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Entrepreneurial Student Teams and Start-up Project Continuance Intention at Hungarian Universities

DOI: 10.7595/management.fon.2025.0005

Abstract:

Research Question: The study investigates into whether the characteristics of early-stage innovative student entrepreneurship projects, student team composition, and the intention of continuing the project are related at Hungarian universities. **Motivation:** Entrepreneurship has long been recognized as a vital driver of innovation, economic development, and societal progress. Within the educational landscape, fostering entrepreneurial skills among university students has become increasingly critical, particularly considering global challenges demanding creative solutions and innovative ventures. This study is motivated by the need to understand the dynamics of early-stage student entrepreneurship projects within the framework of the Hungarian Startup University Program (HSUP). Specifically, it seeks to explore the relationship between the intrinsic characteristics and dynamics of startup projects, such as team composition and skill diversity, and their likelihood of continued development. In addition, the research aims to identify the attributes of student teams that excel in entrepreneurial ventures. **Idea:** The Hungarian Startup University Program (HSUP) is a fully uniform, centrally managed programme that students from participating universities can take as an undergraduate course, receive ECR credits and earn scholarship for promising project ideas. Our investigation aims to shed light on both the intrinsic characteristics of these entrepreneurial teams and the broader implications of their endeavours. **Data:** We explore the dynamics of 186 startup initiatives launched by university students, involving a total of 880 participants, within the framework of HSUP across 27 Hungarian universities during the 2021/2022 academic year. **Tools:** Through a systematic quantitative analysis of HSUP progress reports submitted by emerging entrepreneurial teams, we identify patterns related to team competencies, composition, and the trajectory of innovation and technological development within their projects. **Findings:** Our analysis reveals that teams comprising members from multiple universities and possessing engineering and IT skills are more likely to advance their projects. Additionally, the development of a minimum viable product (MVP) may predict the intention to continue the venture. Team diversity further emerges as a critical factor in the success of student startup projects. Beyond these findings, our study provides valuable insights into the entrepreneurial ecosystem cultivated by HSUP, highlighting its broader socio-economic implications. **Contribution:** Our findings offer actionable guidance for entrepreneurship education educators and researchers in the context of refining and fostering programs such as HSUP, thereby enhancing their efficacy in cultivating entrepreneurial acumen among university students and amplifying their capacity to drive innovation and economic growth.

Keywords: entrepreneurship education, startups, Hungarian Startup University Program, student entrepreneurship, nascent entrepreneurs

JEL Classification: L26, M13, O30

1. Introduction

Entrepreneurship education (EE) is widely recognized for its role in enhancing both the quality and quantity of enterprise creation (Martin et al., 2013; Matlay, 2006) and has significant societal benefits (Szendrei-Pal, 2023). The number of higher education institutions offering EE grows steadily, and interest in EE research has been sustained since the first entrepreneurship course for MBA students was offered at Harvard University in the US in 1947 (Bechard & Gregoire, 2005). The rise of formalised EE occurred in the 1990s and

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2000s. By the turn of the millennium, virtually all US universities offered some form of entrepreneurship course to their students. The catching-up with this trend started later in Europe and has been slower than overseas (Wilson, 2008).

In contrast to studies that analyse the entrepreneurial process at the individual level (psychological factors) and firm level (firm-specific factors), our study analyses entrepreneurship at the team level, such as the dynamics, diversity, and composition of entrepreneurial teams. Indeed, most new ventures are not the result of individual endeavour but of teamwork (Visintin & Pittino, 2014). An entrepreneurial team typically consists of two or more individuals who work on the implementation of a new business idea, participate in its subsequent management, and share ownership. The critical success factor of the start-up process lies in the characteristics of the founding team, or "New Venture Team" (Klotz et al., 2014). There is a growing academic interest in the initial stage of entrepreneurial team formation, the process by which founders form a team to start a new venture (Lazar et al., 2020).

In this paper we explore the link between EE and early-stage entrepreneurship. The main research question addressed is how student project and team characteristics relate to the intention of continuing the venture following EE. In what follows, we discuss the importance of EE at universities, the research methodology, and the main characteristics of the Hungarian Startup University Program (HSUP), which was the basis for our data collection. After presenting the results, we draw conclusions on the composition of student entrepreneurship teams and the potential impact of EE carried out via HSUP.

2. Relevance of Entrepreneurship Education at Universities

The investigation of student entrepreneurship projects at universities is relevant because a significant proportion of innovative small businesses (start-ups) are started by university students (Eesley & Miller, 2018), who are mostly novice (inexperienced) entrepreneurs. Start-ups and spin-offs are the main vehicles for the “third mission” of universities, which is particularly well developed among entrepreneurial universities (Etzkowitz, 1983; Etzkowitz, 2002). University start-ups also draw on the research and even teaching activities of universities, as long as the students who found the company are also involved in EE (Knudsen et al., 2021).

The expansion of EE hinges on critical questions such as the efficiency of conducting the courses, the qualifications of the instructors, and the impact of these formal programmes (Lyu et al., 2024). Additionally, a key dilemma lies in determining what to teach and how to teach entrepreneurship, assessing whether the teaching methods align with real-world demands, understanding the entrepreneurial ambitions and intentions of participants (Solomon, 2007), and evaluating whether the students attending these courses match the profiles envisioned by the educators (Luthje & Franke, 2003).

Universities typically invest in entrepreneurship education because it not only helps students' personal development and career prospects but also contributes significantly to the development of a region as well as to the national economy (Berge et al., 2022). Nowadays, institutions offer entrepreneurship courses in a variety of formats to a rather heterogeneous population of students, which has an impact on the structure of the student entrepreneurial teams that form on campus (Barbini et al., 2021). There are full-semester courses, multi-course programmes, non-credit workshops, and summer universities that incorporate both traditional and innovative pedagogical approaches. Analyses of students' entrepreneurial intentions, such as the two-decade-old Global University Entrepreneurial Spirit Survey (GUESS) studies, have shown that the primary motivation of entrepreneurship education for participants is not to start a business; they are interested in studying entrepreneurship for a variety of other reasons (Gubik, 2022).

Regarding the impact of entrepreneurship education, it is important to highlight that international research shows that students who participate in EE programmes are more interested in entrepreneurship as a career and more likely to start a business. Furthermore, students who participate in entrepreneurship education are more confident that they can be successful as entrepreneurs (Schneider et al., 2021).

The attractiveness of entrepreneurship as career path for students is a key determinant of their intentions to continue their studies. Surveys of university students' entrepreneurial intentions, notably the GUESS survey in Hungary, show that students' main career aspirations after graduation are to be employed and that the proportion of students planning a career as an entrepreneur is low. However, the analysis also highlights that this can be significantly improved by EE and a supportive and entrepreneurial higher education environment (Gubik, 2021).

3. Research Framework and Methodology

This study builds on three concepts of entrepreneurship: early-stage entrepreneurship, entrepreneurial teams, and entrepreneurship education. The following two research questions are addressed:

- What are the characteristics of entrepreneurial student projects originating from Hungarian universities?
- Is there a connection between the characteristics of entrepreneurial student projects and students' intention to pursue the project after completing EE?

To address these research questions, we analysed data from 186 startup projects involving 880 university students participating in the HSUP training program, which spanned 27 Hungarian universities during the study year. Rather than relying on a sampling procedure, our study examined the entire population, facilitated by the support of the national innovation agency overseeing the HSUP program. Investigating the characteristics and activities of entrepreneurial projects and teams launched during the program offers valuable insights into the formation and processes of early-stage businesses.

3.1 The context: Hungarian Startup University Program (HSUP)

HSUP has been running in Hungarian higher education institutions since September 2020, and was initiated by the National Research, Development and Innovation Office. The HSUP is a two-semester long e-learning course that combines theoretical and practical teaching elements, with a strong emphasis on extra-curricular opportunities, events, and integration into the innovation ecosystem. HSUP is a fully uniform, publicly funded, centrally managed programme, which any students from the participating universities can take as an undergraduate course. Students are motivated to take the HSUP courses not only to enhance their entrepreneurial skills and learn about the start-up world, but also for the credits, the potential scholarship, the teamwork experience, and, last but not least, because of the flexible (online) working environment (Novotny et al., 2023).

The HSUP aims primarily at broad-based attitude formation, innovation evangelisation, and introducing Hungarian higher education students to the basics of entrepreneurship and especially to the basics of starting innovative businesses, which aims to involve as many potential future innovators as possible in an inclusive way, both vertically (bachelor, master and PhD) and horizontally (geographically and disciplinary). A secondary objective is to nurture and support concrete projects and enterprises resulting from the completion of the programme, and to launch actual enterprises.

The HSUP has managed to engage over 10,000 students since its launch in 2020. Some innovative projects attracted venture capital funding or joined business support programmes and start-up incubators for further development. Out of the nearly 200 projects launched annually, only 4-5 project teams (2-3%) have progressed to establish actual businesses. While HSUP has achieved significant milestones, it has faced challenges as a centrally managed, top-down initiative. Integration into some Hungarian universities has been uneven, complicated by changes in programme management and teaching methodologies. Despite promising participation rates, output factors (e.g., proportion of projects evolving into successful enterprises) remain modest, though in line with international innovation benchmarks (Cooper & Edgett, 2007). This study focuses on specific aspects of HSUP, including team composition, project progression, and entrepreneurial intentions, rather than providing a comprehensive evaluation of the programme.

3.2 Data and variables

In the academic year 2021-2022, a total of 186 student startup projects were created under the Hungarian Startup University programme. At the end of the programme, the project teams had to report on the characteristics and development of their entrepreneurial project in a textual progress report, following a predefined structure. These reports were provided by the National Innovation Agency in anonymized form to ensure the privacy of participants was fully protected. We conducted a systematic coding and content analysis of the progress reports to obtain a comprehensive picture of the student projects, including information on the project team composition, problem and the suggested solution, market and types of potential customers, business model, competitors, financing needs, experiences gained and future goals including the intention to continue the project.

The progress reports also provided valuable insights into the intention of start-up projects to continue beyond the training. Each team was required to respond to the question, "Will you continue your project after

the training, and if so, what are your specific plans?" Teams could provide a simple "yes" or "no" answer, along with details about the funding requirements for their projects, if applicable. Also, our analysis evaluated the teams' technology development achievements during the project, including the creation of an initial prototype, or Minimum Viable Product (MVP), to effectively demonstrate the feasibility of the technology, product, or service.

In addition to the steps taken to develop the technology, we also identified the degree of effort to increase the solution's business maturity, represented by the following variables:

- Concrete, numerically supported primary market research on the market environment is available, conducted through qualitative methods such as interviews.
- Primary market research using quantitative methods, including a questionnaire-based approach, has been conducted.
- A competitor analysis identifying specific market actors is planned or conducted.
- The team provides specific figures to justify the pricing logic of the product or service.
- The team estimates the amount of investment or pre-seed capital needed to continue the project.

The following team and project characteristics were examined in relation to the intention to continue with the project post-training:

The size of the teams ranged between three and five members. Regarding gender distribution, teams were categorized into five distinct types based on the composition of male and female members: (1) all-male teams, (2) male-dominated teams, (3) gender-balanced teams, (4) female-dominated teams, and (5) all-female teams. A notable feature of HSUP teams is their composition, as members may originate from either a single university or multiple universities. To reflect this, the teams were classified as either "homogeneous" or "heterogeneous."

Another variable analysed was the competencies of team members, defined according to their roles within the team. Participants were prompted in their progress reports to specify their responsibilities, contributions to the project, and tasks undertaken. Based on these self-reported descriptions, team competencies were categorized according to members' academic or professional focus: (1) management, (2) IT, (3) engineering, (4) medical, (5) design, (6) marketing, (7) finance, and (8) legal expertise.

To identify the technological domain of each student initiative, the study utilized the typology developed by Savin et al. (2023), which is based on a cluster analysis of subject areas.

3.3 Content analysis

Content analysis is a method of studying and analysing communication in a systematic, objective and quantitative way to measure variables (Kerlinger, 1986). The progress reports, submitted at the end of the course, mainly contain textual responses to open-ended questions about the entrepreneurial projects. To effectively analyse these data, we first developed a methodological framework for conducting content analysis. The variables, derived deductively from the literature, were tested and refined through trial coding using a sample of 48 randomly selected reports. The trial coding was manually conducted by the authors independently and in parallel. Results were then compared, discrepancies were analysed to identify their causes, and the codebook was iteratively refined until the coding rules were clearly defined and consistently applied.

In addition to the description of the variables, the codebook contains the interpretation and evaluation rules for the conversion of qualitative data into valid and reliable quantitative data. The validity of the codes was therefore ensured by consistent and coherent adherence to the rules of the codebook. Based on the finalised codebook, all the 186 progress reports were (re)coded, allowing a complete data analysis on the quantified variables using the results of all the projects participating in the programme. Statistical analyses were carried out using IBM SPSS 28 software.

4. Results

Projects show a wide variation in terms of their subject area. The software/application industry is the most common, with a quarter of projects (25.0%) being classified as such. 11.7% of the projects are "other business services", 8.9% are fintech solutions, and the further 7.2%-7.2% are related to consumer products and HR. The share of projects related to the gaming/animation area, popular among young people, is 5.5%, with

energy projects of high global economic importance but the share of solutions focusing on agribusiness is also low (5.0%). There are also few projects targeting big data/data analytics, a popular topic in the start-up world, with around 1.7% of projects in this area.

4.1 Team characteristics

The projects exhibit significant variation in their subject areas. The most prevalent category is the software/application industry, accounting for 25.0% of all projects. Other notable categories include "other business services" (11.7%), fintech solutions (8.9%), and consumer products and HR, each representing 7.2%. While gaming and animation make up 5.5% of the projects, energy-related initiatives – which have considerable global economic importance – comprise a similarly modest share. Solutions focused on agribusiness also remain limited at 5.0%, and projects targeting big data and data analytics, a prominent theme in the startup ecosystem, are notably scarce, amounting to just 1.7%. (Table 1).

Regarding team member roles, marketing and management competencies are more typical than those related to technology development and engineering. Notably, engineering competencies are entirely absent in 60% of the projects. The presence of IT competencies is relatively stronger, with approximately two-thirds of teams (68%) including a member focused on IT development. However, nearly half of these teams (44%) have only a single individual dedicated to IT tasks, highlighting a potential limitation in technical expertise within the teams.

Table 1: Descriptive statistics on HSUP team characteristics (N=186)

Variable	Value	Frequencies	Percent (%)
Team heterogeneity (members coming from one or more universities)	Homogeneous	33	17.6
	Heterogeneous	153	81.8
Team size	3 students	9	4.8
	4 students	36	19.4
	5 students	137	73.7
	6 students	4	2.2
Gender distribution	Purely male	16	8.6
	Male majority	69	36.9
	Balanced	13	7.0
	Female majority	73	39.0
	Purely female	15	8.0

4.2 Project continuance

Among the 186 student teams, 71% (133 teams) indicated their intention to advance their project after the completion of the HSUP courses. While there is a significant correlation between the industry classification of student projects and the specialisation of the project leaders' university ($p = 0.02$), the intention to continue is not influenced by the university's specialisation. These findings align with prior research on similar topics (Morris et al., 2017).

Role of Team Competence and Heterogeneity

Engineering competence emerged as a critical factor associated with project continuance. Teams with at least one student studying engineering were significantly more likely to plan future advancement, with 88% expressing such intentions compared to 64.7% in teams lacking engineering expertise (Fisher's test: 0.006). However, the strength of this relationship, indicated by a Cramer's V of 0.247, is weaker than moderate. Other competencies, such as IT and medical, show weaker, non-significant positive correlations (see Table 2). Results in Table 2 also suggest a weak positive relationship between heterogeneous teams (from multiple universities) and the intention to continue. Teams with diverse or balanced gender compositions show a weak positive association with MVP creation but no strong influence on project continuance.

Table 2: Relationship between team composition, project continuance intentions, and MVP creation (N=186)

Team composition by gender	**Continuance intentions**		**MVP**	
	Correlation	–0.133	Correlation	0.187*
	Cramer V.	0.215	Cramer V.	0.195
	Frequency		**Percent, %**	
Purely male	16		8.60	
Male majority	69		37.10	
Balanced	13		7.00	
Female majority	73		39.20	
Purely female	15		8.10	
Team heterogeneity based on university	Correlation	1.68*	Correlation	0.187*
	Cramer V.	0.168	Cramer V.	0.094
	Frequency		**Percent, %**	
Homogeneous	33		17.7	
Heterogeneous	153		82.3	
Availability of competencies	**Continuance intentions**		**MVP**	
	Correlation	Cramer V.	Correlation	Cramer V.
Management	0.073	0.184	–0.104	0.125
IT	0.107	0.133	0.094	0.229
Engineering	0.263*	0.266	0.137	0.158
Medical	0.122	0.124	0.138	0.266
Design	–0.025	0.098	0.181*	0.223
Marketing	–0.37	0.069	–0.007	0.138
Financial	–0.17	0.152	–0.043	0.159
Legal	0.135	0.135	0.047	0.163

*Note: * ($p < 0.05$)*

MVP Creation

Progressing to the implementation stage and developing a Minimum Viable Product (MVP) proved to be important for a positive outlook. Teams that successfully created an MVP were significantly more likely to plan for project continuance (83.9%) compared to those that did not (65.4%). The relationship between MVP creation and project continuance is statistically significant (Fisher's test: 0.013), although the strength of this relationship is relatively weak (Cramer's V = 0.187).

Market research and financial planning

The link between market research and MVP creation is also noteworthy. For projects without market research, 77.9% lacked an MVP, while this figure dropped to 61.5% for projects that conducted market research. Teams conducting market research reached the MVP stage in 38.5% of cases, compared to just 22.1% of those without market research. These findings, supported by a Fisher's test value of 0.011 and a Cramer's V of 0.178, indicate a weak but significant relationship.

Similarly, the need for future funding is also linked with MVP creation. Teams that specified funding requirements were more likely to produce an MVP (38.1%) than those that did not (23.5%). While this relationship is significant (Fisher's test: 0.023), it remains weak (Cramer's V = 0.158).

MVP and project continuance

Teams that successfully created an MVP demonstrated a higher likelihood of planning future continuance (83.9%) compared to those without an MVP (65.4%). This significant relationship (Fisher's test: 0.007) has a relatively weak strength (Cramer's V = 0.187). Furthermore, while market research correlates positively with MVP creation, only 23.5% of teams without market research achieved an MVP, compared to 38.1% of those conducting such research. These results suggest that while creating an MVP is linked to continuance intentions, further investigation is needed to clarify these relationships.

Summary and Conclusions

This study examines the dynamics of 186 entrepreneurial projects formed by 880 university students within the Hungarian Startup University Program (HSUP), focusing on team composition, competencies, and progress outcomes such as MVP creation and continuance intentions.

University entrepreneurship programmes have shown mixed outcomes in promoting entrepreneurial activity. While starting a business requires more than one or two entrepreneurship courses, prior studies indicate that EE positively influences entrepreneurial intentions and skills, which can translate into entrepreneurial actions over time (Rauch & Hulsink, 2015). University programmes might not significantly increase entrepreneurship rates but can enhance venture quality, reducing startup failures and increasing firm revenue (Eesley & Lee, 2021). Similarly, our analysis of HSUP highlights its role in fostering entrepreneurial skills and team diversity, with modest impacts on successful startup formation. There are broader contributions of these programmes that should be emphasized, such as fostering innovation and entrepreneurial behaviour in varied career paths and in various types of organizations.

Our results reveal that project continuance is significantly influenced by specific team characteristics and developmental milestones. Key findings show that teams with diverse gender composition and members from multiple universities have a slight positive association with project advancement and MVP creation, though the relationships are weak. Engineering competencies stand out as the most significant factor influencing both continuance intentions and MVP creation, while design and IT skills also positively contribute to MVP development. These findings underscore the importance of technical and creative expertise in driving the success of entrepreneurial projects, and the need for fostering technical and innovative skills in EE, even at non-technical universities, to enhance project sustainability and success. This is in line with recent research that found that the technical skills (business sciences and engineering) of the entrepreneurial team have a strong impact on the success of the start-up venture (Costa da Reis, 2021).

From a broader perspective, the university is a key player in the entrepreneurial ecosystem (Guerrero et al., 2016), and an incubator for developing entrepreneurial thinking (Novotny et al., 2020). The HSUP aims to facilitate the integration of universities into local and national innovation ecosystems, by connecting students with other ecosystem actors, such as startup entrepreneurs, large companies, experts, investors, government programs, and innovative students of other universities. Moreover, higher education institutions can enrich the programme by incorporating additional content, utilizing it as a platform to strengthen their own innovation ecosystems, and integrating it as a key component of their bottom-up support structures. (Abootorabi et al., 2021).

Another advantage of HSUP is that it draws on a wide range of interested university students, so it can ignite the spark in those who are not basically preparing for an entrepreneurial career, have not yet gained entrepreneurial experience in their own company or through their friends and family members. However, in the process, students may recognize the complexities and challenges of starting a business (Oosterbeek et al., 2010), which may ultimately reduce the desire of many to commit to entrepreneurship. The HSUP enables universities to incorporate real entrepreneurial experience into classroom methods, thus strengthening their role in the ecosystem (Amo et al., 2020). Life-like, experiential learning develops competences more effectively and improves entrepreneurial intentions to a greater extent in comparison with courses using traditional knowledge transfer methods (Borsi & Dory, 2015).

5. Limitations and Future Research

The authors acknowledge several limitations of this study. The analysis of the progress reports from the second year of the HSUP provides only a snapshot in time, making it difficult to draw long-term conclusions. Still, the analysis reflects the realities of the specific cohort of HSUP students, where the sequence of entrepreneurial activities (e.g., market research and validation, business model development, MVP development) may not always align with the best practices of the entrepreneurial process, and largely depend on the teams' earlier experiences, background, preferences, and mentorship access. Future research could also examine other cohorts of HSUP participants and similar programmes in different settings to enhance the robustness and generalizability of the findings.

The progress reports varied in both quantity and quality, resulting in missing or incomplete data that may have impacted the content analysis. However, the findings and research process have highlighted critical aspects for both the management of the HSUP programme and the university educators involved. These insights offer valuable feedback and suggest practical directions to further research on EE and for programme improvement.

For example, it is worthwhile to further research using causal methods on how team-level inputs (demographic and psychological factors, human resources, roles, goals, team composition and team processes) influence the team's various results (project milestones) and early-stage entrepreneurial performance. It can also be interesting to study the role and leadership skills of team leaders (ideas), as well as the team climate and conflicts that arise. Investigating the role of the entrepreneurial ecosystem is one of the latest research directions regarding the incubation of startups (Mate et al., 2024), so it is worthwhile to examine how students interact with various actors of the (university and regional) ecosystem and how they get resources from them. Student start-ups not only exploit their environment but also contribute to the bottom-up development of university entrepreneurship and innovation ecosystems. A longitudinal study of the afterlife of teams and startup projects and their various impacts can also be useful, since the success factors can be primarily identified by longer-term monitoring of the entrepreneurial process.

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Acknowledgement

The authors express their gratitude to the National Innovation Agency for allowing the scientific analysis of the HSUP progress reports made in the second semester of the 2021-2022 academic year. The research was supported by the Széchenyi István University Foundation.

Received: 2024-04-29
Revision requested: 2024-12-23
Revised: 2025-01-15
Accepted: 2025-02-02

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