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Cultivating Entrepreneurship and Startup Culture: A Case Study of Thiagarajar College of Engineering

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***Abstract*--- In an era where innovation and entrepreneurship play a pivotal role in driving economic growth and societal progress, educational institutions are increasingly recognizing the importance of fostering an entrepreneurial mindset among their students. This case study focuses on the exemplary efforts of Thiagarajar College of Engineering in Madurai to cultivate entrepreneurship and nurture a thriving startup culture within its campus. The study begins by delving into the college's strategic approach to curriculum development. It examines how Thiagarajar College of Engineering has integrated entrepreneurship-related courses and modules across various disciplines, equipping students with the knowledge and skills required to ideate, validate, and execute innovative business concepts. By analyzing the college's curriculum adaptation, this study sheds light on the methods employed to seamlessly integrate entrepreneurship education with technical learning. The role of industry collaborations in enriching the entrepreneurial ecosystem is another key aspect under scrutiny. The case study examines how the college has fostered partnerships with various startup companies. Furthermore, the case study explores the array of support systems established by the college to encourage students' entrepreneurial journeys. This includes the provision of mentorship from experienced entrepreneurs, access to seed funding and incubation facilities, and guidance on intellectual property protection. By investigating these support mechanisms, the study elucidates how Thiagarajar College of Engineering (TCE) empowers its students to transform their ideas into viable startups.**

***Keywords*— Entrepreneurship, Incubation, Seed funding.**

***JEET Category*— Practice**

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I. INTRODUCTION

TCE, established in 1957, is an autonomous institution affiliated with Anna University, Chennai. Known for its strong academic programs in engineering, technology, and management, TCE consistently ranks among the top engineering colleges in India. The college offers undergraduate, postgraduate, and doctoral programs in various disciplines, including engineering, computer science, management, and more. TCE places a strong emphasis on academic excellence, research, and innovation. The institution is equipped with modern infrastructure, state-of-the-art laboratories, and a vibrant campus environment that supports both curricular and extracurricular activities.

Entrepreneurship Development Cell (EDC) at TCE: The Entrepreneurship Development Cell at TCE is a platform that encourages and nurtures entrepreneurial spirit among students. The cell's primary objective is to empower students with the knowledge, skills, and resources required to embark on entrepreneurial ventures and contribute to economic growth (Hardie, B., Highfield, C., & Lee, K.,2020). The key features of our ED cell are as follows. The awareness about the Entrepreneurial activities are given to the students through organizing workshops, seminars, and guest lectures featuring successful entrepreneurs, industry experts, and business leaders. These sessions expose students to real-world experiences, challenges, and opportunities in entrepreneurship. TCE's EDC provides guidance and mentorship to students with innovative business ideas. The cell assists in transforming these ideas into viable business plans and offers incubation support to help students launch their startups through incubation support. To foster a competitive spirit and encourage innovative thinking, the EDC organizes business plan competitions. These events allow students to present their business ideas to a panel of judges and potential investors. Workshops on various aspects of entrepreneurship, such as market research, financial management, and pitching skills, are conducted to enhance students' entrepreneurial skills. The EDC

facilitates interactions between students, alumni, entrepreneurs, and investors, creating a network that supports the exchange of ideas, collaborations, and partnerships. The cell collaborates with local industries, startups, and organizations to provide students with exposure to real-world business environments and opportunities for internships (Fellnhofer, K., 2018). Moreover the regular showcases and exhibitions are organized to provide a platform for students to display their startup projects, products, and prototypes. Through these initiatives, TCE's Entrepreneurship Development Cell instills an entrepreneurial culture within the campus, motivating students to think creatively, take calculated risks, and contribute to economic growth through innovation and business ventures (Da Silva,G. B., Costa, H. G.,& De Barros,M. D., 2015). By examining the college's approach to curriculum development, support systems, industry collaborations, and student engagement, this study offers valuable insights for other engineering institutions seeking to enhance their entrepreneurial ecosystem

II. INITIATIVES OF REPUTED INSTITUTIONS TOWARDS ENTREPRENEURSHIP

This study elaborates the initiatives taken by different reputed institutions to foster the Entrepreneurship culture with the students' minds (Hua, J., Zheng, K., & Fan, S.,2022). These institutions exemplify a diverse range of initiatives aimed at fostering entrepreneurship within their colleges. By providing students with education, mentorship, resources, and real-world experiences, they contribute to the development of innovative and successful entrepreneurs.

2.1 Indian Institute of Technology Bombay (IIT Bombay)

IIT Bombay has established the Society for Innovation and Entrepreneurship (SINE), an incubation center that supports technology-driven startups. SINE provides startups with infrastructure, mentoring, funding opportunities, and access to a network of industry experts. They also organize the Eureka! Business Plan Competition, one of the largest such competitions in Asia, to encourage students and startups to present their innovative business ideas. IIT Bombay alumni founded Saral Design Solutions,a successful startup which focuses on providing affordable and hygienic menstrual hygiene products. The startup emerged from IIT Bombay's incubation ecosystem and serves as an inspiring example of innovation and impact. The DSCE at IIT Bombay offers a range of programs and initiatives to support entrepreneurship education and research. It hosts conferences, workshops, and speaker series to bring together entrepreneurs, investors, and academics. The Research Park at IIT Bombay serves as a hub for innovation and entrepreneurship. It provides a collaborative environment for startups, researchers, and industry partners to collaborate, exchange ideas, and develop innovative solutions.

2.2 Stanford University

Stanford University's Stanford Technology Ventures Program (STVP) offers courses, workshops, and resources for students interested in entrepreneurship. The university's proximity to Silicon Valley provides students with access to a vibrant startup ecosystem and networking opportunities. STVP is a leading global research center that focuses on understanding and fostering the role of innovation and entrepreneurship in the advancement of technology and society. In association with StartX, a nonprofit startup accelerator, the cell provides resources, mentorship, and a supportive community to help Stanford-affiliated entrepreneurs turn their ideas into successful companies. It offers an online Innovation and Entrepreneurship Certificate program through the Stanford Center for Professional Development. This program is designed for learners around the world who want to gain a comprehensive understanding of entrepreneurship principles. It promotes the Stanford Ignite program which is designed to impart essential business knowledge to individuals with non-business backgrounds. It offers intensive, part-time courses that cover various aspects of business, entrepreneurship, and innovation.

2.3 Nanyang Technological University (NTU), Singapore:

NTU has been actively involved in promoting entrepreneurship among its students and fostering a culture of innovation. NTUitive is the innovation and enterprise company of NTU. It serves

as a hub for entrepreneurship activities, supporting students, faculty, and researchers in translating their innovative ideas into successful startups. NTUitive provides resources such as mentoring, funding, and incubation facilities. The NTC at NTU is dedicated to promoting technopreneurship and nurturing entrepreneurial talent among students. It offers programs, workshops, and courses that help students develop their entrepreneurial skills and knowledge. Also NTU participates in the annual Global Entrepreneurship Week, during which it hosts a series of events, talks, and workshops to inspire and educate students about entrepreneurship.

2.4 University of Cambridge:

The University of Cambridge has a rich history of entrepreneurship and innovation, with several initiatives and activities that support and promote entrepreneurship among its students, researchers, and alumni. It offers programs like the Ignite accelerator and the Cambridge Social Ventures program. These initiatives provide mentoring, training, and funding support to help students and alumni launch and grow their ventures. It has the Cambridge Judge Business School which offers a range of programs, including MBA courses, focused on entrepreneurship and innovation. It also conducts research in the field of entrepreneurship and hosts events and conferences that bring together academics, practitioners, and students to discuss key topics. It offers Cambridge LaunchPad which helps students and recent graduates explore entrepreneurship and develop their startup ideas. The university has innovation centers and co-working spaces where entrepreneurs can collaborate, develop ideas, and receive support. Also it provides an investment fund through CIC (Cambridge Innovation Capital) that focuses on supporting companies originating from the University of Cambridge. It provides funding to early-stage and growth-stage startups working on breakthrough technologies.

III. TCE ED CELL INITIATIVES TO ENCOURAGE INNOVATION

Thiagarajar College of Engineering's commitment to promoting entrepreneurship is reflected in its dedicated Entrepreneurship Development (ED) Cell, which serves as a catalyst for aspiring entrepreneurs. The institution's roadmap for cultivating entrepreneurship encompasses various stages, including ideation, validation, mentorship, incubation, and funding assistance. By providing a structured pathway, TCE's ED Cell empowers students to transform their innovative ideas into viable startups.

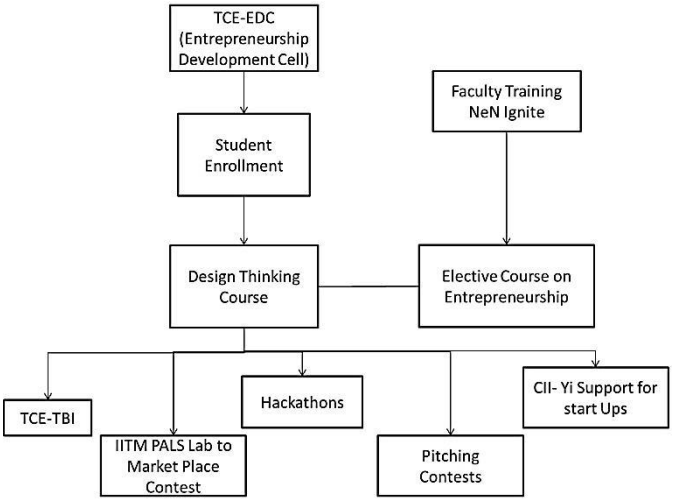

Fig. 1. Roadmap of TCE ED Cell in creating successful Entrepreneurs

The college's integrated approach to entrepreneurial education within its engineering curriculum empowers students to think innovatively and cultivate entrepreneurial mindsets. By offering dedicated courses, collaborative projects, design thinking workshops, and exposure to real-world entrepreneurs, it equips its engineering graduates with the skills and mindset needed to thrive in today's dynamic business landscape. This case study serves as a model for educational institutions seeking to combine technical excellence with entrepreneurial thinking.

3.1 Workshop on Business Model Canvas

The TCE ED cell regularly organizes CSEO connect programs, where accomplished CEOs from startup companies share their experiences, fostering skill development among the students. An occasion facilitated by CISCO Launch Pad took place on April 13, 2022 where attendees were addressed by esteemed guests. The session drew participation from approximately 150 students representing 9 diverse departments. Noteworthy is the CEO Connect event

in the CISCO creators zone, featuring Mr. Vinod Krishnan, CEO of Geons Logix.

Fig. 2. CEO CONNECT with Mr.Vinod Krishnan, CEO, Geons Logix.

The Center for Innovation at IIT Madras presented its featured projects, prompting a discussion on methods for cultivating novel products. Professors also delved into strategies crucial for achieving expansion. A session on Experience Sharing revolved around the Build Club @ IITMIC, featuring insights from Ms. Sruthi Kannan and Mr. Lakshmi Narasimhan, heads of Cisco Launch pad. The event elucidated the process of accessing the portfolio explorer and Devnet. In her role as the chief guest, Ms. Sruthi Kannan provided an overview of contemporary entrepreneurial trends and diverse project use cases.

3.2 Industry Collaboration : Cross-Disciplinary

TCE Build Club arises as a joint effort between IIT Madras Research Park, TCE Madurai, and Maxelerator Foundation. Dedicated to fostering innovation, this initiative, inaugurated on September 5, 2023, empowers students to transform concepts into market-ready realities. Aligned with the objective of cultivating a surge in entrepreneurial ventures, the program echoes IITM Build Club's fundamental mission. Remarkably, this marks the inaugural extension beyond IIT Madras, prompted by the abundant talents resident at TCE.

Fig. 3. Build Club project display in collaboration with IITM

Students commit additional hours beyond their regular classes to engage in productive work within the Build Club, crafting innovative products. Acknowledging their relentless dedication, IITM Research Park bestows upon them the honor of spearheading two pivotal national projects. Notably, eight adept students took part in the IITM IC project internship, under the astute guidance of Institute Professor Mr. Ashok Junjunwallah and successfully completed their innovative solution on the problem statements like Autonomous WheelChair Vehicle (AWCV) and High-throughput Autonomous, Sustainable Human/Goods Transportation for India's next Century (HASHTIC). The Times of India mentioned this innovation in their article that a group of starry-eyed engineering students from colleges across Tamilnadu, Andra Pradesh, Telangana and Kerala are spending two and a half months at the innovation ecosystem working with senior engineers, faculty and mentors on technology solutions for social impact. TCE students feel proud that they are also in part of this internship program.

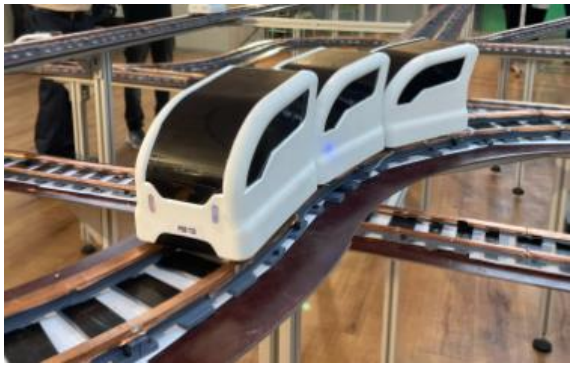

Fig. 4. High-throughput Autonomous vehicle.

3.3 Integrated Curriculum Design:

TCE offers a 3-credit general elective course on entrepreneurship development to instigate and accumulate the students with a like mindset and enrich them to think innovatively and transform their ideas into viable business models. TCE also offers a four-year Bachelor of Technology (B. Tech.) degree programme in Computer Science and Business Systems (CSBS) in association with Tata

Consultancy Services (TCS), customized in the CDIO framework of the Institution. During their coursework they get exposed to many supportive courses such as a 2-credit course on Fundamentals of Economics in first year, a 3-credit course in Introduction to Innovation, IP Management & Entrepreneurship in second year, 2-credit course in Business Strategy, 2-credit courses such as Financial & Cost Accounting in and Financial Management in pre-final and final year. It sets a vibrant curriculum designed to find the perfect amalgamation of technology and business. Adjunct faculties from well renowned colleges are invited to handle classes for the students. Project based outcomes are encouraged among the students and they also get to preserve their work by patenting their innovation. Thus the college integrates entrepreneurial education into its engineering curriculum.

3.4 Startup Incubator and Accelerator:

Thiagarajar College of Engineering - Technology Business Incubator (TCE-TBI) is operational since 2014 with the funding support from NSTEDB, Department of Science and Technology (DST), Government of India. Ample opportunities arise from them for the active participation of students. They also promote alumni, student and faculty-led ventures in alignment with the identified core areas of TBI. Recently, a Student innovator open house event was held on August 28, 2023, sponsored by ANICUT Capital to help students pitch their ideas to win an investment of maximum 15 Lakhs.

3.5 Industry Partnerships and Collaborations

StartupTN Devhack 2023 Hackathon was organized at TCE on January 27, 2023, co partnered with the Maxellarator foundation, TCE-Madurai, Google developer groups-Madurai and Young Indians. Developer community from colleges, startups and working professionals were invited and active flooding of participation from in and around Madurai city was seen. An open survey was conducted on their strengths and learning experience by joining in this largest challenge. Almost all the participants felt this as a remarkable experience and aspired to have a startup sooner or later in their career. Also the Meet with CEO of Hi TEch solutions, Chennai has been organized to present the startup ideas of the ED Cell students. Dr.C. Mathizhalagan reviewed the projects and collaboratively worked with Hi Tech solutions to deliver a market ready product.

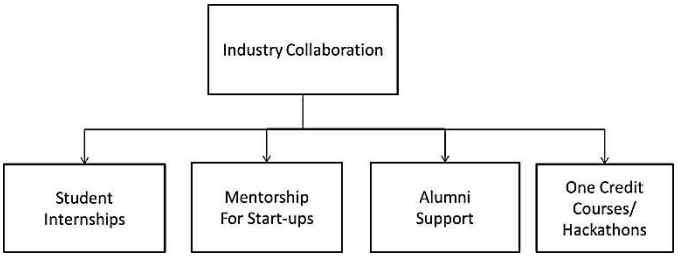

Fig. 5. Industry collaborative culture

3.6 Entrepreneurial Support Centers:

One of the National Entrepreneurship Network(NEN) programs known as Wadhwani Entrepreneur Network conducted WEN Ignite 3.0 for mainstreaming entrepreneurship knowledge in education. It was a FoP of 14 Weeks, 35 hours' program to institutes department level coordinators of EDC cell for creation of "Practice Ventures". It is a Milestone based journey with real time evaluation, feedback and global jury validation on the ventures entrepreneurial journey. Faculties in groups created a compelling Value Prop, sustainable Business Model with Financial Stability and submitted a Validated MVP. The certified faculties and their valuable feedback provided a great support system to the aspiring students.

3.7 Design Thinking Course

To showcase the output of this design thinking course demo day event was organized by the ED Cell, IIC and TCE-TBI of the institution to showcase by pitching their ideas and projects of Design Thinking Course conducted in almost all departments. The number of participants for the event were 117 across seven departments namely EEE, ECE, Civil, Mechanical, Mechatronics, IT and CSE. The participants had exhibited their ideas/prototypes and the first year students got an opportunity to visit and expose themselves to the developing solutions to the challenges around. This event has highly motivated the first year students to inculcate them a thought of being "An engineer" as "Solution Finder ". Almost 400 first year students have visited this event. This exhibition has provided the opportunities for discussions with faculty evaluators, and also seeds

the ideas for further refinement. The participants have received the feedback from the evaluators to promote their ideas and projects to the next level.

IV. RESULTS AND DISCUSSIONS

All the strategies developed and adopted by TCE ED Cell supported by TCE-TBI and other organization have helped students methodize their ideas into various success stories. To list a few, the TNSI Challenge 2022 winners got Rs. 1 Lakh cash prize for showcasing their stupendous talents under the faculty mentorship. Numbers of students of TCE were also shortlisted as state finalist in EDII-TN organized TNSI'2022 event. Recently held Madurai Hackathon'2023, organized by Madurai Tech Community in association with TCE gave a wide opportunity to work on problem statements such as infrastructure, Green environment awareness and solid waste management. Students of TCE bagged cash prize of Rs. 60,000. They have got a key to convert their ideas into successful ventures. Students have also showcased their talents in StartupTN DevHack'2023 and won cash prize of Rs. 40,000 by finding an innovative solution on Task Management. The recent alumni of the college are current CEO of successfully running business ventures. Continuous instigation from the active department level coordinators of ED Cell has helped to bring out the talents among their students and help students to connect with their dreams. Seed grants from EDII to TCE-TBI of total project cost 2,13,000 and 18,00,000 have boosted the morale of incumbents. Currently the market ready projects are ready to embark their journey as start-ups in near future.

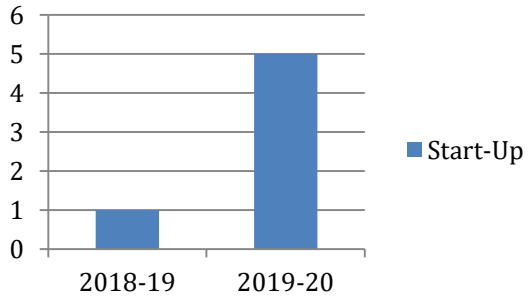

Fig. 6. Number of Entrepreneurs and Incubates

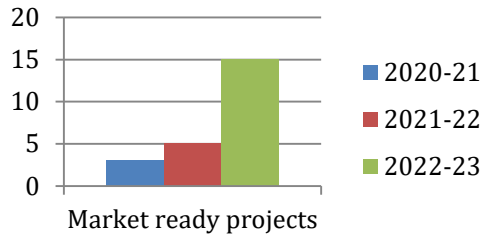

Fig. 7. ED Cell contribution towards market ready projects

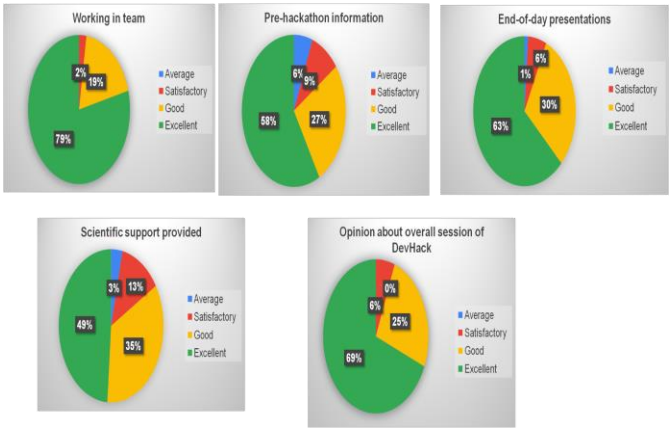

Fig. 8. Analysis chart on participants' feedback on Hackathons

A survey was conducted on Innovation and entrepreneurship education in extracurricular activities and competitions which lead to outcome based market ready projects.

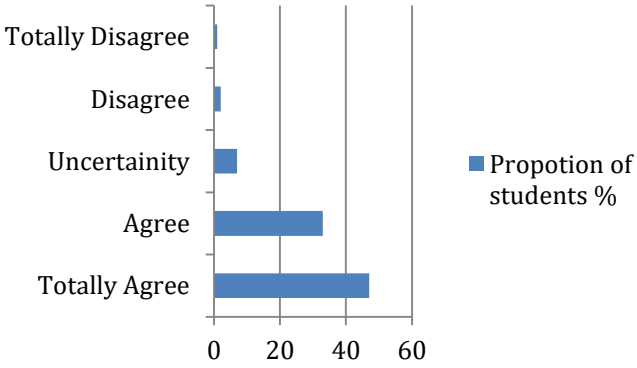

Fig 9. Student survey on Innovation and entrepreneurship education

V. CONCLUSION

The roadmap presented by TCE's ED Cell can serve as a foundation, but it is essential for each institution to tailor its approach to its unique strengths, resources, and local ecosystem. Further research in this domain could involve longitudinal studies to assess the long-term impact of the entrepreneurial culture nurtured within such institutions and comparative analyses across different educational contexts. As the case study of TCE demonstrates, the cultivation of entrepreneurship and the promotion of a startup culture go beyond theoretical teachings. Practical exposure, hands-on experience, and mentorship play pivotal roles in shaping the mindset of future entrepreneurs. Moreover, the importance of fostering a spirit of innovation, risk-taking, and resilience cannot be overstated. By creating an environment that encourages experimentation and learning from failures, institutions can truly empower their students to become successful entrepreneurs who drive economic growth and innovation.

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