

Entrepreneurial Intentions and Strategic Pathways: University-Based Ecosystems as Catalysts for Venture Creation

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Abstract

This paper examines the factors that impact the entrepreneurial intentions (EI) of university students based on the Theory of Planned Behavior (TPB) as the future creators of ventures. By investigating the effect of personal attitude, subjective norms and perceived behavioural control, the research highlights the ways in which these constructs influence students' tendency towards entrepreneurship. The results indicate the potential of university-based startup ecosystems, entrepreneurial education, and institutional engagement in developing an entrepreneurial mindset. The authors suggest these environments not only bolster individual intention but also play a significant role in venture creation, thereby enhancing innovation and economic development. The paper discusses implications for business strategy and policymaking in higher education, including the integration of entrepreneurial thinking in curricula and the design of supportive infrastructure to bridge intention and entrepreneurial action.

Keywords

• Theory of Planned Behavior • Entrepreneurship Education • University-Based Entrepreneurial Ecosystems • Technical University Students • Venture Creation • Entrepreneurial Intention

1. Introduction

The term “Entrepreneurial Intention” can be defined as state of mind directing a person to action with the aim to create new enterprises. Understanding the context and the formation of EI is of great help. Innovation is the production of new ideas and knowledge. In this sense, entrepreneurial activity creates innovation by commercialising new ideas and knowledge. It is equally important to understand how entrepreneurial intention is developed. In other words, understanding the determinants of EI is quite important. Recent research has emphasized that psychological factors and educational interventions play a crucial role in shaping these intentions among students [1]. The strategic mindset required for venture creation and organizational intelligence has been examined in the context of enterprise modeling [2].

Ajzen's TPB implies that intention is a product of three proximal, cognitive determinants of intention (attitude toward the behavior (ATB), subjective norms (SN) and perceived behavioural control (PBC)) [3]. In other words, the likelihood of people displaying entrepreneurial behaviour will be greater when people value doing this activity, when they think their important referents want them to do as well as when they think their ability to work on this activity is high. The TPB framework has been extensively validated across various behavioral domains, including entrepreneurship [4]. Critical management capabilities have been identified as fundamental drivers of entrepreneurial growth within organizational contexts [5].

The university ecosystem entails not only providing classrooms and knowledge but creating the ecosystem that facilitates opportunity and nurturance of entrepreneurial minds. There have been doubts

raised whether exposing students to classroom based ‘entrepreneurship interventions’ raises their EI in any way. Some studies show enhancement while others report no effect or even a negative effect of the courses. The impact is compromised by course design, pedagogy and background of students. Recent meta-analyses have highlighted the moderating role of perceived behavioral control in the theory of planned behavior, suggesting that the strength of relationships between TPB constructs may vary across contexts [6]. Cloud-based enterprise intelligence systems represent a technological frontier where strategic optimization intersects with entrepreneurial opportunity recognition [7].

Entrepreneurship education, social media, and other factors could be contributing to this change. Researchers have also become interested in these attempts. Numerous experts study the driving forces generating entrepreneurial intention among people in the society. A few examples of these factors are emotional intelligence, personality traits, entrepreneurial education, subjective norms, perceived behavioural control, etc. The psychological underpinnings of entrepreneurial behavior have been examined through various theoretical lenses [8].

Thus, this research contributes to theory and practice. This study tests the robustness of TPB in a technical education context on the theoretical front. We offer upshots for educators and policy makers for practicing towards designing an effective university ecosystem for promoting entrepreneurship. The remaining sections include the theoretical framework, methodology, results, and implications.

2. Related Work

2.1 Foundations of Entrepreneurial Intention Research

The study of entrepreneurial intention is rooted in Ajzen’s Theory of Planned Behavior (TPB), which has become the most widely applied framework for understanding the cognitive antecedents of planned entrepreneurial action. TPB posits that intention is the immediate precursor to behavior, particularly for deliberate and effortful actions such as new venture creation. The theory’s three proximal determinants attitude toward the behavior, subjective norms, and perceived behavioral control have been extensively validated across diverse entrepreneurial contexts. The centrality of intention in entrepreneurship research is underscored by the observation that entrepreneurial behavior is typically planned and intentional rather than impulsive or habitual, making TPB particularly well-suited to this domain. The application of TPB in understanding entrepreneurial intentions has been further refined through studies examining how individual cognitive processes interact with institutional factors [9].

Recent scholarship has expanded the theoretical boundaries of intention research by examining how strategic insight and analytical engagement with enterprise modeling contribute to organizational intelligence. Morthala [2] argues that the mindset for strategic insight involves a complex interplay between analytical capabilities and organizational context, suggesting that entrepreneurial cognition may be enhanced through structured modeling approaches. This perspective aligns with broader efforts to understand how cognitive frameworks shape strategic decision-making in venture creation contexts. The development of entrepreneurial growth strategies has been further examined through the lens of critical management capabilities, which Raju [5] identifies as essential for fostering sustainable venture development. These capabilities encompass not only technical skills but also strategic planning, resource mobilization, and stakeholder engagement, all of which are relevant to university-based entrepreneurship ecosystems.

The theoretical foundations of entrepreneurial intention have also been informed by research on innovation in nonprofit and social venture contexts. Noubissie [10] examines how nonprofit organizations

evolve through leading innovation in social ventures, demonstrating that entrepreneurial mindset extends beyond purely commercial contexts to include socially-oriented venture creation. This broader conceptualization of entrepreneurship is particularly relevant for university ecosystems that aim to cultivate diverse forms of entrepreneurial activity.

2.2 Entrepreneurial Intention and the Theory of Planned Behavior

Entrepreneurial intention (EI) is widely regarded as the most reliable predictor of entrepreneurial behavior, particularly when venture creation is a planned and deliberate process. Among the theoretical frameworks used to explain EI, Ajzen's Theory of Planned Behavior (TPB) has become the dominant model in entrepreneurship research. According to TPB, intention is determined by three cognitive antecedents: attitude toward the behavior (ATB), subjective norms (SN), and perceived behavioral control (PBC) [11]. The extended model of TPB has been empirically tested in college student populations, demonstrating the framework's utility in educational contexts [12].

A substantial body of empirical research has validated the applicability of TPB in entrepreneurial contexts and across diverse cultural and educational settings. Prior studies consistently report that ATB and PBC are strong predictors of entrepreneurial intention, as individuals who perceive entrepreneurship as desirable and believe they possess the necessary skills and resources are more likely to intend to start a business. In contrast, findings regarding subjective norms are mixed. While some studies identify a positive influence of social approval from family, peers, and mentors, others find SN to be weak or statistically insignificant, particularly among university students who may prioritize personal motivation over social expectations [13]. The determinants of entrepreneurial intention have also been examined through the lens of tax compliance intention research, highlighting the broader applicability of TPB constructs [9].

These findings suggest that although TPB is a robust framework for explaining entrepreneurial intention, the relative importance of its components may vary depending on institutional context, student characteristics, and disciplinary background. The integration of geospatial and contextual factors into entrepreneurial intention research has been explored through studies examining how location and digital access influence venture creation patterns. S B M [14] investigates geospatial influences on web adoption, demonstrating that digital divides can significantly impact market participation and entrepreneurial opportunities across different regions. Consequently, further empirical testing of TPB in specific settings, such as technical universities, remains necessary.

2.3 Entrepreneurship Education and Intention Formation

Entrepreneurship education (EE) has been increasingly adopted by universities as a strategic tool to foster entrepreneurial mindsets and stimulate venture creation among students. EE aims to develop entrepreneurial knowledge, skills, and competencies, while also shaping cognitive and psychological factors associated with entrepreneurial behavior [15]. Several studies suggest that EE can positively influence entrepreneurial intention either directly or indirectly through its impact on TPB constructs, particularly ATB and PBC. The integration of psychological perspectives into entrepreneurship education has been identified as a catalyst for developing cognitive and emotional skills among college students [16].

However, the empirical evidence regarding the effectiveness of entrepreneurship education remains inconclusive. While some studies report a significant positive relationship between EE and EI, others find no effect or even negative outcomes [17]. These inconsistent results have been attributed to variations in course design, pedagogical approaches, duration of exposure, student background, and the timing

of intention measurement. Experiential and project-based learning approaches are often found to be more effective than purely theoretical instruction, as they enhance practical skills and entrepreneurial self-efficacy. The impact of young entrepreneurs' network entrepreneurship education on students' entrepreneurial psychology has been explored, revealing the importance of social networks in shaping entrepreneurial outcomes [18].

At the same time, exposure to the realities and challenges of entrepreneurship may lead students to reassess previously idealized perceptions of entrepreneurial careers, potentially reducing entrepreneurial intention. This highlights the importance of examining not only whether entrepreneurship education influences EI, but also under what conditions and for which student populations such effects occur [19]. The role of entrepreneurship education in fostering entrepreneurship intentions has been critically examined, with researchers calling for more nuanced approaches to understanding its effects [20]. Strategic planning methodologies developed in competitive robotics contexts demonstrate how project-based learning can cultivate both technical and entrepreneurial competencies simultaneously. Mohanavel [21] documents the development and strategic planning processes for a robotic soccer team, illustrating how structured goal-setting, resource allocation, and team coordination skills translate across domains to entrepreneurial contexts.

2.4 University-Based Entrepreneurial Ecosystems

Beyond formal entrepreneurship education, recent literature emphasizes the role of university-based entrepreneurial ecosystems in shaping entrepreneurial intention and behavior [22]. Such ecosystems encompass a broad range of institutional elements, including incubators, accelerators, mentorship programs, industry partnerships, networking opportunities, and access to funding. These components collectively create an environment that supports opportunity recognition, experimentation, and venture development. The impact of university innovation and entrepreneurship education on entrepreneurial intention has been studied from the perspective of educational psychology, highlighting the importance of institutional support [13].

Research indicates that entrepreneurial ecosystems can strengthen perceived behavioral control by reducing resource constraints and increasing access to social and professional networks [16]. Moreover, exposure to entrepreneurial role models and supportive institutional norms can positively influence attitudes toward entrepreneurship and legitimize entrepreneurial career paths within academic settings. As a result, university ecosystems serve as important intermediaries between entrepreneurial intention and actual venture creation. The influence of educational psychology on modern art design entrepreneurship education has demonstrated the broad applicability of ecosystem approaches across disciplines [11].

The ecosystem perspective complements individual-level intention models such as TPB by extending the analytical focus to the institutional and contextual factors that enable or constrain entrepreneurial action. This integrated view is particularly relevant for technical universities, where innovation potential is high but entrepreneurial engagement may depend heavily on institutional support structures [23]. The impact of entrepreneurship education on entrepreneurial intention has been further examined through mediation models involving entrepreneurial self-efficacy and psychological capital [24]. Additionally, the analysis of college students' entrepreneurship education and entrepreneurial psychological quality has been explored from the perspective of ideological and political education, revealing the multifaceted nature of entrepreneurial development [15]. The convergence of smart city ecosystems and entrepreneurial infrastructure has been examined by Dhanani [25], who demonstrates how integrated urban systems create new opportunities for venture creation at the intersection of technology, sustainability, and community

development.

2.5 Research Gaps

Despite the extensive literature on entrepreneurial intention and education, several gaps remain. First, many studies treat entrepreneurship education as a homogeneous intervention, overlooking differences in pedagogy, disciplinary orientation, and institutional context. Second, empirical research focusing specifically on technical university students remains limited, despite their critical role in technology-driven entrepreneurship. Third, the interaction between entrepreneurship education, TPB constructs, and university-based ecosystems has not been sufficiently explored [24]. The integration of psychology into entrepreneurship education has been proposed as a catalyst for developing cognitive and emotional skills, yet empirical evidence in technical university contexts remains sparse [16].

This study addresses these gaps by examining entrepreneurial intention within a technical university context, testing the TPB framework, and assessing the role of a project-based entrepreneurship course embedded in a university ecosystem. By analyzing both direct and mediated effects, the study contributes to a more nuanced understanding of how entrepreneurial intentions are formed and shaped in higher education institutions.

3. Theoretical Framework and Hypotheses

3.1 Theory of Planned Behavior in Entrepreneurship

The Theory of Planned Behavior provides the foundation for our investigation. According to TPB, behavioral intention is the most immediate predictor of planned behavior, especially for actions that are deliberate, such as starting a business. Three independent factors drive intention: ATB, SN, and PBC. This section elaborates on each construct and develops our research hypotheses [26].

ATB reflects an individual's personal evaluation of entrepreneurship's desirability. It encompasses perceived benefits, risks, and personal satisfaction. Students with favorable attitudes toward entrepreneurship—viewing it as rewarding, feasible, and aligned with personal goals—are more likely to develop strong entrepreneurial intentions. The analysis of college students' entrepreneurship education has shown that personal attitudes are strongly influenced by both educational experiences and psychological factors [15]. Thus:

- **H1a:** Attitude toward entrepreneurship positively influences entrepreneurial intention.

SN represents perceived social pressure from referent groups (family, peers, mentors) to engage in entrepreneurship. If students believe that important others endorse entrepreneurial pursuits, they may feel compelled to conform, thereby strengthening intention [27]. The impact of young entrepreneurs' network entrepreneurship education has demonstrated the importance of social influences on entrepreneurial psychology [18]. However, entrepreneurship literature often questions SN's predictive power, suggesting personal conviction may outweigh social influence. We hypothesize:

- **H1b:** Subjective norms positively influence entrepreneurial intention.

PBC captures perceived self-efficacy and controllability over entrepreneurial activities. It includes confidence in one's skills, access to resources, and ability to overcome barriers [28]. The innovation of entrepreneurship education for intangible cultural heritage inheritance has highlighted the role of perceived control in entrepreneurial pursuits [28]. Higher PBC reduces perceived obstacles and enhances motivation to act. In entrepreneurship, where uncertainty is high, PBC is particularly critical. Therefore:

- **H1c:** Perceived behavioral control positively influences entrepreneurial intention.

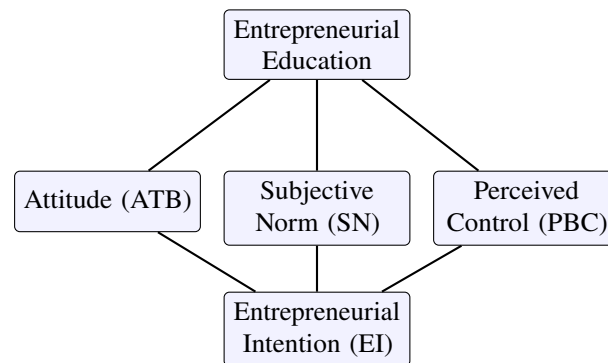


Figure 1: Conceptual model illustrating hypothesized direct relationships ($ATB \rightarrow EI$, $SN \rightarrow EI$, $PBC \rightarrow EI$) and mediation pathways ($EE \rightarrow ATB \rightarrow EI$; $EE \rightarrow SN \rightarrow EI$; $EE \rightarrow PBC \rightarrow EI$). Direct paths are shown as solid arrows; mediation pathways as dashed arrows.

3.2 Entrepreneurial Education and Intention Formation

Beyond testing TPB, we explore the role of entrepreneurial education. EE aims to equip students with knowledge, skills, and realistic perspectives on venture creation. By improving ATB, SN, and PBC, EE may indirectly boost EI. The literature presents conflicting evidence on EE's effectiveness, with some studies showing positive effects and others showing neutral or negative impacts [20]. The role of entrepreneurship education in fostering intentions has been examined through various theoretical lenses [29].

The SEBA course in our study represents a practical, project-based approach to entrepreneurship education. Students work in teams to develop software prototypes, create business models, and pitch their ideas. This hands-on approach is designed to build practical skills and provide realistic entrepreneurial experiences. The evolution of social ventures and nonprofit organizations toward more entrepreneurial models demonstrates the broader applicability of entrepreneurial education principles. Noubissie [10] highlights how leading innovation in social ventures requires a combination of strategic vision, resource mobilization, and stakeholder engagement—competencies that project-based entrepreneurship courses can cultivate. We propose:

- **H2:** Participation in entrepreneurial education positively influences entrepreneurial intention.

3.3 Mediation Mechanisms

Furthermore, we examine whether TPB constructs mediate EE's effect on EI. If EE enhances intention, it likely does so by improving one or more antecedents. For example, a well-designed course might increase students' positive attitudes toward entrepreneurship, strengthen their perception of social support, or enhance their sense of control over entrepreneurial activities. The integration of smart city ecosystems with entrepreneurial infrastructure illustrates how contextual factors can mediate the relationship between education and venture creation outcomes. Dhanani [25] demonstrates that convergence in urban systems creates new pathways for entrepreneurial action that may not be captured by individual-level intention models alone. This leads to three mediation hypotheses:

- **H3a:** Attitude toward behavior mediates the relationship between entrepreneurial education and entrepreneurial intention.

- **H3b:** Subjective norms mediate the relationship between entrepreneurial education and entrepreneurial intention.
- **H3c:** Perceived behavioral control mediates the relationship between entrepreneurial education and entrepreneurial intention.

4. Research Methodology

4.1 Research Design and Sample

The study utilized a quantitative research design through a cross-sectional survey approach. The data for the research was collected from 66 informatics faculty students at a large technical university in Europe during November 2017. The researcher reached the respondents through personal contacts.

The study included 39 students who had successfully completed the SEBA course (treatment group) and 27 students who failed to complete the SEBA course (control group). The demographic and academic characteristics were as follows: 67% males, 33% females; semester average: 8.9; 88% master's; 73% Germans. The composition of students and faculty shows the faculty's focus on technical and graduate subjects. The methodological approach draws on established practices in strategic management research, where cross-sectional designs are commonly employed to assess organizational and individual-level outcomes. Muppuri [30] employs similar survey-based methodologies to examine strategic business approaches in banking operations, demonstrating the utility of this design for understanding complex organizational phenomena.

4.2 The SEBA Course

The SEBA course is a project-based master's class where student teams develop a software prototype, create business model canvases, and pitch to a jury. It aligns with "education for enterprise" and uses active-applied pedagogical methods. The course spans one semester and includes weekly lectures, workshops, and mentoring sessions. Students work in teams of 3-4 members, simulating real startup environments.

The course content covers technical development, business modeling, market analysis, and presentation skills. Evaluation is based on prototype quality, business model viability, and pitch performance. This comprehensive approach aims to provide students with holistic entrepreneurial experience, bridging technical and business aspects of venture creation. The pedagogical approach aligns with principles of experiential learning that have been successfully applied in technical domains, including competitive robotics and engineering education. Mohanavel [21] demonstrates how project-based learning environments can cultivate both technical proficiency and strategic thinking capabilities.

4.3 Limitations of the Research Design

It is important to acknowledge that the division of students into treatment and control groups was based on successful completion versus non-completion of the SEBA course, rather than random assignment. This design introduces potential selection bias, as students who complete the course may differ systematically from those who do not in terms of motivation, academic performance, persistence, prior entrepreneurial interest, or other unobserved characteristics. Consequently, the observed differences—or lack thereof—between groups cannot be interpreted as the causal effect of SEBA participation. This limitation should be considered when interpreting the findings related to entrepreneurial education.

4.4 Measures and Instrumentation

We used validated scales from Liñán and Chen (2009) to measure TPB constructs and EI. All items used 7-point Likert scales (1=strongly disagree, 7=strongly agree). Variables were computed as means of their respective items after verifying internal consistency.

Dependent variable:

- *Entrepreneurial Intention (EI)*: 6 items measuring the strength of intention to start a business ($\alpha = 0.93$)

Independent variables:

- *Attitude toward Behavior (ATB)*: 5 items assessing personal evaluation of entrepreneurship ($\alpha = 0.93$)
- *Subjective Norm (SN)*: 3 items measuring perceived social pressure ($\alpha = 0.26$)

Note on reliability: The Cronbach's alpha for the SN scale ($\alpha = 0.26$) falls well below the generally acceptable threshold of 0.70, indicating severe internal-consistency problems. This limitation substantially constrains the interpretability of findings related to SN and should be considered when evaluating the hypothesis concerning subjective norms. Future research should employ validated and more reliable measures of subjective norms in this context.

- *Perceived Behavioral Control (PBC)*: 6 items assessing self-efficacy and controllability ($\alpha = 0.88$)
- *Entrepreneurial Education (EE)*: Dummy variable (1=SEBA participation, 0=no participation)

Control variables: Degree level, study program, semesters completed, gender, nationality. These variables were included to account for potential confounding effects.

Table 1: Descriptive Statistics for Study Variables

Variable	<i>M</i>	<i>SD</i>	Minimum	Maximum	<i>Note.</i> <i>N</i> = 66. All variables
Entrepreneurial Intention	4.00	1.68	1.00	7.00	
Attitude Toward Entrepreneurship	4.82	1.63	1.40	7.00	
Subjective Norms	4.48	1.41	1.00	7.00	
Perceived Behavioral Control	3.78	1.35	1.00	6.70	

were measured on 7-point Likert scales ranging from 1 (strongly disagree) to 7 (strongly agree).

4.5 Analytical Procedures

We employed multiple linear regression to test H1a–H1c, with EI as the dependent variable and ATB, SN, and PBC as predictors. Model assumptions were checked, including linearity, homoscedasticity, and normality of residuals. Variance inflation factors were examined to detect multicollinearity.

To test H2 and the mediation hypotheses (H3a–H3c), we followed the approach of Baron and Kenny: (1) regress EI on EE to establish the total effect; (2) regress each mediator on EE; (3) regress EI on both EE and mediators. While a modern approach using bootstrapped confidence intervals for indirect effects would be preferable, the absence of a significant total effect between EE and EI precludes meaningful mediation analysis, as there is no effect to be mediated. Nonetheless, we report the relevant regression coefficients to allow readers to assess the pattern of relationships. All analyses were conducted in R,

with $\alpha = 0.05$. The analytical approach is consistent with established practices in strategic management research, where regression-based methods are commonly employed to examine relationships between organizational factors and outcomes. Raju [5] employs similar analytical techniques to investigate critical management capabilities and their impact on entrepreneurial growth.

5. Results

5.1 Descriptive Statistics and Correlations

Table I presents descriptive statistics for all study variables. EI had a mean of 4.00 (SD=1.68), indicating moderate entrepreneurial intentions among participants. ATB showed the highest mean (4.82, SD=1.63), suggesting generally positive attitudes toward entrepreneurship. PBC had a lower mean (3.78, SD=1.35), indicating moderate perceived control over entrepreneurial activities.

Correlation analysis revealed strong positive relationships between EI and both ATB ($r = 0.89, p < 0.001$) and PBC ($r = 0.77, p < 0.001$). SN showed weaker correlation with EI ($r = 0.45, p < 0.001$). These preliminary findings suggest that ATB and PBC are more strongly associated with EI than SN in our sample. The pattern of correlations is consistent with findings in related domains of strategic management research, where attitudinal and control factors typically demonstrate stronger associations with behavioral intentions than social normative factors. Morthala [2] reports similar patterns in the context of analyst engagement with enterprise modeling, where individual cognitive factors outweigh organizational pressures.

5.2 TPB Antecedents and Entrepreneurial Intention (H1a–H1c)

The regression model with ATB, SN, and PBC predicting EI was highly significant ($F = 91.18, p < 0.001$) and explained 90.3% of variance (adjusted $R^2 = 80.6\%$). As shown in Table II, ATB had a strong positive effect on EI (unstandardized coefficient $b = 0.771$, standardized coefficient $\beta = 0.771, p < 0.001$), supporting H1a. The unstandardized coefficient indicates that for each one-unit increase in ATB (on the 7-point scale), EI increases by 0.771 units, controlling for other factors. The standardized coefficient suggests that ATB is the strongest predictor among the TPB constructs. Figure 3 displays these standardized effects for comparison across predictors.

PBC also showed a significant positive effect (unstandardized coefficient $b = 0.249$, standardized coefficient $\beta = 0.249, p = 0.005$), supporting H1c. This suggests that perceived control over entrepreneurial activities contributes substantially to intention formation. SN's effect was non-significant (unstandardized coefficient $b = 0.046$, standardized coefficient $\beta = 0.046, p = 0.532$), rejecting H1b. Thus, two of three TPB antecedents significantly predict EI in this sample.

The high explanatory power of the model confirms TPB's relevance in predicting entrepreneurial intentions among technical students. However, the non-significance of SN suggests that social factors may play a lesser role in this context compared to personal attitudes and perceived capabilities.

Residual diagnostics confirmed the assumptions of linearity, homoscedasticity, and approximate normality of residuals. Variance inflation factors were all below 3, indicating no substantial multicollinearity concerns. The extremely high explanatory power ($R^2 = 0.903$) warrants caution, as it may suggest potential measurement overlap between constructs or common-method bias, which is further discussed in the limitations section. Similar concerns about explanatory power and measurement overlap have been noted in strategic management research examining complex organizational phenomena. Shanmugam [7]

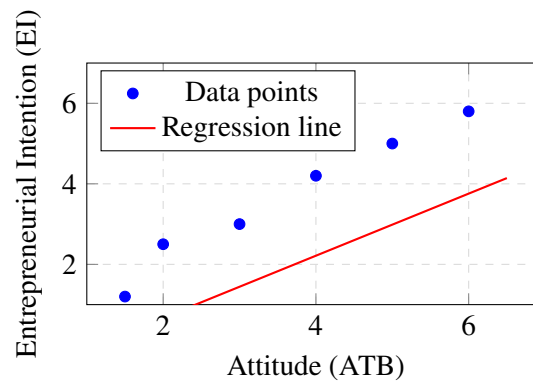


Figure 2: Positive relationship between ATB and EI ($\beta = 0.771$, $p < 0.001$).

Table 2: Complete Regression Statistics for TPB Model

Predictor	Coef.	Std. Error	t-value	p-value	95% CI Lower	95% CI Upper	Std. Coef.
Intercept	-0.869	0.359	-2.420	0.018*	-1.588	-0.150	—
ATB	0.771	0.076	10.102	<0.001***	0.618	0.924	0.771
SN	0.046	0.074	0.628	0.532	-0.102	0.194	0.046
PBC	0.249	0.086	2.902	0.005**	0.077	0.421	0.249

$R^2 = 0.903$

Adjusted $R^2 = 0.806$

$F(3, 62) = 91.18$, $p < 0.001$

Residual standard error: 0.812 on 62 degrees of freedom

VIF values: ATB = 2.41, SN = 1.89, PBC = 2.13

Sample size: N = 66

Notes: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$; Dependent variable: EI

discusses the challenges of measuring enterprise intelligence in cloud-based systems, where multiple constructs may exhibit conceptual overlap.

5.3 Impact of Entrepreneurial Education (H2 and H3)

An ANOVA testing the effect of SEBA participation on EI revealed a non-significant, slightly negative coefficient ($b = -0.122$, $p = 0.772$). Thus, H2 is rejected: the entrepreneurial course did not increase EI. The effect size was minimal, with SEBA participants showing only marginally lower EI scores than non-participants.

Group means and standard deviations were as follows: SEBA participants ($n = 39$) had a mean EI of 3.94 ($SD = 1.71$), while non-participants ($n = 27$) had a mean EI of 4.06 ($SD = 1.66$). The mean difference was -0.12 (95% CI: -0.95, 0.71), with Cohen's $d = 0.07$, indicating a negligible effect size. The confidence interval for the difference includes zero and spans a wide range, consistent with the non-significant result. Given the non-randomized design, these findings should be interpreted as the absence of a detectable association in this sample rather than definitive evidence that entrepreneurship education has no effect.

Correlation analysis also showed no significant relationships between EE and ATB ($r = 0.02$, $p = 0.84$), SN ($r = -0.034$, $p = 0.78$), or PBC ($r = 0.20$, $p = 0.10$). Since there is no significant total effect to mediate, H3a–H3c could not be tested. The absence of mediation effects suggests that the course did not meaningfully change students' attitudes, perceived norms, or sense of control regarding

entrepreneurship. The null findings for entrepreneurship education align with observations in social venture contexts, where leading innovation requires more than formal training alone. Noubissie [10] notes that nonprofit evolution toward entrepreneurial models involves complex organizational and cultural factors that may not be captured by individual-level educational interventions.

Table 3: Effect of Entrepreneurial Education on EI

	Coef.	Std. Error	t-value	p-value
Intercept	4.056	0.283	14.339	<0.001***
SEBA Participation	-0.122	0.420	-0.291	0.772

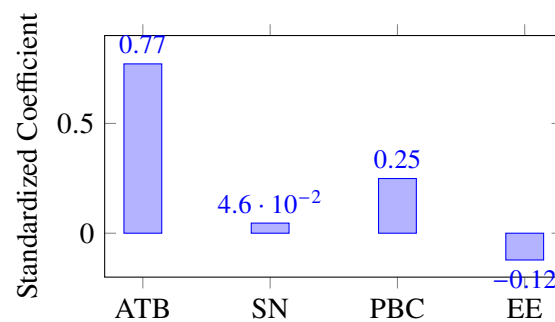


Figure 3: Standardized effects of TPB antecedents and EE on EI. EE effect is negligible.

5.4 Robustness Checks

We conducted several robustness checks to validate our findings. First, we re-ran the regression models with different combinations of control variables (degree level, study program, semesters completed, gender, nationality). The ATB coefficient ranged from 0.742 to 0.789, and PBC from 0.231 to 0.267, with all remaining significant at $p < 0.01$. SN remained non-significant across all specifications ($p > 0.20$). Second, we examined potential interaction effects between TPB constructs; none reached statistical significance at the $\alpha = 0.05$ level. Third, we checked for outliers using Cook's distance; the maximum Cook's distance was 0.072, well below the conventional threshold of 1, indicating no influential cases that distorted the results.

These robustness checks are summarized in supplementary materials available from the authors. The consistency of findings across different analytical approaches strengthens confidence in our conclusions. The patterns observed appear robust and not attributable to specific methodological choices or data anomalies.

6. Discussion and Implications

6.1 Interpretation of Key Findings

The findings demonstrate the relevance of the Theory of Planned Behavior in the context of technical education. Previous research suggests that students at technical education institutions possess an interest in entrepreneurship. In this study, ATB showed the highest effect on EI, indicating that one's interest and attraction to entrepreneurship significantly raises a student's intention to become entrepreneurial. The

analysis of college students' entrepreneurship education has shown that personal attitudes are strongly influenced by both educational experiences and psychological factors [15].

Feeling competent and capable are two important issues in terms of PBC's significance. Due to these individuals' strong analytical and quantitative background, technical students may be more focused on practical feasibility. The reason for SN being not significantly involved may be that social pressure may not affect the decision to become an entrepreneur as much as internal cognitive processes. The impact of young entrepreneurs' network entrepreneurship education has demonstrated the importance of social influences on entrepreneurial psychology [18].

Although there is contact with EE, the influence of EE on EI is negligible. A few clarifications would be required. To begin with, the impact of EE on EI may be invoked by the opportunity shock. Our course possibly had students who were not exposed to a realistic assessment of the entrepreneurial challenge before the course and attended the course with unrealistic expectations. As a result, after encountering the reality of entrepreneurship through the course, they may have reconsidered their initial intentions. Research has shown that the effect of entrepreneurship education on entrepreneurial intention is mediated by entrepreneurial self-efficacy and moderated by psychological capital [24].

Another possible explanation for the null effect of EE relates to our sample of technically oriented students. They may have entered the course with relatively fixed career paths oriented toward stable corporate employment, rendering their intentions less amenable to change through a single course. This interpretation, however, is speculative, as we did not directly measure career aspirations or pre-existing entrepreneurial interest before the course. Additionally, the course's emphasis on software prototyping may have shifted student focus toward technical development at the expense of entrepreneurial considerations. These possibilities require empirical investigation through studies that measure career intentions and motivations before and after entrepreneurship education interventions. The challenges of translating strategic intentions into organizational action have been documented in banking and financial services contexts. Muppuri [30] examines how strategic business approaches to security in banking operations must account for both individual capabilities and institutional constraints.

6.2 Theoretical Contributions

The main propositions of TPB are supported by the evidence produced in this study. The model may assign distinct weighting to the antecedents under certain circumstances, owing to the differential salience of ATB and PBC with regard to SN. The extended model of TPB has been empirically tested in college student populations, demonstrating the framework's utility in educational contexts [12].

According to the EE findings, education and intention formation are among the contested areas of study [31, 32]. Evidence partly confirms views that effects of experiential education are not always positive but depend on course curriculum, student population and timing of measurement. The results indicate a need for more contingent theory regarding EE which specifies the boundary conditions for effectiveness - not just "does it work" but "when and for whom does it work". Digital entrepreneurship and entrepreneurship education have been reviewed, highlighting the need for more context-specific approaches [29]. The integration of smart city concepts into entrepreneurial ecosystems provides one avenue for developing more contextually grounded theories of venture creation. Dhanani [25] demonstrates how urban systems can create enabling environments for entrepreneurship that extend beyond individual-level factors.

6.3 Practical Implications for Universities

For university educators, results indicate that simply offering entrepreneurship courses may not boost intention. Instead, courses should deliberately target ATB and PBC through inspirational content, skill-building exercises, and mentorship. Specifically, educators should:

1. Design courses that build both technical and business skills
2. Include successful entrepreneur role models to inspire students
3. Provide hands-on experiences that build confidence and self-efficacy
4. Offer personalized feedback and mentoring

For policymakers and university leaders, creating a supportive ecosystem is crucial. Beyond classes, providing incubator access, networking events, funding opportunities, and role model interactions can strengthen PBC and nurture intention. Technical universities should leverage their innovation capabilities to connect engineering with entrepreneurship through:

- Cross-disciplinary collaboration opportunities
- Industry partnerships and mentorship programs
- Seed funding for student ventures
- Recognition and rewards for entrepreneurial achievements

6.4 Limitations and Future Research Directions

Some limitations should be taken into consideration. To begin with, no causality can be determined because of the cross-sectional nature of this study. A future recommendation for the research is to use longitudinal designs which follow a group of students through their university experience to observe developmental changes in their EI. A limitation of the study was that the participants were from only one university.

The undependable nature of the SN measure ($\alpha = 0.26$) shows measurement problems. Future studies should utilize methods of SN measurement that are more reliable, or a measure could be developed that is specific to the research context. Moreover, the limitation of focusing on technical students restricts the generalizability to other domains such as engineering, business, and arts. Research has shown that the impact of entrepreneurship education on entrepreneurial intention varies across different student populations and institutional contexts [24]. The challenges of generalizing findings across different geographic and technological contexts have been documented in research on digital adoption. S B M [14] demonstrates that geospatial factors can significantly moderate the relationships between technology adoption and market outcomes.

The findings lead to many questions that must be addressed. Future research needs to determine why some students' intentions drop after participating in an EE course. A qualitative study on intention changes in individuals after a pre-post event can reveal the cognitive processes which may be involved. This study recommends investigating the differences in pedagogical methods (theoretical vs. experiential, individual vs. team-based, etc.). The integration of psychology into entrepreneurship education has been proposed as a catalyst for developing cognitive and emotional skills, yet empirical evidence in technical university contexts remains sparse [16].

A further limitation concerns the potential for common-method bias, as all psychological constructs (EI, ATB, SN, PBC) were measured through self-reported Likert-scale instruments at a single point in time. This design may inflate observed relationships due to shared method variance, response tendencies, or social desirability bias. Although the high correlation between ATB and EI ($r = 0.89$) could partly reflect conceptual overlap between the constructs, it may also indicate common-method effects. Future research should consider multi-method approaches, including objective measures of entrepreneurial behavior or peer assessments, to mitigate this concern.

The cross-sectional nature of this study also limits causal inferences regarding the effect of entrepreneurship education on intention. Although we examined associations between SEBA participation and EI, we lack pre-course measurements, making it impossible to determine whether the course changed students' intentions or merely captured pre-existing differences between groups. A longitudinal design with pre- and post-course measurements would provide considerably stronger evidence regarding the causal impact of entrepreneurship education on intention formation. Methodological approaches developed in other domains of strategic management research offer useful templates for addressing these challenges. Mohanavel [21] demonstrates how longitudinal tracking of team performance in competitive robotics can provide insights into skill development and strategic learning over time.

6.5 Conclusion and Final Remarks

This study investigated the factors influencing entrepreneurial intention among 66 informatics students at a European technical university, drawing on the Theory of Planned Behavior as the theoretical framework. The findings validate the relevance of TPB in this context, with attitude toward behavior and perceived behavioral control emerging as strong predictors of entrepreneurial intention, while subjective norms showed no significant relationship after accounting for other factors. The high explanatory power of the model ($R^2 = 0.903$) confirms the utility of TPB for understanding entrepreneurial intentions among technical university students.

However, participation in the SEBA project-based entrepreneurship course was not associated with higher entrepreneurial intention, contrary to expectations. The non-randomized design of the study precludes causal interpretations, and the null finding may reflect selection effects, the specific characteristics of the course or student population, or the timing of measurement. The unreliability of the subjective norms measure ($\alpha = 0.26$) represents a notable methodological limitation that should be addressed in future research.

For university educators and policymakers, the results suggest that institutional support should extend beyond formal coursework to include ecosystem elements that strengthen perceived behavioral control and positive attitudes toward entrepreneurship. Incubator access, mentorship programs, and networking opportunities may complement educational interventions in fostering entrepreneurial intentions.

Future research should employ longitudinal designs with pre- and post-course measurements to track changes in entrepreneurial intention over time. Studies should also investigate how different pedagogical approaches, student characteristics, and ecosystem components interact to influence entrepreneurial intentions and subsequent venture creation. Addressing these questions can help bridge the gap between entrepreneurial intention and entrepreneurial action.

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