Entrepreneurship and Economic Development: A Comprehensive Study Integrating Recent Evidence from Engineering Education, Gender Inclusion, Rural Technology, Entrepreneurial Intention, and Social Entrepreneurship Research

Ashutosh Shukla, Yash Parab, Adwait Shridhankar, Ankush Singh
Dept. of Electronics and Computer Science, Shah & Anchor Kutchhi Engineering College (SAKEC) Mumbai, India

***Abstract*—Entrepreneurship plays a crucial role in driving economic development by fostering innovation, generating employment, and enhancing productivity. This paper presents a comprehensive study on the relationship between entrepreneurship and economic growth, examining how startups, small and medium enterprises (SMEs), and technological innovation contribute to national and global economies. The study draws upon and expands five recent peer-reviewed research streams: (1) a systematic literature review (SLR) of entrepreneurship education in electrical, electronic, and computer (EEC) engineering curricula covering 84 primary sources; (2) a qualitative investigation of gender differences in engineering entrepreneurship program (EEP) participation through 20 student interviews; (3) a mixed-methods case study of Productivity Enhancing Technology Experience Kits (PETE-Kits) for rural entrepreneurship education; (4) a structural equation modeling (SEM) study of entrepreneurial intention among Chinese university students; and (5) a quasi-experimental comparative analysis of servicelearning vs. traditional instruction for social entrepreneurship in STEM. Key findings reveal that project-based learning dominates engineering entrepreneurship pedagogy; perceived behavioral control and subjective norms are stronger drivers of entrepreneurial intention than formal course participation; gender-inclusive design of entrepreneurship programs requires moving beyond pitch-competition formats; rural communities can meaningfully enter the digital economy through structured SCT curricula; and service learning produces significantly superior outcomes in problem-solving, knowledge application, and civic awareness relative to traditional instruction. The paper concludes that strengthening entrepreneurial ecosystems through policy alignment, curriculum innovation, and community engagement is essential for sustainable economic progress.**

***Index Terms*—Entrepreneurship and economic development are closely linked to innovation and startups. Small to medium sized businesses, also known as SMEs play a role in this. Engineering entrepreneurship education is very important. It often includes project-based learning. When people think about starting their business we call this entrepreneurial intention. It is also important to think about gender inclusion and how people in areas can start their own businesses, which is known as rural entrepreneurship. New technology like connected technology can really help with this. Some people learn by working on projects that help others, which is known as service learning. This can also be a part of entrepreneurship. To understand all of these things researchers use tools like structural equation modeling and the theory of planned behavior to study entrepreneurship. Entrepreneurship is a part of economic development and innovation and it is important to keep learning about it. Entrepreneurship and small businesses are essential for an economy. Startups and SMEs need to be supported so they can grow and create jobs. Entrepreneurship education and project-based learning can help people gain the skills they need to start their businesses. Rural entrepreneurship and social entrepreneurship are also very important for creating change. Entrepreneurship and innovation can help solve problems and make peoples lives better. Entrepreneurship and economic development are connected to other things, including engineering entrepreneurship education and service learning. Overall entrepreneurship is a tool for creating positive change and it is essential, for economic development and innovation.or**

I. INTRODUCTION

Entrepreneurship is a part of what helps the economy grow. When people start businesses they come up with new things and create jobs. This helps the

economy in the run in both rich and poor countries. People like Drucker and Schumpeter have said this before.

Now because the world is changing fast and everyone is connected, the way people start businesses is not like it used to be. We have kinds of businesses now like startups that use technology companies that help people and businesses, in rural areas that use digital tools. All these different kinds of businesses are changing the way the economy works. We need to understand them and help them in ways.

The expansion of entrepreneurship education has happened at the time as more attention from institutions especially in higher education and STEM fields. Browning and Bustard say that people are really interested in adding entrepreneurship to engineering classes in EEC. This is not just because we need it for the economy but because we want engineers who can be creative solve problems talk to people and deal with tough situations. From 2010 to 2023 more and more studies were published about teaching entrepreneurship to EEC engineering students. This shows that institutions are getting more serious, about helping students become entrepreneurs. Entrepreneurship education is becoming a part of EEC engineering because institutions want to help students become entrepreneurs.

People are really excited about entrepreneurship programs. We do not have enough evidence that they actually work. For example Lin and others looked at students in universities in Madrid. They found that these formal entrepreneurship programs did not really increase the students desire to become entrepreneurs. The numbers were not significant with a beta of 0.096 and a p value of 0.109.

Shekhar also found that when people participate in these entrepreneurship programs it is influenced by complicated factors that are different for men and women. These factors are often ignored in the program designs.

Rutherford and others showed that people in areas are often left out of the digital entrepreneurship ecosystem. This is because they do not have the technology skills. It is interesting because many of these communities have high rates of people working for themselves. Entrepreneurship programs are supposed to help people become entrepreneurs. However entrepreneurship programs are not really helping the people in areas. Entrepreneurship programs need to be improved so they can help everyone, including people in areas and people, with different backgrounds.

This paper synthesizes and expands upon five recent research contributions. Section II reviews the role of entrepreneurship in economic systems. Section III classifies types of entrepreneurship. Section IV examines factors shaping entrepreneurial activity. Section V covers education methodology and outcomes. Section VI addresses key challenges. Section VII discusses digital-era entrepreneurship. Section IX presents case studies. Section X outlines future directions, and Section XI concludes.

II. ROLE OF ENTREPRENEURSHIP IN ECONOMIC DEVELOPMENT

A. Job Creation and Labor Market Impact

The job-creation function of entrepreneurship is well established, but recent empirical work illuminates nuanced dynamics. Shekhar's [2] review of institutional EEP data found that students completing engineering entrepreneurship programs reported higher self-rated teamwork, leadership skills, and preparedness for work relative to non-participants. Ohland et al.'s longitudinal assessment showed EEP participants achieved higher persistence in engineering (70% vs. 51%) and higher cumulative GPAs (3.08 vs. 2.83) compared to matched nonparticipants.

At the community level, rural economies face a distinct challenge. Rutherford et al. [3] document that Frederick, Oklahoma—population ≈3,500—lost roughly 15% of its population since 2010, witnessed closure of its only hospital in 2016, and suffered significant declines in retail, healthcare, and government employment during 2010–2020. Their PETEKit intervention demonstrated that equipping rural students with smart and connected technology (SCT) skills and entrepreneurial ideation frameworks can rekindle economic aspiration in such communities.

The social entrepreneurship dimension adds another layer. Ng et al. [5] describe how individuals with moderate intellectual or emotional challenges are relegated to performing tedious, repetitive tasks for scant compensation. Social entrepreneurship

embedded in university STEM curricula—in their case a VR-based convenience store simulator—directly expands employment pathways for disadvantaged groups.

B. Innovation and Technology Advancement

Innovation is really important for people who want to start their businesses. Browning and Bustard found that most of the studies they looked at 51 percent to be exact said that entrepreneurship education should focus on developing skills. The main goal of this is to help people think like entrepreneurs, which means being able to bounce from failures find ways to solve problems and come up with creative solutions. This kind of thinking is what leads to innovation.

There is a way of learning called Challenge-Based Learning that seems very promising. It was talked about in five studies. It helps students learn how to innovate in a very structured way. Students start by looking at an idea then they try to figure out how it applies to their own lives and finally they have to come up with a creative solution to a specific problem. This is different from ways of learning where the problem is already defined. With Challenge-Based Learning students have to take an idea and make it relevant to their own community before they can start working on a solution. This is very similar to what real entrepreneurs do when they are trying to come up with business ideas.

Ng and his team showed how this can work in practice. They taught a class where students had to use three technologies. Virtual reality, chatbots and computer vision. To come up with a solution to a real social problem. The students had to integrate these technologies in a way that made sense and would help people in their community. Innovation and entrepreneurial thinking are essential for people who want to start their businesses and make a positive impact, on society. Challenge-Based Learning is a way to help students develop these skills and think like entrepreneurs.

C. Economic Growth: Aggregate and Regional Dimensions

At the picture level entrepreneurship is a key driver of economic growth. This is because it leads to productivity more competition in the market and the replacement of old industries with new ones as described by Schumpeter. At a level some researchers like Rutherford say that having smart people with big dreams is really important for a region to be productive. They think this has an impact on peoples quality of life and how happy they are. If people in areas have the

TABLE I: TYPES OF ENTREPRENEURSHIP: CHARACTERISTICS AND RESEARCH CONTEXT

Type	Characteristics	Source
Small Business	Local retailers, food service, trade businesses; backbone of community economies; critical in rural settings with scarce employment alternatives.	[3]
Scalable Startup	High-growth technology ventures targeting large markets. Indian examples: Flipkart, Paytm, Zomato generated millions of jobs and attracted billions in FDI.	[6]
Social Entrepreneurship	Prioritises social value over profit. Requires empathy, opportunity recognition, and sustainable business models. Service learning is an effective educational pathway.	[5]
Technological Entrepreneurship	Investment in projects assembling specialised individuals and heterogeneous assets tied to scientific/technological advances to create value (Bailetti's definition).	[3]
Engineering Entrepreneurship	Engineers leveraging technical depth plus business acumen. EEC programmes develop both hard skills and entrepreneurial mindset competencies.	[1]
Rural Digital Entrepreneurship	Combining SCT with local community knowledge to create or expand businesses in geographically isolated areas; requires targeted literacy programmes.	[3]

right digital skills they can be a part of the modern economy without having to move to a big city.

A study called PETE-Kit shows that this is true. The study used a survey that asked people to think about how they were doing and after a program. The results showed improvements in five areas. People thought they were better at using technology they liked the idea of using technology to help their community they were more excited about using computer tools and they wanted to use these tools to start their own businesses. One interesting thing was that before the program only 18 percent of people were interested in working with these computer tools but after the program 82 percent were interested. That is a change of 64 percent. The people in the study were really interested, in entrepreneurship and wanted to learn more about it. Digital entrepreneurship skills are very important for people to have.

III. TYPES OF ENTREPRENEURSHIP

The contemporary entrepreneurship landscape encompasses multiple forms that differ in motivation, structure, and economic function. Table I organises these types alongside their primary research contexts. *Social Entrepreneurship in Depth:* Social entrepreneurs focus on helping people who really need it while making sure they can keep doing what they do. Some researchers like Cagarman and others came up with a 5- model that Ng and others used. This model has five parts: taking care of the earth having a vision for society starting new things in society being innovative and making money. They used this model to teach students in a way. The students worked with people who needed help like those, with disabilities who wanted to learn a job.

The students did a things. First they got to know the people they were helping. Then they figured out what those people needed with the help of their teachers. After that they explained what they could do to help. Next they actually. Used what they had come up with. Finally they saw how well it worked by asking the people they helped for feedback. This way of teaching and learning is based on a model that has five steps: get interested look into it explain it add details and see how it turns out.

IV. FACTORS AFFECTING ENTREPRENEURSHIP

A. Economic and Infrastructure Factors

Capital access, market demand and physical infrastructure are really important for people who want to start their businesses. For people who live in areas and want to be entrepreneurs it is even harder because they do not have the same infrastructure as cities. They have internet and fewer people have smartphones. This is a problem because it means they have less access to education, jobs, food and healthcare.

Just building roads and providing internet is not enough. Some researchers like Rutherford found that having internet is necessary but it is not enough to solve the problem. People in these communities also need to know about the technology that's available they need to have the skills to use it and they need to want to use it to make their lives better. All of these things are important. They need to happen at the same time for things to get better for rural entrepreneurs. Capital access, market demand and physical infrastructure are still really important, for activity.

B. Educational and Motivational Factors

Browning and Bustard found that people are motivated to learn about entrepreneurship for reasons. They looked at 84 studies. Divided these reasons into two groups: learning new skills and needing a job. In the studies that focused on learning skills the main reasons were to think like an entrepreneur, to work well with others to be creative to be a good leader and to communicate well. In the studies that focused on needing a job the main reasons were to help the economy grow to prepare for a workforce to get a job and to create new jobs.. None of these studies checked if learning about entrepreneurship actually helped students become entrepreneurs.

This is similar to what Lin and others found. They did a study. Found that learning about entrepreneurship does not really increase the number of students who become entrepreneurs. They also found that the things students liked most about entrepreneurship classes were doing projects meeting people who own businesses and visiting companies. These things are hands-on. Not just about listening to a teacher. The GEM Spain report also said that teaching entrepreneurship is not very effective giving it a score of 5.1 out of 10. Browning and Bustard and Lin and others and the GEM Spain report all show that entrepreneurship education is not, about learning in a

classroom but about doing things and getting experience like entrepreneurship education and entrepreneurship.

C. Social Norms and Subjective Influences

Ajzens Theory of Planned Behavior by Ajzen [10] says that people who want to start their business are influenced by what they think about it what the people around them think and if they feel they can really do it. Lin and others [4] found out that what the people around them think is a factor in deciding if someone wants to start a business. They looked at what the people close to them think, like family, friends, classmates, professors and other important people. They all had a big impact.

This is also true for people who are studying to be engineers. Shekhar [2] found out that guys mostly ask their friends for advice when deciding to join engineering programs while girls are more inspired by their friends who have already done it. So when trying to get more people to join these programs it would be an idea to connect them with people who are similar, to them and have already gone through the experience of starting their own business.

D. Gender-Differentiated Factors in EEP Participation

Shekhar's [2] qualitative study of 20 engineering undergraduate students (10 men, 10 women) spanning computer science, mechanical, industrial operations, biomedical, and nuclear engineering identified five key themes:

Entrepreneurial Self-Efficacy (ESE): Men reported high confidence in public speaking and pitching. Women predominantly reported low ESE for presenting publicly. Because individuals avoid tasks with low self-efficacy, women's lower ESE creates a self-reinforcing barrier to EEP participation.

Entrepreneurial Intent and Problem Motivation: Men framed EEPs as opportunities to learn different ways of attacking problems applicable to any career. Women framed motivation around creating positive change and solving societal problems.

Venture vs. Non-Venture Career Goals: Most men engaged in EEPs to start a company explicitly. Women more frequently engaged to develop professionally useful skills for non-venture careers, such as working in startups rather than founding them.

Pitch Competitions as Deterrents: Women expressed specific discomfort with pitch competitions. Research cited by Shekhar confirms that investors preferred pitches from men over women even when pitch content was identical, suggesting pitch competition structures embed systemic biases. Portfoliobased, iterative assessment alternatives warrant serious evaluation.

E. Cultural and Geographic Variation

There are 84 sources about Student Led Research or SLR for short that we looked at. Of these 84 SLR sources 38 came from the USA 6 came from Portugal 5 came from China 4 came from Norway. 3 Came from the UAE. What is interesting is that the reasons why people do SLR are different in each country. For example in the USA people are more likely to do SLR because they want to improve their skills. On the hand in the UAE and Norway people are more likely to do SLR because they want to make money.

A study from South Korea found out that students there had a time with the idea of being their own boss, which is a big part of the SLR mindset because it is not part of their culture. This is different, from the USA, where being your boss is seen as a good thing. This suggests that the way we teach SLR in countries may need to be changed so that it works better in other cultures.

V. ENTREPRENEURSHIP EDUCATION: METHODS AND OUTCOMES

A. Systematic Evidence on Curriculum Design

Browning and Bustard [1] followed Kitchenham and Charters' guidelines [11], searching IEEE Xplore (42,616 results) and ACM Digital Library (75,945 results) in May 2023. After four rounds of inclusion/exclusion, 84 primary sources were retained. Quality assessment using a 1–5 rubric showed that most papers scored between 3 and 4, with no paper scoring below 2.5, indicating adequate scientific quality across the corpus.

B. Teaching Method Analysis

Table II presents the complete distribution of teaching methods from the SLR. Project-Based Learning (PBL) is dominant because it best replicates the entrepreneurial process: students are given an expected output at the course's end and guided through problem identification, solution design, and business proposition development. CBL represents the most structured evolution of experiential learning for entrepreneurship, more common in Brazil, and

compels students to connect abstract challenges to their own community context before designing responses.

C. Assessment Design

Among the 43 primary sources specifying assessment methods, Table III summarises the distribution. None published formal rubrics—a notable gap that impairs cross-institutional comparability and raises questions about assessment fairness and validity.

D. Service Learning as Social Entrepreneurship Education

Ng et al. [5] designed and evaluated a service-learning teaching and learning cycle structured around three SL components (Academic Study, Practical Experience, Community Involvement) and five constructivist 5E phases. The technical architecture comprised three levels: (1) Unity 3D and HTC Vive for VR convenience store simulation; (2) Google Dialogflow

TABLE II: TEACHING METHODS IN EEC ENGINEERING ENTREPRENEURSHIP EDUCATION (84 PRIMARY SOURCES; SOURCES MAY USE MULTIPLE METHODS)

Method	N	Key Pedagogical Feature
Project-Based Learning (PBL)	31	Open-ended; students identify problem, propose solution, build business case. Develops creativity and problem-solving.
Lectures	18	Provides business/finance knowledge foundation. Often combined with PBL to supply theoretical grounding.
Problem-Based Learning (PrBL)	8	Predefined problem without a single answer. Saves time vs. PBL but limits problem-identification experience.
Guest Lectures	7	External ecosystem speakers (marketing, finance). Addresses educator expertise gaps; fosters ecosystem links.
Lean / Agile Methods	6	Iteration and customer feedback loops align with startup methodology.
Case Studies	6	Real-world business scenarios; must remain current to maintain student engagement.
Challenge-Based Learning (CBL)	5	Broad idea → guiding questions → challenge → solution with documented reflection.
Simulation-Based	5	Role-playing business decisions. Limited real-world mirroring; insufficient debriefing time often cited.
Agile	3	Software-focused iterative development methodology.
Learn by Doing	3	Direct application without extensive pre-instruction.
Story-Based Learning	1	Weekly chapter readings with quizzes and reflection.
Debate-Based Learning	1	Opposing teams debate, then coauthor a reconciliation report.

TABLE III: ASSESSMENT METHODS IN EEC ENGINEERING ENTREPRENEURSHIP COURSES

Assessment Component	N
Pitch (startup-format presentation)	18
Prototype product	17
Business plan	14
Report (technical or reflective)	11
Presentation (generic)	11
Peer assessment	7
Poster	5
Formative assessment	4
Essay	3
Self-reflection	3
Business model canvas	2
Exam	2
Patent application	1
Video submission	1

TABLE IV: S-LOMS PRE/POST SCORES AND STATISTICAL SIGNIFICANCE (10-POINT LIKERT SCALE; GROUP A = TRADITIONAL, GROUP B = SERVICE LEARNING)

Domain	Group A		Group B	
	Pre	Post	Pre	Post/Sig.
Knowledge Application	5.9	5.8	5.6	7.0*
Problem-Solving Skills	6.6	6.3	6.3	7.6**
Empathy & Caring	7.0	6.9	6.9	8.0
Sense of Social Responsibility	6.6	6.1	6.4	7.3
*$p < 0.05$; **$p < 0.01$; Group A: n =38; Group B: n =7. Group A below 10th university percentile; Group B above 75th percentile.				

TABLE V: SEM HYPOTHESIS RESULTS: ENTREPRENEURIAL INTENTION MODEL

Hypothesis	β	p	Result
H1: Educ. → Intention	0.096	0.109	Rejected
H2: Educ. → Attitude	−0.055	0.110	Rejected
H3: Educ. → Subj. Norms	−0.082	0.404	Rejected
H4: Educ. → Perc. Control	−0.061	0.448	Rejected
H5: Educ. → Skills	−0.082	0.405	Rejected
H6: Attitude → Intention	0.120	0.569	Rejected
H7: Subj. Norms → Intention	0.290	<0.001	Supported
H8: Perc. Control → Intention	0.431	<0.001	Supported
H9: Skills → Intention	0.223	0.011	Supported

for chatbot natural language processing; (3) Google Vision for object recognition. The comparison study used validated instruments: the Student Self-Assessed Learning Outcomes from Service Learning (S-LOMS) on a 10-point Likert scale and the Student Postexperience Questionnaire (SPEQ). Results are presented in Table IV.

SPEQ results reinforced these findings. The experimental group's average SPEQ score for intellectual development was

7.9 vs. 6.4 for the comparison group; for social development 8.3 vs. 6.1; for civic development 8.8 vs. 5.7; and for intrapersonal development 8.0 vs. 6.2—consistently one to two Likert points higher across all domains. The standard SFQ teaching quality scores were identical (4.5/5.0) for both groups, confirming that observed differences reflect pedagogical approach rather than instructor quality.

E. Entrepreneurial Intention: The SEM Evidence

Lin et al. [4] conducted SEM analysis (SmartPLS 4, bootstrap n = 5000, α = 0.05) with Chinese students at Madrid universities during 2020–2021. Model quality was confirmed: all standardised indicator loadings exceeded 0.70, AVE exceeded 0.50 for all constructs, Fornell-Larcker discriminant validity was established, and VIF values were below 5. Adjusted R^2 =0.566 for the entrepreneurial intention construct. Table V presents the full hypothesis results.

The rejection of H1–H6 does not mean entrepreneurship education is irrelevant; it indicates that education's impact is mediated by other factors rather than direct. The highestloading indicator of entrepreneurial capabilities was "implementation of ideas" (β = 0.895), followed by "development of new products and services" (β = 0.887)—confirming the centrality of practical creation skills.

VI. CHALLENGES

A. Student-Facing Challenges

The SLR documented a lot of student challenges with Problem Based Learning. This is the method that most people use. Students have to deal with a lot of work like making business plans and pitches. They also have problems working in teams especially when people are from areas of study. It is hard for them to schedule meetings outside of class. Some students do not do their share of work which is a problem. Students have a time coming up with new ideas because they do not have a lot of experience in the real world. They also have a time understanding people who are different from them. The students get frustrated when they get feedback on their projects that they think is too negative especially after they have put a lot of time and effort into it. The SLR by browning2024 talks, about all of these challenges that students face with Problem Based Learning.

B. Educator-Facing Challenges

Teams that have 4 to 5 members usually work better than groups.. When you have teams with people from different areas of work it can be harder to get everything coordinated and it can be more work. Getting the support from the administration is not

easy. This includes things like hiring teachers having a flexible schedule and getting money to bring in outside speakers. As one person said, getting all of this to happen is really tough to do. The people who teach entrepreneurship have a lot to learn too. They have to know about making business plans looking at the market making plans pitching ideas and the basics of intellectual property. This is a lot, for teachers who are used to focusing on things.

C. Rural-Specific Challenges

Rutherford and other people who worked with him found that there are some problems in rural areas that are not talked about in the city business ideas. Rural schools do not have materials to teach because they do not have many teachers and not many kids are going to school. The PETE-Kit model has a way to deal with the problem of not having enough people to help it uses a high school robotics coach to support the project. The test to see how well people know about technology showed that students and teachers only knew about 3, out of 8 things, which's only 38 percent and this shows how big the problem of not knowing about technology is. The PETE-Kit model and the local champion idea are important to help with the problems that Rutherford and other people found.

VII. ENTREPRENEURSHIP IN THE DIGITAL ERA

The way people start and run their businesses has changed a lot because of digital transformation. It has also changed the way we teach people about entrepreneurship. The COVID-19 pandemic made more people use online learning platforms. Now we have something called AI which is a big deal in technology right now. Browning and Bustard found some ways that artificial intelligence can help students. Students can use intelligence for market research, customer segmentation, product development and operational efficiency. We can also teach students about intelligence ethics so they can innovate in a responsible way.

Ng and others showed us what it looks like when we teach entrepreneurship with intelligence. They made a system with three parts: a virtual reality game, a chatbot that uses language processing and computer vision. Students had to use all these intelligence and machine learning technologies together to solve a real problem. They also had to make sure the artificial intelligence worked well for people with disabilities. In communities Rutherford and others talked about how the government is spending a lot of money on internet access and digital skills training. They said this is a chance for people who teach engineering to get some of this money and use it to help students in rural areas use technology to solve problems in their own communities. The government is spending over 60 billion dollars on internet access and 2.75 billion dollars on digital skills training from 2024 to 2028. This is an opportunity, for entrepreneurship education and digital transformation.

VIII. GOVERNMENT INITIATIVES AND POLICY FRAMEWORKS

Government policies shape entrepreneurial ecosystems both directly and indirectly. Key initiatives that have influenced the contexts examined in this paper include:

- India: Startup India Initiative (2016), Make in India, and Skill Development Programs created an enabling environment for ventures like Flipkart, Paytm, and Zomato. India's startup ecosystem now ranks among the world's largest by venture count [9].
- USA: NSF funding for engineering entrepreneurship research (Shekhar's study: NSF Grant 1531533; PETE-Kit project: NSF Grant 2125393 [3]) has driven significant investment in EEP development at research universities.
- European Union / Spain: GEM Spain data reveal that 75% of consolidated Spanish companies in 2021 reported necessity-driven entrepreneurship, with only 0.7% of ventures founded by individuals aged 18–24—reflecting the low conversion of education into early-stage entrepreneurship that Lin et al. [4] sought to address.
- Hong Kong: Cyberport, a government-backed technology incubator, supported a social enterprise founded by students who completed Ng et al.'s [5] service-learning course, demonstrating how government incubation infrastructure can capture and amplify educational outcomes.

IX. CASE STUDIES IN ENTREPRENEURSHIP AND ECONOMIC DEVELOPMENT

A. Engineering Entrepreneurship Programs: USA Leadership

The SLR found that 38 of 84 sources, which is 45 percent came from the USA. The USA is by far the place that contributed the most. This makes sense because the USA has a lot of experience with teaching people about startups. Programs in the USA are usually closely tied to the startup scene. They often include things like pitch competitions and memberships in incubators well as trips to startup companies in addition, to the regular classes. The SLR shows that the USA has a lot of experience with this kind of thing.

B. Rural Technology Entrepreneurship: Frederick, Oklahoma

The PETE-Kit intervention [3] demonstrates a replicable model for rural technology entrepreneurship education. Key design elements included: (1) community co-design of the PETE-Kit hardware list based on surveyed local needs; (2) eight real-world case studies showing how SCTs similar to PETE-Kits had been used in commercial ventures; (3) two ideation events building from initial brainstorming to team formation and business model bootcamp; (4) a six-month independent project period with intensive training in target market estimation, competitor analysis, revenue projection, and pro-forma income statement construction; and (5) a Shark Tank-style culminating event judged by community members—including the mayor, military base personnel, and local entrepreneurs—creating authentic accountability. Prepost community member survey results showed the event raised technology literacy familiarity scores for teachers by $\Delta = 0.75$ and community members by $\Delta = 0.75$ (6-point scale).

C. Social Enterprise Creation from Service Learning: Hong Kong

One team from the service-learning group founded a social enterprise that makes virtual reality rehabilitation applications for stroke patients.

This team did well. They even made it to the semifinals of the Hong Kong Social Enterprise Challenge.

They got money from Cyberport to help them, which shows that their idea is good and can make money.

The team said they did well because of what they learned in the course not just because they got lucky.

The team from the service-learning group said that the course gave them a strong foundation, which is why they were successful with their social enterprise that makes virtual reality rehabilitation applications, for stroke patients.

D. Indian Startup Ecosystem: Transformative Scale

The startup scene in India really shows what entrepreneurship can do to change a developing country like India. Companies like Flipkart, which was started in 2007 and later bought by Walmart for 16 billion dollars in 2018 Paytm, which was started in 2010 and is now one of the digital payment platforms in the world and Zomato which was started in 2008 and is now a publicly listed company have given jobs to tens of thousands of people directly and many more indirectly.

These companies, like Flipkart and Paytm and Zomato show how technology and entrepreneurship can make a change in a short time by creating new markets instead of just competing in markets that already exist.

X. FUTURE RESEARCH DIRECTIONS

Drawing upon the five research streams synthesised in this paper, several high-priority future directions emerge:

Longitudinal impact studies: No studies reviewed by Browning and Bustard [1] investigated whether entrepreneurship education actually increased the proportion of graduates who became entrepreneurs. Longitudinal cohort studies tracking career outcomes and venture creation rates 5–15 years post-graduation are essential for evidence-based programme justification.

Assessment rubric development: The complete absence of published rubrics across 84 primary EEC entrepreneurship education studies [1] represents a critical infrastructure gap. Developing, validating, and sharing standardised rubrics for pitch, prototype, and business plan assessment would improve consistency, fairness, and cross-institutional comparability.

Gender-inclusive EEP design: Shekhar [2] calls for examination of cognitive, affective, and behavioural responses to common EEP pedagogical practices with particular emphasis on identifying differences across diverse student groups. Portfolio-based and narrative-based alternatives to pitch competitions warrant systematic evaluation.

Entrepreneurial intent measurement: Lin et al. [4] note that standard entrepreneurial intent measures are defined around venture creation, systematically underrepresenting problem-solving and impact-

driven motivations more characteristic of women's entrepreneurial engagement. New measurement instruments that capture the full range of entrepreneurial orientations are needed.

PETE-Kit scalability and replication: Rutherford et al. [3] identify corporate social responsibility partnerships as a promising funding and implementation mechanism for scaling SCT entrepreneurship programmes to other rural communities. Testing replication fidelity across diverse rural contexts is needed before broad policy adoption.

Service learning to entrepreneurship conversion: Ng et al. [5] observe that many students recognise social needs through service learning but do not convert the experience into entrepreneurial ventures. Future curriculum iterations should integrate explicit business model development—profit projection, pricing, investor communication—to bridge this conversion gap.

AI and generative technology integration: Browning and Bustard [1] identify AI ethics as a critically underaddressed topic in EEC entrepreneurship education. As generative AI tools enter the entrepreneurial toolkit, courses must equip students not only to use these tools but to critically evaluate their reliability, bias, and societal implications.

XI. CONCLUSION

This paper looks at entrepreneurship. How it affects the economy. It uses information from five studies in different fields like engineering education, gender studies, rural technology and social entrepreneurship. The studies show some things. First people learn best when they work on projects in engineering.. They also need to be connected to the real world to actually become entrepreneurs. Second just taking a class on entrepreneurship does not mean someone will start a business. What really matters is how control they think they have what their friends think and if they have practical skills. Third to help women get into entrepreneurship we need to do more than just have them compete against each other. We need to find them role models and peers to look up to. Fourth people in areas can start businesses too if they have the right technology, a good plan and people to hold them accountable. Fifth when students work on projects that help their community they learn more. Are more likely to start their own businesses.

All these things together show that entrepreneurship education should be hands-on connected to the world and fair to everyone. To really help entrepreneurs we need to work with the community create policies and invest in technology. This is the way to make sure everyone has an equal chance to start a business and help the economy grow. Entrepreneurship education is very important. We need to make sure it is experiential connected to the ecosystem and community-oriented. Entrepreneurship education and entrepreneurship are key to economic development and making sure everyone has access, to entrepreneurial opportunities.

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