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Article

AI-Embedded Digital Tools in Business Education and Entrepreneurial Intention: Gender-Based Structural Modeling

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Abstract

The usage of artificial intelligence (AI)-enabled technologies and information technology (IT) systems in entrepreneurship education has increased due to the digital revolution of higher education. With a focus on gender-related disparities, this study investigates how students' entrepreneurial intentions are influenced by digital business modeling tools. From non-AI to AI-embedded and fully AI-driven systems, the study places digital tools on a continuum. Data from 440 students taking part in entrepreneurial workshops using the AI-enabled digital tool KABADA served as the basis for the empirical investigation. Before and after the session, changes in entrepreneurial intention and its major antecedents—attitude toward entrepreneurship, subjective norms, and perceived behavioral control—are evaluated using structural equation modeling. According to the findings, attending the KABADA workshop has a statistically significant positive indirect impact on entrepreneurial intention, which is mainly mediated by perceived behavioral control. Significant gender differences are revealed by multi-group analysis: for female students, the main factor influencing entrepreneurial intention is perceived behavioral control, while for male students, the main factor is attitude toward entrepreneurship. These results emphasize the significance of IT systems that integrate guided user engagement with AI-based analytics to improve entrepreneurial self-efficacy, especially among women.

Keywords: digital tools; artificial intelligence (AI); KABADA workshop; entrepreneurial intention; business education; genders

1. Introduction

Higher education is changing as a result of the quick growth of artificial intelligence (AI) and digital technologies, especially in the area of entrepreneurship education (Bergmann et al., 2018; Bikse et al., 2021). Curricula are progressively incorporating digital IT systems to facilitate data-driven decision-making, business modeling, and practical learning (Bygstad et al., 2022; Rof et al., 2020; Zhang, 2021). Universities are under increasing pressure to provide students with the digital competences and entrepreneurial skills needed in a data-driven economy as entrepreneurial activity becomes increasingly technology-intensive (Garcez et al., 2022; Mavlutova et al., 2020).

Digital technologies, from AI-embedded and completely AI-driven platforms to template-based company planning software, are now frequently used in entrepreneurship education. Business strategies, market assessments, and financial predictions can be generated automatically by AI-driven systems, greatly lowering the amount of work that users must do. Fully automated systems, however, might restrict active learning and the growth of analytical and strategic abilities in educational settings. AI-embedded systems, which support learning while preserving user engagement, provide a more balanced approach by combining automated analytics with structured user input. From the standpoint of IT systems, these tools operate as socio-technical systems where

successful human-AI interaction is necessary for learning results (Iwu et al., 2021; Zdolsek Draksler & Sirec, 2021).

Digital technologies are becoming more widely used in business education, but less is known about how they affect entrepreneurial intention, especially when it comes to gender disparities. Attitudes toward entrepreneurship, subjective norms, and perceived behavioral control all have an impact on entrepreneurial intention, which is widely acknowledged as a crucial precursor of entrepreneurial behavior (Cera et al., 2020; Hattab, 2014; Martínez-Gregorio et al., 2021; Reissová et al., 2020; Wang et al., 2023). Previous studies show that these parameters are significantly influenced by gender, with women frequently expressing lower perceived behavioral control in technology-related and entrepreneurial areas despite having similar levels of competence and education (Duffy et al., 2016; Sweida & Sherman, 2020; Vamvaka et al., 2020). This brings up significant issues regarding how inclusive digital entrepreneurship education is and how much different learner groups are supported by IT systems (Silesky-Gonzalez et al., 2025).

The research aims to broaden its impact on important discussions about the digital transformation of education, focusing on the use of digital tools in business education, highlighting gender inequalities in their use in increasing students' entrepreneurial intentions.

This study examines how students' entrepreneurial intention is affected by KABADA (Knowledge Alliance of Business Idea Assessment: Digital Approach), an AI-embedded digital business modeling tool. The study examines the direct and indirect impacts of digital tool usage on entrepreneurial intention using data from university-level entrepreneurship seminars and structural equation modeling. Gender-based variations in these impacts are given particular consideration. By showing how the design and pedagogical use of AI-supported IT systems can improve entrepreneurial self-efficacy and encourage more inclusive entrepreneurship education, the findings add to the body of knowledge on digital transformation in education.

2. Theoretical Framework

Digital tools powered by artificial intelligence (AI) and data analytics are changing entrepreneurship education in a number of ways (Cruz-Cardenas et al., 2022; Aditya et al., 2021). Students may test business methods in risk-free settings thanks to virtual simulation games and mixed-reality environments, which improve experiential learning (Rodriguez-Abitia & Bribiesca-Correa, 2021). Personalized learning experiences are provided by AI-powered chatbots and recommendation engines, which walk students through difficult entrepreneurship ideas and provide them immediate feedback. Furthermore, social networks, MOOCs, and online platforms increase options for collaboration, allowing students to interact with international startup groups, exchange ideas, and improve their startup concepts (Akour & Alenezi, 2022; Alenezi, 2021; Alshammary & Alhalafawy, 2023; Khan et al., 2021; Wegner et al., 2023).

For thorough company planning, a number of digital tools are available; however, the majority of these tools are not free, and many of them can be costly, ranging from basic plans to premium versions. Bizplan, BizPlanBuilder, Cuttles, Business Plan, Pro, Business Sorter, and other programs are among the most often used ones (Lesinskis et al., 2023).

This study employs a comparative analysis to classify the most popular business plan created digital tools into three groups according to the degree of AI integration: (1) Non-AI tools, which generate content using predefined templates and manual input; (2) AI-embedded tools, which offer users both flexibility and efficiency by combining AI-assisted automation with manual customization; and (3) AI-driven tools, which use advanced natural language processing, machine learning, and predictive analytics to automatically generate business plans and market insights. By utilizing data-driven recommendations, AI-driven solutions offer organized company planning, boosting entrepreneurial intention and enhancing decision-making effectiveness. In the meanwhile, hybrid models provide users authority over the creation of venture strategies while enabling them to improve AI-generated recommendations (Schiavone et al., 2023, Wut et al., 2025).

Making strategic decisions based on trustworthy data is essential to long-term success in a world driven by AI and digital transformation, guaranteeing startup position as a leader (Galovski, 2025; Rohaetin, 2020).

As an example, Venturekit is an AI-powered tool that can create thorough business plans on its own for specific companies by creating comprehensive documents that include executive summaries, SWOT analysis, financial predictions, marketing strategies, and more by utilizing cutting-edge AI algorithms, such as the most recent GPT-4 language models.

Venturekit's main functionality is essentially powered by AI, in contrast to tools that are only AI-embedded, where AI capabilities are supplemental. The platform's AI algorithm analyses user-inputted core company data to produce a comprehensive, well-organized business plan. This method greatly cuts down on the time and effort usually needed for company planning, making it accessible even to students who have never written one before (Venturekit).

However, despite the fact that AI-driven digital tools like as Venturekit are easy to use, the authors conclude that for the purposes of student entrepreneurship training, it would be more useful to use AI-embedded digital tools, which also offer data analytics, but also give students the opportunity to supplement their knowledge and skills in writing a business plan.

The authors use the KABADA tool they created to carry out further research within the parameters of this study. The authors created KABADA, which stands for Knowledge Alliance of Business Idea Assessment: Digital Approach, with assistance from the EU Erasmus+ project. Students and other users can create their business plans step-by-step with the help of KABADA's digital tool, which is an organized, web-based solution, see Figure 1.

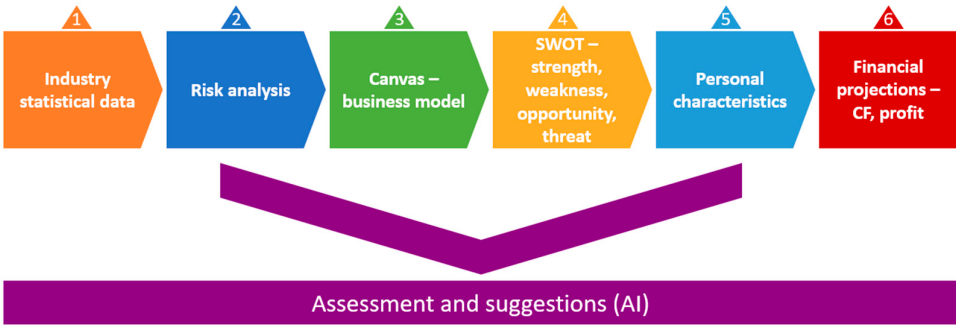


Figure 1. KABADA tool insight.

With theoretical research as a guide, students can create their business plans step-by-step with the assistance of KABADA's digital tool, which is an organized, web-based solution. The tool helps prospective entrepreneurs understand where they stand, where and how they can contemplate heading, and what opportunities and obstacles lie ahead. It is informed by theoretical research, pertinent statistics, and AI insights (Mavlutova et al., 2025).

AI algorithms are incorporated into the system based on the business plans made on the KABADA platform. These algorithms guarantee the gathering, organizing, and processing of data from earlier business plans in order to provide KABADA users with this data in an organized manner. As a result, when students are working on business ideas, the AI system provides guidance for decision-making.

The KABADA tool is also associated with the usage of big data; it gathers a vast amount of business plans that include detailed information on business models, financial assumptions, and forecasts. The system must be able to interpret these plans and provide future users with recommendations that are simple to comprehend.

KABADA introduces to the business statistics of the selected industry and country, the system offers a comparison of country-level indicators with industry trends across the EU, obtained from Eurostat's Structural Business Statistics database. Further, KABADA analyses the various risks at the

macro, industry and company level, PESTE (Political, Economic, Social, Technological, Environmental Factors) and Michael Porter's Five Forces analysis are employed. Business model development using the Business Canvas by Osterwalder (2005), SWOT (Strengths, Weaknesses, Opportunities, Threats) analysis with the aim of generating assumptions for the development of an overall strategy. When creating a business model and SWOT analysis, the KABADA tool allows users to make a choice from a set of predefined options in the system. It also includes a personal characteristics and financial forecast blocks, which are linked to the previously created business model Canvas.

In recent years, the number of female-led businesses in the entrepreneurial ecosystem has increased, fostering innovation and economic progress. Research has demonstrated that identical business ideas presented by male and female entrepreneurs are assessed differently by investors, with women experiencing more scrutiny and skepticism (Carvalho et al., 2021). Fostering a more equitable funding environment requires advocacy campaigns that support gender-inclusive investment practices and educational programs that aim to increase financial literacy (Vamvaka et al., 2020).

There are nearly twice as many male entrepreneurs as female entrepreneurs, despite the fact that female are more likely to participate in firms and have greater levels of self-efficacy and entrepreneurship education, according to a number of studies. Studies show that entrepreneurial intention is significantly more influenced by gender than by age or academic discipline (Voda & Florea, 2019; Wang & Liu, 2024).

Despite years of study in IT and similar areas at universities, current research reveals that women are not strong in information technology (IT) and related industries, starting financial start-ups in the digital age. In a world where demand for IT services and applications is rising, it is crucial to educate women as technology professionals and entrepreneurs through the use of STEM and IT, particularly in start-ups.

3. Materials and Methods

Data were collected during 10 entrepreneurial workshops. Duration of one workshop was 3 hours. Participants were students from Central and Eastern European (CEE) or Southern European (SE) countries. Sample was selected using convenience sampling method. All workshops involved digital tool KABADA. Participants filled in questionnaires before and after the workshop. Data were filtered, removing duplicates and responses with missing values. In total, n=440 responses were obtained. Respondent distribution by several demographic variables is presented in Table 1.

Table 1. Distribution of respondents.

Variable	Before	After
n	248	192
Age		
<22	35.5 %	38.0 %
22-25	37.5 %	34.4 %
Gender		
Male	49.6 %	51.6 %
Female	50.4 %	48.4 %
Region		
CEE	49.6 %	49.0 %
SE	50.4 %	51.0 %
Level of studies		
Bachelor 1st and 2nd	45.2 %	44.3 %
Bachelor 3rd and 4th	30.2 %	29.2 %
Master and doctor	24.6 %	26.6 %
Experience in entrepreneurship		

None	44.4 %	40.6 %
A few	33.9 %	39.1 %
Some	18.5 %	16.7 %
A lot	3.2 %	3.6 %

Theoretical research model used in the analysis is presented in Figure 2. It is based on Ajzen’s theory of planned behavior (Ajzen, 1991), with workshop variable added to it.

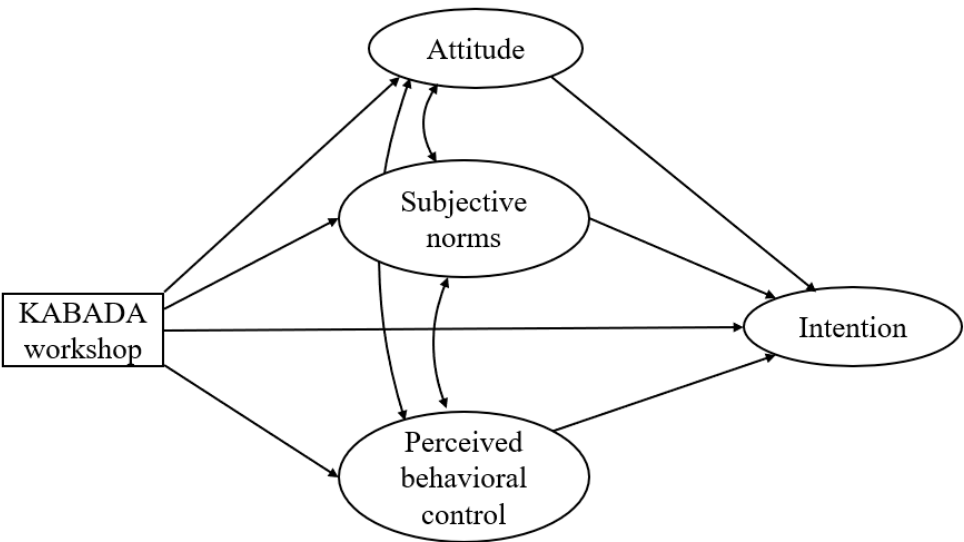


Figure 2. SEM of the impact of a KABADA workshop on entrepreneurial intention.

KABADA workshop is a binary variable that describes whether responses were provided before or after the workshop. Attitude towards entrepreneurship, subjective norms, perceived behavioral control and entrepreneurial intention are latent variables corresponding to concepts in Ajzen’s theory. Attitude, subjective norms and perceived behavioral control are allowed to correlate in the model, which indicates possible common causes not included. Questions and statements corresponding to latent variables are provided below.

- Attitude towards entrepreneurship:
What are your feelings when you imagine that you could be an entrepreneur?
- A1. I am interested;
 - A2. I feel strong;
 - A3. I feel inspired.
- Subjective norms:
- N1. Entrepreneurs are respected and highly valued in society;
 - N2. Many people consider entrepreneurship to be a good career path;
 - N3. Entrepreneurship is socially significant activity.
- Perceived behavioral control:
- C1. Please make a self-assessment! My knowledge of entrepreneurship is;
 - C2. Starting an entrepreneurship would be easy for me;
 - C3. If I start my own entrepreneurship project, I would have a high probability of succeeding.
- Entrepreneurial intention:
- I1. How high is your intention to become an entrepreneur?
 - I2. Do you agree that entrepreneurship could fulfil your life?
 - I3. I consider starting or participating in entrepreneurship within the next 5 years.

Analysis was performed using R (R Core Team, 2024), structural equation model estimation and testing was performed using library *lavaan* (Rosseel, 2012). As an estimator, maximum likelihood estimator with robust (Huber-White) standard errors and scaled test statistics was selected.

4. Results

Initially confirmatory factor analysis (CFA) model was estimated and measures for determining reliability (Cronbach's alpha and composite reliability) and convergent validity (average variance extracted) were calculated in order to assess reliability of the questionnaire. Standardized loadings of latent variables and reliability measures are presented in Table 2.

Table 2. Standardized loadings of latent variables and their reliability measures.

Variable and questions	Standardized loading	Cronbach's alpha	Composite reliability	Average variance extracted
Attitude		0.872	0.869	0.693
A1	0.852			
A2	0.826			
A3	0.818			
Subjective norms		0.606	0.586	0.329
N1	0.552			
N2	0.549			
N3	0.619			
Perceived behavioral control		0.725	0.730	0.474
C1	0.631			
C2	0.669			
C3	0.758			
Intention		0.821	0.841	0.642
I1	0.835			
I2	0.692			
I3	0.834			

For two of the variables (attitude and intention) all reliability measures are above the recommended cut-off values — Cronbach’s alpha and composite reliability above 0.7, average variance extracted above 0.5 (Cheung et al., 2024; Fornell & Larcker, 1981). For perceived behavioral norms average variance extracted is below cut-off values, other measures are within recommended values. For subjective norms all measures are below recommended cut-off values and standardized loadings are comparatively low. This suggests that changing subjective norms may not be adequately characterized.

HTMT criterion values are presented in Table 3. All values are below 0.85, confirming the discriminant validity (Henseler et al., 2015).

Table 3. HTMT criterion values.

	Attitude	Subjective norms	Perceived behavioral control
Subjective norms	0.719		
Perceived behavioral control	0.545	0.531	
Intention	0.803	0.626	0.730

Consequently, structural equation model was estimated and tested. Model characteristics and fit indices are presented in Table 4. Model fit for data is average, only one of the indices (SRMR) is

within recommended values, other indices are not. χ^2 is statistically significant, however such result is expected when working with larger sample sizes.

Table 4. Model characteristics and fit indices.

	χ^2	RMSEA	SRMR	CFI	TLI
Model values	343.72 (p<0.001)	0.085	0.050	0.926	0.897
Recommended values (West et al., 2023)	Statistically insignificant	<0.06	<0.08	>0.95	>0.95

Path coefficients of structural equation model, including unstandardized coefficients, their standard error and p-value and standardized coefficients, are presented in Table 5.

Table 5. Resulting path coefficients of structural equation model.

Path	Unstandardized coefficient	Standard error	p-value	Standardized coefficient
KABADA → Attitude	0.020	0.103	0.846	0.010
KABADA → Norms	0.025	0.127	0.845	0.012
KABADA → PBC	0.554	0.119	<0.001	0.265
KABADA → Intention	-0.018	0.163	0.910	-0.004
Attitude → Intention	1.238	0.295	<0.001	0.600
Norms → Intention	-0.094	0.236	0.690	-0.046
PBC → Intention	0.850	0.181	<0.001	0.427

Structural model with corresponding path coefficients is presented in Figure 3. For this and following figures, star notation shows significance level of path coefficients (* – significant at $\alpha=0.05$, ** – significant at $\alpha=0.01$, *** – significant at $\alpha=0.001$). Workshop has a statistically significant effect on perceived behavioral control, meanwhile it does not have a significant effect on other variables (attitude, subjective norms and intention). Intention is statistically significantly affected by both attitude and perceived behavioral control, the effect of subjective norms on intention is not statistically significant.

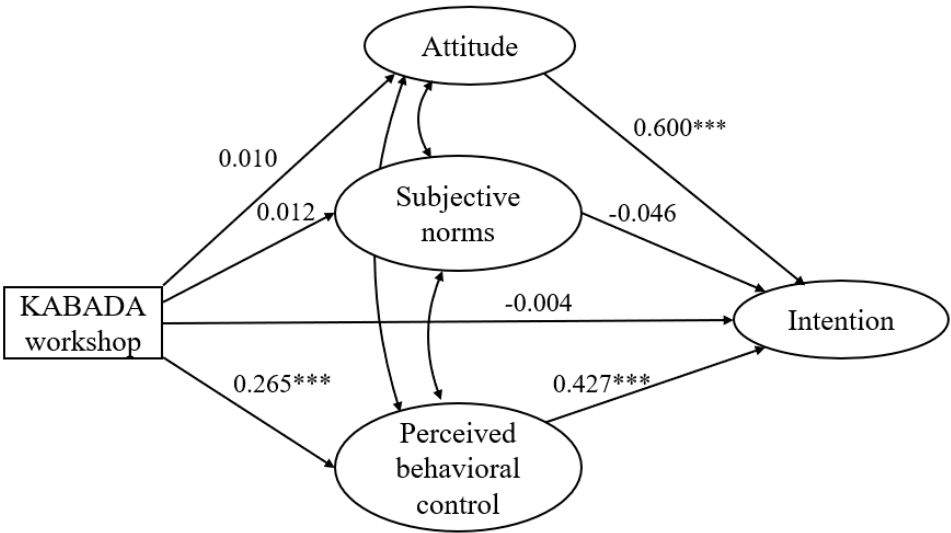


Figure 3. Structural model with corresponding standardized path coefficients.

Additionally, overall workshop effect on intention was calculated, results are presented in Table 6. Total effect of KABADA workshop on intention is statistically significant, mainly mediated through perceived behavioral control.

Table 6. Effect of workshop on entrepreneurial intention.

Effect	Unstandardized coefficient	Standard error	p-value	Standardized coefficient
Through perceived behavioral control	0.471	0.146	0.001	0.113
Through subjective norms	-0.002	0.014	0.865	-0.001
Through attitude	0.025	0.128	0.846	0.006
Total indirect effect	0.493	0.220	0.025	0.119
Direct effect	-0.018	0.163	0.910	-0.004
Total effect	0.475	0.219	0.030	0.114

Consequently, multiple group analysis was performed, using equivalent model and dividing responses in groups by participant gender. Confirmatory factor analysis models with and without fixed parameter loading values were compared using likelihood-ratio test. Corresponding p-value is 0.497. which confirms weak invariance. When performed similar analysis, but fixing intercepts, strong invariance was not confirmed (p=0.002).

Model fit indices for multigroup model are presented in table 7. Unstandardized loadings were fixed between the groups. Equivalently to the simple model, multigroup model has an average fit for data.

Path coefficients for female group are presented in Table 8 and Figure 4. Total effect of workshop on entrepreneurial intention is calculated and presented in Table 9. Path coefficients for male group are presented in Table 10 and Figure 5, total effect of workshop on intention is presented in Table 11.

Table 7. Model characteristics and fit indices.

	χ^2	RMSEA	SRMR	CFI	TLI
Model values	285.50 (p<0.001)	0.085	0.057	0.921	0.897
Recommended values (West et al., 2023)	Statistically insignificant	<0.06	<0.08	>0.95	>0.95

Table 8. Path coefficients for female group.

Path	Unstandardized coefficient	Standard error	p-value	Standardized coefficient
KABADA → Attitude	0.092	0.147	0.529	0.046
KABADA → Norms	0.092	0.177	0.604	0.046
KABADA → PBC	0.716	0.180	<0.001	0.334
KABADA → Intention	-0.275	0.279	0.325	-0.060
Attitude → Intention	0.794	0.313	0.011	0.354
Norms → Intention	0.340	0.262	0.194	0.151
PBC → Intention	1.125	0.291	<0.001	0.531

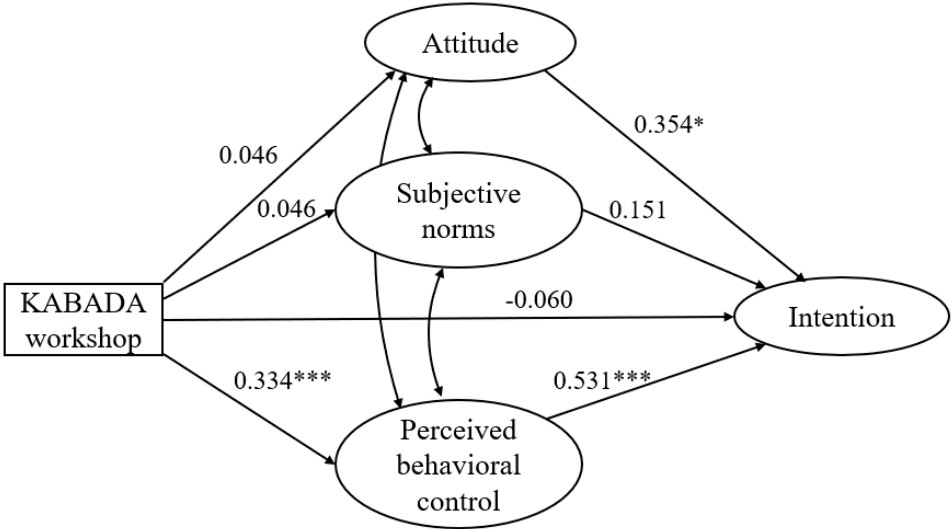


Figure 4. Structural model with corresponding standardized path coefficients for female group.

Table 9. Effect of workshop on entrepreneurial intention for female group.

Effect	Unstandardized coefficient	Standard error	p-value	Standardized coefficient
Through perceived behavioral control	0.806	0.291	0.006	0.177
Through subjective norms	0.031	0.062	0.615	0.007
Through attitude	0.073	0.120	0.542	0.016
Total indirect effect	0.910	0.372	0.014	0.200
Direct effect	-0.275	0.279	0.325	-0.060
Total effect	0.635	0.337	0.059	0.140

Table 10. Path coefficients for male group.

Path	Unstandardized coefficient	Standard error	p-value	Standardized coefficient
KABADA → Attitude	-0.049	0.145	0.737	-0.024
KABADA → Norms	-0.028	0.176	0.873	-0.014
KABADA → PBC	0.584	0.211	0.006	0.212
KABADA → Intention	0.061	0.259	0.812	0.013
Attitude → Intention	1.866	0.471	<0.001	0.808
Norms → Intention	-0.580	0.523	0.268	-0.250
PBC → Intention	0.688	0.222	0.002	0.411

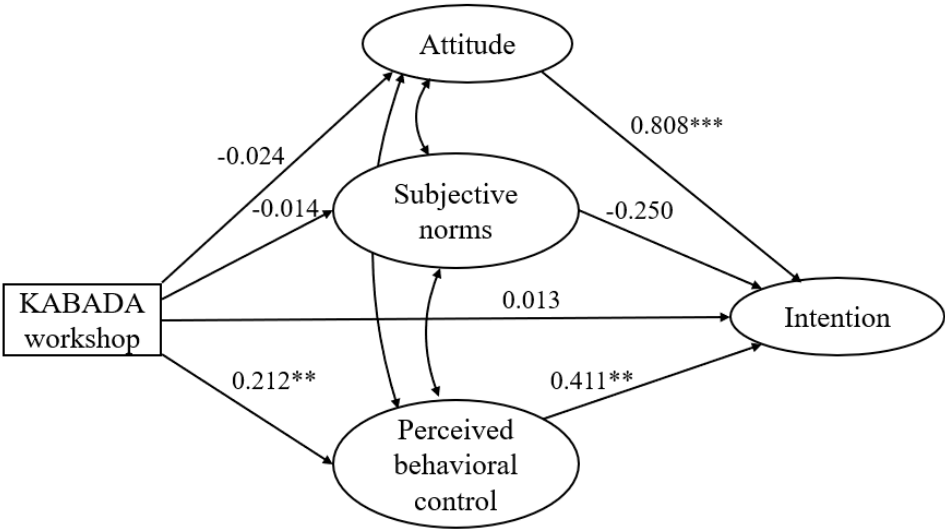


Figure 5. Structural model with corresponding standardized path coefficients for male group.

Table 11. Effect of workshop on entrepreneurial intention for male group.

Effect	Unstandardized coefficient	Standard error	p-value	Standardized coefficient
Through perceived behavioral control	0.402	0.189	0.034	0.087
Through subjective norms	0.016	0.103	0.874	0.004
Through attitude	-0.091	0.273	0.739	-0.020
Total indirect effect	0.327	0.328	0.319	0.071
Direct effect	0.061	0.259	0.812	0.013
Total effect	0.389	0.340	0.253	0.084

For both groups effect of workshop on intention mediated through perceived behavioral control is statistically significant, however total effect is not. For male group main factor affecting entrepreneurial intention is attitude towards entrepreneurship, however for female group perceived behavioral control is the main factor affecting intention and attitude plays a smaller role. As workshop has a significant effect only on perceived behavioral control and therefore main effect of workshop on intention is mediating effect through perceived behavioral control, workshop effect on intention is more pronounced in female group, compared to male group.

5. Discussion

The results of this study demonstrate that, when incorporated into business education through organized learning interventions, AI-embedded digital tools can significantly enhance entrepreneurial intention. The findings show that, mostly through perceived behavioral control, attending the KABADA workshop had a statistically significant favorable overall impact on entrepreneurial intention. This confirms earlier studies that found perceived behavioral control to be a crucial factor in determining entrepreneurial intention and a major way that education affects entrepreneurial success (Vamvaka et al., 2020; Voda & Florea, 2019).

The findings emphasize the value of AI-embedded rather than fully AI-driven technologies in educational settings from the standpoint of IT systems. Although completely automated AI systems are capable of producing business plans effectively, they could decrease the need for active learning and skill development. On the other hand, students' confidence in their entrepreneurial skills is increased by KABADA's design, which combines data analytics, AI-supported recommendations,

and user-driven decision-making. This is consistent with research highlighting how AI literacy and human-AI engagement might enhance learning outcomes and employability (Lesinskis et al., 2025; Wut et al., 2025).

Significant gender disparities in the factors influencing entrepreneurial intention are revealed by the multi-group study. Perceived behavioral control is the primary motivator for female students, while attitude toward entrepreneurship is more significant for male students. These results are in line with earlier studies (Carvalho et al., 2021) that indicate women encounter more obstacles concerning confidence, risk perception, and resource access in entrepreneurial and technology-intensive settings. Significantly, the findings imply that by improving female participants' perceptions of behavioral control, AI-embedded digital tools may be able to lessen these differences.

Overall, by showing how well-designed AI-supported IT systems might increase entrepreneurial self-efficacy and encourage more inclusive learning outcomes, the study contributes to the body of knowledge on digital transformation in higher education. According to Cruz-Cardenas et al. (2022) and Lesinskis et al. (2023), the results highlight the necessity for entrepreneurship education to shift from tool adoption to pedagogically informed system design that takes behavioral and gender-related aspects into account.

6. Conclusions

With an emphasis on their effects on students' entrepreneurial intention and gender-related disparities, this chapter explored the use of AI-embedded digital tools in entrepreneurship education. The results show that entrepreneurial intention is positively and statistically significantly impacted by the employment of the KABADA digital business modeling tool, mainly through perceived behavioral control. This suggests that IT solutions that facilitate guided decision-making, data analytics, and structured engagement can boost students' self-confidence in their capacity for entrepreneurship.

The study emphasizes the significance of creating AI-supported educational platforms that strike a balance between automation and active user interaction from the perspective of IT systems. While fully automated AI-driven solutions might be effective, AI-embedded systems work better in educational settings where reflective learning and skill development are crucial. Overall, the findings highlight the necessity of incorporating AI-supported, pedagogically informed digital tools into entrepreneurship education in order to promote inclusive, data-driven, and future-focused learning environments.

The findings also show that the mechanisms influencing entrepreneurial inclination varied significantly by gender. For male students, entrepreneurial attitudes are more important, whereas for female students, perceived behavioral control is the most important factor. These results imply that, especially in technology-intensive learning environments, AI-embedded instructional tools can help lower gender-related barriers by boosting entrepreneurial self-efficacy.

There is a need to integrate AI-powered business modelling into curricula, while providing students with the necessary skills and abilities to navigate the rapidly changing business environment. The results of the study show that digital tools, including AI-powered ones, are important in entrepreneurship education, promoting student education in general and entrepreneurial intention in particular. Entrepreneurship education must evolve, using the latest digital technological advances, preparing students for the challenges and opportunities of a data-driven economy.

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