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ER&D
Playbook
2023

INDUSTRY ACADEMIA COLLABORATION

Enabling Successful Innovation & Preparing Industry Ready Talent

2022

Acknowledgements

This Playbook is an upshot of the quarterly immersive sessions conducted by nasscom on Industry Academia Collaboration. nasscom ER&D council is grateful to our esteemed panelists

- **Sumeet Verma -** Director, Strategy – Research and Growth Initiatives, Intel India
- **Padmini Ramesh -** External Collaborations Mission Leader, GE
- **Prof. Manu Santhanam -** Dean of sponsored research and industrial consultancy, IIT Madras
- **Prof. Arkaprava Basu -** Associate Professor, IISc Bangalore
- **Prasad Shetye -** Executive Vice President, ER&D, Capgemini
- **Pawankumar Fakatkar -** Subject Matter Expert - Model-Based Design, KPIT
- **Dr. Anandhi Jayadharmarajan -** Dean – Academics, New Horizon College of Engineering, Bengaluru
- **Dr. Nilkanth B Chopade -** Deputy Director, Pimpri Chinchwad College of Engineering, Pune
- **Vijay Mantri -** Head of Innovation, L&T Technology Services (LTTS)
- **Dr. Ashwin Sadasiva Kumar -** Senior Vice President, Capability Transformation and Operations, Virtusa
- **Santhiya R, Engineer -** CTO Team, LTTS
- **Anuranjan M B, Associate Engineer -** Technology, part of the TMT - West Innovations and Solutions Team, Virtusa

who actively participated and shared their insights with us. Their expertise, disruptive thought process, and point of views will help to establish successful Industry Academia Collaboration. We would also like to thank **Vandhna Babu, Principal Analyst, nasscom** for moderating the discussion.

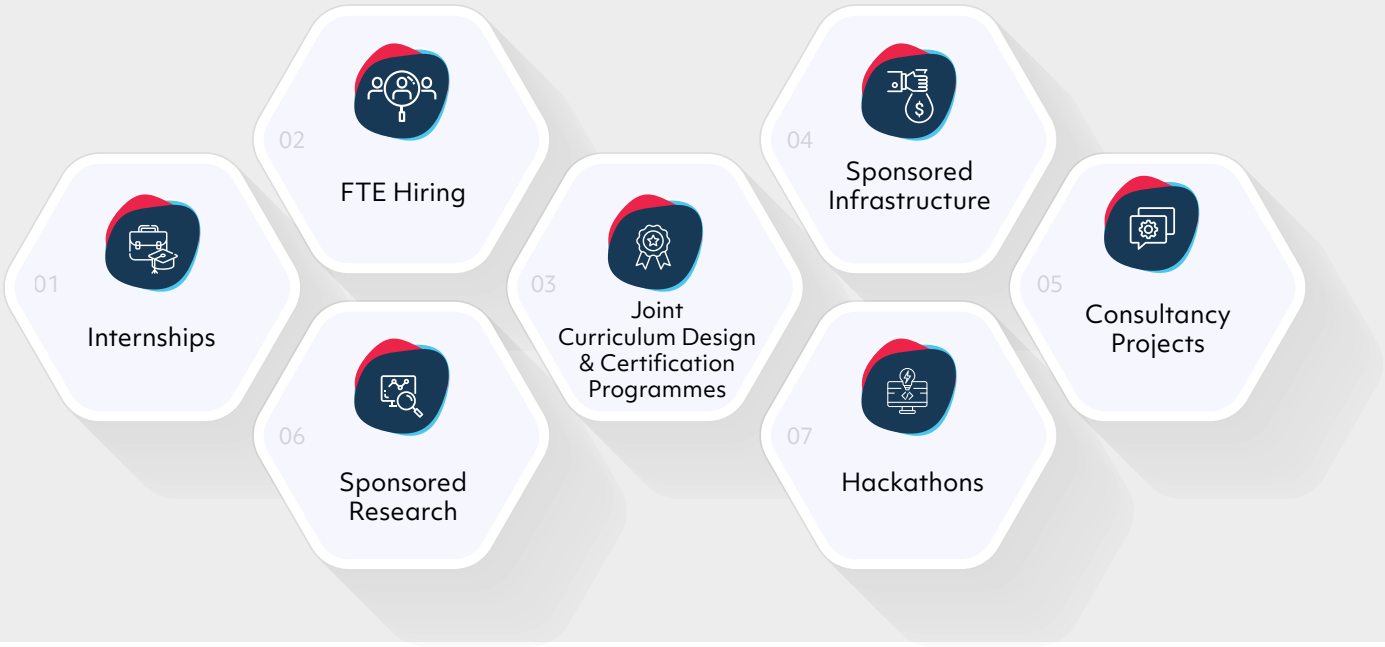
THE CONTENT

Executive Summary

A strong Industry-academia collaboration will help the ER&D players to tackle the changing realities efficiently. Globally Industry-academia partnerships have been instrumental in advancing research and creating a skilled workforce, thereby promoting technological innovation and growth. Industry benefits from these collaborations by gaining work-ready talent with specialised knowledge and practical training, while universities benefit by having opportunities to work on relevant technologies and issues.

There are multiple aspects of the Industry Academia Collaboration. Both Industry and Academia have the need for such collaboration for their growth, but the current state of the Industry Academia Collaboration in India has lots of challenges which need to be addressed.

There are different approaches through which Industry and Academia can collaborate, like:



Initiatives are required from both Industry and Academia to tackle the challenges and the role of government is also crucial to foster collaboration. Many initiatives are taken by the Indian government to provide the necessary impetus to developing the ecosystem for Industry Academia Collaboration.

Indian ER&D Players can refer this playbook to:

- Understand the various nuances of Industry Academia Collaboration.
- Know how it's becoming more vital to engage with the Academia to drive the fast pace of innovation.
- Explore the best practices and various successful models of engaging with the universities.
- Know about various initiatives taken by ER&D Stakeholders to enable effective and successful Industry Academia Collaboration.

01 Introduction

Today's era is marked by the rise of technology giants, deep tech start-ups, and innovative disruptors. The endless possibilities of digitization and technology adoption have ushered in a paradigm shift in the industry dynamics and competitive landscape. Enterprises are undergoing a distinct transformation as a result of confluence of forces such as rapid technological change, evolving customer expectations, shorter product life cycles, disruptive business models, and increased competition from new age startups.

Global enterprises are increasingly adopting tech-enabled business models to stay relevant and continue their growth trajectory. Global market dynamics are fast-evolving, where companies are compelled to develop new strategies to compete.

The talent profile and persona are also changing, and there is a rising demand for cross-skilled and diverse engineering and digital talent. Organisations are rapidly embracing consortium and co-opetition approaches to address the industry challenges, innovate, generate new revenue streams and stay relevant to their customers. As a result, this dynamic era necessitates a rapid rate of innovation.

A strong Industry-academia collaboration will help the ER&D players to tackle the changing realities efficiently. Globally Industry-academia partnerships have been instrumental in advancing research and creating a skilled workforce, thereby promoting technological innovation and growth. Industry benefits from these collaborations by gaining work-ready talent with specialised knowledge and practical training, while universities benefit by having opportunities to work on relevant and emerging technologies and industry challenges.

02 Need of Effective Industry Academia Collaboration in India

The existing gap between the skills among engineering graduates and the industry requirements is huge, which impacts their employability. Collaboration between Industry and Academia facilitates the wholesome skill development by imparting both technical and soft skills to the future workforce to improve their employability and reduce the talent gap.

At the same time, globally Industry-academia partnerships have been instrumental in advancing research and creating a skilled workforce, thereby promoting technological innovation and growth. India climbed from 81st in 2015 to 40th in 2022 on the Global Innovation Index[1] as published by World Intellectual Property Organization (WIPO). India can realise its full potential to become an innovation hub through fostering the ecosystem for Industry-academia Collaboration.

2.1 Need for the Industry

[1] https://www.globalinnovationindex.org/gii-2022-report

Access to domain expertise and University IPs:

Collaboration with academia can provide access to expertise and knowledge base around the emerging technologies that may not be available in-house, along with the already developed technologies, products and processes.

Utilise research infrastructure:

Universities have developed sophisticated research infrastructure for conducting R&D, such as specialised equipments, test and research facilities, which can be availed by industry.

Tap into university talent:

Opportunity to train the future workforce according to the industry demands and to engage them in solving the current and future industry challenges.

Optimization in internal R&D costs:

Access to the academic expertise and research talent can significantly optimize the internal R&D expenditures and processes.

Upskilling the current workforce:

In addition to training the future workforce, the current workforce working in the industry can be made more productive by upskilling them with the latest technical developments.

Improved problem-solving:

Collaborating with academia can bring new perspectives and approaches to problem-solving, leading to more innovative and effective solutions.

Improved public perception:

Collaborating with academia can help improve the public perception of an industry, by demonstrating a commitment to advancing knowledge and contributing to the common good. Also, it helps them to be at the forefront of their industry by having a competitive edge.

Improved knowledge transfer:

Collaborating with academia can help to facilitate the transfer of knowledge between the two sectors, enabling new ideas and technologies to be more easily adopted and commercialised.

2.2 Need for Academia

Access to better R&D funding:

Universities are under pressure due to limited funding, which restricts their efforts in doing high quality research work. Industry-academia collaboration can help accelerate research and development (R&D) by providing funding and resources that may not be available internally.

Commercialising research efforts:

The technical breakthroughs achieved through extensive research can be commercialised and quick progression can be made from the Research stage to the Deployment stage.

Better industry exposure to students and faculty:

Student exposure to the industry is improved through collaborative engagements, preparing them for the workforce. The collaborative approach results in professors and students who teaming up with industry partners on real world problems which can also be taken as degree projects.

Technical skill development:

Exposure to industry problems broadens and deepens the perspectives of both professors and students, thereby enhancing their technical capabilities. Students gain practical experience, which shortens the learning curve for industry practices and increases their employability.

Soft Skill Development:

Apart from technical skills and hands-on experience, industry is also looking for talent with "soft skills" such as curiosity, ability to ask questions, ability to challenge the status quo, effective communication (assertiveness), intuitiveness and creativity. Collaborative work helps students develop these soft skills to complement their technical prowess.

> "Our customers expect us to move away from 'do-as-directed' kind of attitude and the engineers need to be playing lead roles over a period of time."

Prasad Shetye
Executive VP, ER&D,
Capgemini

Create entrepreneurial culture:

Both students and professors build entrepreneurial traits and ambition through interaction with industry professionals.

Enhanced role in influencing the country's economic growth:

Playing a decisive role in influencing the country's economic growth by directly engaging with the industry to resolve the industry problems in effective ways, lead to more innovation and higher employment.

03 Current state of Industry Academia Collaboration in India

India has traditionally lagged behind countries such as U.S, Germany, Singapore and Japan when it comes to building strong partnerships between universities and the industries which is evident from its rankings in the Global Innovation Index in comparison to the countries like US, Singapore, with the current ranking for India in University/Industry Collaboration being 42[2]. Although, industry and academia have collaborated on a variety of fronts over the years, but it has been in a very limited extent:

- **Limited to Tier-1 academic institutes:**
  Research collaborations have been limited to the tier-1 institutes of the country, like the IITs & IIITs with marginal focus on the tier-2 colleges.
- **Lack of centralised approach:**
  Research collaborations have been mostly led by individual professors and not necessarily institutionalised as a formal practice by the universities. Also the universities lack the unified approach towards research conducted across disciplines, and traditionally takes a department focussed approach.
- **R&D done by the public sector:**
  In the Indian context, R&D, and particularly collaborative R&D, has been largely viewed as a domain controlled by public sector enterprises (PSEs), with a dearth of private players. It's typically PSEs, who provide use cases and problem statements to academia for solution, or academia takes their ideas and solutions to PSEs for industrialization.
- **Dependence on the government funding:**
  Academia is still highly dependent on the government for the research grants, and funds for establishing state-of-the-art R&D facilities. Thereby reducing the incentives to collaborate with industry.

Dearth of industry-academia collaboration in India can be attributed to the numerous obstacles faced by both sectors.

3.1 Existing Challenges

Despite the positive momentum and the existence of industry-academia collaboration over the years (though in a scarce capacity), multiple challenges prevent successful industry-university collaboration from reaching its full potential in India:

3.1.1 For Academia

- **Inadequate marketing of its strengths to industry:**
  In majority of academic institutions, because of lack of time and interest, academicians have been unable to effectively market their work to the industry. As a result, the industry remains mostly unaware about the niche facilities and research problems being worked upon in universities.
- **Lack of awareness of the real industry needs:**
  Except for the tier-1 and a few tier-2 universities, academics are not aligned with the industry's current needs due to their emphasis on teaching and fundamental research as well as their isolation from industry circles.

[2] *https://www.globalinnovationindex.org/gii-2022-report*

- **Industry's expectations of rapid results:**
  Contrary to the industry's expectation of quick results, research is a time-consuming process accompanied by uncertainty about its positive outcomes. Such pressure makes the academicians reluctant to join hands with the industry.
- **Limited funding:**
  Research and training programmes necessitates substantial financial investments in both R&D facilities and human resources whereas industry comes with a limited budget to obtain quick results.
- **Restrictive internal policies and procedures:**
  Inflexibility when dealing with collaborative projects and additional levels of rigid policies and processes hinder innovation and discourage academicians from working with the industry.
- **Lack of appropriate incentives:**
  Absence of appropriate incentives and recognition for faculty engaged in industry projects as compared to pure academicians.
- **Lack of specialised technical infrastructure:**
  Universities lack the specialised R&D facilities that are aligned to the fast evolving industry needs.
- **IP Policies:**
  Different perspectives exist between industry and academia regarding IP ownership.

3.1.2 For Industry

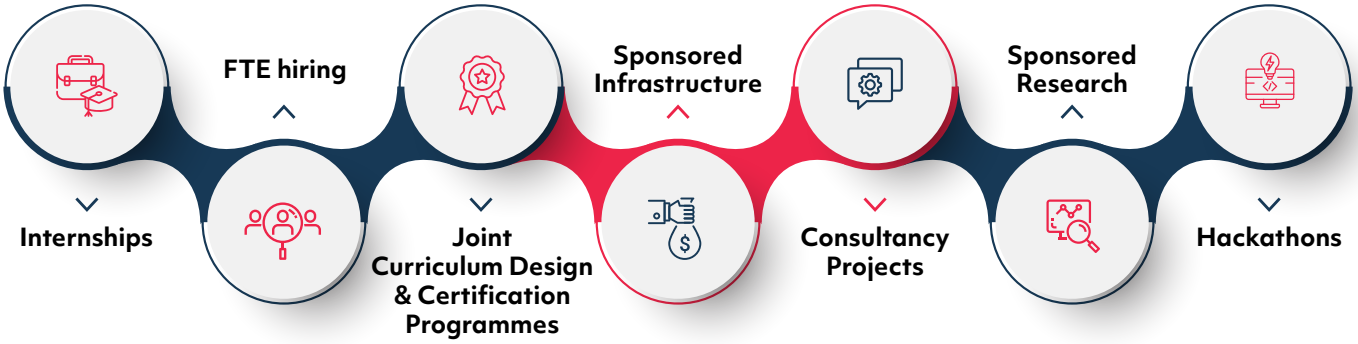
- **Unawareness of the academic community's resource potential:**
  Different perspectives exist between industry and academia regarding IP ownership.
- **Bureaucratic Processes and Paperwork:**
  Any joint work with academia involves lots of complicated paperwork and bureaucratic processes which are highly time-consuming, making the collaboration less appealing.
- **Lack of long-term perspective:**
  Investment is guided by efforts that yield quick result-oriented solutions. Industry adheres to the philosophy of lower investment and higher returns, missing the opportunity to view knowledge as a sustainable competitive resource that can generate enormous returns in the long run.
- **Limited Funding and uncertainity of outcomes:**
  Difficulty in moving money from the parent company to the local country, in case of Global MNCs. The costing frames are typically directed by reluctance to invest in its internal R&D which has either long term or unclear output. Global MNCs seek tangible R&D outcomes, which are frequently unclear in terms of Industry-Academia Collaboration.
- **Confidentiality concerns:**
  Concerns about the disclosure of crucial data and confidential information regarding failure or success, as well as the dread of losing one's competitive edge.
- **IP policies:**
  The absence of a legal framework for intellectual property (IP) sharing is one of the major concerns in the Indian ecosystem. In the case of collaborative research, the problem becomes more complex. Industry wants to make investments under the condition that it owns 100 percent ownership of the patents for the developed technologies/products and to have the competitive edge in the market.

- **Absence of exclusive University Industry Interaction Cells:**
  Dedicated cells to handle the entire work related to the collaboration with industry are missing. Coordination needs to be done with multiple entities, making it more difficult for both the academicians and the industry.
- **Unavailability/Shortage of relevant Faculty & Research Scholars:**
  Limited domain experts, overburdened faculty and students make it difficult for the industry to get solutions to their problems through collaborative approach.

04 Different approaches of Industry

Academia Collaboration

Different forms of collaboration can be implemented to enhance the partnership between the industry and academia:



4.1 Internships

Student internships in India have seen an increase as industry and academia collaboration becomes more prevalent. Companies and educational institutions have come together to offer students hands-on experience in their field of study, providing a bridge between theoretical knowledge and practical application. Internships benefit both parties, as students gain real-world experience and companies receive a pool of talented, fresh graduates to hire from.

AICTE-CISCO Virtual Internship 2022

It is an initiative by the All India Council for Technical Education (AICTE) for 2nd year B.E./B.Tech. students. This virtual internship program will provide 20,000 virtual internships in cybersecurity through the Cisco Networking Academy program. This unique collaboration between industry and the government will help build a pool of skilled talent significant for future jobs relevant in the industry. The selected interns will receive INR 10,000 on successful completion of the internship and a certificate depending on the quality of work.

Texas Instruments Internships

Texas Instruments (TI) offers internships to students and recent graduates, across the globe to give them opportunity to work on challenging projects and have hands-on experience. The internships are available in various areas, such as electronics, software engineering, finance, etc. The duration of the intership is typically 10-12 weeks and it offers competitive compensation and benfits to its interns, as well as opportunities for career advancement within the company.

4.2 FTE hiring

FTE (Full-Time Equivalent) hiring is a popular practice of hiring employees on a full-time basis, typically with benefits and long-term job security to bring in new talent and grow the workforce. FTE hiring often results from successful internships or other forms of short-term employment, where companies have had the opportunity to assess the abilities and potential of a student or recent graduate. FTE hiring helps to establish a long-term, mutually beneficial relationship between the company and the employee, and is seen as a positive outcome of effective industry-academia collaboration. Multiple benefits accrue to the industry when FTEs are recruited through strategic university partnerships:

- Consistent and Reliable Staffing
- Long-term cost savings by reducing the expenses of onboarding and training
- Strengthen employer branding with the university

4.3 Joint Curriculum Design & Certification Programmes

Technical education in India contributes significantly to the overall education system and is critical to the nation's social and economic development. However, India's technical education system has not kept pace with the rapid advancements happening in the industry. Because of dearth of industry exposure, and opportunities to participate in real-world projects, recent engineering graduates lack the necessary skills to be industry ready.

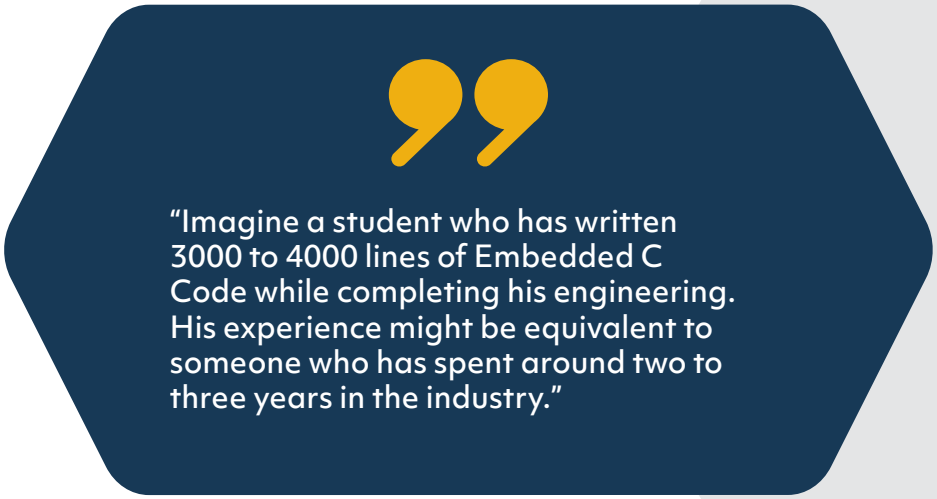
Universities require innovative ideas to keep pace with changes in Industry to better equip the students to stay ahead in the years to come. To bridge the existing gap, industry and academia can collaborate to jointly design curriculum and certification programmes that are industry oriented and will assist students in honing their skills and becoming industry ready.

4.3.1 Teaching and training of the future workforce

The students can be trained and made more employable by reimagining the curriculum and making it more industry-relevant.

Best practices to drive curriculum design:

- **Redesigning the Curriculum:**
  Academic institutions should redesign their curriculum and create new programmes in response to the industry's needs and demands.
- **Continuous Updates:**
  The curriculum should be updated continuously based on the current and upcoming technologies and processes in the industry.
- **Regular Review of Curriculum by Industry Experts:**
  Industry experts should be included in the Board of Studies to ensure that regular review of the curriculum to remove the obsolete topics and update subjects according to the current trends.



"Imagine a student who has written 3000 to 4000 lines of Embedded C Code while completing his engineering. His experience might be equivalent to someone who has spent around two to three years in the industry."

Pawankumar Fakatkar
Subject Matter Expert - Model-Based Design, **KPIT**

Examples of Joint Curriculum Design by Industry and Academia:

Bosch, Matlab and NIT Calicut

In 2017, Bosch Global Software Technologies Private Limited (BGSW) entered into a tripartite collaboration with NIT Calicut and MathWorks to create a new final-year undergraduate course on Electric Vehicle System Engineering – a course that covers EV fundamentals (such as regenerative braking, inverter topologies, and pulse-width modulation techniques), energy storage systems, electric drivetrain systems, and modelling and simulation of EV systems. Initially signed for three years, the collaboration was extended for an additional five years in 2021. Designed for a class size of 15 students initially, the course attracted 44-50 students in the first year of its roll-out and went on to attract more than 100 students in its second year. The top students get an internship opportunity with BGSW while many students have job offers from leading automotive players such as Bajaj Auto and Ampere EV9.

Cyient and SR University

Cyient collaborated with SR University, Warangal to help SR University in developing an industry-oriented curriculum, focused on Advanced Manufacturing Systems. This will greatly help reduce the skill gap between the need and availability of resources trained in areas such as design for additive manufacturing. The course focuses on subjects, such as smart materials, intelligent manufacturing systems, flexible manufacturing system, quality and precision engineering, advanced materials technology, etc. The program emphasizes on enhancing knowledge of cutting edge technologies such as laser material processing, intelligent robotics, micro-engineering, nanotechnology, non-conventional machining, etc.

GlobalLogic and GLA University

GlobalLogic has an MoU with GLA University (Mathura) to build educational and training programs for engineering graduates, in the areas of emerging technologies, such as AI, IoT, machine learning, and cloud computing. As part of this MoU, GlobalLogic is helping to build an academic syllabus and course material for the university. GlobalLogic also helps in developing prototypes, live projects, research projects and is instrumental in briefing the faculty and designing the course structure during the academic year. The students of the college are encouraged to participate in various hackathons organised by GlobalLogic.

4.3.2 Training and upskilling of the current workforce

This revamping should not only focus on training the next generation of workers, but also on enhancing the current workforce in the industry. Increasing numbers of professionals are becoming interested in acquiring new skills. Efforts must be made to improve their capabilities by providing them with courses they can pursue while remaining an active member of the workforce.

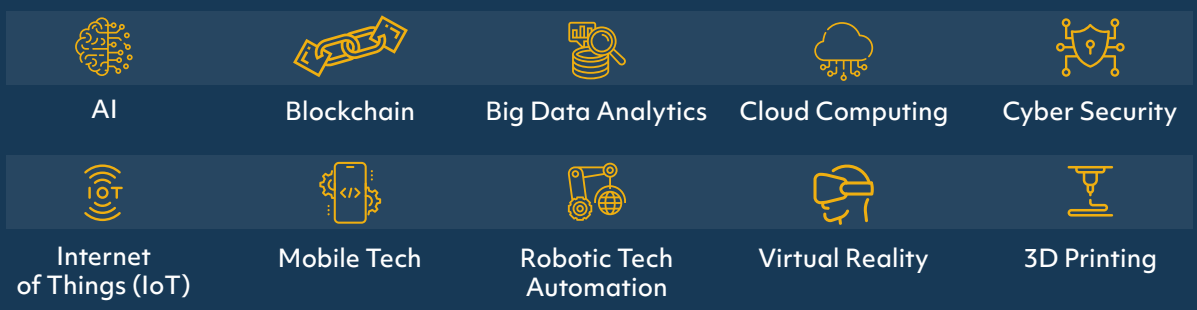
A range of programmes, from short term workshops, certification programmes to joint Postgraduate programmes must be designed and developed.

BITS Pilani

BITS Pilani provides a seven-semester Work Integrated Learning Programme designed for Process Engineering professionals engaged in day-to-day activities. This programme aims to increase knowledge and provide a more comprehensive understanding of all the essential aspects of Process Engineering. The programme is intended for professionals working in process-based industries, including Oil & Gas, Energy, Metals & Mining, Chemicals, Fertilizers, and Pharma.

FutureSkills by nasscom

- Nasscom FutureSkills programme was launched to reskill 2 million professionals and students over a period of 5 years.
- It focuses on 155+ skills spanning across 70+ job roles on the following emerging technologies:



- In FutureSkills portal, learners can access free and paid content, virtual labs, and earn certification on the chosen skills.

4.4 Sponsored Infrastructure

Facilities sponsored by the Industry

Companies provide funding or resources to educational institutions for research, development, or other projects. Sponsored infrastructure can take many forms, such as funding for laboratory equipment, research facilities, or even whole research centres. This type of collaboration benefits both parties, as it provides companies with access to cutting-edge research and development, and academic institutions receive the support and resources needed to advance their field of study.

Erricson and IIT Delhi

Ericsson established Centre of Excellence and Innovation for 5G technology for the country at Indian Institute of Technology, Delhi. The CoE aims to fast-track 5G deployments in the country by bringing together telecom ecosystems, academia, industry and start-ups to develop new 5G-based apps and business models that could potentially lead to better agricultural yields, better healthcare, smarter cities, more efficient manufacturing and enhanced lifestyles.

It has led to multiple success stories, such as:

- Development of several protoypes and solutions for 5G networks, such as a real-time 5G-enabled hologram technology which can be used in education and healthcare sectors.
- Developmet of several IoT-based solutions, such as and intellgient traffic management system which uses IoT sensors to detect and traffic in real-time.

Samsung and IIT Delhi

Samsung India has established an IoT research lab in IIT, Delhi to carry out research on sensor data processing, network architecture and embedded intelligence to build a smarter communication landscape for end users. The lab equipments have been provided by Samsung. The lab is carrying out research on areas, such as sensor data processing, network architecture and embedded intelligence. The current focus of the lab is mainly on three domains:

- Research at IIT Delhi
- Collaborative research with Samsung
- Lab exercises for IoT course/training offered by Samsung

The scope of work will be widened in the future. Many students including doctoral students are currently working in the IoT lab.

Leveraging university infrastructure for industry R&D

The existing research infrastructure of the universities is leveraged by the industry for their requirements. For example, National Wind Tunnel Facility (NWTF) at IIT Kanpur is extensively used by the industry clients, such as Boeing, Tata, for their testing needs for prototypes like aircraft wings, chimneys, building models etc.

4.5 Consultancy Projects

Through consultancy projects, academic institutions offer research services to businesses. In this type of industry-academia collaboration, academic researchers and institutions leverage their expertise to provide answers to specific business questions or provide solutions to industry challenges. Consulting research projects may include market research, technology evaluation, scientific investigation, etc.

IIT Kharagpur Development of an automated system for monitoring crop growth

Indian Institute of Technology (IIT) Kharagpur worked on a consultancy project to develop an automated system that can monitor the growth of crops in real-time, providing farmers with information to improve their crop yields.

The system developed by the team consists of a network of sensors and cameras that are placed in the fields to measure various parameters such as soil moisture, temperature, humidity, and to take images at regular intervals, providing real-time data. The data is then analyzed using machine learning algorithms to provide insights into the growth and health of the crops. Farmers can access this information through a mobile app or a web interface, allowing them to make informed decisions about fertilization, irrigation, and other crop management practices.

This automated system is helping farmers to have improved crop yields, reduced costs and follow sustainable farming practices.

4.6 Sponsored Research

- **Fundamental Research:**

Primarily, academia focuses on basic research and the development of core principles. Fundamental research refers to basic or pure research which aims to advance scientific knowledge and understanding without immediate practical applications. The industry partner provides funding and access to real-world problems, while the academic partner contributes expertise and resources for the research. The ultimate goal of the collaboration is to drive innovation and economic growth through the translation of basic research into practical applications and commercial products.

- **Applied Research:**

Applied research refers to research that takes basic scientific knowledge and uses it to develop specific, practical applications and solutions to real-world problems. It is focused on practical applications and commercialization, and is often carried out in partnership between universities and industry organisations. The industry partner provides funding, access to relevant problems and potential commercialization opportunities, while the academic partner contributes expertise and resources. Industry is not only the source of support but also the promoter and performer of applied R&D. The goal is to drive innovation by translating research into tangible products and services for the marketplace.

"Industry Sponsored Research is a long-term, multi-year commitment. 2-3 years is a good sweet spot to begin, anything less becomes difficult for academia and anymore is overcommitting from industry perspective. It's better to start with 2-3 years and then extend based on progress."

Sumeet Verma
Director, Strategy – Research and Growth Initiatives, **Intel India**

Ashoka University in collaboration with Mphasis

Ashoka University has collaborated with IT solutions provider Mphasis to set up a laboratory for machine learning and computational thinking, with a potential for large societal impact. The laboratory also works to translate research activity into educational modules focusing on the construction of entire systems that allow students to understand and experientially recreate the project. This approach to education is aimed at creating a more engaging and widely accessible mode of learning.

Samsung Innovation Campus program

Samsung R&D Institute Bengaluru (SRI-B) has established the Samsung Innovation Campus program at the Cambridge Institute of Technology (CIT) in Bengaluru to train young people in technology areas such as AI, IoT, big data, and coding and programming. As part of the program, the students and faculty at CIT will get the opportunity to work on projects related to ML, AI, Big data etc. Additionally, SRI-B will also train the faculty at CIT. It has also set-up a data lab, Samsung SEED lab, which is equipped with servers, data acquisition devices, quality analysis tools, among others. It also has a backend infrastructure to store, process and archive large volumes of data. In the subsequent phases, the in-house capabilities of the lab will be expanded to cater for technologies such as 3D and AR/VR.

4.7 Hackathons

Hackathons have become an extremely popular component of competitive education, industrial recruiting, or generating ideas for start-ups, where a large number of students and researchers can engage in rapid and collaborative engineering for a brief period of time. It is a very successful instrument for ideation, as it brings together various stakeholders such as organisations, universities, researchers, developers, students, investors and so on.

The university-industry collaborative approach of the hackathon provides several benefits for its stakeholders ranging from developing creative and innovative solutions to the enterprise's problems, to promoting the reputation and recognition of the university's programs, and finally enhancing the teaching and learning experience for the college students and professors. Hackathons have become a common approach for industries to find solutions for business problems or investigate new technology areas.

Below are the benefits derived from the hackathons:

For Industry

- Introduction of fresh perspectives from students and academia to solving industry challenges as they move from ideation to industrialization.
- Recruit talented, ready-to-perform professionals.
- Saving the time and resources to train the newly-recruited talent.
- Promoting reputation and recognition of the organisations.

For Academia (Students)

- Enable students to have an appreciation for interdisciplinary engineering, system approach for solving engineering challenges, collaborative way of working.
- The entire process enables thinking out-of-the-box, stimulating critical thinking, while also helping students to sharpen their presentation and communication skills in their efforts of bringing ideas to life.
- Understanding the pros and cons of proposed solutions and enhancing the ideas further through continuous mentoring and feedback.

TECHgium by L&T Technology Services

TECHgium is a multi-stage, open innovation competition platform that engages students to come out with solutions on real life industry specific use cases and challenges.

Steps

- Call for various industry challenges
- Concept submission
- Technical Presentation
- POC Development & Demonstration
- Final Presentation
- Winner announcement

Impact

- 30,000 students registered in the last concluded edition
- 50-75 problem statements solved

Benefits for Participants

- POC round students get an opportunity to participate in LTTS recruitment process
- Takeaway awards worth Rs 18 lakhs to top 3 winners
- Certificates for teams presenting in stage-2 Technical Presentation
- Engage with industry leaders and subject-matter experts to receive regular feedback
- Opportunity to involve faculty to mentor through the process

Jatayu by Virtusa

Jatayu is an innovation challenge for the students of Virtusa CoE Campus Institutes, through a controlled and integrated environment, with Virtusa providing mentorship to students on domain and next-gen technologies.

Steps

- Registered teams get use cases to choose from
- Submission of solutions to the College Faculty for shortlisting
- Selected solutions shared with Virtusa
- Evaluation of POC in 2 stages
- Industrialization of Project

Impact

- 17000+ registrations
- 6 solutions selected for industrializations out of total 11 problem statements
- 100+ offers given

Benefits for Participants

- Work on the latest, new-age technologies
- Access to mentors at Virtusa
- Patenting opportunities for the selected solution
- Long-term internship at Virtusa
- Full-time employment opportunity
- Cash prizes and multiple awards

TechHack by PeopleTech Group

TechHack,the first edition of flagship hackathon of PeopleTech Group, aims to stimulate and nurture the creative thinking and problem-solving abilities of its participants. Through this platform, participants will have the opportunity to work on real-life business problems from the following key focus area:

- **Mobility** (Safety, Security, Comfort & convenience, and Efficiency)
- **Enterprise Digital Transformation** (HR, Finance, Supply Chain, and Sales & Marketing)
- **AgriTech** (Precision Agriculture, Livestock Management, Food Processing, and Packaging)

Steps

- Idea/use-cases submission
- Shortlisting of applications
- Technical presentation
- PoC Demonstration
- Winner announcement

Impact

- 5000 registrations done

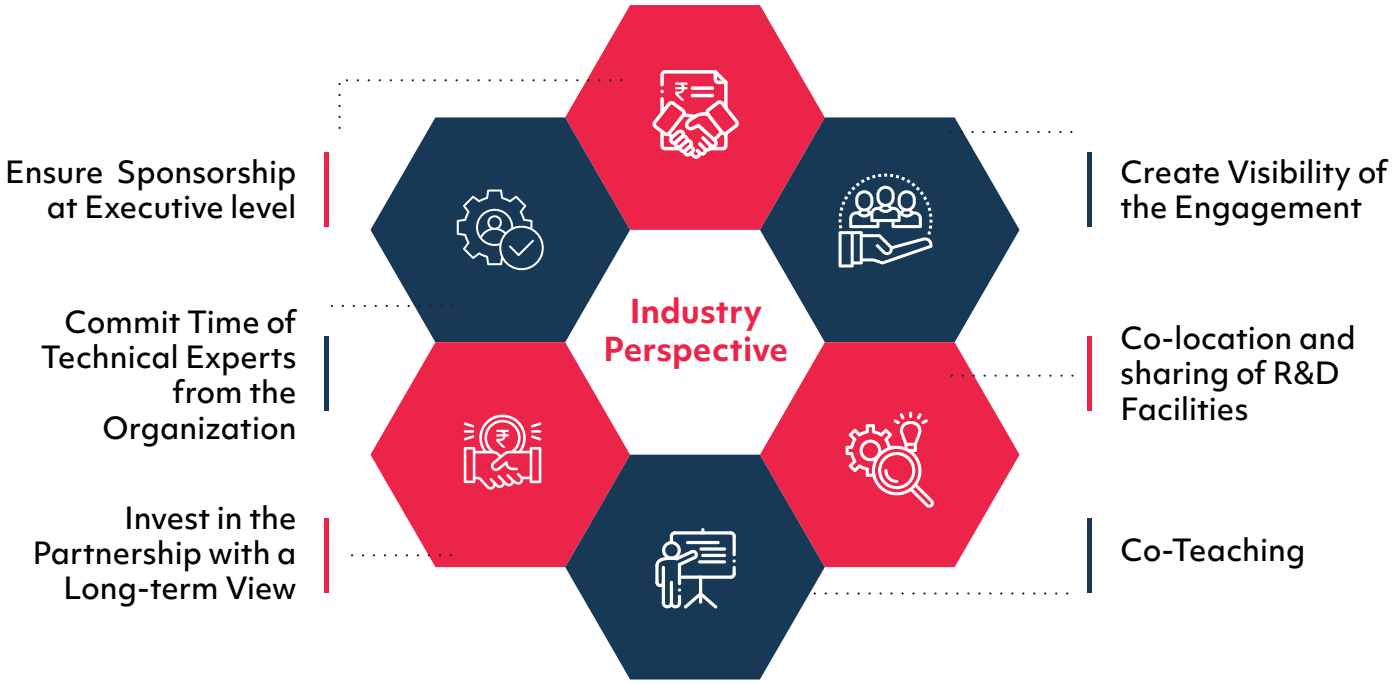
Benefits for Participants

- Overseas employment
- Mentoring by industry experts and leaders
- Retaining IP ownership of the idea
- Cash prizes
- Internship at PeopleTech
- Getting incubation & accelerator support

05 Building a Successful Industry Academia Collaboration

To develop a successful industry-academia collaboration, the challenges must be addressed and new strategies should be employed to initiate and strengthen the partnership from both the industry and academia perspectives, along with bringing the overall policy reforms in the IP framework:

5.1 Industry Perspective



Ensure Sponsorship at Executive Level:

Assigning an executive sponsor to the collaboration who can act as a champion for the partnership and help secure the resources and support needed to achieve the collaboration's goals.

Commit Time of Technical Experts from the Organization

Identify and engage key stakeholders, department heads, domain experts, and other decision-makers, to ensure that their technical support and involvement in the collaboration is secured.

Invest in the Partnership With a Long-Term View

Define the goals and objectives of the collaboration, for both industry and academic partners, keeping the long-term vision in mind. Clearly communicate the benefits of the collaboration to executives and other stakeholders, highlighting the expected outcomes and the impact that the collaboration will have on the organisation's growth.

Create Visibility of the Engagement:

All the key stakeholders and the department heads must be made aware of the engagements being conducted with the academia to seek more inputs, ideas, and create more avenues for expanding the collaboration.

Co-location and sharing of R&D facilities:

Co-locating and sharing of the R&D facilities, between the universities and industries, must be promoted.

Co-Teaching:

Encouragement of training programmes, across multiple technical domains, for industry professionals by the academic community, and for academic scholars by the industry experts (following the train the trainer approach.

Industry-Academia Engineering Excellence Connect Program by Capgemini

"We have tried to bring in our customers into this entire model, by actually getting them into the colleges where we have signed the MoUs to help them meet the faculties and interact with the students. It gives them a phenomenal confidence that there is an ecosystem in place in terms of building up the talent in the emerging skills in India. Customers were overwhelmed with the kind of talent that is available and the way in which we are nurturing that talent to cater to the requirements of the customer."

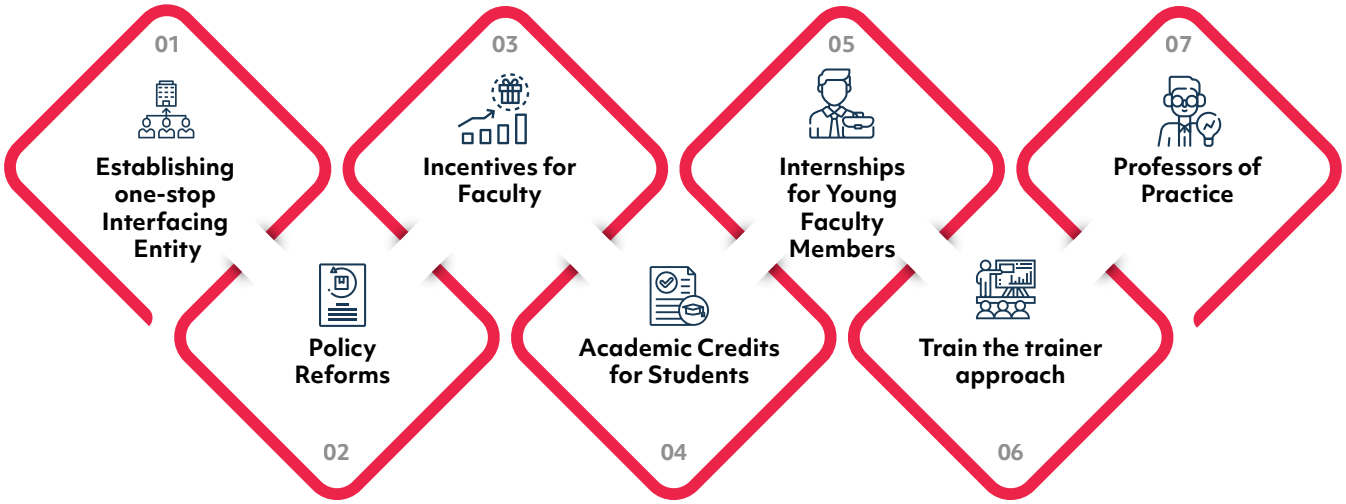
Prasad Shetye
Executive VP, ER&D, **Capgemini**

Engagement models of Intel

Various ways in which Intel India has engaged with Academia:

- **High Impact Research:**
  Intel collaborates with academia to conduct R&D with strategic impact vision. For example: Intel has collaborated with IIIT Bengaluru to set a research center for data sciences and AI to develop new alogrithms and techniques for analyzing large-scale data and building intelligent systems.
- **Knowledge & Innovation Exchange:**
  Industry experts from Intel India go to colleges to give talks, lectures etc. and vice versa to enable a communication platform for knowledge exchange.
- **Collaborative Classroom/Co-Teaching:**
  Intel representatives teach in academia, predominantly focusing on research challenges and growing research talent.
- **Executive Connect:**
  Intel brings institutes on the global road map to enhance recognition. For example, Intel has collaborated with BITS Pilani to establish a CoE for Internet of Things (IoT) with the focus of developing new technologies and solutions for IoT ecosystem, enhancing its recognition.

5.2 University Perspective



Establishing a one-stop Interfacing Entity:

Establishing a dedicated facilitating agency within the University premises to look after all the interactions with the industry, instead of multiple agencies handling similar work. It also significantly reduces the pressure and workload on the faculty members, who can now delegate the administrative, project planning and financial tasks to a single-entity.

Policy Reforms:

Reforming policies of academic institutions to reduce bureaucratic procedures to facilitate more faculties engaging in the industry oriented R&D.

Incentives for Faculty:

Incentives and rewards should be provided for the Professors to engage in joint research projects with industry, as done in IIT Madras.

Academic Credits for students:

Provision for awarding academic credit for participation in industry-related projects through hackathons, semester-long part-time internships, etc must be implemented to encourage students.

Internship for Young Faculty Members:

Sabbatical immersion in the industry to allow a very relevant exposure to industry practices, as part of Faculty Development Programme, encouraging faculty members to work in industry for 6 months to 2 years time frame.

Train the Trainer approach:

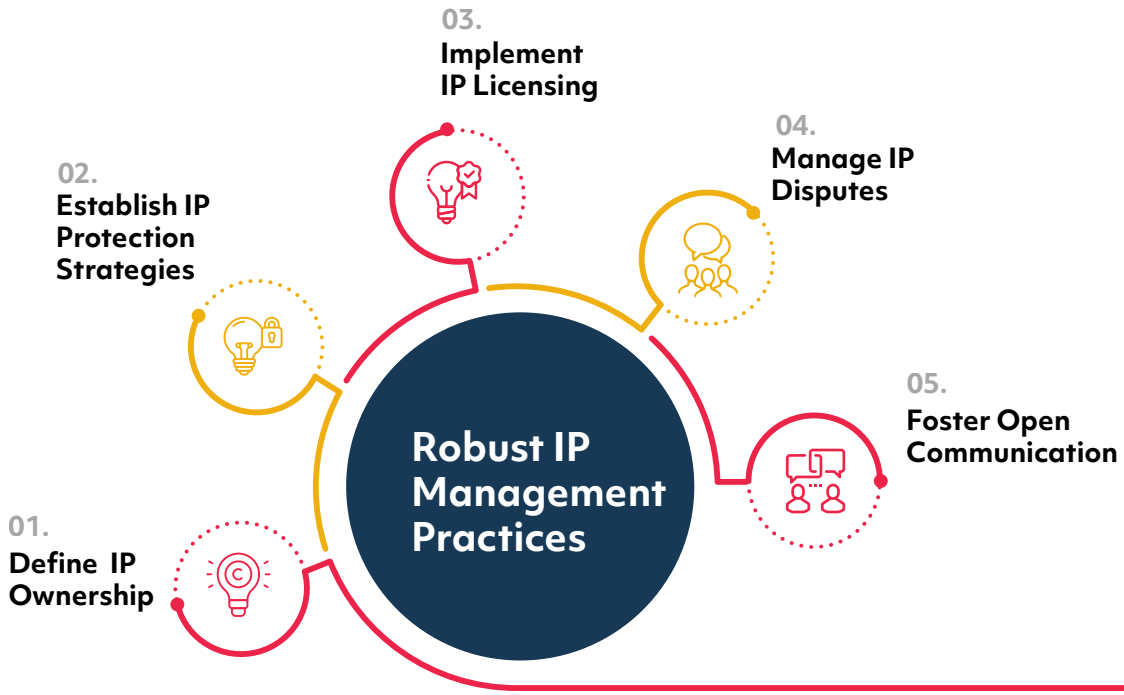
Training programmes offered by industry professionals to keep faculty up to date on the latest technologies and skills.

Professors of Practice:

Encouraging industry experienced practitioners to join as faculty, similar to what is prevalent in Germany, where professionals with extensive practical experience in a specific field and a strong record of professional achievement are invited to teach courses or give lectures. The title of Professor of Practice is intended to recognize the individual's expertise and contributions to their field, and to provide students with valuable insights and perspectives from a real-world practitioner of the subject matter.

5.3 Robust IP Management Practices

A robust IP management framework is a must to make significant growth in the industry academia collaborations. To create well-defined IP (Intellectual Property) management practices, the following steps can be taken:



Define IP ownership:

Establish clear agreements on who owns the IP generated through the collaboration, including patents, trademarks, copyrights, and trade secrets.

Establish IP protection strategies:

Decide on the best methods for protecting the IP generated through the collaboration, such as such as evaluation of potential risks (example: infringement by competitors or unauthorized use by employees), developing an IP protection plan (through patents, confidentiality agreements, and employee training programs), regular monitoring of the IP asset and enforcing the IP rights in case of infringement.

Implement IP licensing:

Develop and implement licensing agreements that outline the terms and conditions for using the IP generated through the collaboration, such as licensing fees, royalties, and restrictions on use.

Manage IP disputes:

Have a plan in place for resolving any disputes that may arise over the ownership, use, or commercialization of the IP generated through the collaboration.

Foster open communication:

Encourage open communication and transparency between the industry and academic partners to ensure that both parties understand their respective roles and obligations regarding IP management.

By implementing these practices, industry-academia collaborations can effectively manage their IP and ensure that the knowledge generated through their partnership is used to drive innovation and economic growth.

IP Policy Framework of MIT

The Massachusetts Institute of Technology (MIT) has implemented a clear and transparent IP policy framework for industry-academia collaboration, that seeks to balance the interests of both parties while promoting innovation. The policy framework has the following key features:

- **Ownership:**
  Outlining the ownership of IP generated through collaborative research by allowing joint ownership of IP, with MIT retaining a royalty-free licence for educational and research purposes.
- **Commercialization:**
  Enabling the commercialization of IP generated and encouraging the formation of startups to commercialise the IP, as MIT and industry partners are free to negotiate licencing agreements for the commercialization of the IP.
- **Confidentiality:**
  Having provisions for the protection of confidential information shared between MIT and industry partners by requiring both parties to sign a confidentiality agreement prior to the sharing of confidential information.

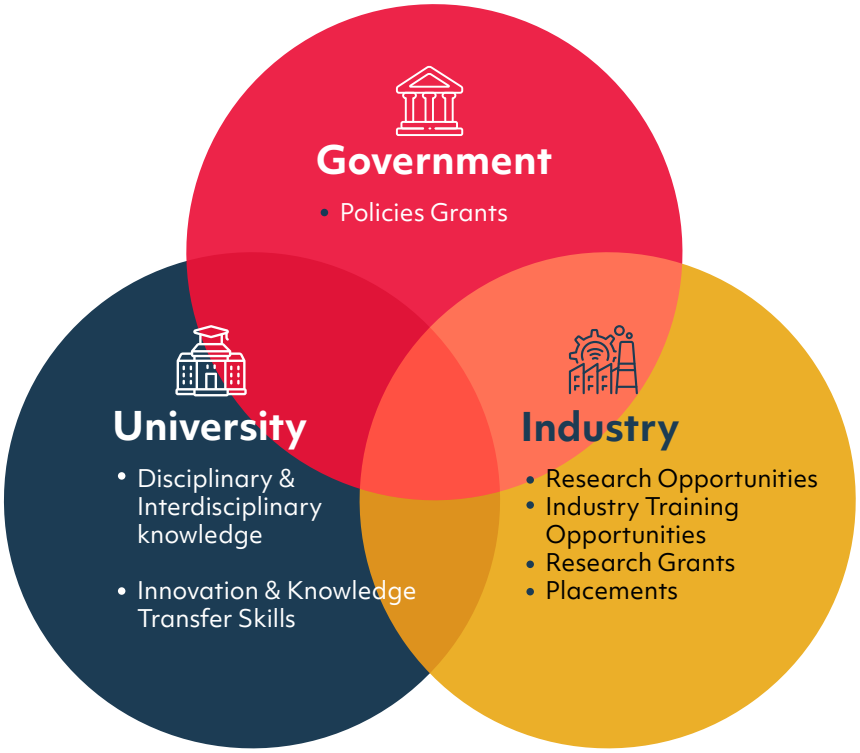
- **Dispute Resolution:**
  Including a dispute resolution mechanism for resolving any disputes that may arise between MIT and industry partners regarding the ownership and commercialization of IP and encouraging the amicable resolution of disputes through negotiation and mediation.
- **Transparency:**
  Promoting transparency in the collaborative research process by ensuring that all agreements and contracts between MIT and industry partners are publicly available, subject to confidentiality clauses.

06 Role of the Government

Contribution of government is very crucial in overcoming barriers and ensuring successful outcomes to promote and facilitate industry-academia collaboration. Through funding support, regulatory frameworks, knowledge transfer mechanisms (like patent licensing, incubator programs, etc.), and economic development initiatives (to provide more avenues for collaborative work), government can play a vital role in bringing together industry and academia to achieve common goals. It can be better understood by examining the Triple Helix model of innovation.

Triple Helix model of Innovation

The model refers to the relationship between academia, industry, and government that drive economic and social progress, as defined by notions such as the knowledge economy and the knowledge society. Each sector is represented by a circle (helix) in the innovation helical framework theory, with overlapping circles indicating interactions. Theorised by Henry Etzkowitz and Loet Leydesdorff in the 1990s, this framework conceptualised the relationship between these three entities and explained the formation of new hybrid entities, such as technology transfer offices and scientific parks, as a result of interactions between the three sectors. The triple helix innovation framework has been widely embraced and has contributed to the transformation of each industry as applied by policy makers.



Government plays a vital role in providing the necessary impetus to the other two elements of the triple helix model of innovation in order for them to successfully collaborate.

Below are some examples of globally successful industry-academia collaborations where the government provided the initial push and support:

Fraunhofer Society, Germany

- It is the largest application-oriented research organisation of Europe, with
  - **76 institutes and research units** located across the globe
  - More than **30,000 employees** (predominantly scientists and engineers)
  - More than **3000 corporations as clients**
- The society focuses on scaling up cutting-edge technology into real working technology on an industrial timetable, leading to the development of advanced systems and processes.
- Fraunhofer institutes are **co-located with major universities** and work closely with industries, while University Professors and Doctoral/Master's' degree candidates provide additional expertise and knowledge.
- **Funding:**

  They generate the funds from both the public sector (30%) and contract research earnings (70%) i.e. money earned by providing research as a service to clients.
- **Example of Latest Projects:**

  Dynamic energy management using batteries and photovoltaics-

  Fraunhofer researchers have developed a solution that combines renewable energy with electricity from the public grid and uses batteries to compensate for fluctuations. It benefits businesses that want to invest in sustainability with photovoltaics and reduce their energy costs simultaneously. It also allows for more efficient management of charging stations for electric vehicles. In addition, they constructed a living laboratory that simulates real-world conditions so that industry customers can test components and system solutions.

Magnet Program by Israel Innovation Authority

- It involves pre-competitive research and development within a consortium of multiple companies and academic researchers. The emphasis is on developing new generic technologies that can further lead to development of advanced products.
- **Funding:**

  On the basis of the approved R&D costs, grants are provided to the industrial and academic partners.
- Under this initiative, a number of **consortiums specialising** in specific areas of technology were formed in response to the national needs. For example: Nano-functional Material (NFM) Consortium, Pharmacological Consortium, etc.

Initiatives taken by the Indian Government

The Indian government has taken multiple initiatives in this direction, which can be utilised by the ER&D stakeholders to augment their efforts in establishing effective Industry-Academia Collaboration.

In the recent years, the Indian government has already taken the following steps:

01. Establishment of interfacing bodies in the nation's leading academic institutions like

- **Technology Transfer Cells:**
  Technology transfer cells are academic or commercial entities that facilitate intellectual property rights management and technology transfer by bridging the gap between research and practice. They provide support for collaboration and mediate relationships between different innovation stakeholders - academia and industry.
- **Incubation Centres:**
  Incubation Centres provide transitory and facilitative assistance to the start-ups to help new age entrepreneurs and young minds to transform their innovative ideas into viable business propositions.
- **Research Parks:**
  Research Parks are entities with specialized R&D infrastructure and office spaces to facilitate collaboration between the industry and the academia by encouraging sharing of ideas, expertise, and resources among various stakeholders. Research parks are located inside the universities and invite the industry to set-up their R&D center on its premises.

IIT Madras Research Park

The first academic Research Park of India was established in 2010 to promote technological innovation and entrepreneurship through collaborative R&D work between academia and industry.

- The land was provided by the state government, while the initial corpus came from a variety of sources.
- It was founded **as an independent section 8 company** promoted by IIT Madras.
- It began operations by inviting PSUs and private companies to set up their R&D centres on its premises,
- An **incubator** is established within its premises to provide a wholesome approach to the innovation ecosystem.

02. **Manthan Portal:**

A platform launched by the Office of the Principal Scientific Adviser to Govt. of India to drive R&D collaboration between industry and research institutes in pursuit of SDG goals and other national missions which aims to act as a meeting ground for multiple stakeholders in the innovation ecosystem. The Manthan platform aims to:

- Scale up interactions among stakeholders and facilitate innovation
- Share challenges in various emerging technologies and scientific interventions through information exchange sessions, exhibitions, and events by empowering the Demand Side users to share their problem statements.
- Encourage Supply Side users to submit proposals in response to the opportunities created by the Demand Side users.

The/Nudge Prize-Ashirvad Water Challenge

It was launched in Feb 2022 to tackle the issue of 'lack of access to clean drinking water' by supporting the solutions given by innovators and startups with a prize budget of INR 2.5 Crores. Contestants were supported by eminent experts from industry and academia, along with support from multiple investor partners, knowledge partners, incubator & accelerator partners. 7 water-tech startups were selected from a pool of 25 teams. The 7 shortlisted startups are further competing to present their disruptive solutions to impact water ecosystem.

03. Centre of Excellence (CoEs) & Common Engineering Facility Centres (CEFCs):

Multiple CoEs & CEFCs are being established in the country in both academic institutes and the industrial clusters to emerge as the oasis of collaborative problem-solving.

CEFC Project: Center for Industry 4.0 (C4i4) Lab, Pune

It was established by the Department of Heavy Industries, Government of India as part of a national initiative named SAMARTH (Smart Automated Manufacturing and Rapid Transformation Hub) Udyog to address challenges faced by the industry in adapting to Industry 4.0. C4i4 Lab prepares use cases of Industry 4.0 and demonstrates the benefits to the companies, providing access to technology and resources to support Industry 4.0 pilot projects in companies.

- C4i4 partners with leading organizations such as Dassault Systemes and Kirloskar Group, to utilize their resources, equipment, and expertise to demonstrate technologies in the experience centers.
- C4i4 developed a 16-week hands on program for mid and senior level managers to train them, which starts with basic Industry 4.0 awareness and ends with successful implementation of pilot projects by the participants.
- It has also initiated the "Academia Facilitation Programme" to develop network and cooperation between industry and academia to train graduate students for Industry 4.0.

SERB-FIRE (Science & Engineering Research Board-Fund for Industrial Research Engagement)

SERB, a statutory body under the Department of Science and Technology, Government of India, was established to promote basic research in science & engineering, and to provide financial support to scientists, academic institutions, R&D Laboratories, and other agencies for doing the relevant research.

The Program 'SERB-FIRE', led by SERB under the Industry Relevant R&D (IRRD) scheme, with the support of industry members, aims to support ideas that address well-defined problems of industrial relevance in project mode. It tackles challenges in the research and innovation space in India by creating an ecosystem that will accelerate the growth of research work with national impact and utilize the expertise of academia.

- Through the SERB Industry-Academia Programs, the government and industry partners **create a pool of funding, resources, and a network** to support innovative research projects with breakthrough impact.
- The program has been launched with a **co-funding mechanism** between SERB and industry, with equal share.
- SERB signed partnership agreement with **GE India, Applied Materials, and Intel India,** to begin with.

Research institutions, academic institutions, and R&D Laboratories were invited to submit proposals for the focus areas and problem statements specified by the industry partners, for Breakthrough Applied Research, which aims to have a transformative impact on the research priority of the particular industry sponsor.

SERB-FIRE in partnership with GE India

- Funding support by SERB and GE India shall be on equal basis of 1:1 ratio for projects jointly executed by academic partners and GE India under the program.
- R&D proposals were solicited from scientists in specified themes falling under the following research areas:

1. Healthcare Technologies (5 Themes)

1. A scalable image quality transfer approach for differential diagnosis of dementia using MR oximetry at low field strengths
2. Meta-learning framework for Imaging applications
3. Patient-specific Precision Surgical Aids
4. Oncology Digital Model for Home Infusion
5. Smart Patient Summaries for Oncology

2. Aviation Technologies (3 Themes)

1. Development of miniatured auto-focus high resolution camera for Inspection which can map the Airfoil defects.
2. Understand and Model MTR Evolution in Titanium-64.
3. Developing Robust containment system for high-speed rotating components in aircraft systems.

3. Renewable Technologies (2 Themes)

1. Development of a modelling framework with appropriate meso and micro scale models for accurate wind resource estimation.
2. Matrix performance improvement in composite structure using Carbon Nano Tubes.

"We are focusing on utilization of various opportunities like SERB-FIRE, where the industry defines the problem area and takes lead in terms of identification of the right academic institutions where at least the problem definition and the outcome definition is clearer up front for both academia and industry. We spend a lot of time in terms of paperwork, trying to lay down very clear terms and roles & responsibilities, IP sharing agreement, cost sharing agreement. We have tried to set up a focused team to take care of these aspects while technical teams focus on research content."

Padmini Ramesh
External Collaborations Mission Leader, **GE**

07 Way Forward

The evident need for strong collaboration between industry and academia coupled with the existing and innovative models to foster such engagements gives the motivation to act for all the ER&D stakeholders involved in the Indian ecosystem.

Key Recommendations:

Below are some of the recommendations to enable effective and successful industry academia collaborations in India:

- **Establishing University Industry Collaboration (UIC) Council:**

UIC Council, composed of representatives from all the ER&D stakeholders, can play a strategic role in identifying key areas and driving initiatives to foster an ecosystem for such collaboration.

- **Public-Private Partnership model:**

The government should encourage the establishment of centres under PPP model where industry, with or without the aid of the government, can establish research centres, common engineering facility centres, and training centres inside academic campuses in order to maximise the intellectual and technical capacity of both academic and industrial world.

- **Unification of multiple initiatives:**

In the wake of the critical need for the industry-academia collaborations, multiple initiatives have been launched by all the 3 stakeholders of the triple helix model of innovation. To maximise their impact and make them play complementary roles, a unified approach must be applied in bringing together all the platforms and models, encouraging them to effectively interact with one another.

- **Tax Benefits:**

Tax exemptions and other incentives for the industry expenditures on collaborative R&D with academia must be given to boost the investments made by the ER&D player in the joint collaboration.

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About nasscom

Nasscom is the industry association for the technology sector in India. A not-for-profit organization funded by the industry, its objective is to build a growth-led and sustainable technology and business service sector in the country with over 3,000 members. nasscom Insights is the in-house research and analytics arm of nasscom generating insights and driving thought leadership for today's business leaders and entrepreneurs to strengthen India's position as a hub for digital technologies and innovation. nasscom is focused on the development of the technology sector through policy advocacy and setting up the strategic direction to dominate new frontiers.

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