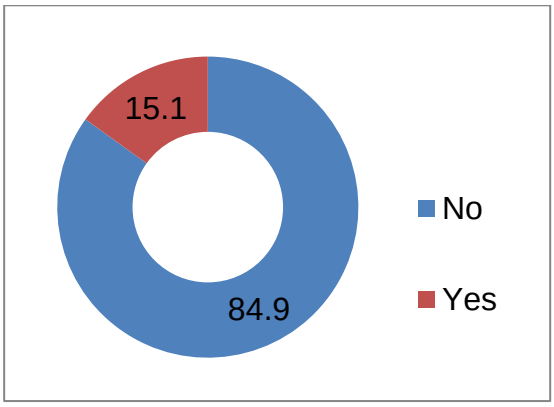
The second question discusses participation in academic events such as conferences, seminars, and workshops. Among the student group, 59.4 per cent have not participated, while 40.2 per cent have participated in an event organized during their course period. NIPERs need to work on this very keenly so that students get enough exposure to future research directions and career possibilities. Events can have a long-lasting impact on students' motivations and future career perceptions. Research events help students network, seek mentorship and create collaborations with other researchers in their field.

Figure 12: Recently Participated in any Academia Industry Event



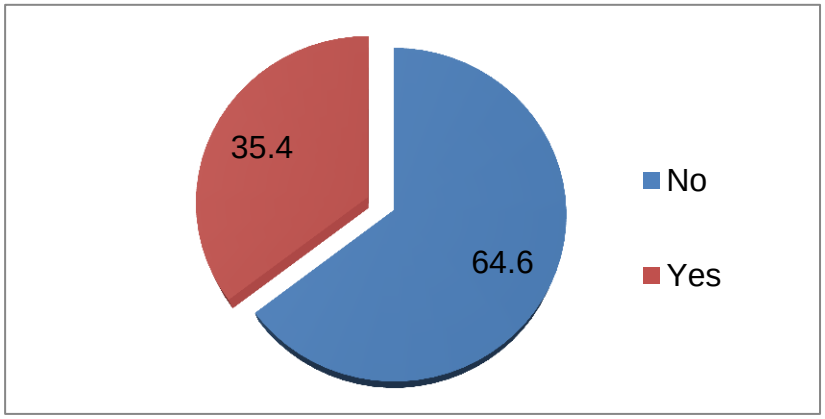
The third question discusses whether students have ever presented a paper at any conference or such event.' The survey results show that 85 per cent of students have not submitted a paper to any conference recently, while 14 per cent of students have done so recently. This highlights a significant point: students do not participate extensively in events, conferences, or seminars. Faculty groups should take the responsibility to motivate, prepare and help students for participation in such events and conferences. The conference may be arranged within the institute by another institute or a foreign institute.

Figure 13: Paper presentation at a conference



Another question on the list is about students' collaborations with faculty on any project. 35 per cent have consented to collaborate with any faculty, while 64 per cent or more have said they have not collaborated with any faculty for research projects. The institutions need to allow and take help from the students and engage them with various projects. It should be a compulsory activity or part of the curriculum. This process will significantly help students excel in their field and achieve more significant chances of success and growth.

Figure 14: Collaborated with faculty for research projects



Among all the students, over 79 per cent have not visited any pharmaceutical company. At the same time, 20 per cent of the students in the survey visited the pharmaceutical industry during their study time. Even if students are delighted with the existing research environment, the survey results suggest a different story and most of these students have not visited any pharmaceutical company recently.

Figure 15: Visit to Pharmaceuticals Company during the stay

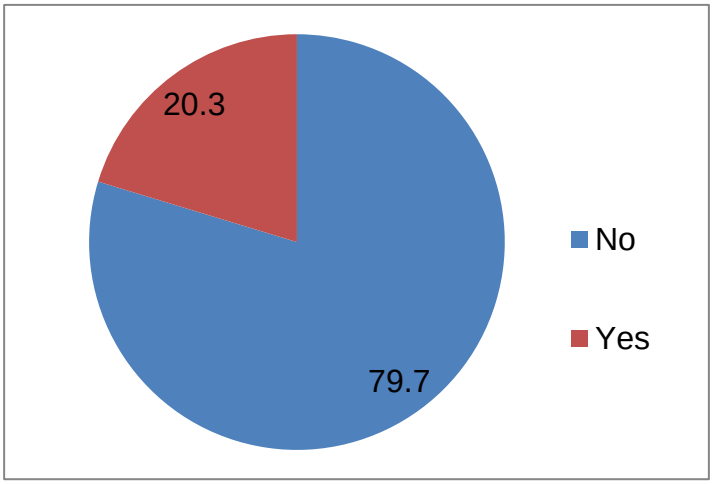
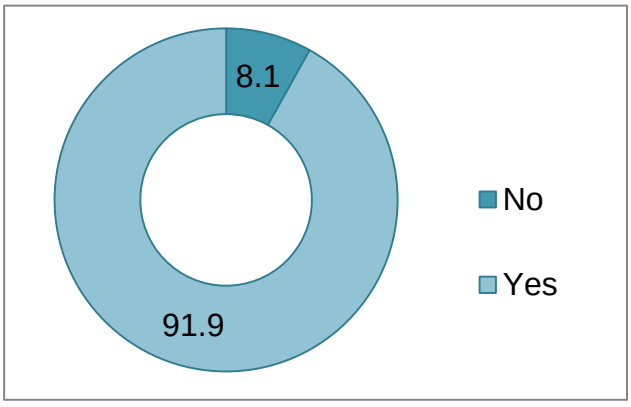


Figure 18 below shows that around 92 per cent of students have received training for pharmaceutical collaboration or jobs. Placement in the industry depends on multiple factors, and training is one of the significant factors among these. There is a scope for improvement to help students develop an orientation for leadership and research roles in pharmaceutical industries.

Figure 16: Training for pharmaceutical collaborations or training for job

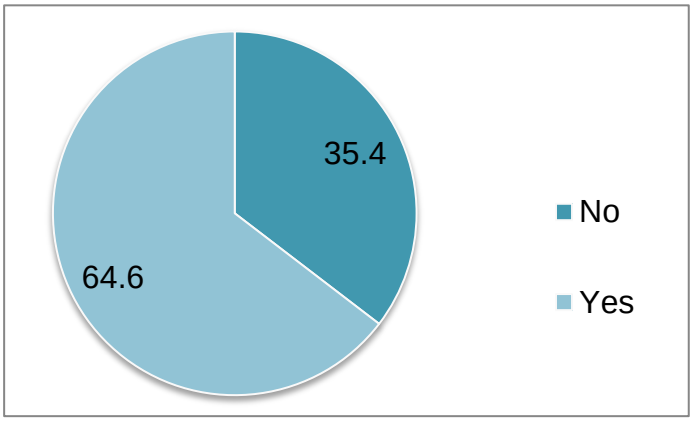


5.4. IPR and NIPER Institutions

Intellectual property rights are critical for scientific research, and it depict the level of delivery and interest in innovation and new scientific discoveries. So, to understand the IPR status of students currently studying in NIPER institutions, the question was asked whether the institute curriculum contains a course on IPR. In response to this query, all the students gave their opinions, and it was found that 64 percent had studied a course or had a course in the curriculum.

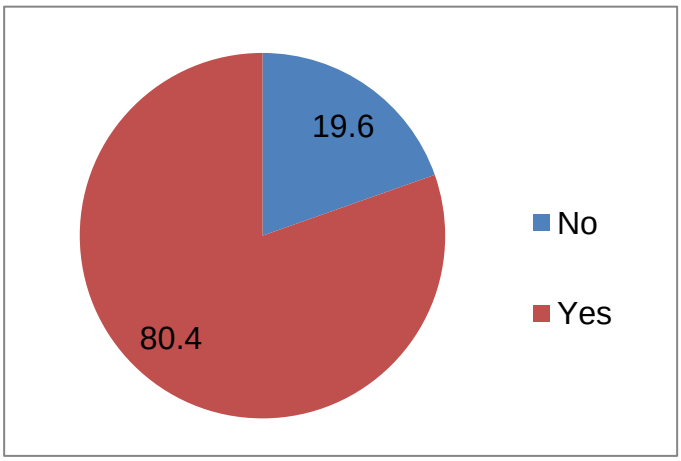
35 per cent declare that they have yet to learn a course on IPR in their respective NIPER institutions.

Figure 17: IPR Course studied



In the last question related to IPR, we asked students whether they knew anyone who has been granted a patent in their respective institute or network. The response shows that more than 80 per cent of students know someone in their network who has been granted a patent. Around 20 per cent of the students confirm they do not know anyone who has been conferred with a patent recently or before. This highlights the visible interest of students in IPR and the minor engagement of students in such research.

Figure 18: Know anyone who has been granted IPR recently

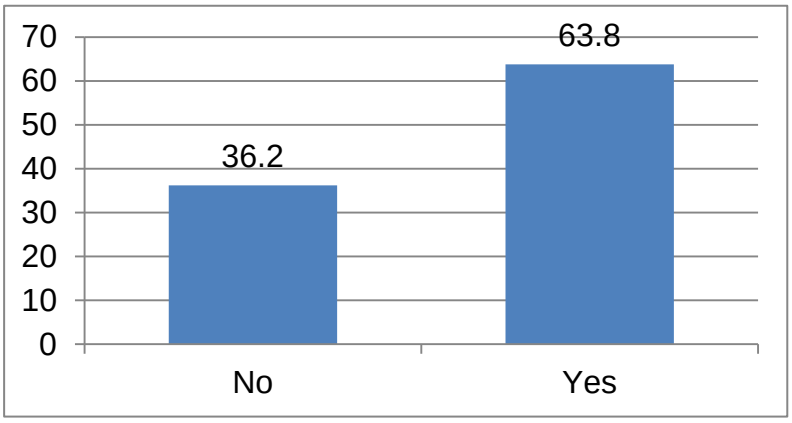


5.5. Technology Transfer

In this section, we will understand technology transfer in NIPER institutions. The first among these questions is whether they have a technology transfer office in their institutions and if they know about it. The results show that the majority, 62 per cent of students, say yes, and around 36 per cent of students

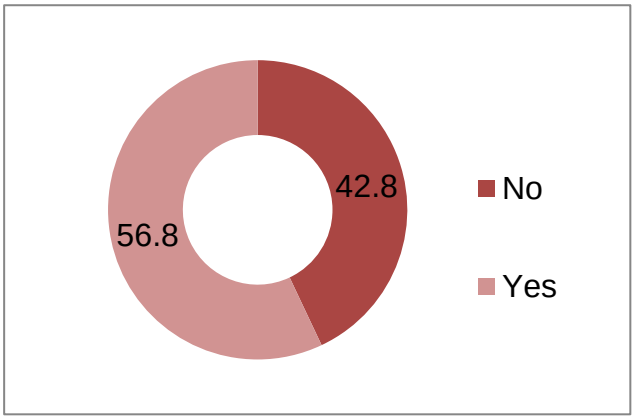
do not know whether their institute has a technology transfer office. The results highlight the knowledge gap among students regarding the know-how of the technology transfer office, which is an essential part of most of the research and innovative institutions in the country.

Figure 19: Technology transfer office at NIPER



Another question is whether students know the role of the institute's technology transfer (TT) office. It is clear from figure 23 below that around 57 per cent of students say yes, and approximately 42 per cent of students do not know the role of technology transfer offices. Students should be well aware of working in such offices in their institutions.

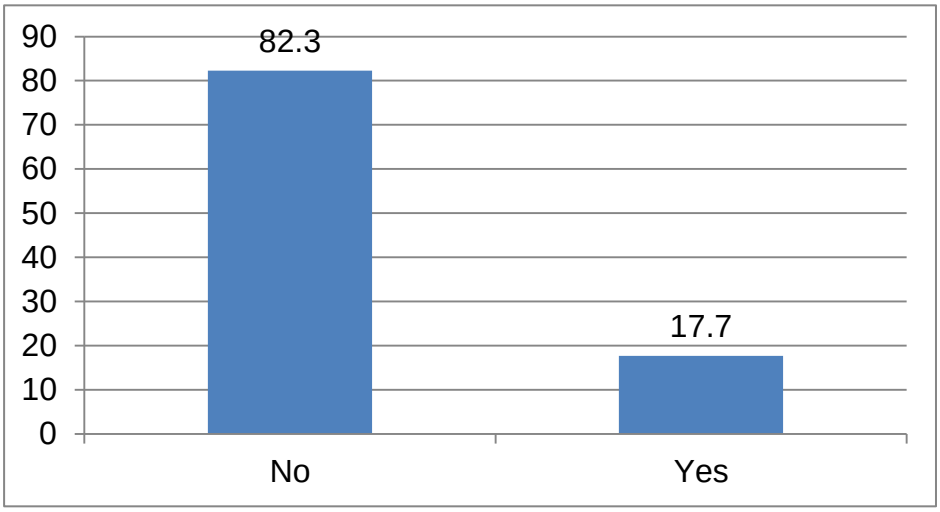
Figure 22: Role of Technology Transfer Office



In response to whether students collaborate with any pharmaceutical industry, only 17.7 per cent of students have said yes, and more than 82 per cent of students have not collaborated with any pharmaceutical industry for research and innovation purposes. This highlights the kind of exposure needed for students in these institutions. It is right to say that students can gain greater visibility and a chance to work with the industry if they can work with the industry and collaborate on projects. This can be made possible by getting

closer to the industry through internships, research grants and interactive sessions.

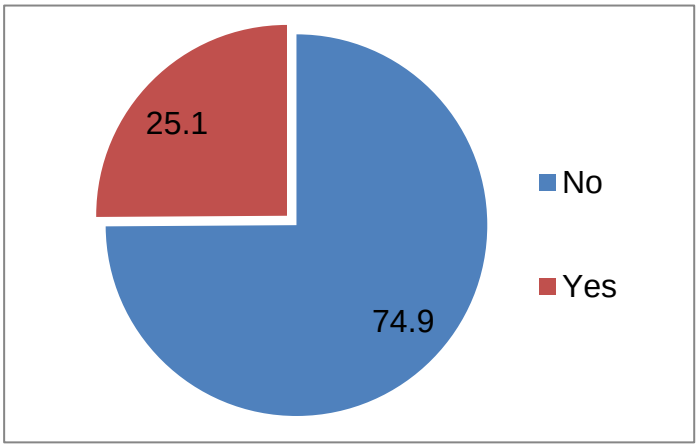
Figure 21: Collaborations with the pharmaceutical industry in any project



5.6. Entrepreneurship

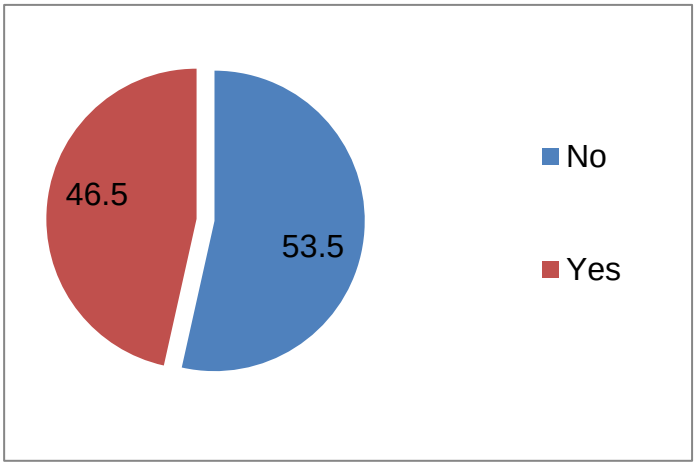
The results show that most students (74 per cent) have not studied entrepreneurship, while another set of 25 per cent of students reflect that they have studied entrepreneurship as a course during their course period.

Figure 22: Studied entrepreneurship as a course



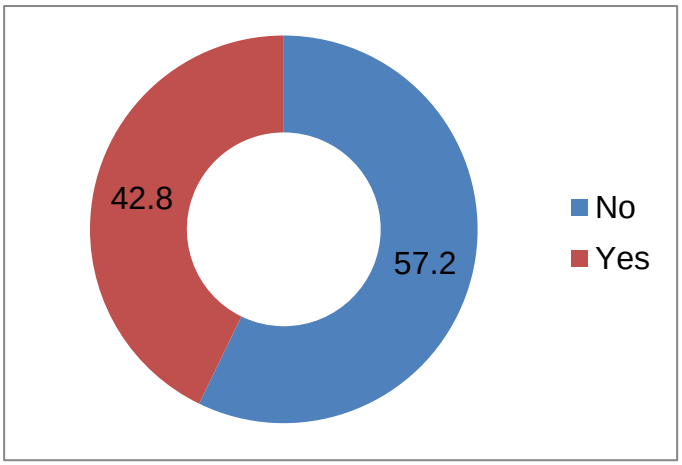
In answer to 'Have you attended any entrepreneurship awareness program recently?', 46 per cent of the students said yes, while 53 per cent had not participated. This reflects that institutions have not been organising any entrepreneurship-related events recently. Keeping venture creation as a focal area, EAP helps students identify opportunities and plan their start-ups and businesses in the pharmaceutical sector.

Figure 23: Participated in an entrepreneurship awareness program



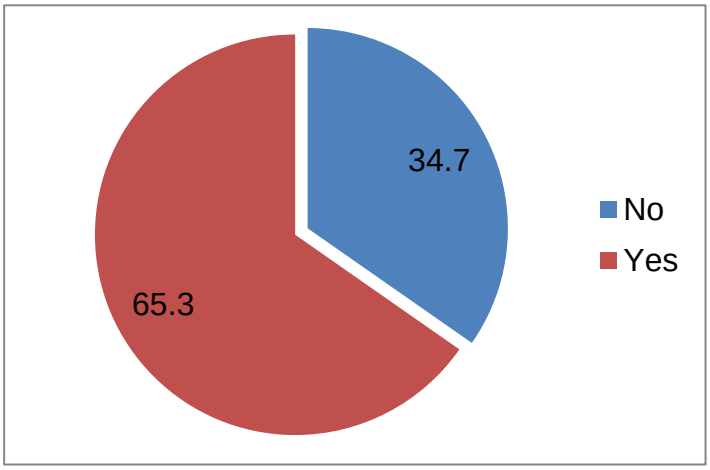
In answer to the question 'whether students have visited any incubation centre recently or before joining this institute', the students report that 57 per cent have not visited any incubation centre, and only 43 per cent confirm visiting an incubation centre recently or during their stay there. Highlights the possibility of not having an incubation centre in most institutes. The incubation centres established by a few NIPERs are yet to be known to most students.

Figure 24: Visited an incubation centre



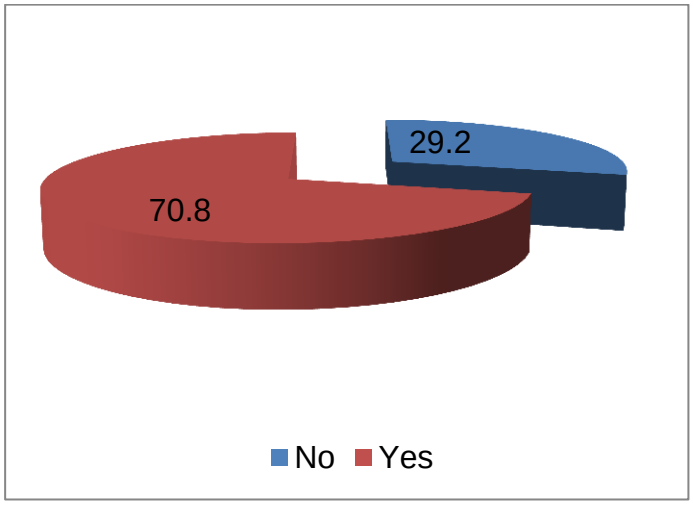
Another question asked was 'whether students can work on start-up ideas in their respective institutions'. Around 66 per cent of the students confirm they are allowed to work on their start-up ideas. Another set of 34 per cent of students say no to any opportunities to work on their start-up ideas. While start-up is not everyone's cup of tea, there is a positive response concerning allowing students to pursue their ideas.

Figure 25: Allowed to work on start-up ideas



We also inquired whether you know any pharmaceutical start-ups in India. The results for this question were satisfactory, and we found that 70 per cent of students know about this, and only 30 per cent did not know any start-ups running in the pharmaceutical sector. While NIPER institutions promote innovation and entrepreneurship, the students should notice the basics that will automatically upgrade their interest and possibility of getting engaged with start-ups in the sector.

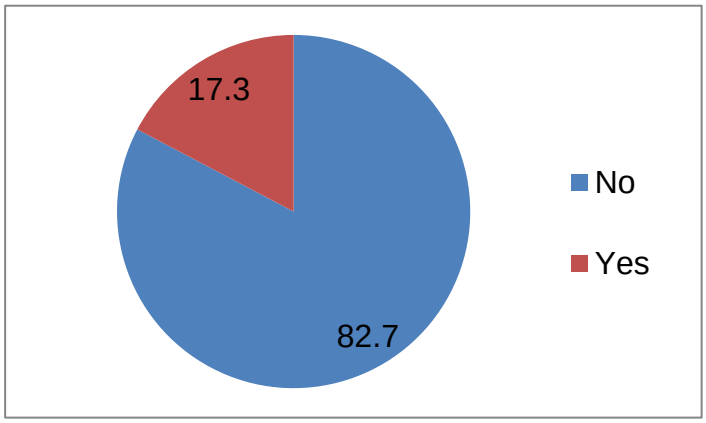
Figure 26: Know pharmaceutical start-ups in India



More than 82 per cent of the students were not part of any start-up idea recently, and only 17 per cent of students have experienced the path of being part of any pharmaceutical start-up in their institute. The limited number of funding and events can be a primary reason for the least involvement of

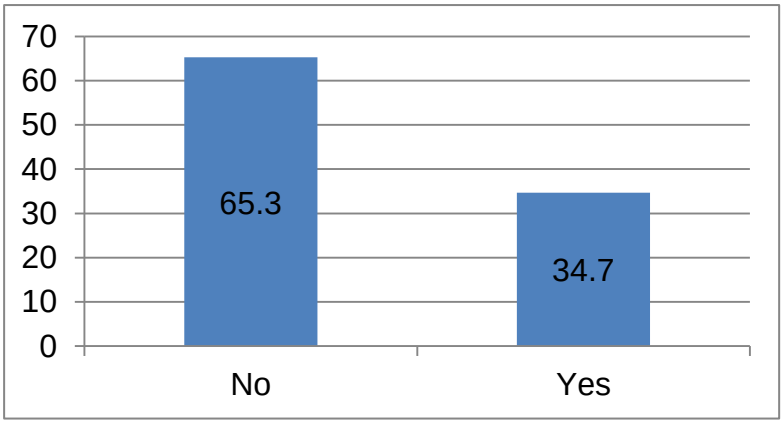
students in the start-up ideas. It is also clear that students need help to create their ideas for start-ups through their respective institutions.

Figure 27: Part of a start-up idea recently or before



The last question related to entrepreneurship is whether students know any faculty involved in start-ups and currently working with start-ups in their respective institutes. More than 65 per cent of students do not know, and around 35 per cent of students know faculty who is directly engaged with student start-ups in their respective institutes. This is an important observation that reflects that students should be aware of faculties practically implementing entrepreneurship in the institute.

Figure 28: Faculty working with start-ups in this institute

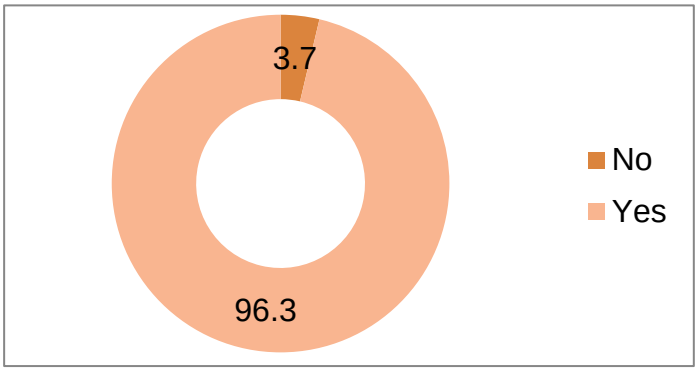


5.7. Placements

In this placement section, we tried to understand the placement and job training status in these institutions. The results show that 96 per cent of students know that they have a placement cell in their institute, and only 4 per cent say they do not know. As an institute of professional studies, all the

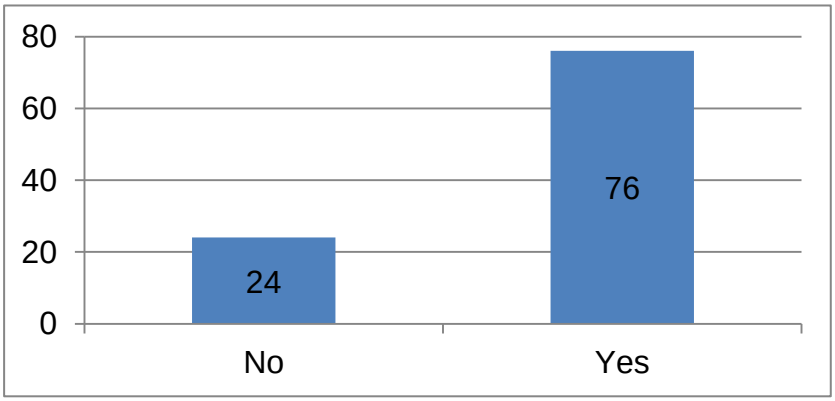
NIPER institutions must have a placement cell to promote their students and increase their chances of getting placed in promising industries and institutions in India. It is a positive outcome that only three per cent of students do not know whether they have a placement cell. Such a positive outcome shows the information dissemination in these institutions.

Figure 29: Placement cell in the institute



Out of the total students, 76 per cent are confident that they have received or will receive placement training through their respective NIPER institutes. Enhancing students' skills is an essential part of the overall grooming of the students for their future endeavours. Such training can also boost students' confidence in receiving better job offers and fast growth during their employment in any industry or their entrepreneurial endeavours.

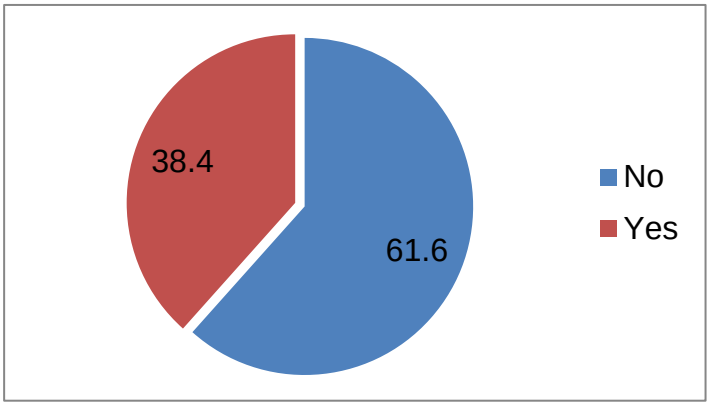
Figure 30: Do you receive any technical/ soft skill training sessions here



We also asked students whether they joined only for a job or they have some other goal also while pursuing this degree. The results show that 40 per cent students joined because they want to pursue a job while as, 60 per cent did not just join here for a job but to take on research, start-up, and find new possibilities

with this degree. The results are quite impressive and it can be seen that there is a great mind-set change and students are now looking for opportunities in various sector other that job.

Figure 31: Joined for job only



5.8. Discussion

In the discussion section of the questionnaire, the students were asked three questions. The first question is related to industry-academia collaboration, the second is related to whether students should be encouraged to garner entrepreneurship and start-up culture, and the third is how to make NIPER institutions self-reliant. While these questions were open-ended and qualitative, we have tried to assemble as many opinions as possible. We have asked this is the most vital section of the questionnaire. After data collection, specific themes are derived and discussed below.

'How can we improve industry-academia collaborations at NIPER?:

Students feel that collaboration, practical research, IPR industrial projects, internship programs, and other measures can break the chain and help NIPERs thrive. Industry visits, collaborations increasing, collaborations and relations, working with small industries, maintaining good relations with industry, Industrial exposure, MOU between NIPER and institutions, Industry collaborations, and industry-oriented courses can significantly help in this endeavour.

Most students surveyed are optimistic about research collaboration between institutions and industry. More significant collaborations and working with other organisations can be exciting and result-oriented. The institutions can work on all

these suggestions and simultaneously increase the visibility and prospects of having a more vibrant future.

Another question is, 'Do you believe NIPER students should be encouraged to take up entrepreneurial ventures/start-ups in the pharmaceutical industry? Why or why not: Most students feel they should be allowed to work on their start-up ideas. Students are very optimistic about this phenomenon and believe that start-up innovation and other such things are part of the future, and we need to be part of the same. Start-ups help generate jobs, economic growth, prospective new pharmaceutical fields, and many more. Pharmaceutical startups can shape the sector's production, manufacturing, supply, demand, and related aspects. Start-ups can create employment and be a great source of income for the country and society.

Another question is, 'How can we make NIPER institutions self-reliant and self-sufficient?': Most students supported collaborations, industry visits, faculty and lab space, research, and more projects. Another set of students suggested alumni product development, Projects, and funding, focus on translational research, students' PhD work can be developed into new products, alumni meetings, more faculties, more research, Internship collaboration can help, and others. These are the most relevant suggestions to make NIPER institutions more self-reliant and focused. Collaboration, increasing the size and number of projects and creating new ways of growth and revenue can make NIPER institutions more self-reliant.

Chapter 6

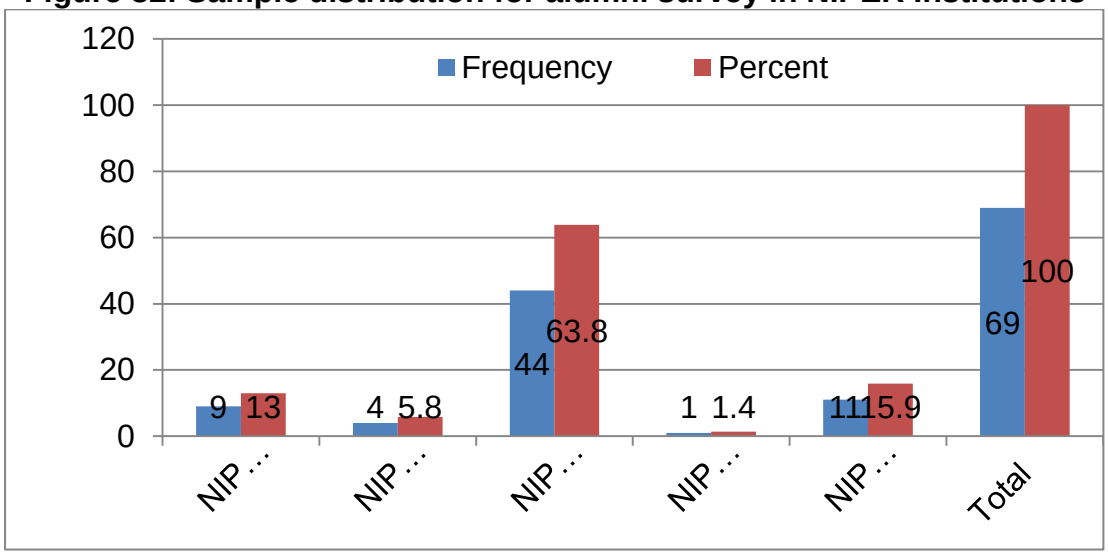
Results and Analysis (Alumni)

In this chapter, we present the results of the alumni survey. It is important to note that the alumni participants graduated within the past 8-12 years since establishing different NIPER educational institutions. The following results are based on the data set of graduate alumni. The data analysis was conducted on alumni data collected from all NIPER institutions in the country.

6.1. Demographics and Alumni Perceptions

The study demographics included gender, course year, course studied, and NIPER institutions. The majority of survey forms were filled out by NIPER Hyderabad alumni, followed by NIPER Mohali, and then by NIPER Ahmedabad alumni. Despite continuous follow-up with institutional authorities, the response rate from NIPER Kolkata, Rae Barelli, and Hajipur was minimal. Due to time constraints and the study's focus, the received data was analyzed, and the following results were obtained.

Figure 32: Sample distribution for alumni survey in NIPER Institutions

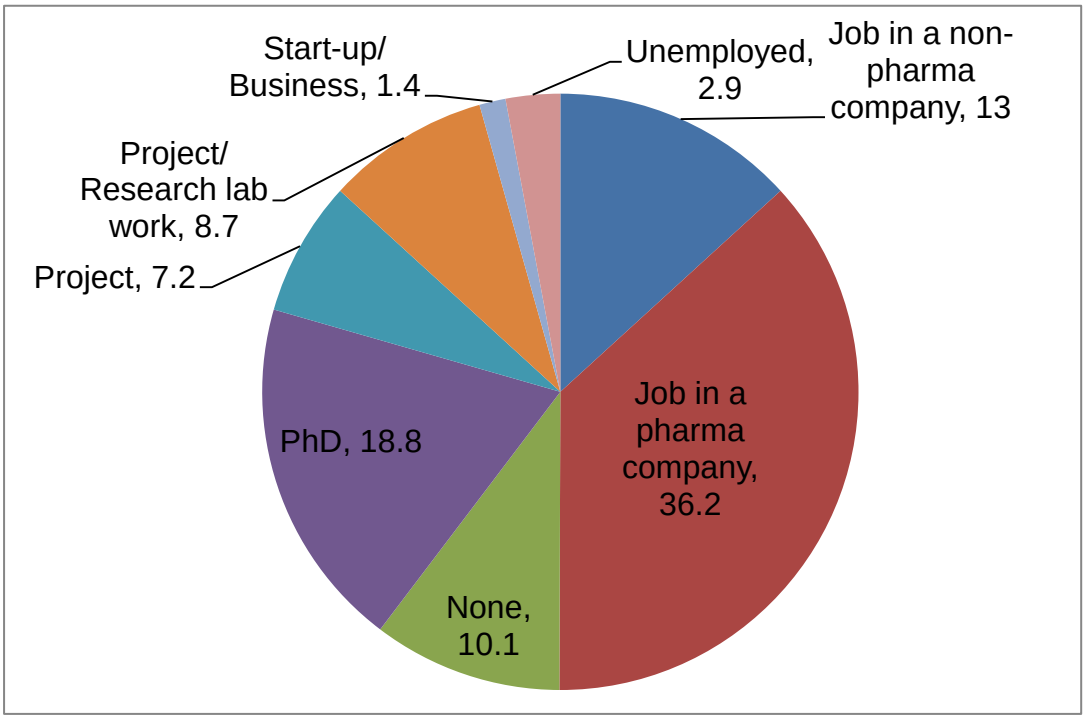


Present occupation

The data shows that alumni have built their careers in pharmaceutical and non-pharmaceutical companies; some are engaged as researchers, and some

are pursuing their Ph.D. Some students work in laboratories, and a small group of alumni are unemployed. Alumni responses have helped us create a follow-up and generate an understanding regarding various perspectives related to NIPER institutions since the beginning.

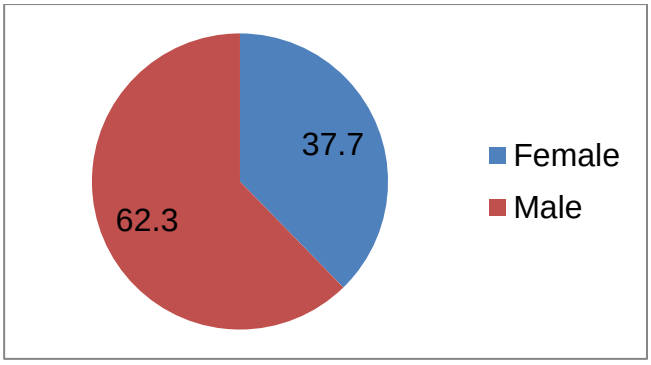
Figure 33: Current occupation of Alumni



Gender

The data points reveal an equal participation of boys and girls in this survey, and the total number is also given. The data show that 37.7 per cent of female alumni and 62.3 per cent of male alumni participated in this survey. The results highlight the role of women in pharmaceutical education and research in India. NIPER institutions have maintained a good ratio of male and female candidates for admission.

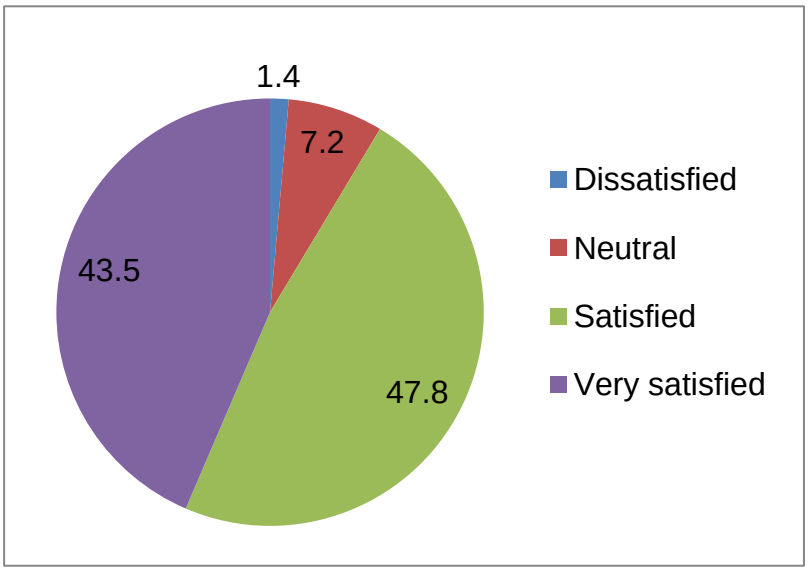
Figure 34: Gender-wise classification of the sample



6.2. Academic and Research Facilities at NIPER

This section will discuss the general perceptions of research facilities and relevant alumni experiences in the NIPER institutions. The first question to alumni reiterates, 'How satisfied are you with the quality of research education provided by NIPER.' In response to this question, 90 per cent of the alumni felt very satisfied or satisfied with the education and research provided by the NIPER institutions in India. However, a meagre percentage of 1.4 felt dissatisfied with the current teaching and research. These data points highlight the role of NIPER institutions, which have increased the standard of pharmaceutical education in India. For both perceptions-based and binomial questions, students and alumni have reflected very differently.

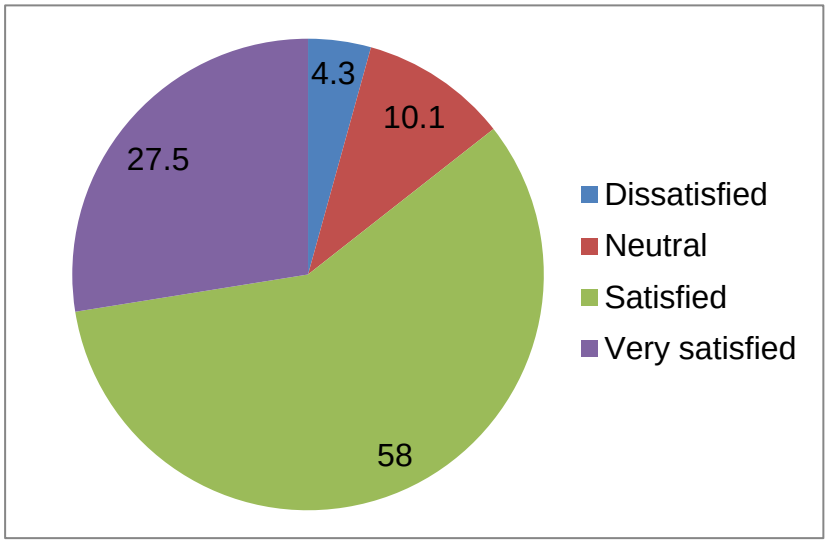
Figure 35: Quality of Research Education Provided by NIPER



The second question asked was, 'How satisfied are you with the curriculum and course content at NIPER? Is it aligned with the industry? In the figure below, it is clear that more than 58 per cent of alumni feel satisfied, while 27.5

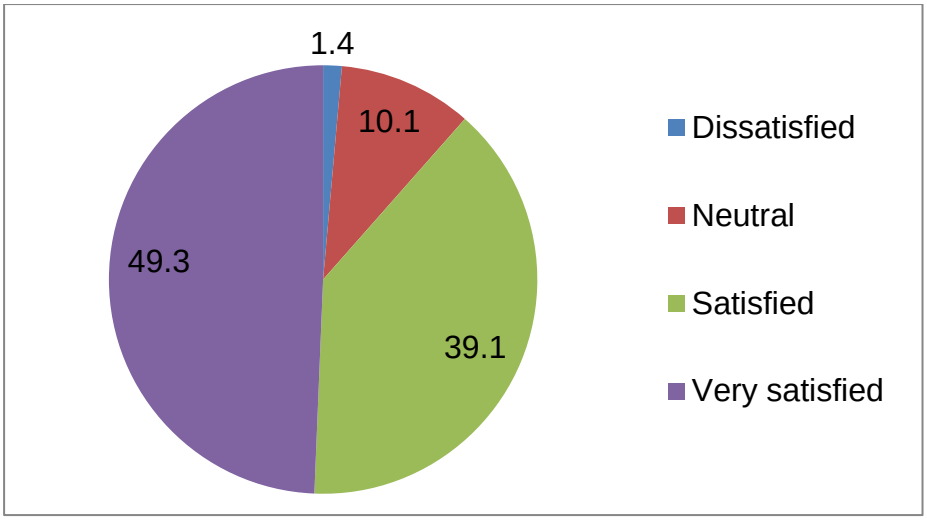
per cent feel very satisfied with the type of curriculum and course content followed in their respective institutes. This reflects the scope of improvement because a small chunk of respondents felt dissatisfied with the curriculum and content provided by NIPER institutions in India.

Figure 36: Curriculum and Course Content at NIPER and its Alliance with Industry



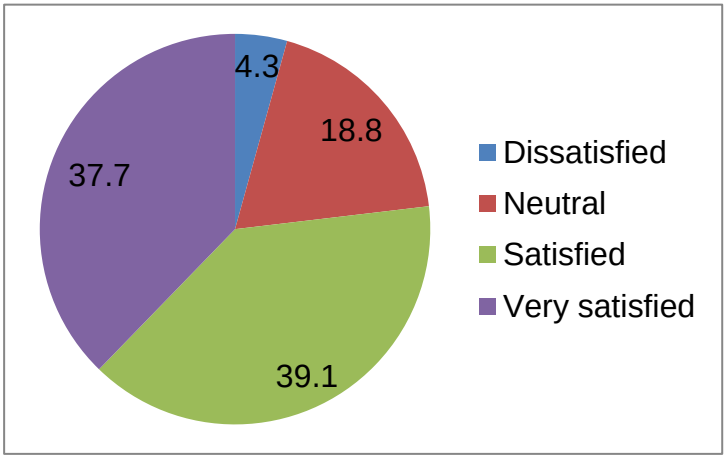
The third question asked was, 'How would you rate the facilities provided by NIPER, such as classrooms, labs, libraries, and computer facilities.' Among all the alumni, 49.3 per cent felt very satisfied, and more than 39.1 per cent felt satisfied with the facilities available in their institutions. Of the total, only one per cent of the alumni felt dissatisfied or very dissatisfied with the facilities the respective NIPER institutions provided. This highlights the kind of facilities provided to students since the institute's inception.

Figure 37: Alumni's perception regarding facilities like labs and classrooms



The number reflects alumni's perceptions of the institute's facilities and research opportunities. In the alumni group, 37 per cent felt very satisfied, and 39 per cent felt satisfied with the kind of research opportunities available in the institute. Research opportunities provide alumni with exposure to new areas of knowledge, and an institutional mentor helps them grasp new areas and use their fresh ideas to develop the field. This also reflects the overall capacity of the institutions in the country to handle and provide world-class facilities. In contrast, most of the NIPER institutions in the country are newly established.

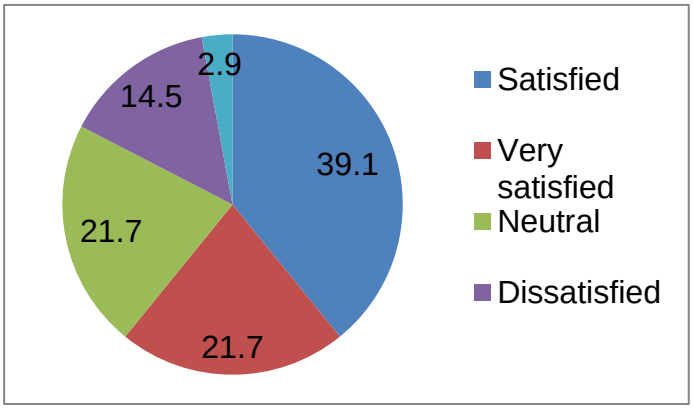
Figure 38: Resource and Research Opportunities in NIPER Institutions



Looking at the figure below, 39 per cent of alumni have felt satisfied, while 21 per cent felt very satisfied with the research opportunities provided to the alumni. At the same time, 14 per cent of alumni felt dissatisfied with the opportunities and prospects for research collaboration at the NIPER Institute. These results highlight the role of NIPER institutions in shaping the new pharmaceutical

professionals in the modern research environment, and research is part of the progress of research development in the country's pharmaceutical sector.

Figure 39: Alumni satisfaction with industry collaboration and placement opportunities

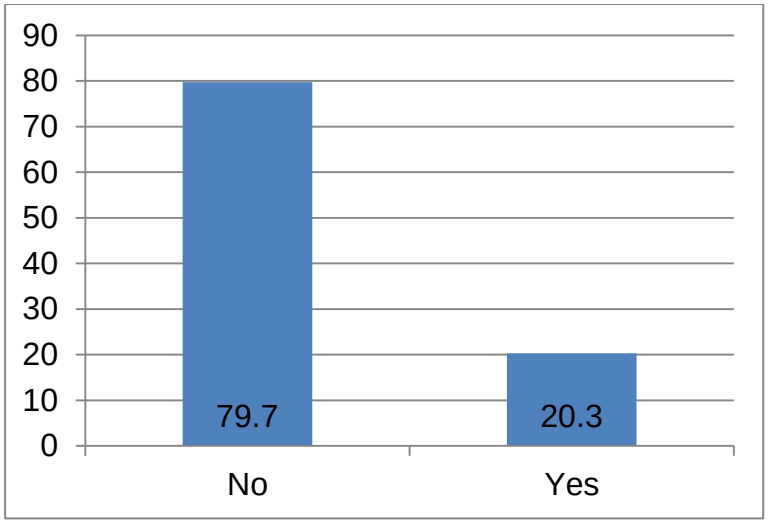


6.3. Industry Academia Interactions

In this list of questions, the researchers wanted to understand alumni's opinions on the condition of industry-academia collaborations when they were students. Ten questions were asked to alumni, and all the questions were binomial, with yes or no as the answer. The results reflect upon the alumni's perceptions regarding industry-academia collaborations based on the choices of yes and no for every question.

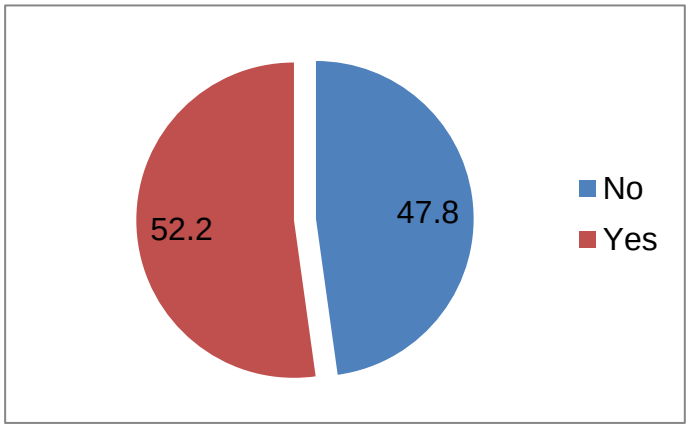
More than 79 per cent of alumni were not part of research projects, and only 20 per cent of the alumni could become a part of a project during their course period. This highlights a great scope for improvement in this context, and NIPER institutions need to work aggressively in this area. This can be a first step in making the NIPER institutions self-reliant and changing the research and pharmaceutical growth environment.

Figure 40: Worked on Research Project



Among the alumni group, 46 per cent did not participate, while as 52 per cent participated in an event organized during their course period. Research events have been conducted more often than recently due to the pandemic. Research events help students and alumni to identify and choose new research areas and have networking opportunities. Institutions need to do events and seminars to emphasize the need for research and pharmaceutical education in the country.

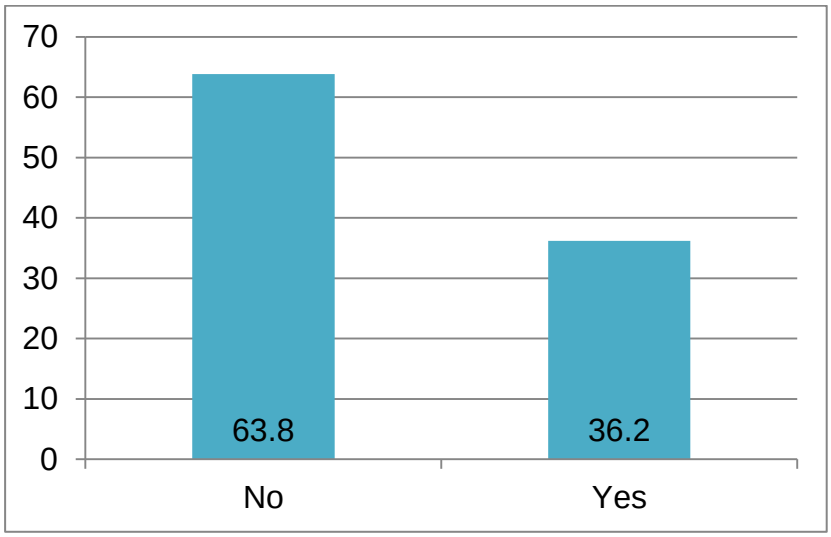
Figure 41: Participated in any Academia Industry Event



The survey results show that 63% of alumni did not present a paper at any conference, while 36% claimed to have presented a paper at a conference during their course period. It shows the level of inattention in NIPER institutions to promote academic conferences and support students in their research interests. It is also important to understand that a conference may be arranged within the institute by another institute or a foreign institute. Alumni can be helped

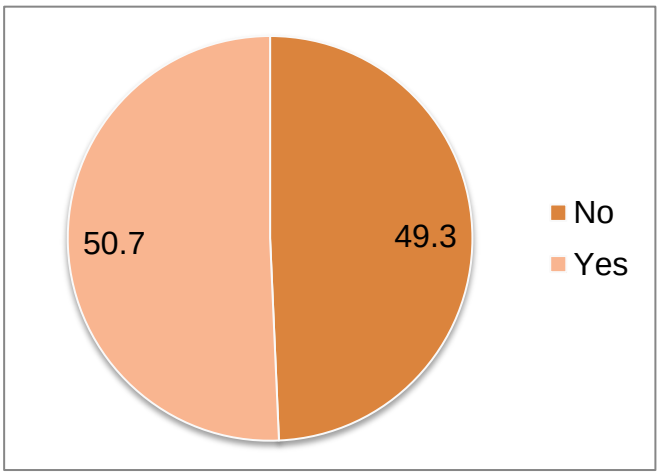
by understanding their concerns and building a research orientation among them.

Figure 42: Paper presentation in a conference



It was also asked to the alumni whether they collaborated with any NIPER faculty for research projects. Out of the total alumni, 50 per cent have consented yes, while as more than 49 per cent said they did not collaborate with any faculty for research projects recently in any NIPER institution.

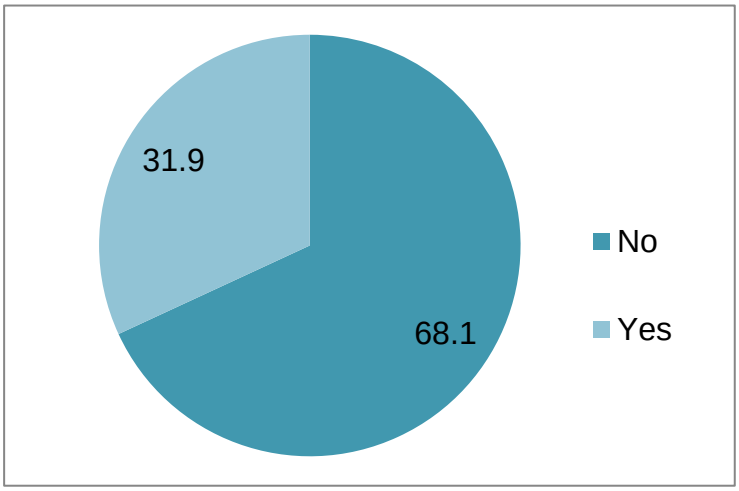
Figure 43: Collaborated with faculty for research projects



Among all the alumni, more than 68 per cent have not visited any pharmaceutical company during their course period. However, a total of 31 per cent of alumni in the survey visited a pharmaceutical company during the study time. This is again an essential revelation that there needs to be more

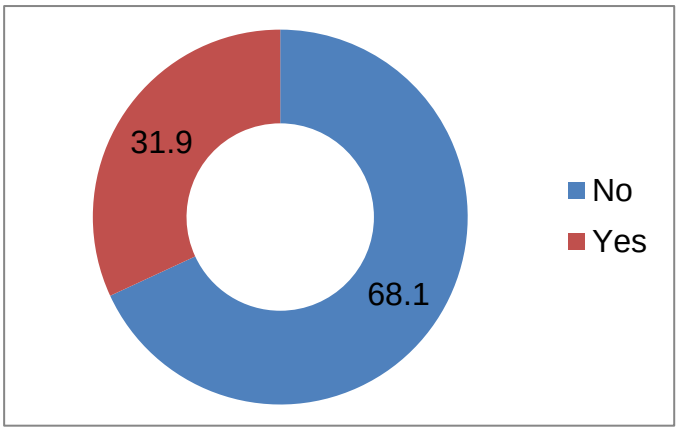
exposure among alumni, and industrial visits are vital for the growth of the industry and the institute. The survey results suggest that most alumni have not visited any pharmaceutical company during their course period.

Figure 44: Visited Pharmaceuticals Company during the course period



Another important question in the list was ‘whether alumni had received any placement training’. Data in the figure below show that 31 percent of alumni received training support while 68 percent or more did not receive any training for the same. Meanwhile, this percentage has increased for current students, as shown in the previous chapter.

Figure 45: Training for pharmaceutical collaborations or job training

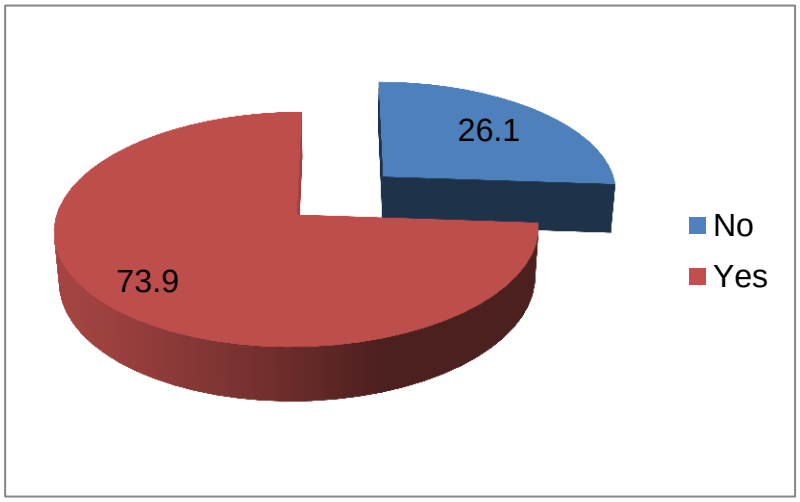


6.4. IPR and NIPER Institutions

Intellectual property rights are critical for scientific research, and it depict the level of delivery and interest in innovation and new scientific innovation. So, to understand the IPR status of NIPER alumni, the question was asked whether the institute's curriculum contains a course on IPR. In response to this query,

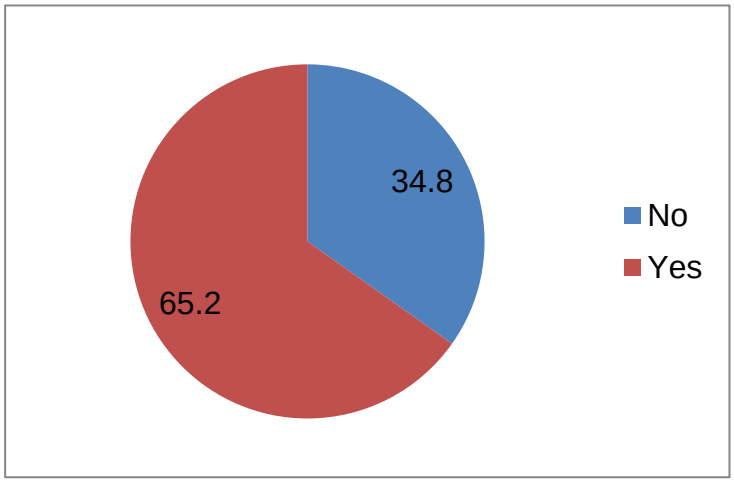
73 per cent of alumni confirmed studying a course on IPR. Another group of alumni, who constitute around 26 per cent, declare that they have not studied any course on IPR in their respective program duration.

Figure 46: IPR Course studied



In the last question 'whether alumni knew anyone who has been granted a patent in their respective institute or network, more than 65 per cent of alumni said yes and 34 per cent of the alumni confirmed they do not know anyone who has been conferred with a patent recently or before. This highlights the visible interest of alumni in IPR and the kind of alumni engagement in such activities and research.

Figure 47: Know anyone who has been granted IPR recently

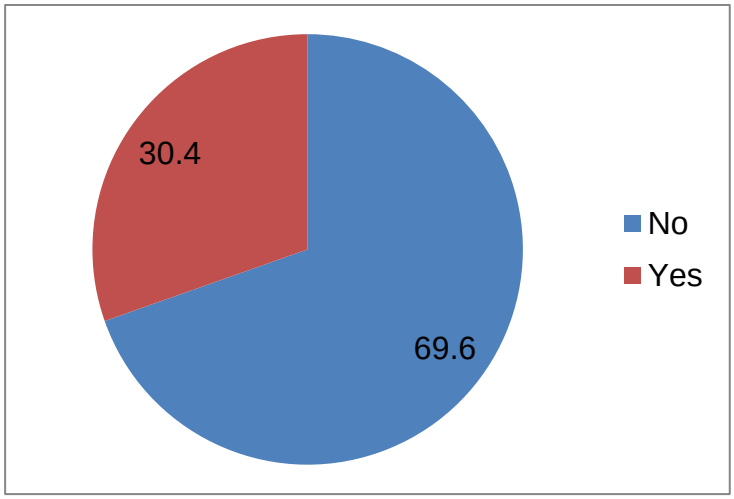


6.5. Patent and Technology Transfer

The first question is 'whether the institute had a technology transfer office when they were part of it'. The alumni data show that 30 per cent say yes, and around

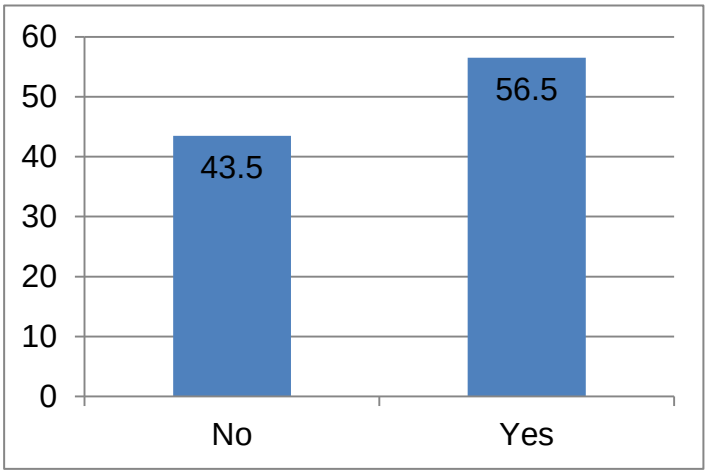
69 per cent of alumni do not know whether their institute had a technology transfer office. The results highlight the knowledge gap among alumni for the technology transfer office, which is a vital part of most of the research and innovation institutions in the country. It is more in alumni because the concept of technology transfer was new to them.

Figure 48: Technology transfer office at NIPER



Most alumni or more than 56 per cent, know the role of technology transfer offices, and around 42 per cent of alumni did not know the role of technology transfer offices in the respective NIPER institute. Alumni should be well aware of such offices and should be part of the academics as well. Students should be well aware of facilities, and they must acknowledge the knowhow as well.

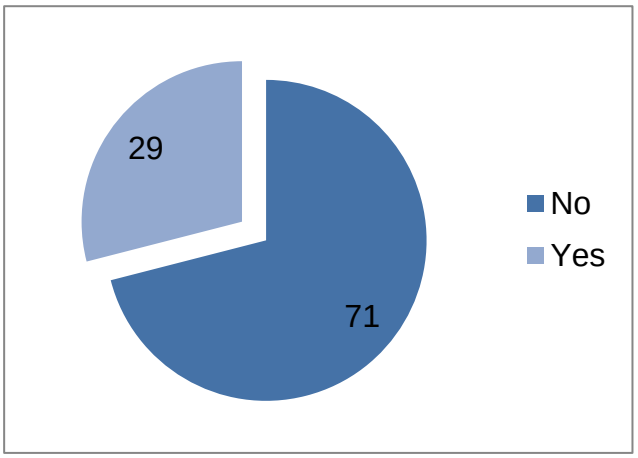
Figure 49: Role of Technology Transfer Office



Among alumni, 29 per cent said yes, while as 71 per cent of alumni have not collaborated with any pharmaceutical industry for research and innovation

purposes. While research collaboration with industries is complex, students can be motivated to push their proposals for consideration and keep track of what students are looking after. The support of the institute can help them understand the process and achieve bigger goals in the given timeline. The students and alumni can be encouraged to develop a collaborative research plan, and faculties can also be engaged in this.

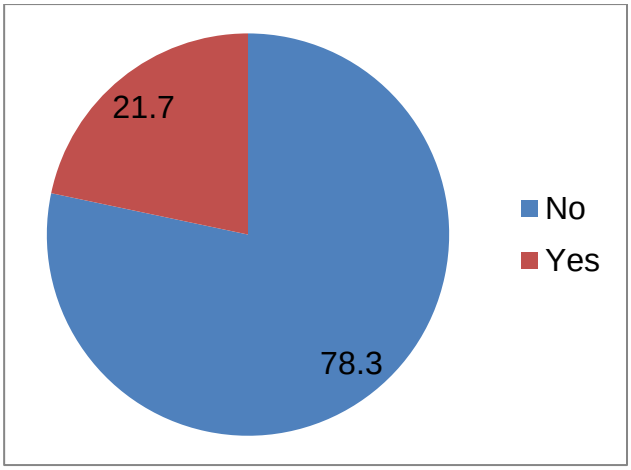
Figure 50: Collaborations with the pharmaceutical industry



6.6. Entrepreneurship

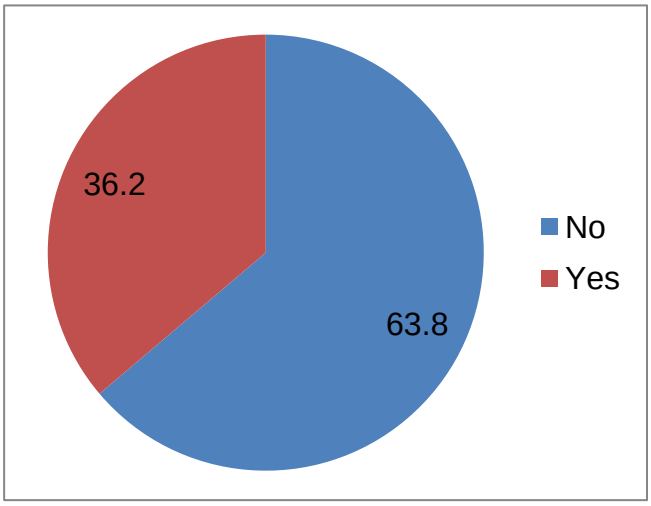
The first question in this section is 'whether alumni have attended any entrepreneurship awareness program recently'. The data shows that more than 78 per cent have not studied any course on entrepreneurship during their study period. However, 21 students have studied entrepreneurship courses during their course study period. This can be because alumni belong to various session years, and the institutions were still building up. The possibility of having a full-fledged course on entrepreneurship during their study time is low.

Figure 52: Studied entrepreneurship during the course period



The results show that 36 per cent of alumni have attended more than 63 per cent, or the majority of alumni, have not been a part of any entrepreneurship awareness program. There can be multiple reasons why alumni have not participated in any such event. EAPs are conducted by most of the institutions throughout the year. Recent government initiatives are helping institutions do more EAP in their institutions to make them more relevant and easy for students to understand entrepreneurship.

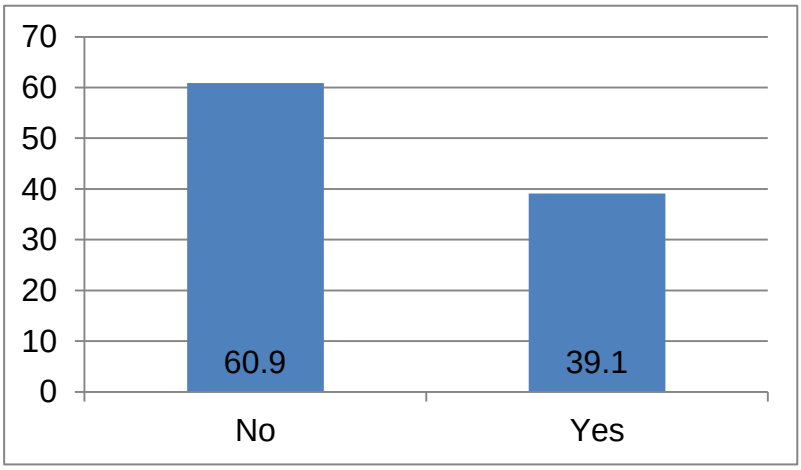
Figure 53: Attended entrepreneurship awareness program



Of the total alumni, 60 per cent have not visited any incubation centre, and only 40 per cent confirm visiting an incubation centre recently or during their stay in this institute. This highlights the possibility of not having an incubation centre in the entire institute or the institute not being able to provide a brief about the same. Incubation centre is again a recent phenomenon. By 2018, India had only 150-200 incubation centres, which have now risen to 800 or more. We have private incubators and tinkering labs in schools, and the ecosystem builds daily.

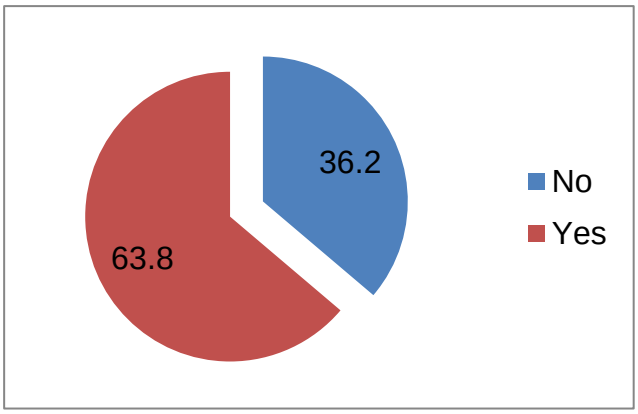
The alumni belong to varied years of study, making it difficult to expect a visit to the incubation centre by any students in the institute.

Figure 54: Visited incubation centre



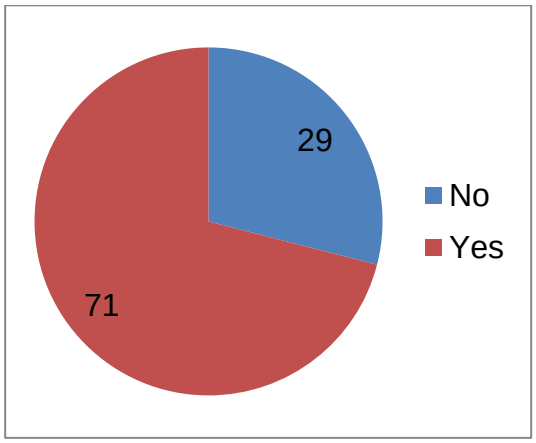
The data shows that 63% of alumni confirmed they were allowed to work on their start-up ideas, while 36 per cent confirmed they were not allowed or encouraged to work on their entrepreneurial or start-up ideas. This identifies the kind of support provided to students in these institutions, which is gaining momentum with every passing year.

Figure 55: Allowed to work on start-up ideas



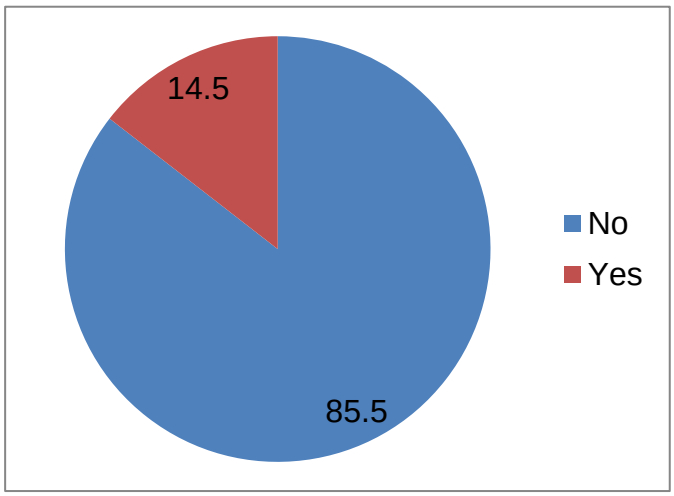
Do alumni know of any pharmaceutical start-ups in India? It was found that 71 per cent of alumni know about start-ups in the pharmaceutical sector, while 29 per cent were unaware of any start-ups running in this sector. NIPER institutions are promoting innovation and entrepreneurship at par, and the basic things, such as start-ups, are gaining positive responses from students and alumni. This know-how will help students build positive opinions and create their own role models for building businesses in the pharmaceutical sector.

Figure 56: I know about pharmaceutical start-ups in India



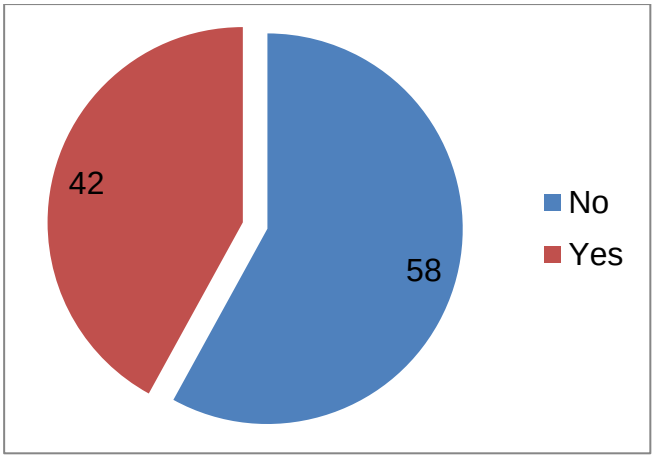
More than 85.5 per cent of the alumni were not part of any start-up idea recently, and only 14 per cent of alumni have experienced the path of being part of any pharmaceutical start-up in their institute. The limited number of funding and events can be a primary reason for the least involvement of alumni in the start-up ideas in the previous years. It is also clear that alumni need help to create their ideas to do start-ups through their respective institutions.

Figure 57: Part of a start-up idea recently or before



Another question asked was whether alumni know faculty members who have been involved in start-ups and are currently working with start-ups in their respective institutes. The results show that more than 58 per cent of alumni did not know any faculty working with a start-up in the institute, and only 42 per cent of alumni know any faculty directly engaged with alumni start-ups in their respective institutes.

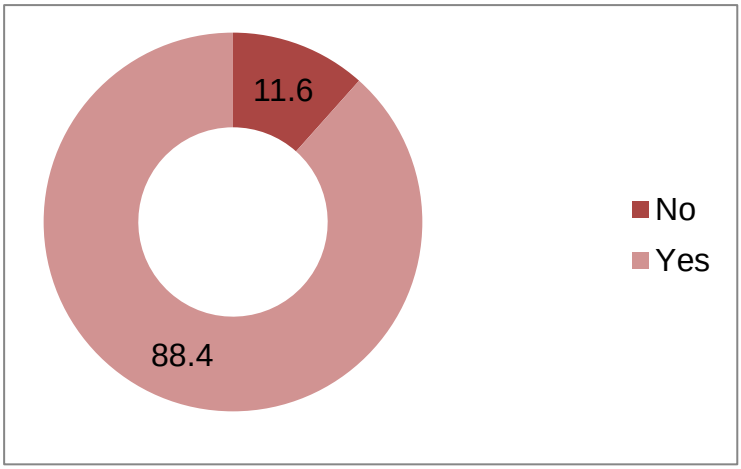
Figure 58: Faculty working with start-ups in this institute



6.7. Placements

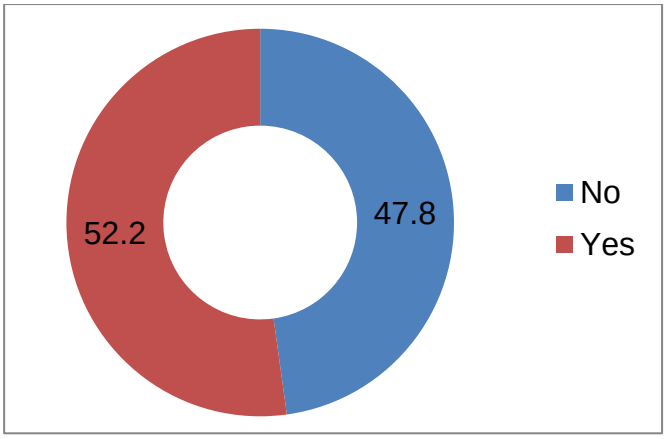
The results show that 88% of alumni knew they have a placement cell in their institute, and only 11% were unaware of the same. As this is about alumni and the institutes were still growing, the figure was not expected. It shows the level of support provided to alumni for getting placed in a good position with the best pharmaceutical companies and research institutions.

Figure 59: Placement cell in the institute



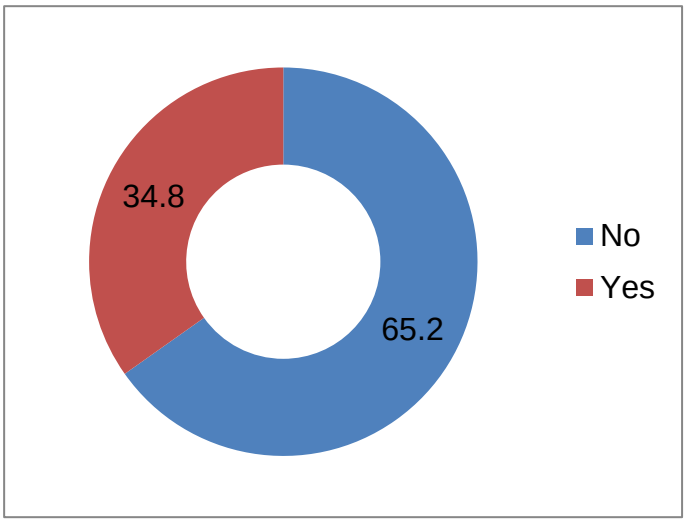
Another question was whether alumni have received any technical/ soft skill training sessions here. Of the total alumni, 52.2 per cent are confident that they have received placement training through their respective NIPER institutes. However, 47 per cent of alumni do not agree with the statement that they have received any training in the institute.

Figure 60: Received placement support and training



We also asked alumni whether they joined only to get a job, and the data shows that only 34 per cent have joined to get a job, while 65 per cent did not just join here for a job but to research, start up, and find new possibilities with this degree. The majority were looking for better opportunities for research or international education. This shows that entrepreneurship and start-ups can be promoted for the growth of institutions in the pharmaceutical sector.

Figure 61: Joined for a job only



6.8. Discussion

The questions in the discussion section were open-ended and qualitative in nature. This is an important question or section of the questionnaire. The opinions received through the survey are presented below.

The first question was, '*How do you think industry-academia collaborations can be improved at NIPER*?': Alumni have reflected upon these questions by giving varied answers. As part of the institute, alumni have suggested practical

research, IPR industrial projects, internship programs, and other measures vital to industry-academia collaborations. For alumni, Industry visits, collaborations, Increasing collaborations and relations, working with small industries, Maintaining good relations with industry, Industrial exposure, MOU between NIPER and institutions, Industry collaborations, and industry-oriented courses are vital. Collaboration should not be limited to specific activities and programs. It should be a holistic plan prepared to disseminate knowledge, create projects and grow together.

Another question *'do you believe NIPER students should be encouraged to take up entrepreneurial ventures/start-ups in the pharmaceutical industry? Why or why not*: In answer to this question, most alumni feel that yes institutions should allow students to work on their start-up ideas. Start-ups help generate jobs, economic growth, prospective new pharmaceutical fields, and many more. India has the most significant demographic dividend, and employment dependencies will be challenging to manage in the coming times. Having start-up ideas and implementing their business mindset will bring change and help these students go beyond the dependency mindset and create their own businesses and give employment to many people and professionals like them.

The last question is '*How can we make NIPER institutions self-reliant and self-sufficient'*: For this question, alumni shared suggestions by supporting collaborations, industry visits, faculty and lab space, research, and more projects. For alumni product development, Projects, and funding, focus on translational research, PhD, and their work can be developed into new products, alumni meetings, more faculties, more research, Internship collaboration can help, and others. These are some of the suggestions. Stagnating as an academic institute will not help any organisation in the future. Sustainability and self-reliance will be required for all the institutions working in technical and professional fields. Creating self-sustaining institutions in the country will require greater initiative, innovation, and change.

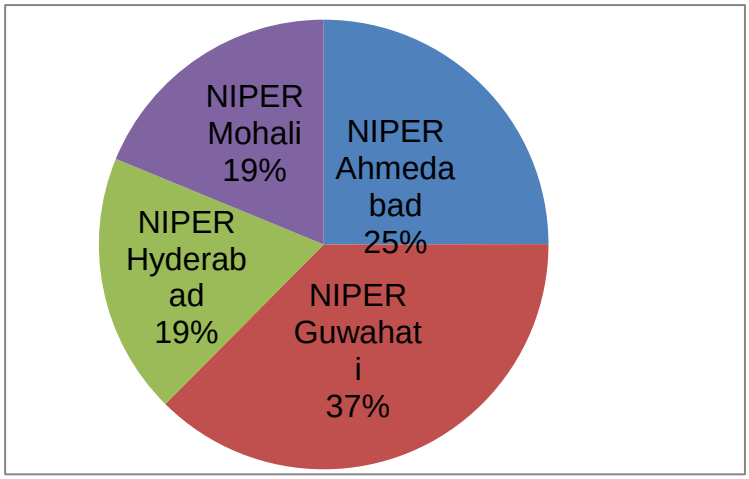
Chapter 7

Results and Analysis (Faculty)

7.1 Demographics and Research Collaborations

Looking into the demographic details of the faculty samples collected from NIPER institutions, it is visible that faculties from NIPER Ahmedabad, Guwahati, Mohali, and Hyderabad have filled in the questionnaire sent through Google Forms. Eight faculties were from NIPER Ahmedabad, 12 from Guwahati, six from Hyderabad, and another from Mohali. The data is also reflected in the below figure.

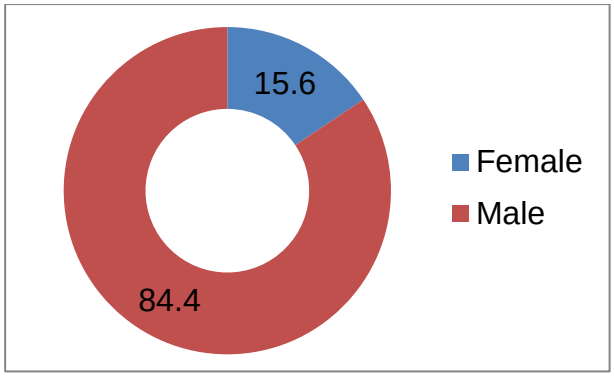
Figure 62: Faculty affiliation



Gender

Gender is another important aspect, and looking into the data, it is clear that 84 per cent of the surveyed faculty are male, and the remaining 15 per cent are female.

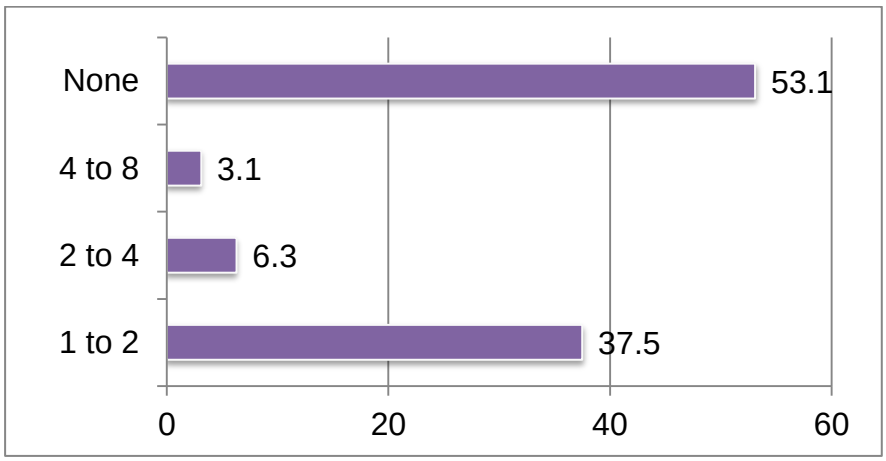
Figure 63: Respondent's gender



Number of projects under faculty

We also asked them how many projects they are handling currently, and the statistics show that 53 percent of the faculty do not have any projects under them currently, while 12 faculties have 1 or 2 projects under them. These numbers are essential as we will also discuss the strength and experience of these faculties with different NIPER institutions.

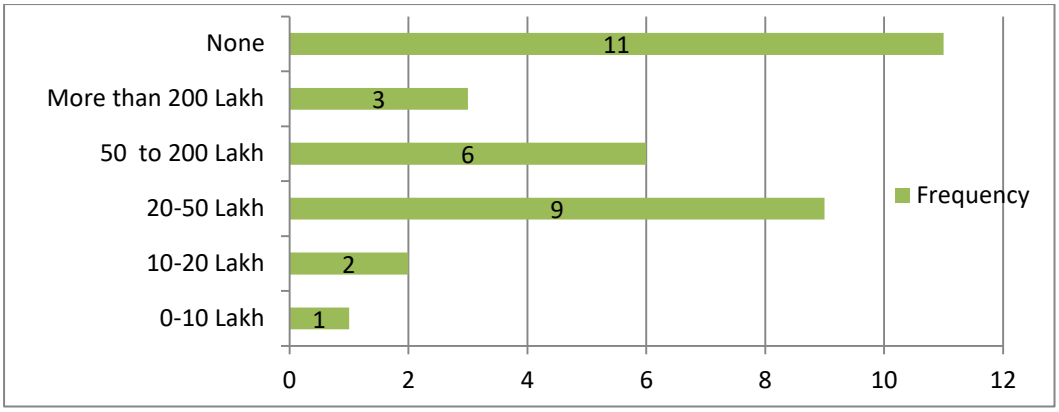
Figure 64: Project under the faculty



Funding received

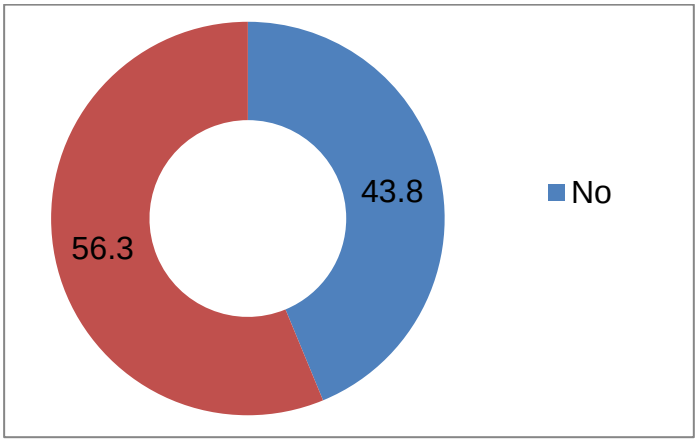
The results in Figure 65 show, that three faculties have received more than 200 lakh funding as project grants, while another six faculties have received 50-200 lakh grants for projects. Another group of nine faculties has received 20 to 50 lakh in project funding. This highlights the research commitments of the NIPER institutions. It looks promising, looking at the experience and the newness of these institutions in the pharmaceutical sector. Through new collaborations and new funding, the chances of breaking the self-reliance barrier will be achieved by these institutions.

Figure 65: Total funding received



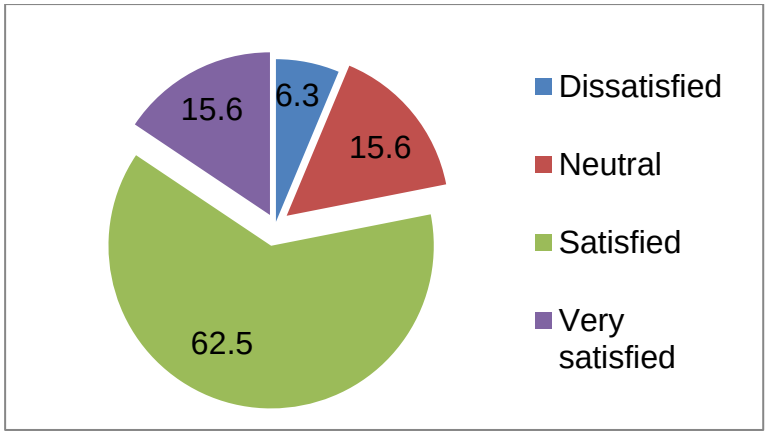
We asked these faculty members whether they were part of any international research collaboration, and the results show that nearly 50 percent of them were part of an international research project or collaboration. This is a clear signal that institutions are building their network and working intensely to create an ecosystem with international collaboration.

Figure 66: International collaborations



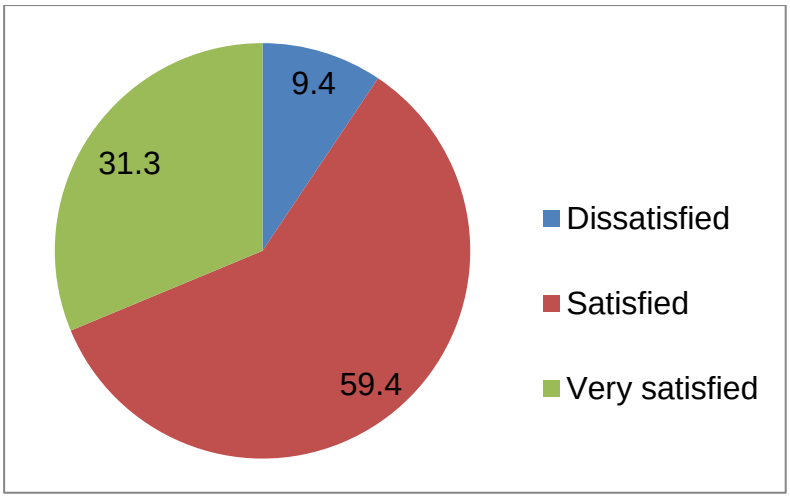
Another question asked was about the satisfaction of research collaborations among NIPER institutions. The results show that most of the faculty are satisfied with the current research collaborations and projects. However, a few faculties look dissatisfied with the research collaboration and opportunities at their respective NIPER institute.

Figure 67: Satisfied with research collaboration of NIPER institutions



We asked them to rate facilities at their respective NIPER institutions, and we got a collective answer that depicts that the majority, 19, feel satisfied, and 10 faculties feel very satisfied with the current research facilities provided by the institute.

Figure 68: Facilities in NIPER institutions



7.2. IPR, Patent and Technology Transfer

Faculties were asked about IPR registered in their name, and the results in the figure below (69) show that 56 percent of the faculty have some registered IPR while 40 percent do not have any IPR registered in their name.

We asked them whether they had any patents on their name. The figure below shows that six faculties have one patent in their name, six faculties have two patents registered on their name, another three faculties have three patents registered on their name, and 14 faculties do not have any patent on their name.

Figure 69: IPR registered under your name

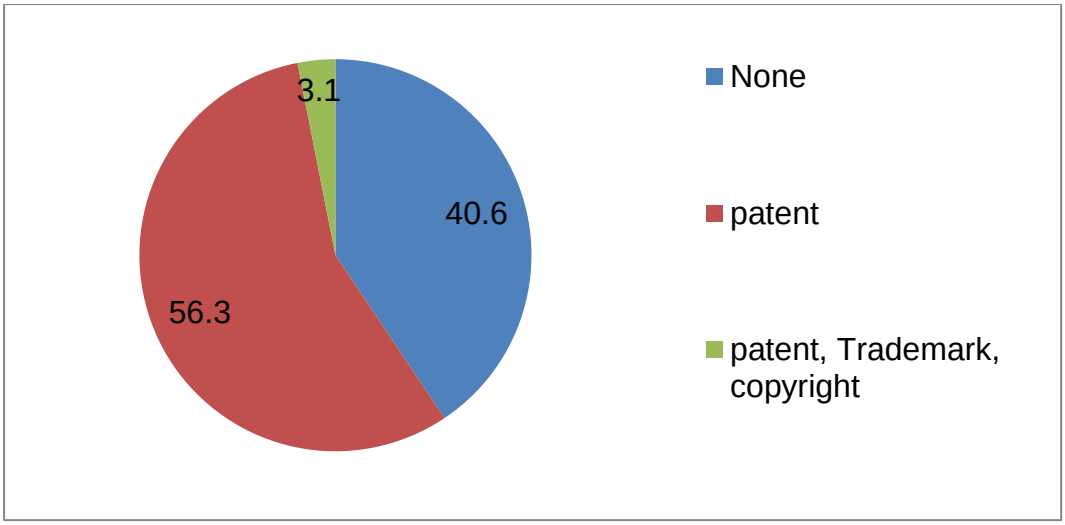
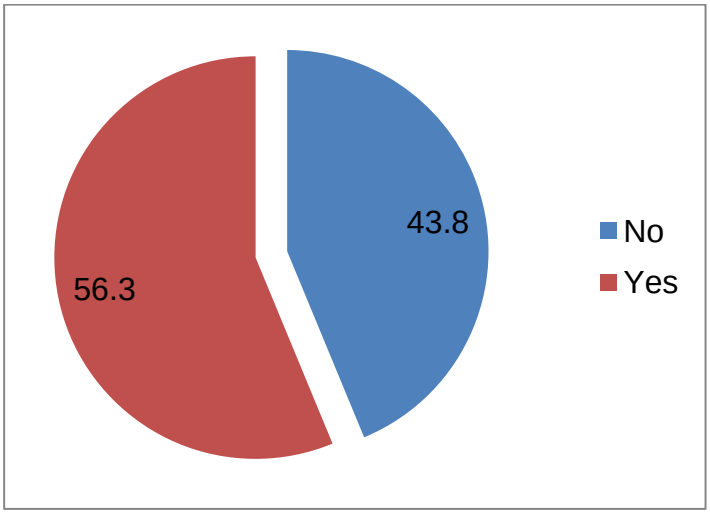
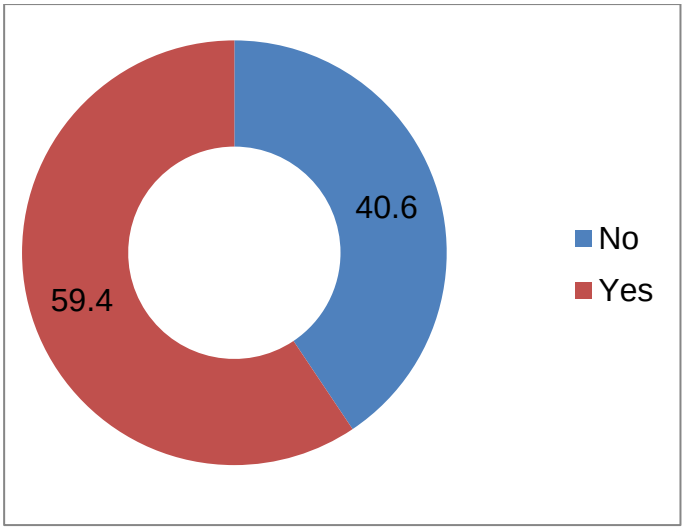


Figure 70: Patents granted



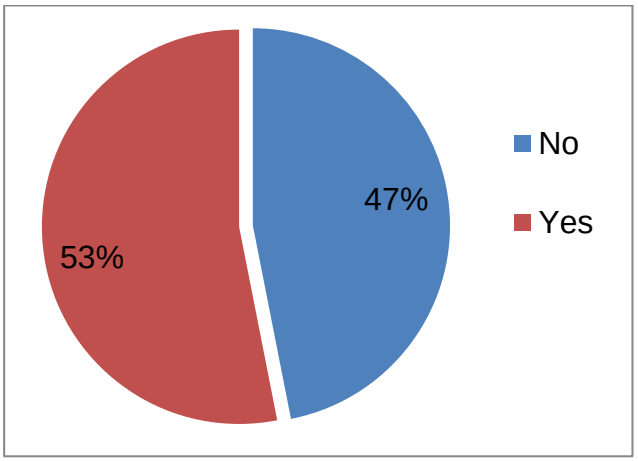
We asked the faculties about their research collaborations in their NIPER institutions. The results show that 56 percent of the faculty members have done research in their institute and outside, and the remaining faculties have never tried to collaborate or could not collaborate for research.

Figure 71: Have you ever collaborated with any researcher on projects



Faculty members were also asked whether they collaborated for research outside their NIPER institute. It is clear from the data that 53% of the faculty members have searched and worked for research collaboration outside their academic environment, and another 46% have not collaborated for the same.

Figure 72: Research Collaboration outside NIPER



Another important question asked was about events that are held in their institutions. The results show that most, or 88 per cent, of the faculties reveal that one or the other events occur throughout the year. They confirm that the conference is being conducted regularly in one or the other institute.

More than 87 per cent of faculty members know about technology transfer offices and technology transfer in general. This is a clear indication that faculties are well aware and there is a need to transfer this knowledge to students as well as in most of the questions, students either find it difficult to

recall the name or do not know about the same. This can be a good way to let students and alumni know what is happening in the industry and how things are changing for them. This will also help students increase their research efforts and get recognised by the offices.

Figure 73: Any recent conference conducted by your institute

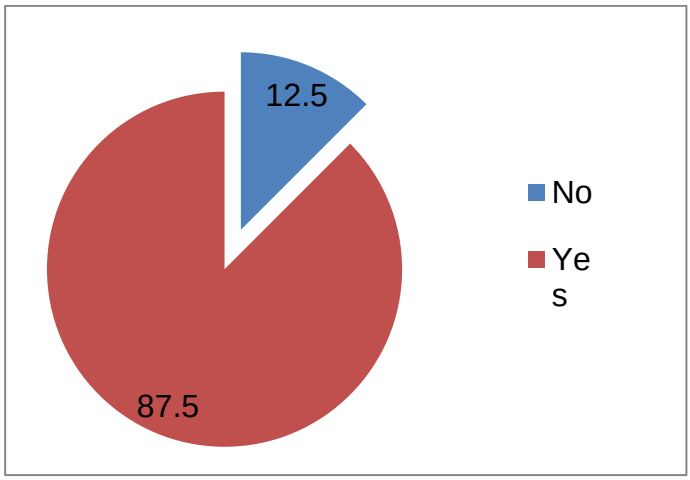
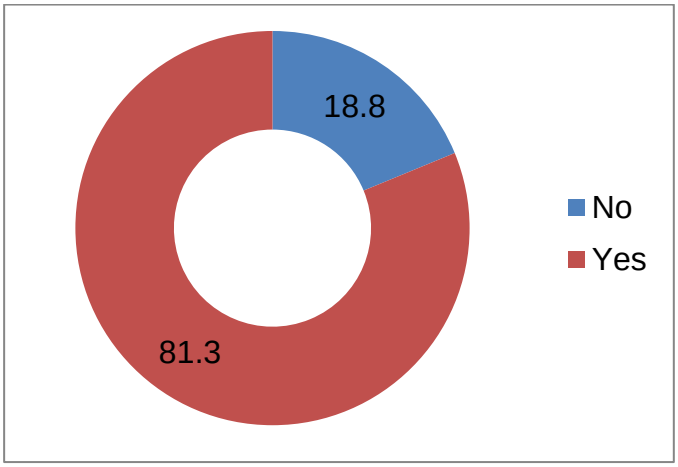


Figure 74: Knowhow of technology transfer offices

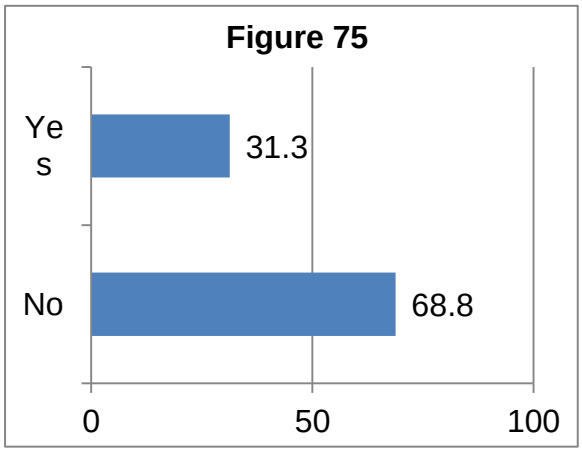


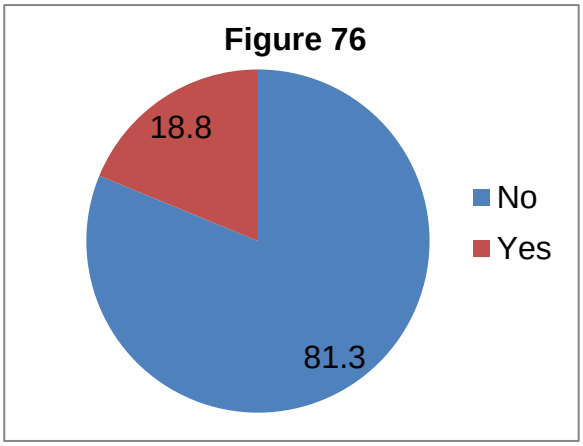
The results show that 31 per cent of the faculties have worked on some pharmaceutical products, while as 69 per cent of the faculty have not worked on any pharmaceutical products in their work experience. We also asked the faultiest to discuss whether they have worked on any medical devices recently or after joining the institute. The results show that only 18 per cent of the faculty have worked, and the remaining 82 per cent, or the majority of the faculty, confirm they have not worked on any such project yet. While all the

faculties have significant research contributions and have compiled much research on their name, the contributions to pharmaceutical products and medical devices are very low. This can be improved by voluntarily working on existing products or creating new products in this line of research.

Figure 75: worked on pharmaceutical products or innovation

Figure 76: worked on medical devices

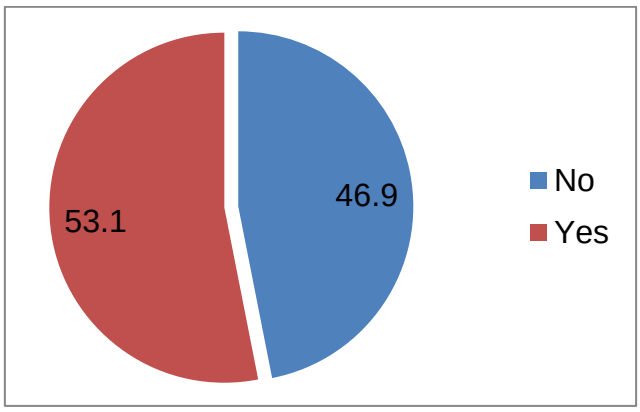




7.3. Entrepreneurship

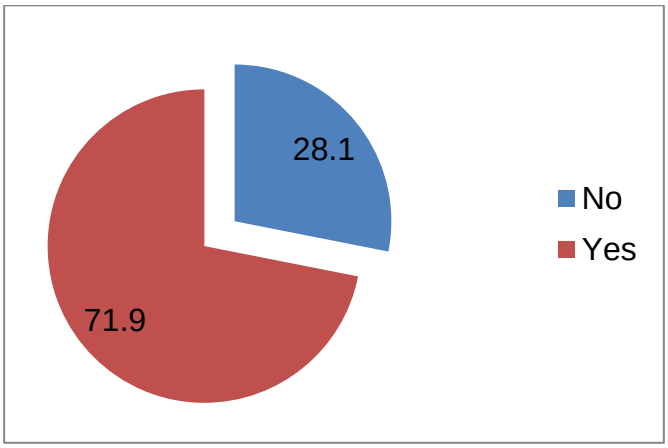
The results highlight that most of the faculty are of the opinion that they are allowed to work on their ideas and on new products and innovations in the field of pharmaceuticals. 53 percent of the faculty gave a positive vote for working on a start-up.

Figure 77: Allowed working on a start-up idea



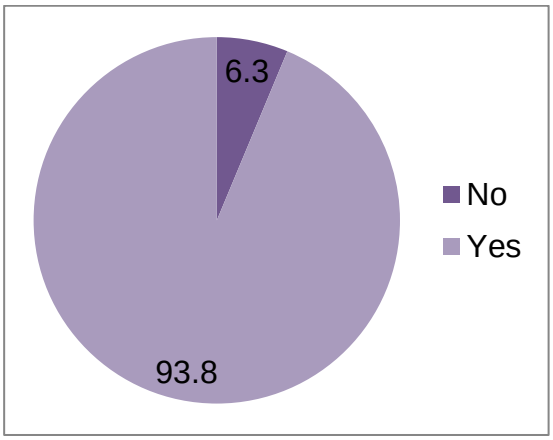
Most of the faculty members are well aware of the pharmaceutical start-ups in the country. More than 70 per cent of faculty members can name one start-up in this field, which is a positive thing happening concerning entrepreneurship culture in the country.

Figure 78: Know any pharmaceutical start-up



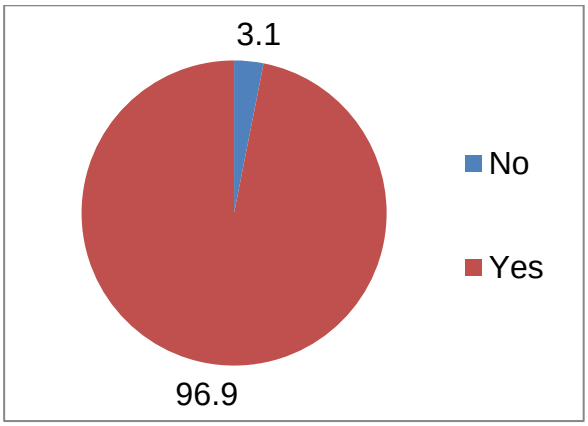
Another question was about incubation centres; more than 93 per cent of the faculty have consented to that. This shows the faculty's commitment to working for entrepreneurship and innovation development of the institute and students. Most of the faculties have visited one or two incubation centres. Such visits give exposure to faculties to understand the workings of these centres, which are institutions in the development of innovative capabilities and start-up culture.

Figure 79: Have you ever visited an incubation centre



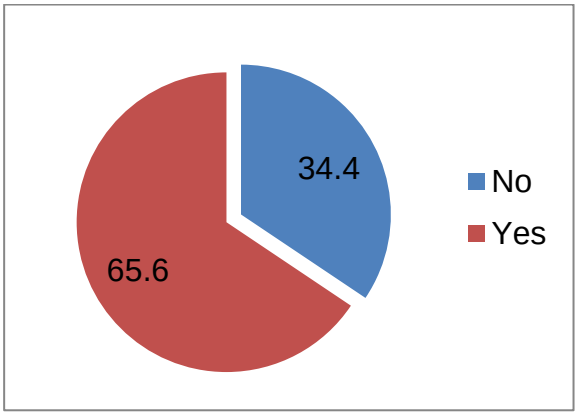
We asked faculties whether they knew the functioning of incubation centres. Most faculties (96 per cent) knew the functioning of incubation centres in the institutions. This makes it more apparent that faculties, as well as students, are well aware of the incubation centres, entrepreneurship and innovation, and this somehow completes the ecosystem and creates a need for students and faculties to work on new ideas and create products and services that are genuinely helpful for society and economy altogether.

Figure 80: Know the functioning of the incubation centre



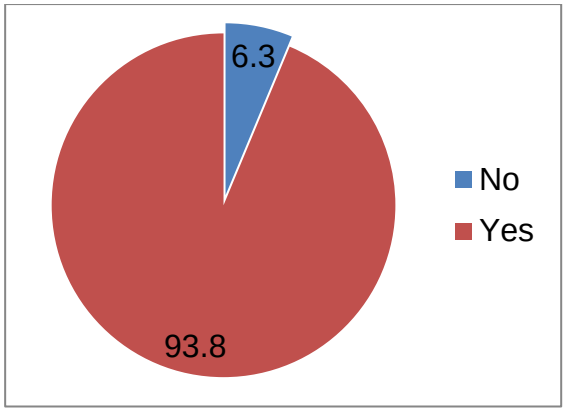
Most of the faculties know incubation and entrepreneurship. 65 per cent of the faculty has been part of a start-up recently. They might have supported or gone through their proposal and worked on any project or product with them. This shows that faculty members are well-engaged with students for their start-up and innovative ideas.

Figure 81: Faculty as part of a start-up



We also wanted to understand whether faculties encourage students to choose entrepreneurship and start-ups as a career. The data reflects that 93 per cent or more have been in favour of recommending students to choose start-ups as a career and begin working on their ideas from the start. This thinking will help them overcome the obstacles and create their own enterprises that can compete and succeed in the market.

Figure 82: Encourage students to pursue start-up as a career



The results in this chapter are encouraging as most of the faculty are of positive opinion regarding the facilities, labs, classrooms, start-up culture, incubation system, innovation, and research support. All this is helpful and creates a positive impression for the working of the NIPER institutions. Such positive results also build a path for newer innovation and changes to make NIPER institutions more relevant, work on ideas, and create new projects to make these institutions self-reliant. In the next chapter, we will discuss and analyse the results and suggest improvements based on the opinions of students, alumni and faculty of the NIPER Institutions in India.

Chapter 8

Policy Implications and Recommendations

The discussion and recommendation chapter builds on the findings from the comprehensive data analysis conducted on various aspects of bridging the academia-industry gap to achieve self-reliance in NIPER institutions in India. This chapter is dedicated to understanding the outcomes, gaps and suggestions for academic-industry collaborations, research initiatives, intellectual property rights, entrepreneurial endeavours, and other pertinent factors. By delving into these critical areas, we can gain valuable insights into current affairs and identify potential strategies to enhance collaboration, foster innovation, and drive self-reliance in the NIPER ecosystem.

Through many programs, the Indian government is spending money to decrease the industry-academia gap. The Ministry of Human Resource Development (HRD) and the All India Council for Technical Education (AICTE) support projects to ensure educational institutions are more relevant to the industry. Similarly, the Science Technology Entrepreneurship Programme (STEP) has been run by the Department of Science and Technology (DST). The World Bank and Britain's Overseas Development Agencies have helped Polytechnics and Regional Engineering Colleges, respectively, so that the two fields can work together better.

The government has worked diligently to build an ecosystem for innovation and entrepreneurship in the country. The Department of Pharmaceuticals took the initiative to help NIPER institutions reach and sign MOUs with major pharmaceutical players and institutions in India. NIPER institutions have signed MOUs with various industries in the country's public and private sectors. Department of pharmaceuticals has been actively engaged in building these relationships, and the departmental initiative stands out. The MOU signing has continued, and all the NIPERs in the country have initiated such deals over the years.

Indian industries want to work with academia for their own good since the quality of workers in the industry cannot be improved without working on quality in

academia. In this area, the Confederation of Indian Industries (CII) has taken several steps, such as increasing the number of Ph.D. Fellowships from 100 to 1000 and funding the global innovation alliance. However, these two fields do not work together as much as they could (Forbes, 2013).

To close the gap between academia and industry, NIPER institutions should focus on what businesses need in this sector. Focus on collaborative research projects and research funds paid for by industry and technology development programmes. By having people from the industry serve on research advisory committees, we can make sure that the results of research answer real-world problems in the industry and make it easier for technology to be transferred. By working on these suggestions, NIPER institutions can improve the quality of education, study, and innovation, which will help India reach its goal of being self-sufficient.

In the current scenario, it's clear that businesses, universities, and academic institutions reach out to each other more often than usual because economies are driven by knowledge. With the existing liberalization, globalization, and privatization policies, big multinational companies are directly competing with Indian industries. The Indian higher technical education system needs to be reworked and structured relatively to meet the difficulties. We need a strong science and technology base, and our people must also step up and meet new challenges. It also means that technical education institutes must stress close partnerships with the industry, create resources, and expose faculty to the industry. The facilities at the academic institutes and industries have to be optimally utilized to make progress in the global economy.

The data analysis in the previous chapter provided a detailed understanding of these institutions' academic and research orientations. The data derived from the students, alumni, and faculty has helped us identify the gaps in the way of working these institutions in India. NIPER institutions, which are declared institutions of national importance, have kept the promise of promoting academic excellence and research work, as indicated by the data gathered for this study. However, the pertinent gaps and recommendations are listed below under various headlines.

8.1. Industry Academic Interaction

Data analysis of academic and research facilities strongly focuses on cutting-edge research and innovation. The presence of state-of-the-art facilities and experienced faculty members has enabled the institutions to conduct research in diverse fields, including pharmaceutical sciences, medical devices, drug discovery, and development.

Gaps and suggestion

1. Reflecting on the students' perception of research facilities and the environment, it can be suggested that institutions need to increase the number of research, academia, and innovation programs. Institutions should strive to increase the involvement of students in research projects and advocate the possibility of faculty and students bringing in new projects independently or collaboratively.
2. Research results highlight that most students were not part of research projects and were mostly busy in their academic lives at NIPER institutions. There is a need to increase the awareness and engagement of students beyond academics in these institutions. Industry-academia collaboration is not possible without the proper engagement of students and faculties.
3. The perception of students and alumni has been positive for all the facilities, labs, curriculum and IPR. However, it has been observed that students and faculty face specific challenges in project implementation and management. It is essential to make arrangements where faculty and students can utilise instruments and facilities to conduct their research.
4. The results also highlight the low number of academic and research events. The government provides various funds for organising research events through conferences and workshops. Such opportunities can be used collectively or individually by institutions for the greater good of the institutions. At least a minimum number of events should be part of the yearly plan, and a centralised mechanism for implementing these programs should exist.
5. Research conferences are a great source of networking between researchers, faculty members, and students. Conferences can be mandatory rather than concentrating on knowledge derived from on-going academic activities. Such participation can help them achieve new linkages, networks, and resources for

future endeavours. There is a need to celebrate any projects that institutions receive, ask for support, and invite people to join hands in making things successful.

6. Industry visits give practical exposure to the students. Industry visits should not be limited to the fulfilment of a formal visit. It should fulfil the purpose by informing students of new openings, research areas, collaborations and discussions. Students should feel enthusiastic rather than taking it as a picnic. It should be based on reporting to the concerned faculty group.
7. Student participation is low from the perspective of collaborations outside the institute. Students can be granted numerous funding and short-term scholarships and research opportunities to pursue short-term research during course time or vacations.
8. Research collaboration between faculty and students needs to be increased, and collaboration outside can also help get more funding and research grants.
9. Corporate social responsibility (CSR) driven grants and research fellowships can be used to support student projects, and special provisions for research grants through CSR can be initiated for NIPER institutions in India.

8.2. Intellectual Property Rights and Technology Transfer

The analysis reveals a positive trend in creating and protecting intellectual property within the NIPER institutions. The institutions have actively pursued patent filings for innovative technologies, drug formulations, and processes developed through their research efforts. This emphasis on IPR has strengthened the institutions' ability to commercialize their innovations and transfer technology to industry partners. Recommendations related to IPR and technology transfer are listed below.

Gaps and suggestion

1. Academic learning for IPR has increased in recent years. Learning from such academic arrangements helps students grow their IPR potential and be confident of infringements. More than 65 per cent of the students have studied a course on IPR. The IPR and its various branches are vital for the country's future research and development growth. The percentage can be increased by providing and teaching this course to all the students.

2. The results indicate that many students and alumni are engaged in IPR-related research work and projects. However, 80 per cent of the students and alumni know someone who has been granted a patent recently. This highlights the relevance of the IPR to students and faculty. IPR, in various forms, can be a great source of learning and resource for relevant institutions. There is a need to build and compete with far better countries in this endeavour.
3. The results of our research report indicate that only a small group of students were part of any research project related to intellectual property rights (IPR) among NIPER institutions in India. This finding suggests that there is a significant gap between industry and academia in the field of pharmaceutical innovation and development. Therefore, we recommend that NIPER institutions take proactive measures to promote and facilitate student participation in IPR-related research projects, such as providing incentives, mentorship, training, and networking opportunities.
4. More than 60 per cent of the students know about technology transfer (TT) and technology transfer offices. This kind of knowledge and information proves that students or alumni are well aware and mentally prepared to break into research with industries. Such a thing also needs an academic push, which will help them gain experience through internships and research visits.
5. While most students and alumni are well aware of the IPR and Technology transfer, there is still a massive gap in research projects with industry for students. Only 17 per cent of the students have previously worked or are currently working with industries on specific assignments and projects. Till academic engagement and classroom pressure are not decreased, the situation will change slowly. Research institutions must provide more freedom for pursuing projects, engagements, research visits, and discussions.

8.3. Entrepreneurship and Start-up

The analysis of entrepreneurship activities within the NIPER institutions highlights a growing culture of innovation and business acumen among students and faculty members. The institutions have implemented entrepreneurship development programs, workshops, and mentorship initiatives to nurture entrepreneurial skills and cultivate a spirit of innovation.

Gaps and suggestion

1. The study indicates that most students are well aware of entrepreneurship and have been part of entrepreneurship awareness programs in their respective institutes. Entrepreneurship, start-ups and innovation are the essential aspects of the global future, and nobody can ignore them. It is more vital than getting a well-paid job as it creates more jobs for the society. An entrepreneurial environment and innovative mind-set will help students achieve heights like other institutions in the country.
2. Entrepreneurship has been taught to students in various institutions as a course, as an awareness program, or through varied means. Student attendance and interest are increasing continuously, which is a positive outcome. Entrepreneurship can be developed and helped by setting up incubation centres or getting students registered with nearby incubation centres to seek support for their ideas in development, IPR, prototyping and seeking experience through internships.
3. The number of start-ups is grim or negligible. While students face much pressure from academics and research, there is a possibility for giving relaxation to students in exceptional cases. Students seeking relaxation to develop ideas and research material should be considered based on their performance in those endeavours. IIT Delhi allows students to pursue their start-up ideas in the form of PhD thesis. Many foreign universities provide grants to develop your research work in a business idea or start-up. Entrepreneurship can bring new research opportunities and allow students to work on new ideas.
4. Incubation centres are modern-day laboratories for start-ups. Students engage in discussions, create prototypes and launch businesses in these centres. Only a proper visit to physical spaces can help students derive benefits from the theoretical knowledge received in varied courses and programs. Increasing visits and internships can lead to knowledge creation, experience building and idea generation.
5. Students and faculty members can work together on ideas and prototypes. Such endeavours create IPR and result in revenue generation as well.

Institutions need to allow students and faculty to pursue their ideas more often.

6. Students should be encouraged to take entrepreneurship as a career choice and make elaborate attempts to build their career in this line. Boot camps and awareness camps can be organised for the students and alumni to encourage them to do the same.
7. Most students and alumni have confirmed that they can work on their start-up ideas, and they know start-ups in the pharmaceutical space. Institutions can have a collective pitching for their students' ideas in one institute and help students get funding from various means.

8.4. Placement Support

There is a positive response from students for the placement support provided by the NIPER institutions. Placements and industrial interactions need utmost care as they bring joy to working towards specific goals.

Gaps and suggestion

1. While students are familiar with existing opportunities through placement cells, NIPER institutions can increase outreach and work for more access to pharmaceutical industries and increase placement support and related activities.
2. Institutions can help by increasing student training activities, related workshops, and experiential learning. Institutions should also encourage students to engage with pharmaceutical start-ups to learn about the real struggles that start-ups face.
3. When asked whether students are here for a job only, the results show that students are interested in jobs. However, they are also looking for start-ups, higher education and research options in their respective institutions or outside.
4. Many students are also interested in doing a PhD in their respective fields to contribute to research and innovation. Regarding research, many international organisations and universities help with short-term and long-term research grants to pursue research ideas.

5. International collaboration is also an essential part of this recommendation for NIPER institutions. Research internships in long-term and short-term collaboration can enhance the research environment.

8.5. Observations and Qualitative Section

Researchers discussed with respondent groups to suggest ways to improve academia and industry collaboration in their respective institutions. The students provided with a lot of suggestions and clarifications regarding the same.

Gaps and suggestion

1. Students and alumni confirm that industry experience can be a great source of knowledge for students to emerge as industry professionals and work on the suitable needs of the industry. The new education policy is bringing many changes, which will help institutions build stronger relationships with industries. A long-term internship program and project association will be required for a sustainable research environment in NIPER institutions.
2. Another suggestion is to collaborate more vehemently with industries and create knowledge zones in their respective institutions that disseminate similar industry knowledge for the industries in the pharmaceutical sector. India's pharmaceutical industries are much more conservative in allowing outside researchers, as understood from the discussions with NIPER directors and industry experts. The need is to produce research results highlighting the pharmaceutical industry's needs.
3. In this regard, to bring more academic-industry collaborations, institutions should emphasize more practical research and learn from their institutions for students. Right now, the research being done is more academic than practice-oriented. Institutions need to work on practical research projects that can get funding from government sources, private sources, and CSR initiatives.
4. Institutions need to work on increasing the number of internships with pharmaceutical industries and collaboration in research projects, which can positively change the learning curve of students and alumni. Internships of varied nature can be introduced, such as short-term, long-term, project-based, and others. Such initiatives at the institutional or collective level will bring positive results.

5. The respondent groups have suggested and believe that students should be allowed to take entrepreneurship and start-up as a career choice, and institutions should play a role in bringing all the required facilities.
6. Particular suggestions have been received to create business development centres in NIPER institutions individually or centrally. These centres can boost the linkages between industry and academia and bring practical change in technology transfer and IPR management.
7. Another thing can be to create a centrally funded research park with the best facilities to trial and experiment with newer innovations and devices. Such a platform will help experience and enhance the students and faculty's innovations and entrepreneurial capabilities.
8. A centrally funded research incubator can be promoted to help innovators get international recognition for their innovation and showcase the achievements of the students and faculty in these institutions.
9. Another suggestion has been received, which is to create a central placement or at least a platform that can highlight the various aspects of training and placement support provided through NIPER institutions in India. This platform can help students explore research and job opportunities with Indian and foreign companies. This will amplify competition and growth of institutions in the long term.
10. For alumni product development, Projects and funding, focus on translational research, PhD and their work can be developed into new products, alumni meetings, more faculties, more research, Internship collaboration can help and others.
11. Students and alumni also know about incubation support and working at incubation centres. The majority of the students were aware of incubation and related terms. All this highlights the role incubation centres can play in vitalizing the relevance of start-ups in the country. Suggestions include increasing collaborations, industry visits, faculty and lab space, research, and more projects.
12. It is noticed that whenever the industry-academia gap is discussed, the common practice is to focus on the renovation and improvement of academia. The survey included discussions with NIPER Directors (Kolkata

and Raebareli) and Industry Practitioners. It has been revealed that the industry needs to improve upon the following practices:

- Provide internships and apprenticeships more regularly
- Sponsor research projects and faculty exchanges
- Participate in career fairs and recruitment events effectively
- Establish mentorship programs
- Share industry data and insights with academia to help universities better understand industry trends and prepare students for the challenges they will face in the workplace.
- Support innovation and entrepreneurship.
- Stay informed about academic trends and the latest developments to ensure their partnerships with universities are effective and mutually beneficial.
- Recognize and reward successful collaboration and acknowledge universities and faculty actively engaged in industry-academia collaboration.
- Incorporate foreign technologies into curriculum and research activities to meet the specific needs and challenges of the Indian pharmaceutical industry. By collaborating with foreign experts and institutions, NIPER's can access advanced technologies, expertise, and scientific knowledge that may not be readily available in India.

Chapter 9

Conclusion

The results of this research study illustrate the notable progress achieved in addressing the gap between academia and industry through the NIPER institutions in India. The institutions have created an atmosphere that promotes self-sufficiency in the pharmaceutical sector by fostering academic-industry relationships, emphasising research quality, prioritising intellectual property rights, and supporting entrepreneurship growth.

The analysis demonstrates that the collective endeavours have resulted in the dissemination of knowledge, the transfer of technology, and the generation of inventive resolutions to practical outcomes. The prioritisation of research and innovation has yielded noteworthy advancements in scientific knowledge and the creation of novel pharmaceuticals and therapeutic approaches. The emphasis placed on protecting intellectual property rights has played a crucial role in enabling the transfer of technology and the commercialization of research findings. Simultaneously, a robust entrepreneurship ecosystem has fostered a conducive environment and mindset for entrepreneurial activities.

Amidst NIPER institutions' ongoing developments, a segment comprises students and alumni who express apprehension regarding their involvement in diverse activities and research endeavours within their different academic establishments. The solution to self-reliance is to foster research collaboration, undertake initiatives, and establish solid industry-academia partnerships across different states and NIPER institutions in India. The presence of entrepreneurship and the rise of start-ups will enhance the perceived trustworthiness of these institutions within the pharmaceutical sector. Consequently, governments and businesses will prefer establishing long-term collaborations with these institutions.

In summary, this research study provides insights into the critical task of addressing the gap between academia and industry in NIPER institutions in India, with the ultimate goal of attaining self-sufficiency by conducting a comprehensive examination of diverse aspects such as collaborations between

academia and industry, research endeavours, management of intellectual property rights (IPR), involvement in entrepreneurship, and associated elements, a complex portrayal arises, delineating the obstacles and prospects that lie in the future.

The results from the analysis of collaborations between academia and industry demonstrate both sectors' growing inclination and readiness to participate in joint endeavours. Nevertheless, the study revealed notable challenges in synchronising objectives, communication impediments, and administrative difficulties. The implementation of comprehensive and transparent structures for cooperation, supported by shared comprehension and explicitly outlined anticipations, arises as a crucial advancement.

The research component of this study highlights the significant importance of advanced research in promoting innovation and facilitating self-sufficiency. The NIPER institutes serve as reservoirs of specialised knowledge, and their research outcomes possess the capacity to stimulate progress in various domains. However, there is a pressing need for increased multidisciplinary research to tackle practical difficulties and meet the demands of many industries. Enhancing research ties with industry stakeholders and prioritising projects that align with industry needs have the potential to greatly amplify the effect of NIPER's research initiatives.

Within the domain of intellectual property rights (IPR), the examination highlights the significance of implementing a solid and efficient strategy for managing IPR. Understanding the complex terrain of patenting, licencing, and technology transfer is crucial to transforming NIPER's inventions into tangible economic benefits. Implementing well-defined policies, comprehensive training programmes, and sufficient allocation of resources can provide researchers with the necessary tools and support to safeguard and capitalise on their intellectual property rights effectively.

The concept of entrepreneurship has emerged as a powerful means of fostering self-reliance. This report sheds light on the progress in cultivating an entrepreneurial mentality across NIPER institutions. Nevertheless, it is crucial to establish a more comprehensive ecosystem that includes mentorship, support for incubation, funding methods, and industrial alliances to facilitate the transition

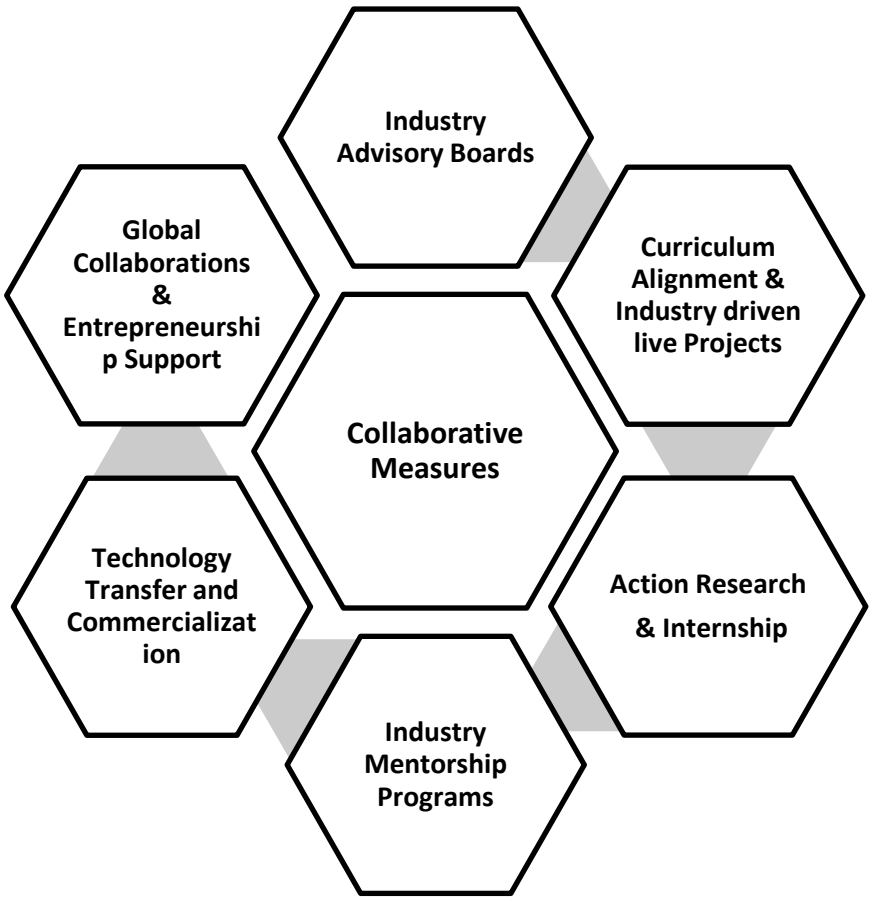
from innovative ideas to commercially viable solutions. Promoting the adoption of entrepreneurial endeavours among students and faculty has the potential to substantially contribute to fostering self-reliance.

The elements above encompass the fundamental components of the research; nonetheless, it is imperative to recognise that attaining self-sufficiency in NIPER institutions requires a comprehensive and interconnected methodology. The dynamic relationship between academics and industry is complex, requiring both careful strategic planning and a cultural transformation that fosters open communication, shared objectives, and mutual esteem. In addition, implementing policy advocacy, active interaction with stakeholders, and ongoing assessment are crucial factors in guiding the trajectory towards self-reliance.

In an ever-changing global environment, achieving self-reliance in the contacts between academics and industry is a strategic necessity and a transforming process that necessitates persistence, flexibility, and shared dedication. This study provides a thorough basis for future endeavours, highlighting the mutually beneficial connection between academics and business and its influential role in driving NIPER institutions towards self-reliance. The NIPER institutions, known for their innovative practices, have contributed valuable insights through this study. These insights provide guidance and illuminate the way towards a future characterised by self-reliance.

This research highlights the importance of a collaborative and innovative partnership between academics and industry to achieve self-reliance at NIPER institutions. It emphasises the need for a shared vision of a self-reliant India as a driving force behind this convergence.

A framework of significant aspects important for industry-academia collaboration for NIPER Institutions, as evident from the survey, is given below:



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ANNEXURE I

Questionnaire for Students

- Name
- Email
- Mobile Number
- Study years and
- Gender (Male / Female)
- Institute of study
- Course studied *(Name ……)*

a. How satisfied are you with the quality of research education provided by NIPER?
Very satisfied ***Satisfied*** ***Not Satisfied*** ***Dissatisfied***

b. How satisfied are you with the curriculum and course content at NIPER? Is it aligned with industry?
Very satisfied ***Satisfied*** ***Not Satisfied*** ***Dissatisfied***

c. How would you rate the facilities provided by NIPER, such as classrooms, labs, libraries, and computer facilities?
Very satisfied ***Satisfied*** ***Not Satisfied*** ***Dissatisfied***

d. How satisfied are you with the research opportunities and resources available at NIPER?
Very satisfied ***Satisfied*** ***Not Satisfied*** ***Dissatisfied***

e. How satisfied are you with the industry collaborations and placement opportunities provided by NIPER?
Very satisfied ***Satisfied*** ***Not Satisfied*** ***Dissatisfied***

1. During your stay and study at NIPER did you get a chance to do anything asked below?

1.1. <u>Industry academia interaction</u>

a) Have you worked in an Industry project (*Yes/No*
b) If yes (Number ….. and Name……..……
c) Did you participate in any Academia-industry event in NIPER (yes/ No)
If Yes, Name please
d) Have you ever presented a paper in any conference or such event (Yes/ No)
e) Have you collaborated with any faculty at NIPER for research projects (Yes/ No)

f) Do you collaborate for research projects outside NIPER as a student's (Yes/ No)

g) Have you got a chance to visit any Pharmaceutical company during your stay at NIPER (Yes/ No)

h) Has your Institute held any conference during your stay at NIPER (Yes/ No)
Number of conference and Name

i) Have you received any training for pharmaceutical collaborations or job training (Yes / No)

1.2. Intellectual Property Rights

a) Are you taught any courses on IPR (yes /No)

b) Do you have any patents granted on your name or in collaboration
Number and innovation type……..

c) Do you own any kind of IPR:
Trademark, copyright, patent, and design rights (Tick right one)

d) Do you know anyone who has been granted a patent in your institute (Yes/ No)

1.3. Entrepreneurship

a. Have you studied entrepreneurship during your course period? *(Yes /No)*

b. Have you attended any entrepreneurship awareness program recently (Yes/ No)

c. Have you visited any incubation centre (Yes/ No)

d. Do you know any pharmaceutical based start-up in India (yes /No)

1.4. Start-up

a. Are you allowed to work on start-up ideas (Yes/ No)

b. Do you know what incubation centres do (Yes /No)

c. Have you been a part of a start-up idea recently or before (Yes / No)

d. Do you know any faculty who is working with a start-up or has his own (Yes/ No)

1.5. Technology transfer

a. Do you have a technology transfer (TT) office at NIPER (Yes/ No)

b. Do you know the role of technology transfer office (yes/ no)

c. Do you collaborate with any pharmaceutical industry in any project (yes/ no)

1.6. Placement

a. Do you have a placement cell in this institute (Yes/ No)

b. Do you receive any technical/ soft skill training sessions here (Yes/ No)

c. Did you join here for job only (Yes/ No)

d. What else than job was in your mind while starting here (Yes/ No)

Details

1.7. Discussion

a. How do you think industry-academia collaborations can be improved at NIPER?

Answer in few points:

b. Have you received any funding for your research projects? If yes, please describe the funding source(s) and how it has helped in your research work.
Name of the project and amount

c. Do you believe that NIPER students should be encouraged to take up entrepreneurial ventures/ Start-up in the pharmaceutical industry? Why or why not?
Answer:

d. How can we make NIPER institutions self-reliant and self sufficient

ANNEXURE II

Questionnaire for Alumni

- Name and Email
- Age
- Study years in NIPER (…….)
- Working with *(Pharma company, Research lab, Start-up, Hospital)*
- Course studied *(Name……)*
- Working (Yes/ No)
- Gender (Male / Female)

f. How satisfied were you with the quality of research education provided by NIPER?
Very satisfied Satisfied Neutral Dissatisfied Very Dissatisfied

g. How satisfied were you with the curriculum and course content at NIPER? Is it aligned with industry?
Very satisfied Satisfied Neutral Dissatisfied Very Dissatisfied

h. How would you rate the facilities provided by NIPER, such as classrooms, labs, libraries, and computer facilities?
Very satisfied Satisfied Neutral Dissatisfied Very Dissatisfied

i. How satisfied were you with the research opportunities and resources available at NIPER?
Very satisfied Satisfied Neutral Dissatisfied Very Dissatisfied

j. How satisfied were you with the industry collaborations and placement opportunities provided by NIPER?
Very satisfied Satisfied Neutral Dissatisfied Very Dissatisfied

2. During your stay and study at NIPER did you get a chance to do anything asked below?

2.1. <u>Industry academia interaction</u>

j) Have you worked in an Industry academia project (*Yes/ No)*

k) If yes (Number ….. and Name……..……

l) Did you participate in any Academia-industry event in NIPER (yes/ No)
If Yes, Name please

m) Have you ever presented a paper in any conference or such event (Yes/ No)

n) Have you collaborated with any faculty at NIPER for research projects (Yes/ No)

o) Did you collaborate for research projects outside NIPER as a student's (Yes/ No)

p) Did you participate in any Pharma fair outside organisation (Yes/ No)

q) Have you got a chance to visit any Pharma company during your stay at NIPER (Yes/ No)

r) Has your Institute held any conference/ workshop during your stay at NIPER (Yes/ No)

Number of conference and Name

s) Have you received any training for Pharma collaborations or job training (yes / No)

2.2. Intellectual Property Rights

e) Did you study any courses on IPR and training for IPR (yes /No)

f) Do you have any patents granted on your name (Yes/ No)

Number and innovation type……..

g) Do you own any kind of IPR:

Trademark, copyright, patent, and design rights (Tick right one)

h) Do you know anyone who has been granted a patent in your institute (Yes/ No)

2.3. Entrepreneurship

e. Have you studied entrepreneurship during your course period? *(Yes /No)*

f. Have you attended any entrepreneurship awareness program recently (Yes/ No)

g. Have you visited any incubation centre (Yes/ No)

h. Do you know any pharmaceutical based start-up in India (yes /No)

2.4. Start-up

a. Are you allowed to work on start-up ideas (Yes/ no)

b. Do you know what incubation centre do (Yes /No)

c. Have you been a part of a start-up company recently or before (Yes / No)

d. Do you know any faculty who is working with a start-up or has his own (Yes/ No)

2.5. Technology transfer

d. Does you Institute have a technology transfer office (Yes/ No) , Officer (yes / No)

e. Do you know the role of technology transfer (TT) office (yes/ no)

f. Did you have any collaboration with pharmaceutical industries (yes/ no)

g. Have you ever worked with any technology transfer officer or office (yes/ no)

2.6. Patents

a. Do you have any patents granted on your name (Yes /No)

b. Do you have any patents granted on your name with other researchers (Yes /N0)

c. Have you ever filled for patents any time before (Yes/ No)

d. Do you know anyone who has been granted a patent in your institute (Yes/ No)

2.7. Placement

a. Did you have a placement cell while you were a student (Yes/ No)

b. Did you receive any technical/ soft skill training sessions here (Yes/ No)

c. Did you receive placement support for getting a job (Yes/ No)

d. Did you have a placement cell in this institute when you were a student (Yes/ No)

2.8. Discussion

e. How do you think industry-academia collaborations can be improved at NIPER?
Points:

f. Do you believe that NIPER students should be encouraged to take up entrepreneurial ventures/ Start-up in the pharmaceutical industry? Why or why not?
Answer:

g. How can we make NIPER institutions self-reliant and self sufficient

ANNEXURE III

Questionnaire for Faculty

a) Name and Number

b) Age

c) Gender

d) Years of work experience with NIPER

e) Do you have industrial projects under you (Yes/ No) How many (……)

f) Number of research papers published in SCOPUS indexed journals

During your work time at NIPER did you get a chance to do anything asked below?

1) Industry Academia Projects

a) Are you handling any research project (Pharma) for the Institute (Yes/ No)

b) What is the total cost of projects you are handling

c) 10-20 Lakh, 20-50 Lakh, 50 lakh to 200 Lakh, More than 200 Lakh

d) Are you part of any international academic collaborations (Yes / No)

e) How satisfied are you with the industry collaborations and partnerships established by NIPER?

f) Very satisfied Satisfied Neutral Not Satisfied Dissatisfied

g) How would you rate the facilities provided by NIPER, such as classrooms, labs, libraries, and computer facilities?

h) Very satisfied Satisfied Neutral Not Satisfied Dissatisfied

2) Intellectual Property rights

a) Are you aware of IPR infringements and laws related to that (Yes/ No)

b) Have you ever collaborated with any Researcher for patents and research (Yes/ No)

3) Patents

a) Do you have any patents granted on your name

Number and innovation type……...

b) Do you own any of IPR:

Trademark, copyright, patent, and design rights

4) Entrepreneurship

a) Have you attended any entrepreneurship awareness program recently (Yes/ No)
b) Have you visited any incubation centre (Yes/ No)
c) Are you allowed to work on new idea individually or with students (Yes/ No)
d) Do you know any pharmaceutical based start-up in India (yes /No)

5) Start-up

a) Are you engaged or do you know any faculty who is working with a start-up (Yes/ No)
b) Have you been a part of a start-up company recently or before (Yes / No)
c) Do you encourage students in pursuing start-up Ideas (Yes/ No)

6) Technology transfer

a) Do you know what technology transfer means and how it is conducted (Yes/ No)
b) Have you ever developed any new technology for Pharma industry (Yes / No)
c) Have you ever worked on medical devices (Yes /No)

Discussion

1. In your opinion, what gaps exist between the academic training at NIPER and the requirements of the pharmaceutical industry?

2. How can NIPER foster a culture of industry engagement among its faculty and students?

3. Do you believe that NIPER students should be encouraged to take up entrepreneurial ventures/ Start-up in the pharmaceutical industry? Why or why not?

4. Can you describe any innovative initiatives or practices that your institution has implemented to improve the quality of education and research?

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