Roadmap for Competency Development in Entrepreneurship Education: An Action Research*

*Milica Jovanović, Jelena Anđelković Labrović, Ivana Kužet, Jasna Petković***

Abstract

The paper outlines a multidisciplinary approach to entrepreneurial education by providing a framework for the development of entrepreneurial competencies in higher education. It entails devising a roadmap for the development of soft and technical skills of an entrepreneur using technology entrepreneurship and human resource management tools. The approach was designed and tested through action research, in two cycles, with two generations of students at an Eastern European university. The results imply that the framework provides insights for curriculum enhancements and that the model successfully fosters creativity, idea validation, and teamwork. The model can be applied beyond business education in diverse educational domains.

Keywords: entrepreneurial education, entrepreneurial competencies, human resource management, technology entrepreneurship, lean startup, team canvas
JEL Codes: I23, L26, O15

1. Introduction

Human resource management (HRM) is becoming increasingly important for creating a sustainable organization and offers great potential for developing entrepreneurial mindset and competencies (Castrogiovanni/Urbano/Loras 2011). Entrepreneurial mindset is an important concept in entrepreneurship and entrepreneurial education and refers to a specific way of thinking, acting, and feeling entrepreneurial opportunities and challenges (Kuratko/Fisher/Audretsch 2021). Rauch and Hulsink (2015) highlight that an entrepreneurial mindset goes beyond starting a business, but also encompasses a set of attitudes and behaviours that can be cultivated and applied in various contexts. Daspit et

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al. (2021) gave a comprehensive overview of the concept of entrepreneurial mindset and offered an integrated definition explaining that "*Entrepreneurial mindset is defined as a cognitive perspective that enables an individual to* ***create value*** *by* ***recognizing and acting*** *on opportunities,* ***making decisions*** *with limited information, and remaining* ***adaptable and resilient*** *in conditions that are often uncertain and complete*".

HRM and entrepreneurial activities are close-knit. Zehir/Gurol/Karaboga/Kole (2016) claim that entrepreneurial orientation positively affects both a company's financial performance and an employee's performance within a company. Recent studies emphasize the specificities of HRM practices in entrepreneurial ventures (see e. g., Hubner/Baum 2018; Moustaghfir/Fatihi/Benouarrek 2020; Orakwue/Iguisi 2020; Nikam/Lahoti/Ray 2023).

Entrepreneurship education has emerged as a crucial component in preparing individuals to thrive in a global landscape characterized by rapid technological advancements, dynamic market trends, and an innovation-led society. It can enhance the capabilities and skills of students, leading to greater self-reliance and enabling them to establish new businesses more effectively (Galvão/Marques/Ferreira 2020). Societal and economic benefits of entrepreneurship require ever-evolving entrepreneurial education practices (Ratten/Usmanij 2021). Entrepreneurship education should develop the entrepreneurial mindset of students (Wardana/Narmaditya/Wibowo/Mahendra/Wibowo/Harwida/Rohman 2020; Jiatong/Murad/Bajun/Tufail/Mirza/Rafiq 2021), it requires practical approaches (Bell/Bell 2020; Lackéus 2020; Anwar/Abdullah 2021), insists on multidisciplinarity (Mavlutova/Lesinskis/Liogys/Hermanis 2020; Huang-Saad/Bodnar/Carberry 2020), enhances the capabilities of students (Lee/Kreiser/Wrede/Kogelen 2018; Galvão et al. 2020; Shah/ Amjed/Jaboob 2020) and may enable students to establish new businesses more effectively (Kim 2023; Dalziel/Basir 2024).

Although the importance and impact of startups on the economy and the necessity of entrepreneurial education are unquestionable, there are many questions about the effectiveness of traditional educational practices on entrepreneurial performance. Shenkoya, Hwang and Sung (2023) research shows that traditional theoretical entrepreneurship courses have no significant effect on the success of student startup ventures. However, other classroom approaches – simulation games and experiential practical activities are highly correlated with students' entrepreneurial intentions and performance (Olokundun/Moses/Iyiola/Ibidunni/Ogbari/Peter/Borishade 2018; Pradubthong/Petsangsri/Pimdee 2019; Zulfiqar/Sarwar/Aziz/Ejaz Chandia/Khan 2019).

An extensive literature review and the authors' practical experience showed there is a lack of multidisciplinary educational approaches that foster entrepreneurial spirit among students. Firstly, there is a need for additional prac-

tical educational approaches that can develop specific entrepreneurial skills. Secondly, the complex nature of entrepreneurship requires a holistic approach, recognizing that successful entrepreneurs are not only capable of identifying opportunities and managing risks but also possess a diverse set of skills spanning creativity, critical thinking, communication, and teamwork.

Multidisciplinary educational approaches have a rising impact on learning experiences (Crnkovic/Aleksic-Maslac/Jerkovic 2006; Thana/Adiatma/Ramli 2022). These approaches integrate knowledge and tools from multiple disciplines to address different teaching domains and improve the understanding of complex problems (Selhorst-Koekkoek/Rusman 2023). For example, Banerjee et al. (2020) integrate mechanical and industrial engineering technologies with approaches from business and IT to improve students' problem-solving skills and entrepreneurial intentions. Multidisciplinary approach to education has shown its effectiveness in medical education (Bismala/Manurung/Andriany/Siregar 2022), engineering education (Jacques/Bissey/Martin 2016; [7] Banerjee/Zgalai/Boukareva 2020), natural sciences (Nagamani/Lakshmi/Sailaja 2023). Furthermore, some authors perceive it as a holistic approach that observes various perspectives of domain education – it combines domain education with business management and entrepreneurship topics (Crnkovic et al. 2006; Weber/Englehart 2011; Nagamani et al. 2023).

The objective of this paper is to provide a roadmap for creating a multidisciplinary approach to competency development in entrepreneurship education by: 1) identifying targeted entrepreneurial competencies, 2) implementing tools for developing entrepreneurship competencies, 3) assessing students' performance, and 4) identifying possible room for improvement of the approach. The paper proposes a roadmap for developing entrepreneurship competencies in higher education with a particular emphasis on human resource skills: teamwork, leadership, conflict resolution, understanding and using benefits of diversity, as well as presentation and communication skills. This approach was designed and tested trough action research in two cycles with two generation of students.

2. Literature review

2.1 Entrepreneurial education

Entrepreneurial skills, competencies, and orientation highly affect performance of both established companies and startups (Moustaghfir et al. 2020; Galvão et al. 2020). Entrepreneurial education has an important role in developing entrepreneurial mindset and skills (Boocock/Frank/Warren 2009; Aly/Audretsch/Grimm 2021; Coyle, 2022). Thus, recent years have seen a growing number of entrepreneurship modules in higher education, international conferences, published articles and books (Henry/Lewis 2018) covering different topics in entrepreneurial education and its diverse objectives. Hubner and Baum

(2018) emphasize the role of human resources development in entrepreneurial ventures and accentuate it as a competitive advantage.

According to Moberg et al. (2012) entrepreneurial education includes "content, methods and activities supporting the creation of knowledge, competencies and experiences that make it possible for students to initiate and participate in entrepreneurial value creating processes" (Moberg/Stenberg/Vestergaard 2012). Many studies have shown that the main goal in entrepreneurial education is to develop entrepreneurial competencies among students (Jiang/Xiong/Cao 2017; Byun/Sung/Park/Choi 2018) by teaching them theoretical and practical aspects of setting up and running a business (European Commission 2016), but also to develop personal competencies such as initiative and creativity, entrepreneurial consciousness and thinking (Jones/Iredale 2014). Athayde suggests that successful entrepreneurs have competencies and attributes which are derived from entrepreneurial education (Athayde 2009). The link between entrepreneurial education and successful entrepreneurial competencies development is presented in many studies (Lai/Lv/Jiang 2015; Kristová/Malach 2017; Potishuk/Kratzer 2017). Studies go further by exploring how entrepreneurial education is linked with company performance through entrepreneurial competencies (Minai/Raza/bin Hashim/Zain/Tariq 2018). Thus, entrepreneurial educators should continue to evolve, promote, and encourage their graduates even after graduation (Bauman/Lucy 2021).

Entrepreneurial education requires innovative approaches, switching from traditional, content-based, passive and single-oriented teaching, to entrepreneurial teaching, which is more active, competency-based, project-centric, collaborative, experiential and multidisciplinary (Kirby 2004). The responsibility for developing competencies in learners is increasingly laid onto educational institutions (Child/Shaw 2020). Since the focus in entrepreneurial education is the development of entrepreneurial competencies, Sutanto and his colleagues suggest implementation of competency-based education and training in entrepreneurship education (Sutanto/Kodrat/Christiani 2021). Competency-based education (CBE) has existed since the early 1970 s, but in recent years, with more focus on competency development, this approach has gained in popularity (Burnette 2016) making it the fastest growing model in higher education. The focus is on assessment and development of students' competencies (Cunningham/Key/Capron 2016), but besides that a full range of supporting learning goals must be articulated, ordered, and located within the educational process (Curry/Docherty 2017). It is important how the teacher structures learning, what its purpose is and how it is defined to students, the way every class is integrated in the course, while keeping all instructions in line with learning objectives (Gervais 2016). In CBE, the assessment mode is also important, since the students are assessed on what they know and how they perform, rather than how much time they spend in a classroom (Ordonez 2014). Sturgis and colleagues suggest that the advantages

of CBE are that "competencies include explicit, measurable, transferable learning objectives, assessment is meaningful and a positive learning experience for students, students receive support based on their individual learning needs, and learning outcomes emphasize competencies that include application and creation of knowledge, along with the development" (Sturgis/Patrick/Pittenger 2011). Also, there is evidence form practice on how employers view employees who followed CBE programs (Henrich 2016). Henrich highlights how much employers value collaboration with colleges since the quality of the curriculum and the firsthand experience students gain helps them solve real-life problems. For a successful implementation of entrepreneurship education and CBE, all stakeholders – the student, teachers and community partners – must collaborate and support each other through constructive feedback (Johnstone/Soares 2014). Specifically, hands-on entrepreneurship courses are one of the key factors affecting the profitability of student startup companies (Shenkoya/Hwang/Sung 2023).

2.2 Entrepreneurial competencies, frameworks, and models

Competencies can be defined as a set of observable and measurable 'attributes' required for individuals' effective work performance, and include knowledge, skills, abilities, values, personal traits, and motives (Boyatzis 1982; Wong 2020). They can be expressed as behaviours that an individual needs to demonstrate, or as minimum standards of performance, or defined level of proficiency (Chacko 2014). In that way, we can define entrepreneurial competencies as a set of skills for problem-solving and decision-making, positive social attitudes, knowledge for innovation, personal traits as creativity, leadership, and the ability to explore and seize opportunities (Crespí/Queiruga-Dios/Queiruga-Dios 2022). Entrepreneurial competencies are a specific group of competencies that are necessary for successful entrepreneurship and the main strategic elements which make companies and startups more successful (Mitchelmore/Rowley 2010).

Researchers tried to categorize entrepreneurial competencies, to better explain which skills, attitudes, and abilities they include. Silveyra grouped entrepreneurial competencies in four categories: entrepreneurship, management and business, human resources, and interpersonal skills (Silveyra/Herrero/Pérez 2021). Tittel and Terzidis categorized them as domain-specific competencies (which include management competencies, organizational and communication skills) personal competencies, and relational competencies (Tittel/Terzidis 2020). Duening et al. (2015) list five crucial skills of entrepreneurial expertise: 1) creating value, 2) lean startup method, 3) consumer discovery and product validation, 4) business model canvas, 5) entrepreneurial method. Lackéus (2014) puts emphasis on cognitive entrepreneurial competencies, based on intellectual skills, and non-cognitive entrepreneurial competencies, which include firsthand experiences. Karcsics and Szakács (2010) explain the importance of personality

traits of entrepreneurs, putting focus on leadership skills, good adaptation skills and a strong ability to shape social relations. Soft skills play a great role in entrepreneurship, as six of 20 reasons for startup failure are people-related (CBInsights 2021): burnout, lack of passion, poor networking skills, unsuitable team, lack of focus, poor team management skills.

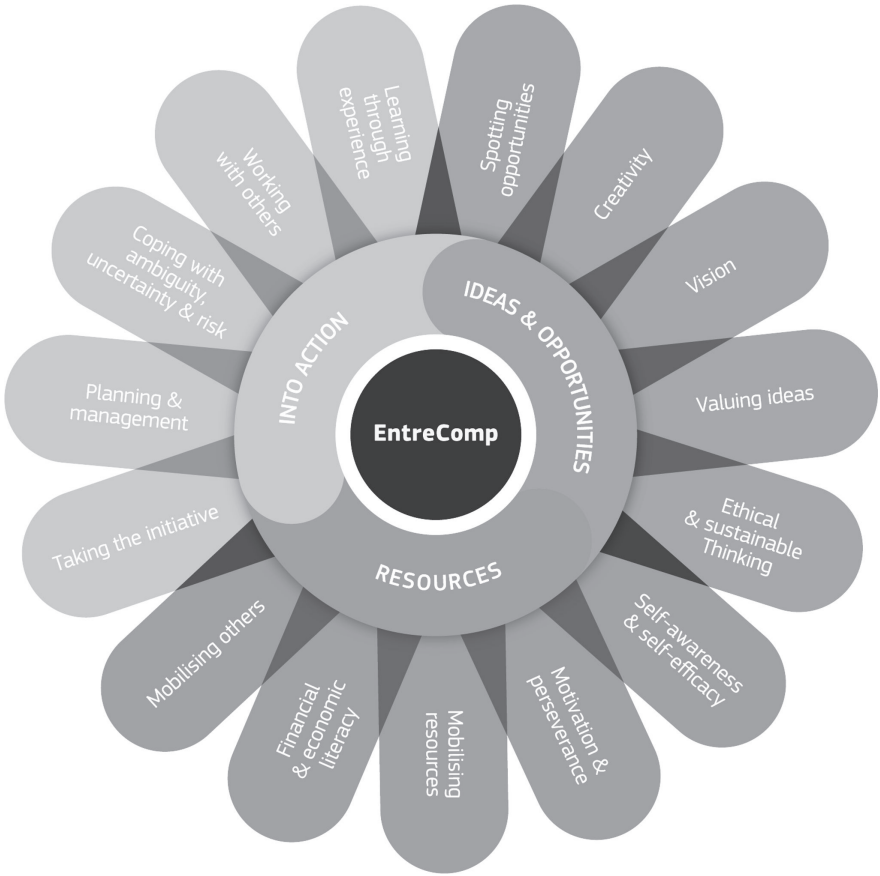

Figure 1: Entrepreneurship Competence Framework (Bacigalupo et al. 2016)

Competencies can be organized through frameworks and models. Competencies frameworks and models represent a list of competencies that are expected for specific job positions or industry. Frameworks and models should integrate job related characteristics, the organizational context, and personal characteristics of an individual, with the aim to provide the best performance (Abdul Hamid/Sentosa 2012). Cooper defines a competency model as a "collection of competencies and standards of performance establishing qualifications for a specific job position" (Cooper 2000). Lucia and Lepsinger (1999) suggest that a competency

model can be used as a descriptive tool that helps a business to meet its strategic objectives. There are already developed competency models and frameworks for entrepreneurial competencies. Amini and colleagues in their meta-analysis identify 42 entrepreneurial competencies (in the health care sector), and develop a framework that has five main dimensions, including communication competencies, personal competencies, managerial competencies, social competencies and health professional entrepreneurial competencies (Amini/Arasti/Bagheri 2018). The European Commission provides a comprehensive framework of entrepreneurship competencies (Figure 1) with the aim to unite education, work, and civic engagement in entrepreneurship (Bacigalupo/Kampylis/Punie/Van den Brande 2016).

Competency frameworks and models can be developed for a variety of purposes, including professional practices and educational processes. Numerous education programs have defined learning outcomes based on competencies that students should develop. The problem arises when those competencies are not defined through comprehensive competencies frameworks and properly delivered across all courses. Shankararaman and Ducrot (2016) suggest a mode of applying a competency framework in education, connecting it with the content of the course and making it more approachable to students. Competencies and models should be aligned with job functions, so industry leaders could help educators to define competency models, and integrate such knowledge, skills, and attitudes into the learning experiences (Ford/Meyer 2015). Despite a high number of frameworks and models developed for different job positions, there is a lack of organized frameworks, variability in methodology for frameworks development, inconsistency in reported results and lack of evaluation of frameworks (Batt/Williams/Rich/Tavares 2021).

2.3. Competency development and the learning process

John Dewey (1938), a renowned American educational theorist, emphasized the experiential aspects of learning. He advocated that learning takes place through individual experiences, lifelong learning, and the way of thinking acquired through education. Dewey (1938) emphasized that the human intellect grows when challenged by problems and dilemmas. The role of education is not to completely satisfy a student's preferences or to impose a curriculum that disregards a student's individual traits. Dewey listed that learning and research cannot be scheduled and that students need time to pursue their own questions and investigations. Therefore, students should be challenged through questions, discussions and suggestions and encouraged by parents, teachers, and peers.

David Kolb (1984) gave the most complete theoretical basis for experiential learning. Kolb asserted that not every experience results in learning; for experience to transform into learning, it must be processed. The essence of Kolb's ex-

periential learning theory is the explanation of the process by which experience is transformed into learning. Kolb's model is based on the experiential learning cycle that has four basic phases (Figure 2): 1) Concrete Experience, 2) Reflective Observation, 3) Abstract Conceptualization, and 4) Active Experimentation.

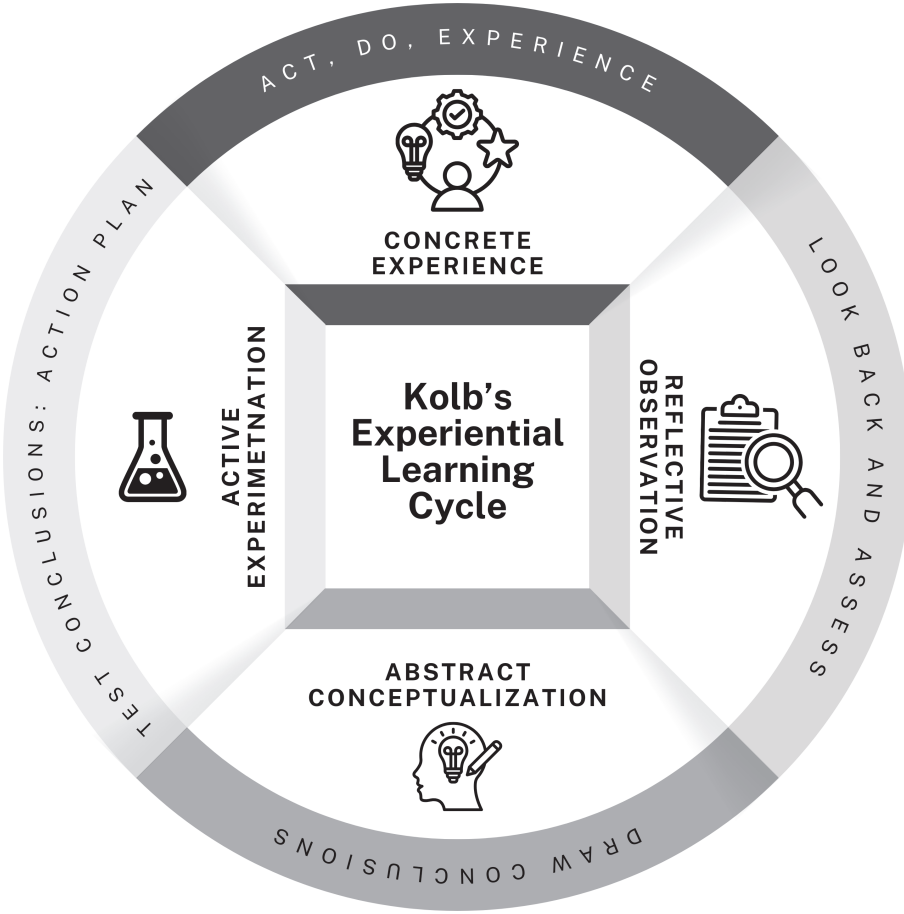

Figure 2: The Kolb's Experiential Learning Cycle (Adapted from Toronto MU (n.d))

Learning from experience is also a foundation of Revans' (1982) Action Learning theory. Action Learning is a problem-solving approach that involves acting and reflecting on the outcomes. This method aims to enhance the problem-solving process and create more straightforward solutions. It is a cycle of "doing" and "reflecting" stages. In most forms of action learning, a coach is included and responsible for promoting and facilitating learning, as well as encouraging the team to be self-managing. The Action Learning process includes: 1) an important and often complex problem; 2) a diverse problem-solving team; 3) an

environment that promotes curiosity, inquiry, and reflection; 4) a requirement that talk be converted into action and, ultimately, a solution; 5) a collective commitment to learning.

When designing the learning process, it is crucial to investigate the importance of creativity in selecting and implementing appropriate educational and training methods. Creative methods and techniques disrupt stereotypical thinking and lead to surprising, original solutions. They foster freedom, novelty, openness, creative observation, flexibility, divergent thinking, rich emotional and intellectual experiences, and tolerance (Milosavljević/Mijanović 2011, p. 8). Common to creative methods and techniques in education is the emphasis on thinking outside established patterns, developing imagination, generating new ideas, and considering different points of view (Milosavljević/Mijanović 2011, p. 27).

The competency development model proposed in this paper builds on these concepts, emphasizing the importance of experiential and action learning. It posits that students can develop entrepreneurial competencies through hands-on experience in entrepreneurship education. Within the suggested model, creative methods such as creating startup projects, help students go through concrete experiences, reflective observation, abstract conceptualization, and active experimentation, thereby enhancing their entrepreneurial skills. Additionally, students are challenged to solve concrete problems in diverse teams and design and present potential solutions to these problems.

2.4. Developing entrepreneurial competencies in higher education

In higher education settings, the predominant approach to fostering competency development often involves lectures delivered by subject matter experts, facilitated discussions on pertinent topics, and interactive workshops featuring case studies that present real-world business challenges (Minniti/Bygrave/Autio/Arenius 2017). Researchers have demonstrated that certain educational methodologies yield superior outcomes in developing entrepreneurial knowledge, competencies, and experiences. For instance, simulation methods allow students to engage in activities mirroring authentic scenarios, encouraging them to experiment without fear of failure, thereby facilitating deeper understanding and competency development (Davies 2002; Shin/Sok/Hyun/Kim 2015). Moreno-Guerrero et al. (2020) highlight additional benefits such as skill enhancement and the cultivation of positive attitudes such as responsibility, self-regulation, and self-efficacy. Furthermore, studies by Walters et al. (2017) underscore the efficacy of simulation techniques in enhancing participants' knowledge, motivation, and competencies. Chernikova et al. (2020) extend these findings by demonstrating that simulation-based learning contributes to the development of complex skills across diverse domains.

Apart from simulations, collaborative teamwork and project-based learning significantly contribute to entrepreneurial competency development through knowledge sharing among team members (Smirnov 2023) and deeper learning experiences (Weber/Funke 2012; Harms 2015; Lackeus 2020). Teamwork significantly contributes to the initial stages of business ideation and planning, since collaboration fosters idea generation, decision-making, and problem-solving skills necessary for developing innovative business models (Knipfer/Schreiner/Schmid/Peus 2018). The Team Canvas is a tool that supports essential aspects of teamwork, and helps teams to set a clear purpose, common and personal goals, values, roles, activities, strengths, and weaknesses (Ivanov/Voloshchuk 2015). It is used as a collaborative tool designed to foster transparency and mutual understanding, while enhancing cohesion work towards common goals (Benson/Dresdow Huffman 2021).

Moreover, university support centres play a crucial role in nurturing students' entrepreneurial competencies, emphasizing characteristics such as active experimentation, authenticity, social interaction, sense of ownership, and resolution support (Man 2019). Ho et al. (2021) emphasize the pivotal role of educators in fostering entrepreneurial abilities through their behaviours and support structures within educational institutions. Additionally, exposure to experienced entrepreneurs who share expertise in problem-solving and business development planning positively impacts students' skills and capabilities (Smirnov 2023). These findings underscore the diverse and impactful educational approaches that effectively cultivate entrepreneurial competencies among university students.

Adaptability is one of the main entrepreneurial competencies that should be addressed in the entrepreneurial orientation (Mojab/Zaefarian/Azizi 2011). One of the most used approaches in early phase startup development is the Lean Startup methodology (Bortolini/Nogueira Cortimiglia/Danilevicz/Ghezzi 2021). Eric Ries developed the Lean Startup methodology to present a startup development approach that focuses on rapid iteration, minimal waste (expenses), and validated learning process (Reis 2011). Lean Startup process is based on: 1) creating a minimum viable product (MVP) – product that has sufficient features to be used and tested by customers; 2) testing the product with customers – early adopters, gathering their feedback, and 3) making data-driven decisions to improve the product. These three steps are known as *Build-Measure-Learn loop* that fosters a culture of continuous innovation. Overall, the Lean Startup methodology provides a systematic approach for startups to launch products efficiently, validate their business ideas, and accelerate their path to success by focusing on customer needs and feedback. Stagars (2015) emphasizes that the Lean Startup is the "ideal approach" in the world of university startups and spin-offs, which helps them validate their idea quickly, and make market-driven changes.

Devising a business model and a successful presentation for the investors is of essential importance for entrepreneurs (Mojab et al. 2011). Entrepreneurial practice offers model canvases as tools for concise presentation of the business models. Although Osterwalder's Business Model Canvas is one of the most used tools for business modelling, Lean Canvas is a strategic tool that is more suitable in early development phases. Maurya (2009) adapted Business Model Canvas to better suit the Lean Startup methodology and provide a more agile customer-centric approach to business development. Link (2016) emphasizes that the Lean Canvas is a valuable tool for student startup teams that seek early customer feedback and work in interdisciplinary teams.

3. Methodology

The roadmap presented in the paper is a two-level multidisciplinary approach consisting of: 1) the framework for model development based on the action research approach, and 2) the implementation of the model for entrepreneurial competency development.

Action research is the most effective, immediate, and natural way of simultaneously changing and adapting (improving) educational practice. It naturally checks or analyses the methods, forms, means of teacher's work or some other educational issues (Kundačina/Banđur 2004, p. 89). The main purpose of pedagogical action research is the systematic research of teaching/learning to facilitate practice, with the dual goal of 1) improving that practice, and 2) contributing to theoretical knowledge for the benefit of the students' learning process (Norton 2009, p. xvi). The spiral flow of action research is evident in the completion of research tasks, which take place through multiple cycles. Steps that are similar are repeated in an analogous order in different phases of an action research. It leads to fine-tuned results based on the previous activities and research. The cyclical nature of action research enables rapid response by participants – the previous cycle is used to decide how to proceed in later cycles. The most crucial step in each cycle is critical reflection on previous outcomes, leading to increased understanding and planning of next steps. The most frequently mentioned model in action research (see Figure 3) was proposed by Kemis and Mctaggart (1988) consisting of the following four steps: planning, action, observation, and reflection (Kundačina/Banđur 2004, p. 132). The initial stimulus is always a real problem or reality that is perceived as unsatisfactory (or even as a crisis), and the first step of research is usually determining research/action goals and planning immediate action. The action is followed by observation (data collection), which forms the basis for critical reflection (interpretation of observation data), i. e. validation of the action. Evaluation provides the basis for plan corrections, new actions, and further repetition of the cycle (Pešić 1998).

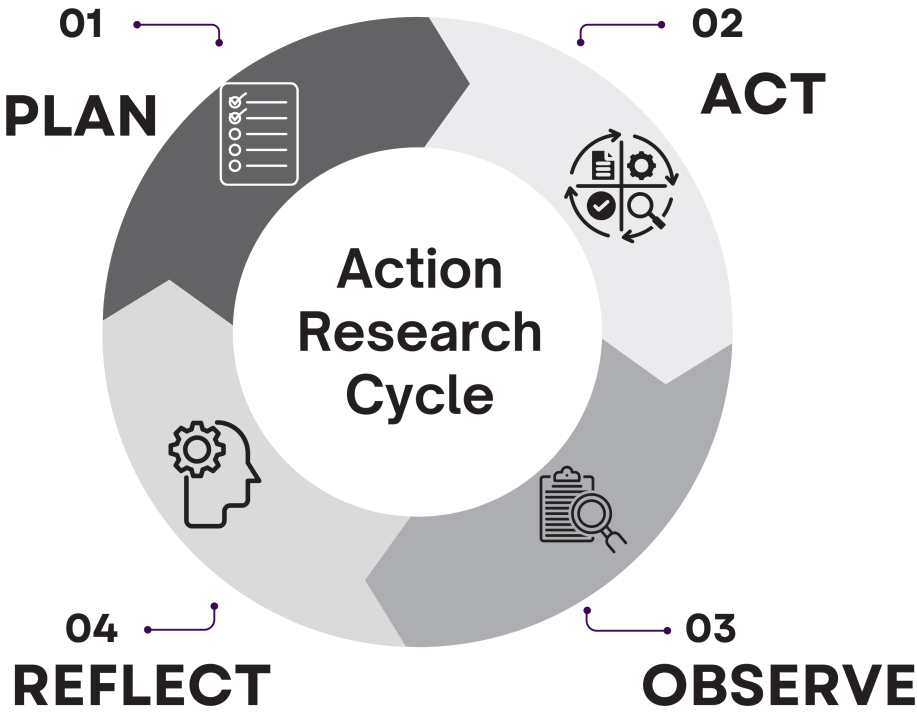

Figure 3: The action research spiral: model of the process of action research according to Kemmis and Mctaggart (McNiff 2013)

The essence of action research is that it is an iterative and ongoing process. The research in this paper was conducted in two cycles and every cycle was implemented through four phases: planning, action, observation, and reflection.

With the aim to use the entrepreneurship competency model and introduce a multidisciplinary approach to competency development in entrepreneurship education, in the first cycle we analysed previously proposed methodologies for the development of competency models and implementation in entrepreneurial education process (Ford/Meyer 2015; Olshanska/Gumennykova/Bila/Orel/Perova/Ivannikova 2019; Batt/Williams/Rich/Tavares 2021). Based on the literature review, we structured our approach as *Roadmap for entrepreneurship competency development*, presented in Figure 3. Five steps of the model were aligned in four phases of an action research (Table 1): 1) In the *Planning* phase we selected Entrepreneurship Competence Framework (Bacigalupo et al. 2016). Based on this framework we selected which competencies will be developed during the course and we chose appropriate tools. All tools and methods for competency development were arranged as items in a roadmap for entrepreneurship competency development. 2) *Action* phase considered implementation and testing of the proposed Roadmap through the delivery of the postgraduate course

Human resources and Technology Entrepreneurship in academic years 2022/23 and 2023/24 at the University of Belgrade, Faculty of Organizational Sciences. Students had a task to submit a project-based assignment consisting of four segments: Lean Startup methodology, Lean Canvas, Team Canvas, and Pitch presentation. 3) *Observation* phase analysed the results of student performance. Teachers assessed students' performance based on how successfully they prepared and presented the results of Lean Startup methodology, Lean Canvas, Team Canvas, and Project pitch. This phase should provide insights on how successful students were in adopting and developing targeted competencies. Based on their performance (assignment results) teachers will get feedback on curricula improvements. 4) Upon this analysis, in the *Reflection* phase, we should check whether the next cycle of the research (next generation) requires interventions based on the learning process. The teaching process could then be repeated using the updated roadmap.

Based on the action research approach and specific tools for technology entrepreneurship and HRM practices, we created the Roadmap for entrepreneurship competency development, presented in Figure 4.

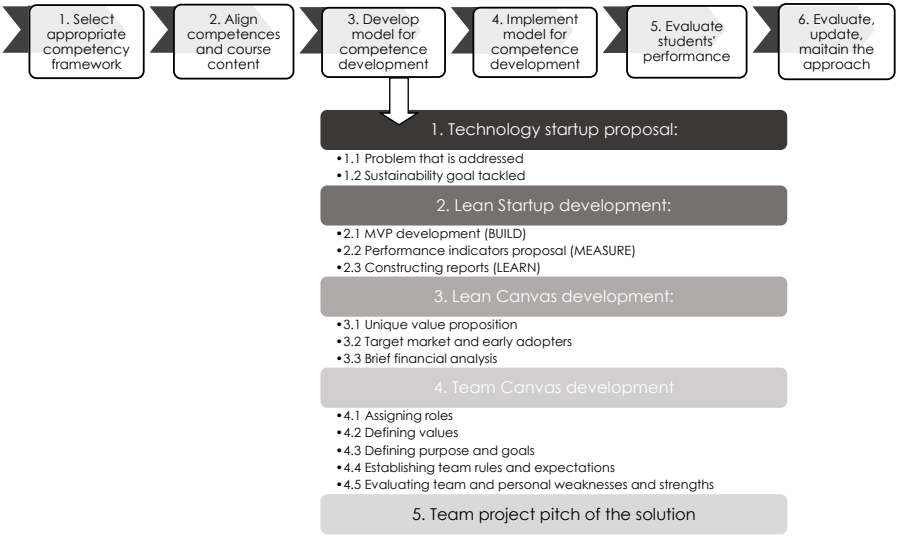

Figure 4: Roadmap for entrepreneurship competency development

The roadmap is a two-level hierarchy process. The first level steps serve to develop and regularly update the delivered method for competency development through action research steps explained in Table 1.

Table 1: Action research phases

Action research phases	Method/model steps	Action research implementation – Cycle I – generation 2022/23	Action research implementation – Cycle II – generation 2023/24
Planning	1. Select appropriate competency framework 2. Align competencies and course content 3. Design methods, tools, and techniques for competency development	1. Entrepreneurship Competence Framework (Bacigalupo et al. 2016) 2. Select competencies and tools for their development 3. Create a roadmap as a 5-step method with tools for competency development	1. Same 2. Same 3. Roadmap with interventions
Action	4. Implementing designed methods, tools, and techniques in class	4. Implementing designed Roadmap in class in the course *Human resources and Technology Entrepreneurship in 2022/23*: 43 students in 11 teams	4.1. Implementing teaching interventions 4.2. Implementing designed Roadmap in class in the course *Human resources and Technology Entrepreneurship in 2023/24:* 24 students in 6 teams
Observation	5. Evaluate students' performance	5. Presenting student performance	5. Presenting student performance
Reflection	6. Evaluate, revise, update this approach	6. Evaluating student performance and suggesting model improvement	6. Evaluating student performance and suggesting model improvement

Step 3 suggests the development of a model for competency development, and it depends on the subject that is being considered for competency development. The model presented in Figure 4 is a multidisciplinary approach that combines HRM and technology entrepreneurship tools. The first step of the method is a technology startup proposal, where a team of students has to target a specific problem they are addressing. Additionally, they need to specify to what sustainable development goal they will contribute with the proposed solution. The second step is to apply the Lean Startup method – propose a minimal viable product (MVP), create performance indicators for the evaluation of the startup success, and appropriate reports that will provide insights for further development. The third task is to create Lean Canvas (Appendix 1) to summarise the business model of the startup. To address teamwork and emphasise the role of people in the startup, students have to develop Team Canvas (Appendix 2). Finally, the last step of the approach is to present a solution to the panel of teachers followed by a Q&A session.

Table 2 matches targeted competencies from the competency framework (Figure 1) and tools used in the applied method for competency development (Figure 3). The proposed approach tackles 13 out of the 15 listed competencies.

Table 2: Targeted competencies and tools for competency development

Competency	Targeted	How is the competency developed
Spotting opportunities	Yes	1.1 Technology startup proposal: problem that is addressed
Creativity	Yes	2.1 Lean Startup: MVP development
Vision	No	
Valuing ideas	Yes	2.3 Lean Startup: Constructing reports 3.1 Lean Canvas: Unique value proposition 3.2 Lean Canvas: Target market and early adopters
Ethical & Sustainable Thinking	Yes	1.2 Technology startup proposal: Sustainability goal tackled
Taking the initiative	Yes	1. Technology startup proposal
Planning & management	Yes	2.2 Lean Startup: Performance indicators proposal 2.3 Lean Startup: Constructing reports 3.2 Lean Canvas: Target market and early adopters
Coping with ambiguity, uncertainty & risk	Yes	4.5 Team Canvas: Evaluating team weaknesses and strengths
Working with others	Yes	4. Team Canvas development
Learning through experience	Yes	All steps
Financial & economic literacy	Yes	2.2 Lean Startup: Performance indicators proposal 3.3 Lean Canvas: Brief financial analysis
Mobilising others	Yes	4. Team Canvas development
Mobilising resources	No	
Motivation & perseverance	Yes	4.3 Team Canvas: Defining purpose and goals
Self-awareness & self-efficacy	Yes	4.1 Team Canvas: Assigning roles 4.5 Team Canvas: Evaluating team and personal weaknesses and strengths

The Entrepreneurship Competence Framework describes in detail the level of each competency (knowledge, skills, and abilities) that can be achieved (see Bacigalupo et al. 2016, p.18). The authors defined three levels of proficiency through learning outcomes: *Foundation*, *Intermediate,* and *Advanced* and their descriptors are provided in Table 3. For example, for competency *Spotting opportunities* descriptors are (Bacigalupo et al. 2016, p.18):

– Foundation level: *Learners can find opportunities to generate value for others*,
– Intermediate level: *Learners can recognize opportunities to address needs that have not been met*, and
– Advanced level: *Learners can seize and shape opportunities to respond to challenges and create value for others.*

This model is based on the principles of Bloom's taxonomy, and we will use it further to assess the level of developed competency on a 10-point scale, where scores 1–3 describe the Foundation level, 4–7 describe the Intermediate level, and scores 8–10 signify the Advanced level of developed competencies.

The model was implemented twice:

1) February 2023 for master level postgraduate students in the course *Human resources and Technology Entrepreneurship* for 43 students grouped into 11 teams.
2) December 2023 for master level postgraduate students in the course *Human resources and Technology Entrepreneurship* for 24 students grouped into 6 teams.

4. Evaluation of students' performance

Table 2 shows the results of the evaluated teams and gives the overview of the scores they achieved for the observed tool. This evaluation provided teachers with the feedback about the developed skills and served as a base for possible interventions for curricula improvement (for example, the Lean Startup methodology required more attention and interventions as students scored the lowest out of the maximum points). Additionally, after the project pitch and the Q&A session, teachers got further insights into students' understanding of concepts, entrepreneurial intentions, and ability to work in startup teams.

Table 3: Results of the students' performance 2022/23

Team	Lean Startup	Lean Canvas	Team Canvas	Project Pitch	TOTAL
Points	[0–4]	[0–8]	[0–10]	[0–8]	[0–30]
Team 1	4	8	9	6	**27**
Team 2	3	7	10	8	**28**
Team 3	4	7	9	8	**28**
Team 4	4	8	7	8	**27**
Team 5	2	9	10	8	**29**
Team 6	4	8	10	8	**30**
Team 7	4	8	10	8	**30**
Team 8	3	7	7	6	**23**
Team 9	1	6	6	6	**19**
Team 10	4	8	9	8	**29**
Team 11	1	6	8	7	**22**
Average	3.09	7.45	8.64	7.36	26.55
Percentage	77.27 %	93.18 %	86.36 %	92.05 %	88.48 %

The lowest score in Lean Startup methodology and additional question in the Q&A session indicated that students failed to capture the specificities of MVP development, as well as performance indicators. Students also failed to understand some core HRM terms: defining purpose, goals, and values in the Team Canvas tool.

The results implied that teachers needed to put more effort into explaining these concepts, provide more practical examples, and offer student additional

office hours. Understanding of these concepts also varied depending on the students' previous educational background. For example, students who graduated in engineering had better understanding of lean startup than students who graduated in social sciences. Through the sessions, students reported improved entrepreneurial intentions. They also stated they considered starting their own business. Evaluation insights contributed to improved curricula development for the next generation: 1) there were more examples and conversation about Lean Startup methodology, especially MVP development; 2) teachers gave in-depth explanations of teamwork characteristics, focusing on the importance of common goals, values, and purpose.

Table 4 shows the performance of the second cohort of postgraduate students, which provided additional insights for the improvement and evaluation of developed competencies among students.

Table 4: Results of the students' performance 2023/24

Team	Lean Startup	Lean Canvas	Team Canvas	Project Pitch	TOTAL
Points	[0–4]	[0–8]	[0–10]	[0–8]	[0–30]
Team 1	3	7	6	6	**22**
Team 2	2	5	8	6	**21**
Team 3	4	8	9	7	**28**
Team 4	4	8	10	8	**30**
Team 5	3	8	9	8	**28**
Team 6	4	7	7	8	**26**
Average	3.33	7.17	8.17	7.17	25.83
Percentage	83.33 %	89.58 %	81.67 %	89.58 %	86.11 %

Revised curricula in the second cycle resulted in better performance in understanding Lean Startup methodology. However, Team Canvas still needs additional intervention.

5. Discussion

The proposed roadmap has been shown to be a helpful tool for designing the model for developing entrepreneurial competencies among students. The model implementation has shown that it is possible to detect weak links and make interventions in the teaching process. Table 5 evaluates the success of the model in developing targeted competencies based on teachers' evaluation of students' performance. The evaluation scores are on a 10-point scale. The category below the score describes the level of competency according to the implemented competency model, and the last column elaborates the given score. The evaluation was performed after the second cohort, upon the implemented intervention during the second cycle of the action research. The columns "Score

[1–10]" and the "Comment" reflect teachers' estimation on the level of competency development based on students' overall performance.

Table 5: Evaluation of the developed competencies

Competency	Score [1–10]	Comment
Spotting opportunities	4 Intermediate	Students were not given problems to be solved, so they had to identify the needs from their environment and respond with their solutions. However, they are not able to address scalable opportunities and most teams proposed IT solutions for SME's or local problems.
Creativity	10 Advanced	Students presented creative solutions with many different aspects and improvements of existing business ideas.
Valuing ideas	9 Advanced	The task required to define unique value proposition of the solution, and teams were very successful in clarifying the value of their proposal.
Ethical & Sustainable Thinking	9 Advanced	Many teams tackled environmental problems and circular economy, and proposed solutions oriented on SDGs.
Taking the initiative	5 Intermediate	In order to respond to teachers' requirements, students had to take initiative and propose startups. Nevertheless, there is doubt whether they would preserve in their initiative if it was not graded.
Planning & management	8 Advanced	The Lean Startup methodology shows great success in planning the initial phases of startup development and further management combined with Lean Canvas. Students gained a variety of management skills in developing a brief business model with Lean Canvas.
Coping with ambiguity, uncertainty & risk	2 Foundation	Though teams were very successful in identifying possible weaknesses of the team, they would need real entrepreneurial experience to develop these competencies.
Working with others	10 Advanced	Students successfully organized in teams, recognized their weaknesses, strengths, discussed ideas, made consensus, and resolved conflicts.
Learning through experience	6 Intermediate	Students passed through the initial phase of startup ideation, but they did not have the opportunity to experience real entrepreneurial dilemmas outside the classroom.
Financial & economic literacy	4 Intermediate	The topics of the course are not focused on financial management, so students did not obtain deep knowledge about these fields, although the approach did have a brief financial analysis.
Mobilising others	10 Advanced	Students had to find their team members and assign the roles in Team Canvas tool. They were very successful in identifying their strengths and weaknesses.
Motivation & perseverance	5 Intermediate	The approach highlights the continuous improvement with Lean Startup methodology. However, entrepreneurial perseverance could be fully developed with a longer implementation and a real startup journey.
Self-awareness & self-efficacy	8 Advanced	Team Canvas tool emphasizes the importance of recognizing each team member's weaknesses and strengths providing a great instrument for self-awareness development. Q&A session with teachers' feedback has been very successful in developing students' self-esteem.

The research shown the effectiveness of the proposed approach, but it would be crucial to test other competency development models to observe the true impact of the methodology and evaluate if other models could be more effective for developing entrepreneurial competencies of students. This will be implemented in future research with control groups that will undergo other competency development models. Another limitation of the approach is a limited access to real-world experience that is constrained by the fixed length of the module delivery at the master's level (four weeks in one semester). However, the Faculty offers a mentorship program that supports the development of students' ideas and further entrepreneurial skill development. During the teaching process, we inform students about the program and motivate them to join the process. The approach presented in this paper gives students a good starting point for their startup development as some student teams have successfully joined and completed the program. The proposed roadmap is conducted as a one country study, but international networks (for example, Danube Cup, Entrepreneurial Mindset Network, etc.) could be a good opportunity to re-validate the proposed multidimensional pedagogical strategy for entrepreneurship competency development in other countries.

The proposed model has been developed for entrepreneurial competencies in the field of technology entrepreneurship and human resources management, but the roadmap is applicable to any entrepreneurially oriented courses and disciplines. Future research will focus on applications in other areas such as biotechnology education. We will assess if the model is applicable and effective in other, non-business-oriented education, and make appropriate adjustments and conclusions.

6. Conclusion

This paper presented an effective, multidimensional pedagogical strategy for entrepreneurship competency development, in response to emerging trends in the entrepreneurial landscape. It provides a framework for the identification of an effective teaching method depending on the specific learning context. The approach presented in the paper combined several methods and tools from HRM and technology entrepreneurship practice to develop entrepreneurial competencies among students. The results of the roadmap implementation have shown that the action research steps are very useful in the creation of a novel approach for developing entrepreneurial competencies. On the other hand, the model for the subject has shown that it has potential to be more effective for some competencies such as: *Coping with ambiguity, uncertainty & risk*, *Financial & economic literacy*, and *Spotting opportunities*. The competencies could be developed by having a real-world experience explained in the Discussion section. Students need genuine entrepreneurial experience to cope with ambiguity, risk, and spot opportunities. Motivation and perseverance are also competencies

that could be developed with a real startup journey, as a highly challenging road. One-year master studies and short semesters are not the most suitable for gaining an authentic entrepreneurial experience. However, connecting the subject with non-formal and supportive university programmes besides regular curricula are an additional opportunity for students to start their entrepreneurial ventures.

The presented approach is very effective for developing an entrepreneurial mindset of students, fostering innovation and creativity that meets the real needs of the society. A more efficient practice leading to the establishment of a startup company would take a longer implementation period, supporting programmes, financial resources, and guided mentorship of student teams.

The approach proposed in this paper is based on the Serbian conditions and has additional value for national contexts that have limited entrepreneurial orientation due to national cultural characteristics that highly affect entrepreneurial activity within a country (see Jovanović/Jevtić/Petković 2018). This is especially important for Eastern and Central European countries that have gone through economic transitions and switched from a predominantly socialist to a capitalistic society. The presented framework is based on the extensive experience of the authors with students that have limited awareness of their entrepreneurial opportunities and interest to pursue an entrepreneurial career path. It could serve as valuable material for educators in post-socialist countries that strive to induce entrepreneurial mindset of students, as it offers several tools for entrepreneurial education that could be implemented in various educational fields.

Further implementation of the roadmap should provide improvements and better insights that will nurture future entrepreneurs and cultivate intrapreneurial qualities, fostering a culture of innovation within organizations. We recognize great value of this approach in other educational domains, especially natural and life sciences to foster entrepreneurial spirit of future biotechnologists, agriculturalists, physicists, that could cultivate the development of student startups in this field. Future research will show the efficiency of the approach in these areas and identify new tools and techniques to improve the Roadmap.

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Appendix 1. Lean Canvas. Source: Mauryia (2009)

Problem List your customers top 3 problems	**Solution** Outline possible solution for each problem	**Unique Value Proposition** Single, clear, and compelling message that turns an unaware visitor into an interested prospect	**Unfair Advantage** Something that can't be easily copied or bought	**Customer Segments** List your target customers and users
Existing Alternatives List how these problems are solved today	**Key Metrics** List key numbers telling how business is doing today	**High level concept** List your X for Y analogy (e.g. YouTube = Flickr for videos)	**Channels** List your path to customers	**Early Adopters** List the characteristics of your ideal customers.
Cost structure List your fixed and variable costs.		**Revenue Structure** List your sources of revenue		

Appendix 2. Team Canvas. Source: Ivanov/Voloshchuk (2015)

The Team Canvas

Version 1.0 | English | theteamcanvas.com

Most important things to talk about in the team to make sure your work as a group is productive, happy and stress-free

TEAM NAME _____ **DATE** _____

PEOPLE & ROLES
What are our names and the roles we have in the team?

GOALS
What we want to achieve as a group? What are our key goals that are feasible, measurable and time-bounded?

VALUES
What do we stand for? What are guiding principles? What are our common values that we want to be at the core of our team?

RULES & ACTION POINTS
What are the rules we want to introduce after doing this session? How do we communicate and keep everyone up to date? How do we make decisions? How do we execute and evaluate what we do?

PURPOSE
Why are we doing what we are doing in the first place?

PERSONAL GOALS
What are our individual personal goals?
Are there personal agendas that we want to open up?

NEEDS & EXPECTATIONS
What each one of us needs to be successful? What are our personal needs towards the team to be at our best?

STRENGTHS & ASSETS
What are the skills we have in the team that will help us achieve our goals? What are interpersonal/soft skills that we have? What are we good at, individually and as a team?

WEAKNESSES & DEVELOPMENT AREAS
What are the weaknesses we have, individually and as a team? What our teammates should know about us? What are some obstacles we see ahead us that we are likely to face?

The Team Canvas by TheTeamCanvas.com
Alexey Ivanov