Building Human Capabilities for an Increasingly Complex Entrepreneurial Ecosystem

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Abstract

The topic of nurturing specific entrepreneurial human capital acquires new relevance as the prospects for economic development in a changing context are associated with it. Relying on a solid base of knowledge, competencies, and progressive tools would allow young professionals to produce decent results in complex entrepreneurial ecosystems. Consequently, close attention is paid to the content of entrepreneurial education.

This article analyzes the dynamics of the emerging research landscape regarding entrepreneurial education. The new context calls for a revision and adjustment of training programs based on many factors. The most common topics of discussion are the following: the transition from formal to creative, hybrid learning that combines different formats and learning styles, the holistic study of the contradictory nature of innovation processes, and the development of entrepreneurial thinking and behavior through previously untouched deep cognitive dimensions. The case of the Kalasalingam Academy of Research and Education (KARE) in India on training entrepreneurs and their adaptation to entrepreneurial ecosystems of different levels and complexity is presented.

Keywords: entrepreneurial education; innovation training; entrepreneurial thinking; meta skills; innovation activity; entrepreneurial ecosystem; creation of venture enterprises; risks; identifying opportunities

Citation: John-Samuvel D., Szymański J.R., Żurek-Mortka M., Sathiyanarayanan M. (2024) Building Human Capabilities for an Increasingly Complex Entrepreneurial Ecosystem. *Foresight and STI Governance*, 18(3), pp. 41–53. DOI: 10.17323/2500-2597.2024.3.41.53

Introduction

Entrepreneurship, its nature, opportunities for and barriers to development continue to be a relevant topic, which in new conditions is being rethought through the prism of different dimensions. Its strategic part is entrepreneurial education and training (EET), the potential of which has been perceived differently at different times, depending on the emerging context and other aspects.

Today, EET takes on new meanings due to the wide range of new challenges, and its role and demand at universities and colleges around the world is growing (Sreenivasan, Suresh, 2023). In the traditional model, universities guide graduates toward a predetermined career path, which will subsequently be influenced by a variety of forces. Entrepreneurial education is aimed at developing a different set of skills, more universal, which, in combination with professional ones, can enrich the content of any specialty and equip it with a more powerful arsenal for action in a complex and changing reality. Many governments directly or indirectly support EET, creating the conditions for the development of adequate human potential upon which economic growth and employment depend (Kuratko, 2005; Pittaway et al., 2007). Dynamic technological development and the emergence of new management concepts have a transformative impact on business, and as a result, entrepreneurial education programs are also subject to adjustments and changes (Fellnhofer, 2019). First of all, this is manifested in the interdisciplinary richness of the programs, the focus on the holistic coverage of reality, with all its ambiguity and complexity (Neumeyer, Santos, 2020). The impact and need for entrepreneurial education at universities continues to be an important part of academic discussions. The relationship between entrepreneurial education, entrepreneurial competencies, and entrepreneurial intentions represents one of the key issues. Numerous studies on the results of EET in different countries indicate its positive effects on the development of entrepreneurial thinking, appropriate behavior, and overall career choice in the business world (Nabi et al., 2017; Boubker et al., 2021). This created a new narrative: entrepreneurs are not necessarily born - they are made (Gorman et al., 1997; Ernst&Young, 2011). It has been found that students who have studied entrepreneurship demonstrate higher motivation for business activity compared to those who have not undergone such training (Westhead, Solesvik, 2016).

Along with this, many works raise the question of the weaknesses of EET - its formalism, inconsistency with new realities, the unbalanced content of programs, and other important omissions. The diversity of business forms and its complex, ambiguous nature are often ignored, and the speed and depth of contextual change is underestimated. As a result, the potential of EET remains insufficiently revealed, while strengthening its practical orientation and introducing a synthesis approach would lead to qualitatively different results.

The research presented in this article contributes to the search for answers to the identified problems. Its goal is to find out how researchers see the picture of the changing entrepreneurial landscape, and how educational programs can be adapted to the requirements of the modern agenda from the business sector and society as a whole, taking into account the emerging new knowledge and tools in this direction.

This article reveals the limitations of established EET paradigms. The case of the Indian Academy of Scientific Research and Education is presented. The Kalasalingam Academy of Research and Education, KARE) for training entrepreneurs who can integrate into ecosystems of different levels and complexity.

Literature Review

EET has been one of the three most popular topics in entrepreneurship research (Landström, Harirchi, 2019; Fayolle et al., 2020). Its positive contribution to enhancing entrepreneurial activity and decision-making about choosing entrepreneurship as a career path has been confirmed in many research papers (Martin et al., 2013). This segment of education is currently being replenished with new disciplines, such as entrepreneurship in engineering (Da Silva et al., 2015), digital entrepreneurship, social entrepreneurship, and work with generative artificial intelligence (AI). The author's many years of teaching experience also indicate an increase in demand for social entrepreneurship programs (Deny, 2020). Thus, recent data from the Global Entrepreneurship Monitor, found an increase in the number of teachers with professorial status specializing in entrepreneurship, reflecting growing demand for entrepreneurial education and training (EET) in Germany. Here, the majority of students in educational programs still consider their preparation for starting a business and the abilities they need to be at a relatively low level (Sternberg et al., 2021). This fact indicates that training programs require constant improvement.

EET at universities and business schools has a history of more than 60 years (Solomon, 2007). Over time, its evolution accelerated (Neck, Corbett, 2018; Fayolle, 2013; Frese, Gielnik, 2014), and it was enriched with new concepts, knowledge and practices (Loi et al., 2021). A recent publication (Sreenivasan, Suresh, 2023) analyzed over 2,185 scientific articles published between 2002 and 2022. A particularly sharp increase in research on this topic began in 2017 and continues to maintain momentum. China makes the largest contribution to the increase in knowledge (443 publications), followed by the USA (288). The second tier includes Great Britain, Germany, Australia, Spain, Finland, India, and the Netherlands.

Progress in entrepreneurial education has moved from simply teaching the basics of creating new companies, to developing an entrepreneurial mindset (EM), developing business scenarios, launching digital enterprises (Ferreira et al., 2018), taking into account subtle cognitive and psychological aspects (in terms of "attitudes", "actions", "beliefs" and "behaviour") (Liñán, Fayolle, 2015). The work (Fayolle, Gailly, 2015) analyzed the critical role of universities in the formation of an entrepreneurial mentality.

The way entrepreneurship is taught varies greatly across countries and universities (Fayolle, Klandt, 2006). Despite the fact that the practice-oriented one has proven to be more effective (Gorman et al., 1997; Edelman et al., 2008), classical lectures are still the most common method. Project-Based Learning (PBL) has many facets, however, the overall purpose of its programs is not only to teach management tools, but also to form an individual with systemic, strategic thinking and appropriate behavior (Fretschner, Weber, 2013).

From the array of these and other EET studies, several thematic clusters can be traced, the description of which we provide.

A shift from formal to informal learning

The impact of EET on entrepreneurial behavior is more complex than previously thought. The nature of partnerships between universities and real businesses varies greatly across countries and cultural contexts. In most cases, it remains formal, superficial and situational, despite the active incentives of government policy (Gao, Zhang, 2024). Meanwhile, research results show that an informal approach to organizing classes develops entrepreneurial thinking (EM), increases curiosity in discovering hidden opportunities in ambiguous environments, and increases openness to acceptable risks.

Many authors offer enriched concepts for PBL that draw on recent advances in behavioral psychology and other sciences. The relevant approach seems to be flexible, adaptive programs with elements of experimentation. The overly theoretical nature of training does not allow entrepreneurial skills to emerge (Sharp et al., 2018). The most effective is considered to be a balanced approach, in which sufficient attention is paid to affective options that trigger deep cognitive processes that stimulate increased interest in solving complex, complicated quests in a complex reality (Loon, Bell, 2017). In the work (Nabi et al., 2017) the proliferation of a hybrid type of learning is demonstrated, synthesizing "passive" elements of education with active ones, which actively use developments from educational psychology and other areas. It has been found that the effectiveness of training increases if its content is adapted to a personal situation (Leitner, 2005; Kneppers et al., 2007).

The same effect is achieved by creating a unique a learning space with elements of art, architecture, and industrial design, flexibly customized to solve different problems (Barry, Meisiek, 2015), which is often described by the concept of a "complex learning environment". It sets bold and provocative tasks that encourage you to think outside the box, explore the "unfamiliar," and apply approaches and solutions that have not been used before (Fast et al., 2010; Mayhew et al., 2016). Working with quests that require attention, certain volitional efforts, and the connection of deep cognitive resources puts learning into a mode of "competition with oneself" (Csikszentmihalyi, 1990; Bronfenbrenner, 1979), which creates extraordinary results. Although the difficulties of strong internal mobilization are initially perceived as an undesirable experience, attitudes toward this state change over time. Young people tend to choose non-trivial tasks that challenge them. The concept of design thinking is also consistent with the concept of a complex learning environment, which also requires significant cognitive effort using framing, the method of analogies, abductive reasoning, mental modeling, and so on (Visser, 2006, 2009). These developments allow you to act quickly in changing conditions by reformulating tasks and skillfully improvising in situations that have not been experienced before (Dong et al., 2016; Garbuio et al., 2018).

Discussions around "innovative ideas"

The topic of generating innovative ideas within EET is increasingly being critically discussed in publications. A number of experts draw attention to a peculiar "fashion" - pushing insufficiently prepared and immature students toward ambitious, innovative projects (Bandera et al., 2021). Often the bet is on the popular narrative about the hero-entrepreneur and his rapid ascent to the business Olympus, thanks to the successful innovation *x*. Many works are devoted to the results of such "overheating," which manifests itself in financial losses, frustration, and refusal to further engage in entrepreneurship. A holistic approach avoids such distortions. Programs should objectively present the process of creating innovations as a difficult, sometimes dangerous, transformative journey, the passage of which requires a wide range of specific skills, often lengthy preparation, and readiness to make certain sacrifices (Byrne, Shepherd, 2015).

Closely related to this topic is another large cluster of research— ***the study of the "dark sides" of entrepreneurship.*** Entrepreneurship, despite its great creative power, can also have negative social, psychological, and financial consequences (Scott, 2024). This issue has been studied for more than 30 years (Wright, Zahra, 2011; Shepherd, 2019; Byrne, Shepherd, 2015; Lundmark, Westelius, 2019; Armstrong, 2005). In a new context, this topic is being rethought, a more accu-

rate understanding of the causes and consequences of losses, crises, and preventive work with them has been sought (Bandera et al., 2021; Ziemianski, Golik, 2020).

The dark side of entrepreneurship refers to negative psychological states and emotional reactions (Shepherd, 2019). Any discussion about the dark side of EET benefits from the clarification of key terms, including risk, danger, and denial of resource support. In entrepreneurship, a special role is played by the aspect of risk and taking into account the phenomenal nature of the innovations themselves, which have destructive potential if treated superficially. For a long time, the world of business was dominated by the mindset of "growth and profit first" (Slater, Dixon-Fowler, 2010). Entrepreneurs were seen as the main "economic engines" pushing the economy forward (Wickham, 2006). At the same time, important blocks of complex reality were ignored, which in such a one-sided process created blocking forces and destructive effects. The modern view takes a different view of the various facets of the entrepreneurial process, calling for critical thinking, an objective assessment of one's potential, personal cognitive biases, an assessment of the characteristics of the context, and consideration of other important factors.

(Bandera et al., 2021) presents the results of a Foresight project based on a Delphi survey, in which the dark sides of entrepreneurship were carefully studied from different points of view. An analysis was carried out of the underestimated aspects that subsequently led to failures and losses.

Among the conclusions: embedded training programs currently look like short instructions for going into "unexplored places", characterized by an overly narrow disciplinary focus (Morris, Liguori, 2016). There is no detailed analysis of risk factors, acceptable losses, methods for increasing self-efficacy, and emotional self-regulation (how to quickly rise after falls, learning creative lessons and valuable experience, etc.). Forming the skills of recalibrating one's negative emotions, overcoming frustration, and objectively assessing one's own entrepreneurial intentions require a lot of time (Vanevenhoven, Liguori, 2013). The work (Khelil, 2016) provides a classification of the main groups of factors of entrepreneurial failure, indicating the corresponding "culprits": "deterministic" (market context), "voluntaristic" (improper asset management), and "emotional" (lack of determination and motivation). The competencies promoted within EET require significant practice (Neck, Corbett, 2018) and new approaches (Bandera et al., 2018; Kassean et al., 2015). For example, recognizing opportunities requires tacit knowledge that can only be gained through experience (Neck, Corbett, 2018; Smith et al., 2009). Delphi survey respondents recommended that EET programs teach "acceptable losses" and "help one understand personal risk tolerance."

During the discussion, the issue of assessing the effectiveness of EET programs was also raised. This is difficult because entrepreneurship, unlike other disciplines such as management, engineering, and medicine, does not have any "objective", unambiguous criteria and assessment tools such as minimum indicators, performance measures, certification, and standardized exams (Pittaway, Edwards, 2012). In addition to the factors noted, the dark side can arise from the entrepreneurial process itself, even when participants enter into it with the best of intentions (Shepherd, 2019).

Formation of entrepreneurial thinking from the perspective of a new understanding of cognitive aspects

The work in this area is quite extensive, so we will pay more attention to it, since the influence of EET on EM is revealed in a variety of non-obvious relationships. Many researchers focus on the task of developing a mindset based on the understanding that the entrepreneurial path requires caution, vigilance, constant revision of both one's own and collective decisions, overly optimistic ideas, familiarity with the paradoxes of ambidexterity - being different from others and being part of a community (Shepherd, Haynie, 2009); combine career with relationships (family, friends) (Kirkwood, Tootell, 2008); while maintaining motivation, at the same time keeping compulsive behavior under control (Spivack, McKelvie, 2018); correctly experience crises, losses, failures (Jenkins et al., 2014).

A sufficient number of publications are devoted to the concept *of entrepreneurial alertness,* which explains the mechanism for developing the ability to recognize emerging business opportunities (Roundy et al., 2018; Liu, 2023). Previous studies have examined the positive and significant relationship between EET and this type of vigilance in university programs (Saadat et al., 2022). However, the focus has not been on the possible implications that different types of courses (whether theoretically or practically oriented) may have (Yang et al., 2021). For some time, vigilance has occupied a central place in opportunity research. There are several dimensions of entrepreneurial alertness: scanning (searching for data), synthesis (summarizing and structuring disparate information), and analyzing potentially valuable opportunities (Tang et al., 2012). In another study, entrepreneurial vigilance, as a part of EM, is presented in other aspects: recognizing hidden opportunities, extracting them, and creating opportunities from scratch (Sarasvathy et al., 2010). According to the concept of entrepreneurial vigilance, its carriers are able to recognize subtle "cues" in a confusing, ambiguous environment (Kirzner, 1979). Rapid *opportunity recognition* involves scanning and searching for weak signals through association, evaluation, and judgment about the nature of the opportunity (Tang et al., 2012). The higher the level of entrepreneurial alertness (a common element of EM), the more likely it is

that opportunities will not take significant time to be discovered (George et al., 2016).

The central argument is that vigilance is not truly entrepreneurial unless it involves judgment and action, constantly filtering and accumulating relevant information (McMullen, Shepherd, 2006). Only in such a process are deep cognitive structures formed - cumulative experience and knowledge that form an understanding of a specific area, market landscape, etc. While scanning and searching can be passive or active, skillfully synthesizing information and compiling it into potentially viable business projects creates the prerequisites for success (Alvarez, Barney, 2017). The work of (Cui et al., 2021) makes a significant contribution to highlighting the implicit effects of EET on the development of entrepreneurial knowledge, skills, behavior, and intentions that arise from the presence of EM. It is about the hidden phenomenon of working with malleable cognitive structures (Krueger, 2015) to create entrepreneurial uniqueness (Cui et al., 2021). The underlying nature of such thinking is cognitive adaptability (Haynie et al., 2010) and the ability to discover opportunities that determine economic success. Various researchers characterize EM as: the ability and willingness to become emotionally involved in the process, act quickly, and mobilize under conditions of uncertainty to achieve a goal (Shepherd et al., 2010); the ability to identify and exploit opportunities without relying on current resources (McMullen et al., 2016); and metacognition, which develops through learning and then becomes ingrained as a habit (Schmidt, Ford, 2003). Among the cognitive components of EM, researchers especially highlight: risk taking, tolerance of uncertainty, dispositional optimism, and vigilance to opportunities and consider them the key driving forces for improving the effectiveness of EET (Kaish, Gilad, 1991; Shane, Venkataraman, 2000; Baron, 2006).

Many experts proceed from the theories of *entrepreneurial intentions, planned behavior* (Ajzen, 1991), and *entrepreneurial events*[1] (Shapero, Sokol, 1982).

Risk taking is not a stable and unchanging trait, but can vary and be shaped depending on different scenarios (Wang et al., 2016), in particular, this trait will increase under the influence of EET (Neneh, 2012).

Tolerance of ambiguity is associated with the ability to respond to uncertain situations, where there is a lot of contradictory, confusing, and unfamiliar information, "clues" are fragmented and vague and can be understood only by interpreting and processing incoming signals (Furnham, Ribchester, 1995). This is an integral part of EM, which perceives ambiguity as a complex variety of potential possibilities.

Dispositional optimism is defined as the basic tendency to believe in the best (Crane et al., 2012), which supports a long-lasting will to overcome difficulties. This parameter is closely related to self-efficacy (Crane, 2014), which, however, can be said about all of the listed components.

Another important driving force, which is also the subject of many works on the topic of EET, is inspiration (Souitaris et al., 2007). A study on a sample of students at a British university demonstrated a close connection between this factor and entrepreneurial intention. Because deep learning engages affective aspects, inspiration can be cultivated as a mediating driver of successful entrepreneurial outcomes. This type of inspiration is likely to be a central construct both as an indicator of the impact of EET and as a predictor of other interventions in the learning process (Nabi et al., 2017).

Entrepreneurial education in the digital world

This theme is also reflected in many works. Digitalization provides entrepreneurs with new tools to achieve their goals. They increasingly rely on data analytics, artificial intelligence, and automation to optimize processes. In the digital context, entrepreneurship is transforming its business models, hence this influences the content of EET (Lamine et al., 2021). The emergence of digital entrepreneurship is a game changer in the modern business landscape, requiring players to be more flexible and adaptable.

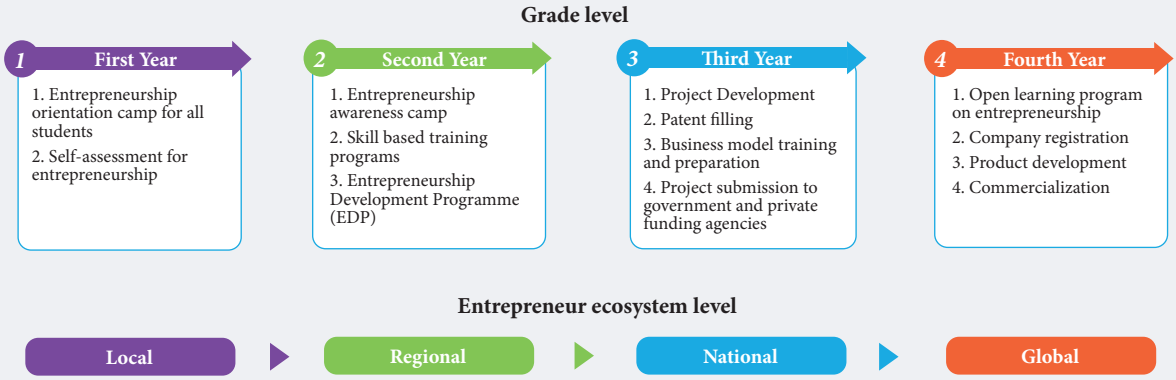
Digital literacy (skills for learning and communicating in a digital environment) must continually evolve as technology becomes more complex. The concept of digital ethics emerges — a critical analysis of personal digital activity (Baierl, Thamm, 2023). A special topic is the rules of security and data protection in the digital world, which offers a wide variety of tools and online platforms for education (through business simulation, gamification elements, agent-based modeling, etc.) (Isabelle, 2020).

Software has emerged that combines the classical modeling approach with entrepreneurial and creative aspects. Training can take place in real or virtual environments. Workshops are being created to create virtual business models, where the management of all stages of the process is practiced. Here, it is easier to master such a complex paradoxical phenomenon as organizational ambidexterity (one of its variants is the ability to simultaneously explore new opportunities and exploit existing resources) (O'Reilly, Tushman, 2013).

Research on digital entrepreneurship education identifies five theories: planned behavior, social cognition,

[1] According to the "entrepreneurial event" model, readiness to create your own business is determined by three groups of factors. The first of them is disruptive events in life, both positive and negative, forcing a change in the usual pattern of behavior. The second is an assessment of the social environment (general cultural context, moods of loved ones, acquaintances, colleagues, presence of mentors, etc.). The third is an assessment of the available resource potential (availability of sources of financing, partner networks, proven prospects of a business ideas, etc.).

Figure 1. **The process of implementing the educational program and the transition of students to new levels of the entrepreneurial ecosystem**



Source: authors.

self-determination, task-technology fit, and interactive engagement (Hayati, Caniago, 2023). In addition, the effectiveness of gamification in online entrepreneurship education has been comprehensively studied from various perspectives. The relationship of this process with digital policy evaluation, self-efficacy, and intention to become a digital entrepreneur has been studied (Xin, Ma, 2023). Incorporating gamification into online entrepreneurial education significantly increases students' intention to engage in digital entrepreneurship. Digital policy and self-efficacy play a mediating role in this regard.

The presented literature review highlights theoretical and practical gaps in EET that hinder its effectiveness.

Universities rarely manage to raise EET to the required level; therefore, the competency potential of graduates is insufficient to fully take advantage of the opportunities in opening career tracks.

The pedagogical approach upon which most programs are based often turns out to be insufficiently comprehensive and does not fully reveal the different facets of entrepreneurial activity, including its dark sides. Finally, due to the narrow orientation of EET programs, students lack awareness of the specifics of broader contexts (industrial, national, international) and their requirements, as a result of which the opportunities for professional self-realization are narrowed.

Formation of Multi-Level Entrepreneurial Competencies: the Case of an Indian University

The case of the Kalasalingam Academy of Research and Education (KARE), founded in 1984, clearly exemplifies a holistic, hybrid approach to entrepreneurial education. Entrepreneurship training itself has been conducted since 2014, for which a special unit was created - the Entrepreneurship Development Center in collaboration with an international network of teachers, methodologists, and consultants, including the authors of this article. Its activities are based on a comprehensive educational program to develop competencies that allow graduates and their business projects to join the global entrepreneurial ecosystem.

The program is designed for technical specialties and covers the entire four-year period of undergraduate study. As they accumulate competencies within existing companies, as well as creating their own startups, students consistently move up the hierarchy of entrepreneurial ecosystems - from local, entry-level to global. At all stages, all kinds of systemic support mechanisms are in place - advisory, financial, infrastructural, and so on (Table 1). The program is designed to ensure that as students move up, they appropriately embrace the growing diversity of contacts and networks, interacting skillfully in complex systems and expanded contexts. In this sequence, entrepreneurial thinking intensively develops, gradual adaptation to larger markets and an intense competitive environment occurs. Familiarity with and the ability to work with different levels and types of entrepreneurial ecosystems helps build the human potential of innovative entrepreneurs with diverse backgrounds. The general scheme of program implementation by year of study is shown in Figure 1.

At the first level of the ecosystem (first year of study) students can dive into the world of entrepreneurship, its different dimensions, and potential tracks. Classes combine different formats - from lectures, master classes, seminars, to meetings with successful entrepreneurs who have realized themselves in business. The level of personal readiness to do business over a long distance and, in fact, internal potential is carefully studied. Students choose priority areas for developing competencies within the program and prepare to open a business at the level of the local entrepreneurial ecosystem, which is formed by the university and local communities. The program includes comprehensive resource support (infrastructure, mentoring, network-

Table 1. **Financing schemes and infrastructure support for the Entrepreneurship Development Center at the KARE Academy**

Initiative	Content	Grant (Thousand USD)	Total no of Beneficiaries	Infrastructural support
Innovation and Entrepreneurship Development Center, IEDC Science Technology and Innovation Hub	Department of Science and Technology (DST)	398	477	Shared working office space with workstations University department / research labs / equipment International Research Centre A Fab-lab & Maker Lab Facility to ideate and test the concepts and product developments made
National Implementing and Monitoring Agency, NIMAT National Initiative for Developing and Harnessing Innovations, STARTUP NIDHI	Entrepreneurship Development and Innovation Institute Tamil Nadu (EDII-TN)	180	1420	
Innovation voucher programme	EDII-TN	66	3	
Atal Innovation Mission (AIM)	ACIC-Kalasalingam Innovation Foundation (ACIC-KIF)	250	62	
MSME Championship	KARE	250	3	
Startup India Seed Fund Scheme, SISFS	Startup India	500	unknown	

Source: authors.

ing opportunities, internships at regional companies). The application of acquired knowledge in practice begins in the format of hackathons and competitions, where, in a collaborative atmosphere, students offer their solutions to real problems faced by local enterprises.

The second level represents the field for action in the context of only one's own region. Entrepreneurial skills are transferred to such dimensions as leadership, communications, marketing, and financial management. Now the knowledge is superimposed on the business context of its region, and there is an immersion in the intricacies of industry trends and sources of financing. Finally, methods of emotional "survival" in the process of failure of starting strategies are mastered. Integration into the regional entrepreneurial ecosystem requires the transformation of one's previous ideas and adaptation to complex combinations of factors and processes. The main training formats at this stage are mentoring, seminars, practical projects, modeling of real business scenarios, and participation in meetings with successful businessmen with a solid background. Step by step, the required level of competencies is being increased to create companies at a higher level.

The third level provides access to the country's entrepreneurial ecosystem. The acquired competencies allow you to create viable prototypes, strategies, and business models, which are submitted for evaluation by investors. The best projects receive support and the opportunity to patent. At this stage, you can join in the implementation of government priorities.

The fourth level is the time to enter the global entrepreneurial ecosystem, starting with joining a professional association and mastering new rules and opportunities. Thinking is developing in the logic of international opportunities. Projects are still in business incubators, with the goal of commercialization being set. A mentality is being formed - "lifelong education", in addition to constantly increasing knowledge, which allows one to improve in identifying weak signals, tracking changes in legislation, and so on. Here, students master strategies for bringing their materialized "products" to the market and their scalability. Familiarity with global trends and approaches helps adapt ideas to international standards and market requirements.

Interactions with foreign experts and graduates opens endless benefits. Here the complex of skills and abilities that were painstakingly laid down at each passing level will be manifested.

Analysis of achievements and constraints to increase program effectiveness

Table 2 describes the evolution of projects to develop entrepreneurial thinking and behavior in KARE since its inception in 2014. Table 3 shows the dynamics and trends of the results obtained over the last five years. It can be seen that after a significant drop in activity associated with the onset of the pandemic, the ecosystem managed to adapt, return to dynamic growth, and exceed pre-crisis indicators, which indicates the continued interest of students in the entrepreneurship track. Graduates of the Center have developed 24 successful products and files 58 patents. Two biomedical companies stand out in particular: LivVolta Healthcare Innovations (founded 2019) and PSM Enterprise (2021). The first develops production technologies, the second uses them to manufacture health and fitness products.[2] Both enterprises have gained stable positions on the national market.

[2] For example, a portable electric muscle stimulation belt.

Table 2. **Creation of entrepreneurship support centers**

Initiatives	Starting year of study	Contents
Innovation and Entrepreneurship Development Center (IEDC)	2014–2015	Pre-Incubation, Prototype Development, Training
Kalasalingam Technology Business Incubator (KTBI)	2017–2018	Incubation Space, Seed Fund, Company Formation
Institution Innovation Council (KARE-IIC)	2018–2019	IPR and I&E Training, NISP, ARIIA
Science Technology and Innovation Hub	2019–2020	Improve the socio-economic status of SC population through Technology and Products
ACIC-Kalasalingam Innovation Foundation (ACIC-KIF)	2020–2021	Promote economy and employment, and enable community-oriented innovations
MSME Championship	2021–2022	MSME Champion Scheme – Recognised Incubator
Startup India Seed Fund Scheme (SISFS)	2022–2023	Financial assistance to startups for proof of concept, prototype development, product trials, market-entry, and commercialization

Source: authors.

Table 3. **Chronology of activities implemented in the last five academic years**

Time Period	Number of Activities	Description
2019–2020	70	The year started strong, marking a vibrant and active ecosystem.
2020–2021	53	There was a notable decrease in activities, likely due to the COVID-19 pandemic, which affected in-person events and engagements.
2021–2022	55	A slight rebound occurred as the ecosystem adapted to the changing circumstances.
2022–2023	69	A significant rise in activities demonstrated the resilience and recovery of the ecosystem.
2023–2024	72	The highest recorded activities, indicating a thriving environment and successful implementation of innovative strategies.

Source: authors.

If we talk about the factors that hinder the increase in the effectiveness of the program, then one of the main problems is attracting funding from the state and other sources. This can become a demotivating factor for both students and their environment (primarily parents). Often, they are not even aware of these opportunities, or are hesitant to take advantage of them, or when faced with difficulties when applying for grants, they retreat. Therefore, the program pays close attention to informing students about existing funding options and assisting them in completing and submitting applications for funds.

Teachers play a key motivating and mentoring role, but at the initial stage it can be difficult to implement due to lack of time and varying degrees of initial motivation among students.

Furthermore, a significant deterrent is the influence of many parents who tend to encourage their children to pursue traditional careers. Entrepreneurship in their eyes is too risky an activity with unstable income. Naturally, this imposes certain barriers. However, this factor can also be eliminated with the help of special consultations for both students and parents.

In solving the identified problems and significantly increasing the effectiveness of training programs, a key role is played by resource support strategies and the formation of a favorable environment of cooperation between teachers, students, and their immediate social environment, which is relevant not only for the case under consideration, but also in other contexts.

Conclusion

The topic of the formation of a specific aspect of human potential shaped by entrepreneurship is acquiring new significance on a global scale. It is with it that the prospects for the dynamic development of the economy and national welfare in a changing environment are linked. Relying on an appropriate arsenal of knowledge, competencies, progressive tools, approaches, and practices will allow graduates of university EET programs to produce worthy results in complex entrepreneurial ecosystems (at the national and global levels).

This article attempts to analyze the emerging landscape of research on entrepreneurial education, its dynamics, and nascent processes that require the revision and adjustment of educational programs taking into account many factors. Among them are the transformation of traditional business models of companies and their adaptation to the complex rules of the game in the global entrepreneurial ecosystem.

The scanning of publications on the topic under consideration has revealed a number of directions that have been voiced earlier, but in recent years have gained increased relevance. The most extensive cluster of publications is built around the thesis that univer-

sities should move from formal education (rooted in tradition, in place for a long period of time, but poorly suited to modern realities) to a creative, hybrid approach combining different formats and learning styles.

A significant number of works cover the problems of limited training in innovation creation processes. Due to the formalism dominating most cultural contexts in the contacts between universities and real businesses, EET programs ignore the full nature of this activity. It overlooks its discrete and "dark" sides, dealing with which requires special training and many non-obvious aspects.

Another vast field of research is devoted to unlocking students' inner potential, developing entrepreneurial thinking and behavior through previously untouched underlying cognitive dimensions. The subtle connections and mechanisms of the formation of such drivers of success as motivation to overcome difficulties, the will to achieve in particularly challenging contexts, the phenomena of entrepreneurial intention and entrepreneurial vigilance (thanks to which hidden opportunities are discovered) are being studied. Their discovery in practice is made possible by the application of the concept of "complex learning environments" in EET. Through the lens of new interdisciplinary knowledge, the entrepreneurial mindset looks like an asset that can be mastered and developed. This corrects the previous notion that entrepreneurs are inherently endowed with a specific talent. The new narrative suggests the opposite - "entrepreneurs are not only born, but also become entrepreneurs". This thesis is well illustrated by the case of KARE Academy in India, which trains entrepreneurs and adapts them to entrepreneurial ecosystems of different levels and complexity. The design of the four-year entrepreneurship education here is centered on the key objective of creating and strengthening in students' thinking a holistic view of reality, an understanding of the value of "lifelong learning", the courage to act globally, to build upon existing networks and create new ones. A sequential process of ascending through a hierarchy of external and internal complexity to an expanding diversity of possibilities is presented. KARE offers a new type of EET program that enables students to progressively ascend to increasingly complex levels of entrepreneurial ecosystems and, using the competencies acquired, to operate effectively at any of them.

In conclusion, there are a number of promising areas of work to ensure that EET programs realize their full potential and remain relevant in changing contexts.

Longitudinal studies are needed to assess the long-term effects of such programs on the career trajectories of graduates and their contribution to societal development. A deeper study of cultural specificity in EET will provide a better understanding of its impact on attitudes toward entrepreneurship, entrepreneurial behavior, and the performance of graduates from different backgrounds. The integration of emerging technologies, such as generative AI, into training programs is to be evaluated.

Policy concepts and regulatory frameworks governing EET should be further analyzed to identify ways to improve them. Relevant criteria are needed to assess the effects of EET programs, including economic, social, and environmental indicators.

The implementation of the above-mentioned set of measures should contribute to building a critical mass of human potential in the new conditions and maximizing opportunities for socioeconomic development.

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