






“From digital canvas learning to economic growth: The human capital pathway in entrepreneurial universities”

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FROM DIGITAL CANVAS LEARNING TO ECONOMIC GROWTH: THE HUMAN CAPITAL PATHWAY IN ENTREPRENEURIAL UNIVERSITIES

Abstract

Despite the rapid digital transformation in higher education, empirical evidence explaining how digital entrepreneurship learning contributes to human capital formation, entrepreneurial universities, and economic growth remains limited. This study investigates the role of Digital Canvas Learning (DCL), a digital-based entrepreneurship learning approach that enables students to design and test business models using an interactive Business Model Canvas. The study employs a structured survey conducted in 2024 involving 206 undergraduate and graduate students enrolled in entrepreneurship programs at universities within Higher Education Service Institutions Regions III and IX, Indonesia. The respondents were selected because they were actively engaged in entrepreneurship education, making the sample relevant for examining the outcomes of digital entrepreneurship learning. The data were analyzed using Partial Least Squares – Structural Equation Modeling (PLS-SEM). The results show that DCL has a strong and significant effect on Human Resource Development ($\beta = 0.752$; $p < 0.001$) and Economic Growth ($\beta = 0.690$; $p < 0.001$), and a significant influence on University Entrepreneurship ($\beta = 0.337$; $p < 0.001$). Furthermore, Human Resource Development significantly affects University Entrepreneurship ($\beta = 0.527$; $p < 0.001$) and Economic Growth ($\beta = 0.273$; $p < 0.001$), while University Entrepreneurship strongly contributes to Economic Growth ($\beta = 0.662$; $p < 0.001$). The structural model explains 79.4% of the variance in Economic Growth, indicating substantial explanatory power. These findings demonstrate that Digital Canvas Learning not only enhances students' entrepreneurial competencies but also strengthens human capital development, supports entrepreneurial universities, and contributes to sustainable economic growth.

Keywords

digitalization, learning, entrepreneurship, human capital, growth

INTRODUCTION

Digital technologies have become a central force reshaping contemporary economic systems by transforming how innovation, productivity, and entrepreneurship are generated and sustained (Khan, 2022). In higher education, this transformation has repositioned universities from traditional knowledge producers into active agents of economic and social development. Under the entrepreneurial university model, academic institutions are increasingly expected to cultivate entrepreneurial mindsets, foster innovation ecosystems, and contribute directly to national competitiveness (Feola et al., 2021). However, the extent to which digitalization truly enables this transformation beyond administrative efficiency and content delivery remains unclear.

Although digital tools are widely adopted in universities, their use often remains instrumental rather than transformational. Prior studies show that digital learning environments can enhance engagement

and experiential learning (Garcez et al., 2022), yet most research focuses on short-term educational outcomes rather than long-term institutional and economic impacts. This issue is particularly salient in emerging economies such as Indonesia, where structural constraints continue to limit the translation of education into entrepreneurial activity. Despite steady economic growth, Indonesia's entrepreneurship ratio remains relatively low compared to neighboring ASEAN countries, suggesting that the challenge lies not only in access to education but also in the effectiveness of learning systems in cultivating productive entrepreneurial capacities. In this context, universities are increasingly viewed as institutional levers for addressing this imbalance.

The Business Model Canvas (BMC) has been widely adopted as a pedagogical framework for entrepreneurship education. While prior studies show that BMC-based learning improves conceptual understanding and problem-solving skills (Hutasuhut et al., 2020), little is known about how its digital adaptation reshapes universities' roles in human capital formation and economic value creation. Existing literature largely treats digital entrepreneurship education as a tool for individual skill development, leaving its broader institutional and macroeconomic implications underexplored. This unresolved tension between the operational use of digital tools and their potential as engines of institutional and economic transformation constitutes the central scientific problem of this study. Without a clearer understanding of how digital learning mechanisms shape human capital and entrepreneurial capacity at the institutional level, universities risk adopting digitalization in ways that are technologically advanced but economically superficial.

1. LITERATURE REVIEW AND HYPOTHESES

The rapid advancement of digital technologies has significantly transformed higher education and entrepreneurship learning. Universities are increasingly expected to develop students' entrepreneurial competencies and innovation capabilities to support economic development and competitiveness in the digital era. In this context, the development of human capital through entrepreneurship education becomes an important strategic objective for higher education institutions. Human Development Theory emphasizes the importance of investing in human capital and individual capabilities as key drivers of productivity and economic performance (Gruzina et al., 2021). Entrepreneurship is widely recognized as a critical mechanism that enables individuals to transform knowledge and innovation into productive economic activities (Olawajun et al., 2022). In the higher education context, universities are increasingly transformed into entrepreneurial institutions that focus not only on the dissemination of knowledge but also on fostering transformational competencies such as critical thinking, problem-solving, digital literacy, and innovation. This transformation supports the emergence of entrepreneurial universities designed to produce grad-

uates equipped to meet the demands of the digital economy. The quality of educators and their ability to integrate digital technologies into learning environments play a crucial role in this transformation (Szymkowiak et al., 2021). Educating future entrepreneurs is therefore essential for strengthening national competitiveness, as students have the potential to become productive contributors to economic development (Ratten & Usmanij, 2021). From a theoretical perspective, the adoption of digital entrepreneurship learning can also be explained through Diffusion of Innovation Theory and Connectivism, which highlights how technological innovations and digital networks facilitate knowledge sharing and learning processes (Menzli et al., 2022; Stasewitsch et al., 2022).

Digital Canvas Learning, which integrates digital technology within the Business Model Canvas (BMC) framework, functions as an innovative tool for Human Resource Development (HRD) in higher education. HRD in this context extends beyond technical training to encompass innovation, critical thinking, and digital literacy, key competencies required to sustain the digital economy (Bennett & McWhorter, 2022; Bygstad et al., 2022). Empirical studies highlight that digital learning environments enhance HRD outcomes. Demonstrates that real-time data analysis, interac-

tive simulations, and collaborative digital tools in entrepreneurship education significantly improve students' cognitive and practical abilities (Jardim, 2021). Similarly, Abaddi (2023) argues that digital transformation in education reshapes learning complexity and social trends, leading to the development of adaptive and agile human resources.

Furthermore, investment in HRD through digital learning directly contributes to productivity and innovation (Rojas et al., 2024). Digital Canvas Learning supports this process by providing structured, technology-based entrepreneurship education that equips students with both business acumen and digital fluency. The broader accessibility of entrepreneurial learning resources ensures inclusivity, scalability, and stronger alignment between education and market needs.

Incorporating Digital Canvas Learning within the university curriculum represents a strategic approach to developing entrepreneurial skills and fostering university entrepreneurship. The integration of digital-based BMC tools helps students visualize and design business models interactively, enabling a more practical understanding of innovation, market validation, and value creation (Pepin et al., 2023). University entrepreneurship refers to a university's ability to cultivate an entrepreneurial ecosystem by promoting policies, infrastructure, and programs that support startups and innovation among students and faculty (Valencia-Arias et al., 2024). Digital Canvas Learning can strengthen these efforts by making entrepreneurship education more interactive, data-driven, and outcome-oriented.

Previous research indicates that technology-based learning platforms, particularly those using the BMC, enhance students' entrepreneurial intention and competence by fostering creativity, analytical reasoning, and risk management skills (Dana et al., 2021; Zhang et al., 2022). The more effectively digital BMC learning is implemented, the stronger the university's entrepreneurial culture is likely to become, consistent with Human Capital perspectives that position skills and competencies as foundational assets for economic and social progress.

Entrepreneurial learning, particularly in digital start-ups, has been shown to influence business

model innovation, with digital capabilities such as digital sensing and operational capabilities mediating this relationship and underscoring the importance of digital skills for business innovation and economic performance (Xiang et al., 2024). Building on this evidence, this study views Digital Canvas Learning as a way to bring those digital capabilities into everyday entrepreneurship teaching, allowing students to practice how they recognize opportunities, shape value propositions, and organize key resources within technology-rich learning settings.

Digital Canvas Learning can contribute to economic development by improving educational outcomes and fostering digital literacy, which are increasingly important in technology-driven economies (Wei, 2023). Empirical evidence also suggests that digital learning is associated with economic progress in both developed and developing countries (Mgadmi et al., 2021) and that it can help underdeveloped regions narrow development gaps through expanded access to quality education (Cheng & Huang, 2022). In addition, developing a robust digital learning business model may directly address educational quality gaps and thereby enable broader community participation in economic growth processes (VatandoustMohammadih et al., 2024).

Human Resource Development (HRD) within higher education not only enhances faculty and student competencies but also supports the cultivation of entrepreneurial mindsets and digital skills needed for global competitiveness (Burgos, 2020). HRD plays a critical role in building entrepreneurial universities, as institutions require capable educators and motivated students to create and sustain innovation ecosystems (Mohiuddin et al., 2022).

Developing HR through entrepreneurship-focused curricula and professional training enhances innovation, risk-taking capacity, and problem-solving abilities (Bauman & Lucy, 2021). Empirical findings show that universities investing in HRD programs through mentoring, incubation, or applied learning report higher student success in new venture creation and entrepreneurial intention (Hassan, 2024; Lv et al., 2021). Thus, universities that prioritize HRD are more likely to de-

velop strong entrepreneurial ecosystems, producing graduates capable of generating new business ventures and contributing to economic resilience.

Human Resource Development (HRD) contributes significantly to economic growth by enhancing both individual and institutional capacities for innovation and productivity. Effective HRD initiatives improve workforce adaptability and competitiveness, particularly in knowledge-based economies (Cooke et al., 2020; Shin et al., 2020). Beyond traditional workforce training, HRD that emphasizes entrepreneurship skills fosters job creation, product innovation, and value addition (Akkermans et al., 2021). Empirical studies also indicate that countries investing in HRD, particularly in digital and entrepreneurial competencies, tend to experience more sustainable patterns of economic growth (Ragmoun, 2022). Universities, as key agents of HRD, indirectly but substantially contribute to economic progress by nurturing a skilled, innovation-oriented generation (Pradhan et al., 2020).

University Entrepreneurship serves as a strategic mechanism linking higher education and economic development. Entrepreneurial universities act as catalysts for innovation and job creation, expanding their role from knowledge dissemination to the commercialization of ideas and technologies (Marozau et al., 2021). The relationship between university entrepreneurship and economic growth manifests through three primary channels: job creation, where student- and alumni-led ventures open new employment opportunities; innovation diffusion, through research commercialization and technology transfer that expand market frontiers; and industrial collaboration, which enhances the competitiveness of local SMEs and stimulates regional economic ecosystems.

Empirical research reinforces that entrepreneurial universities drive GDP growth, reduce unemployment, and strengthen national innovation capacity (Almodóvar-González et al., 2020; Peng & Xu, 2024). This aligns with the argument of Wagner et al. (2021), who contend that knowledge-based entrepreneurial institutions are essential for sustainable economic progress.

Overall, the reviewed studies indicate that digital learning, Human Resource Development, university entrepreneurship, and economic growth

are deeply interconnected. However, most prior research treats these dimensions separately, leaving a theoretical and empirical gap regarding how a structured digital pedagogy such as Digital Canvas Learning simultaneously shapes human capital development, institutional entrepreneurship, and macroeconomic outcomes.

In summary, existing studies have provided valuable insights into the roles of digital learning, Human Resource Development, university entrepreneurship, and economic growth, but these streams of research largely remain fragmented. Most prior work has focused on isolated relationships rather than examining how these dimensions interact within an integrated and systematic framework. Consequently, there is still limited empirical understanding of how a structured digital pedagogical model such as Digital Canvas Learning simultaneously influences human capital formation, institutional entrepreneurial capacity, and macro-level economic outcomes.

Accordingly, the purpose of this study is to examine the role of Digital Canvas Learning in shaping Human Resource Development, University Entrepreneurship, and Economic Growth, and to analyze the direct and indirect relationships among these constructs within the context of higher education in the digital economy.

Therefore, the hypotheses to be tested in the study are as follows:

- H1: *Digital Canvas Learning has a positive impact on Human Resource Development.*
- H2: *Digital Canvas Learning has a positive impact on University Entrepreneurship.*
- H3: *Digital Canvas Learning has a positive impact on Economic Growth.*
- H4: *Human Resource Development has a positive impact on University Entrepreneurship.*
- H5: *Human Resource Development has a positive impact on Economic Growth.*
- H6: *University Entrepreneurship has a positive impact on Economic Growth.*

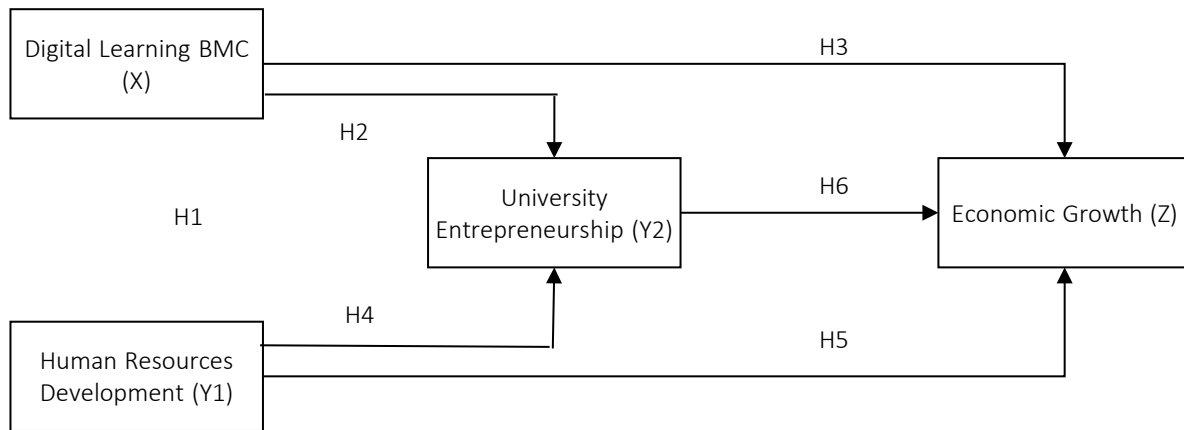


Figure 1. Research model framework (researcher development)

Drawing on the arguments outlined above, this study proposes the conceptual model shown in Figure 1.

2. METHODOLOGY

This study employs a quantitative explanatory research design to examine the causal relationships among digital-based learning, Human Resource Development (HRD), university entrepreneurship, and economic growth in the higher education context. A quantitative approach was selected because it allows systematic hypothesis testing and the estimation of complex relationships among latent variables using standardized indicators. The study adopts Partial Least Squares – Structural Equation Modeling (PLS-SEM) as the main analytical technique, as this method enables the simultaneous assessment of measurement and structural models within a single comprehensive framework. PLS-SEM is particularly suitable for exploratory and predictive research designs, accommodates both reflective and formative constructs, and performs well with moderate sample sizes and non-normally distributed data (Hair et al., 2019).

The study was conducted in universities located within two higher education supervisory regions in Indonesia, namely the Higher Education Service Institutions (LLDIKTI) Region III and Region IX. LLDIKTI are regional offices under the Indonesian Ministry of Education, Culture, Research, and Technology that are responsible for supervising, supporting, and coordinating higher education institutions, particularly private universities, within

designated regional jurisdictions. These regions were purposively selected to capture diverse academic, socio-economic, and technological contexts across western and eastern Indonesia. The target population consisted of undergraduate and post-graduate students enrolled in entrepreneurship-related courses at universities within these regions.

Table 1. Descriptive statistics of respondents' characteristics

	Variable	Frequency	Percentage (%)
Sex	Male	74	35.9
	Female	132	64.1
Age	< 30 years	178	86.4
	30-40 years	11	5.3
	40-50 years	9	4.4
	> 51 years	8	3.9
Education Level	S1	168	81.6
	S2	31	15.0
	S3	7	3.4
Region	LLDIKTI Region III	64	31.1
	LLDIKTI Region IX	142	68.9

Note: N = 206.

Respondents were selected using a purposive sampling method based on clear inclusion criteria. Participants must meet the following criteria:

- 1) be actively enrolled students during the data collection period.
- 2) have completed or be currently attending entrepreneurship courses integrating digital-based learning platforms.
- 3) have direct experience engaging in digital entrepreneurial learning activities.

Students without exposure to digital-based entrepreneurship learning were excluded to ensure the validity and relevance of responses.

A total of 206 valid responses were obtained after screening for completeness and consistency, exceeding the minimum requirement of 200 respondents based on the “10-times rule” (Hair et al., 2017), given the study’s 20 indicators across four latent constructs. Detailed demographic information, including gender, age, level of study, academic discipline, and prior entrepreneurial experience, was collected to provide a comprehensive profile of the respondents and is presented in tabular form in the Results section.

Respondents were undergraduate and graduate students who directly enrolled in Digital Canvas Learning-based entrepreneurship courses, thus gaining empirical experience in designing, testing, and evaluating digital business models. As such, they were the primary actors and direct recipients of the learning interventions studied. The constructions of Human Resource Development and University Entrepreneurship were operationalized at the learning and institutional ecosystem levels, rather than at the national policy level, so they could be validly assessed through students’ academic experiences. Therefore, respondents’ competency lies in their direct involvement in digital entrepreneurship learning practices, not in their capacity as macroeconomic policymakers.

Data were collected through a structured questionnaire distributed online outside of exam periods to ensure a stable academic environment. Participation was voluntary, and all respondents received an explanation of the study’s purpose, guaranteed anonymity, and the right to withdraw at any time without consequence. Consent was provided electronically before completing the questionnaire. No personally identifiable information was collected, and all research procedures were conducted in accordance with international ethical standards for social science research.

All constructs were measured using a five-point Likert scale ranging from 1 (“Strongly disagree”) to 5 (“Strongly agree”). The questionnaire items were adapted from previously validated instruments to ensure theoretical consistency and con-

tent validity. Digital-based learning was measured using three indicators adapted from Fernandes et al. (2022) and Secundo et al. (2021), capturing respondents’ engagement with digital learning platforms, cognitive understanding, and virtual communication patterns. Human Resource Development (HRD) was measured using five items adapted from Nolan and Garavan (2016) and Polat et al. (2017), reflecting professional development opportunities, leadership support, feedback mechanisms, and training availability. University entrepreneurship was operationalized using seven items adapted from Alawneh and Alosheibat (2023) and Barba-Sánchez et al. (2022), covering entrepreneurial culture, regulatory support, infrastructure, access to finance, and innovation facilitation. Economic growth was measured using five items adapted from Mügge (2016) and Nuraini and Hariyani (2019), capturing higher education’s contributions to job creation, digital innovation, and regional development. The selection of these indicators was theoretically justified based on their conceptual alignment with each construct. The full questionnaire is provided in Appendix A.

The analytical procedure followed a structured sequence. First, the questionnaire was reviewed and pilot-tested for clarity. Second, the data was screened for missing values, outliers, and inconsistencies. Third, the measurement model was evaluated to assess indicator reliability, internal consistency, convergent validity, and discriminant validity. Standardized outer loadings above 0.70 were considered acceptable, Average Variance Extracted (AVE) values above 0.50 confirmed convergent validity, and discriminant validity was assessed using the Fornell–Larcker criterion. Indicators with low loadings were removed sequentially to improve construct reliability.

After establishing the adequacy of the measurement model, the structural model was evaluated to test the proposed hypotheses. Path coefficients and t-values were obtained through bootstrapping with 5,000 resamples. The explanatory power of the model was assessed using R^2 values, while multicollinearity was examined using the Variance Inflation Factor (VIF) values, which were maintained below the threshold of 5. Statistical significance was evaluated at the 5% level ($p < 0.05$). All analytical steps follow established PLS-SEM guidelines.

3. RESULTS AND DISCUSSION

3.1. Reliability and validity analysis

According to Table 2, all indicators in this study showed external loading values above 0.70 or were within the acceptable range of 0.50–0.70. Importantly, none of the indicators showed values below 0.50. Therefore, it can be concluded that all indicators used in this study showed an adequate level of convergent validity.

3.2. Hypotheses testing

In line with the quantitative nature of the study, path analysis was employed to test the hypotheses embedded in the research model. The procedure assessed the direct effects of Digital Learning on Human Resource Development, University

Entrepreneurship, and Economic Growth, as well as the mediating role of Human Resource Development in linking Digital Learning to these outcomes. The detailed results of these hypothesis tests are summarized in Table 3.

The results of the structural model analysis indicate that all six hypothesized relationships (H1-H6) are positive and statistically significant at the 0.05 level. Specifically, Digital Learning demonstrates a strong positive effect on Human Resource Development ($\beta = 0.752$, $T = 9.700$, $p < 0.001$), indicating that higher levels of digital learning adoption are associated with greater improvements in human resource competencies.

Digital Learning also exhibits a significant positive influence on University Entrepreneurship ($\beta = 0.337$, $T = 4.013$, $p < 0.001$) and Economic Growth

Table 2. Reliability and validity analysis

Construct	Items	Standardized Loading	Composite Reliability (CR)	Average Variance Extracted (AVE)
Digital Learning	X1	0.932	0.934	0.825
	X2	0.874		
	X3	0.918		
Human Resource Development	Y1_1	0.819	0.929	0.723
	Y1_2	0.838		
	Y1_3	0.861		
	Y1_4	0.861		
	Y1_5	0.871		
University Entrepreneurship	Y2_1	0.807	0.940	0.691
	Y2_2	0.811		
	Y2_3	0.809		
	Y2_4	0.868		
	Y2_5	0.829		
	Y2_6	0.821		
	Y2_7	0.872		
Economic Growth	Z1	0.854	0.938	0.751
	Z2	0.895		
	Z3	0.878		
	Z4	0.865		
	Z5	0.838		

Table 3. Hypothesis test

Hypothesis	Path	β (O)	T Statistics	P Values	Decision
H1	Digital Learning to HR Development	0.752	9.700	0.001	Supported
H2	Digital Learning to University Entrepreneurship	0.337	4.013	0.001	Supported
H3	Digital Learning to Economic Growth	0.690	12.214	0.001	Supported
H4	HR Development to University Entrepreneurship	0.527	6.756	0.001	Supported
H5	HR Development to Economic Growth	0.273	3.955	0.001	Supported
H6	University Entrepreneurship to Economic Growth	0.662	10.320	0.001	Supported

($\beta = 0.690$, $T = 12.214$, $p < 0.001$), suggesting that digital-based learning systems contribute directly to entrepreneurial orientation and macro-level performance outcomes.

Furthermore, Human Resource Development significantly affects University Entrepreneurship ($\beta = 0.527$, $T = 6.756$, $p < 0.001$) and Economic Growth ($\beta = 0.273$, $T = 3.955$, $p < 0.001$). These findings indicate that improvements in human capital are associated with stronger entrepreneurial capacity and increased economic performance.

Finally, University Entrepreneurship shows a strong and statistically significant effect on Economic Growth ($\beta = 0.662$, $T = 10.320$, $p < 0.001$), confirming its central role as a predictor of macro-level outcomes in the proposed model.

4. DISCUSSION

This study provides empirical evidence that Digital Canvas Learning (DCL) plays a central role in shaping human capital formation, entrepreneurial orientation, and macro-level economic outcomes within higher education ecosystems. The strong and significant relationship between DCL and Human Resource Development indicates that digitally mediated, visual, and interactive learning environments do not merely function as instructional tools but act as strategic mechanisms for competency enhancement, adaptability, and professional growth. This finding supports earlier studies suggesting that digital learning technologies enhance cognitive engagement, reflective thinking, and collaborative problem-solving (Capone & Lepore, 2022; Chen et al., 2021). However, this study extends prior research by demonstrating that the integration of the Business Model Canvas into a digital format strengthens not only individual learning outcomes but also systematic human capital development at the institutional level.

The significant effect of Digital Canvas Learning on University Entrepreneurship further highlights the transformative role of digital pedagogy in fostering entrepreneurial mindsets and innovation-oriented behavior. This result is consistent with Blankesteyn et al. (2024) and Sitaridis and Kitsios (2023), who argue that digital learning environments encour-

age experimentation, opportunity recognition, and knowledge recombination, key elements of entrepreneurial behavior. Unlike traditional classroom-based entrepreneurship education, DCL enables students and academic staff to simulate business scenarios, visualize strategic options, and iteratively refine their ideas. This interactive process appears to strengthen the entrepreneurial culture within universities, positioning them as more agile and opportunity-driven institutions.

Moreover, the strong association between Digital Canvas Learning and Economic Growth suggests that the impact of digital learning extends beyond individual skill acquisition and institutional transformation to influence broader socioeconomic outcomes. This finding reinforces the argument that educational digitalization contributes to regional and national competitiveness by accelerating innovation diffusion, improving graduate employability, and strengthening knowledge commercialization pathways. While previous studies have primarily treated digital learning as a pedagogical innovation, this research empirically demonstrates its role as a structural driver of economic performance.

The significant influence of Human Resource Development on University Entrepreneurship underscores the importance of human capital as a foundational resource for entrepreneurial transformation in higher education. This result aligns with Aboobaker and Renjini (2020), Abreu and Grinevich (2024), and Wu and Liu (2021), who emphasize that universities can only function as entrepreneurial institutions when their human resources possess adequate skills, motivation, and adaptive capacity. This study extends these insights by showing that HR development does not operate independently but is embedded within a digitally mediated learning ecosystem that continuously renews institutional capabilities.

In addition, the positive relationship between Human Resource Development and Economic Growth supports the core propositions of human capital theory, which posits that investments in skills and competencies translate into productivity gains and innovation-led growth (Iwu et al., 2021; Tahir et al., 2020). This finding implies that universities contribute to economic performance not only through knowledge production

but also through the quality and adaptability of their human resources. As such, HR development emerges as a strategic conduit through which educational reforms translate into tangible economic outcomes.

Finally, the strong effect of University Entrepreneurship on Economic Growth confirms the pivotal role of entrepreneurial universities as engines of innovation and regional development. This result is consistent with Bayuo et al. (2020) and Bodolica and Spraggon (2021), who highlight universities' capacity to stimulate venture creation, knowledge transfer, and employment generation. By embedding this relationship within a digital learning framework, this study contributes new empirical evidence that digital transformation amplifies the economic function of entrepreneurial universities.

This study explicitly addresses the unresolved tension in literature between treating digital tools as merely operational instructional instruments and recognizing their potential as drivers of institutional and economic transformation. Digital learning technologies are frequently framed as pedagogical enhancements aimed at improving classroom efficiency and student engagement. However, the empirical findings of this research

demonstrate that Digital Canvas Learning (DCL) extends beyond operational functionality. The significant and sequential relationships linking DCL to Human Resource Development, University Entrepreneurship, and ultimately Economic Growth indicate that digitally mediated entrepreneurship learning operates as a systemic capability-building mechanism. In other words, DCL functions not only at the micro-level of instructional delivery but also at the meso-level of institutional transformation and the macro-level of economic impact. By empirically validating these interconnected pathways, this study helps reconcile the conceptual divide and provides evidence that digital entrepreneurship education can serve as a strategic infrastructure for long-term organizational and socioeconomic development.

Overall, these findings reveal a dynamic and interconnected mechanism: Digital Canvas Learning strengthens Human Resource Development, which in turn enhances University Entrepreneurship, ultimately contributing to Economic Growth. This sequential pathway advances existing literature by demonstrating that digital pedagogy is not merely an instructional innovation but a strategic infrastructure for long-term institutional and economic transformation.

CONCLUSION

This study aimed to examine how Digital Canvas Learning contributes to Human Resource Development, University Entrepreneurship, and Economic Growth within higher education ecosystems. By empirically testing the proposed structural model, this research demonstrates that digital learning is not merely a pedagogical tool but a strategic mechanism that shapes institutional transformation and socioeconomic outcomes.

The findings show that Digital Canvas Learning has a strong and significant effect on Human Resource Development, University Entrepreneurship, and Economic Growth. In addition, Human Resource Development plays a crucial role in strengthening the entrepreneurial capacity of universities and enhancing their economic contribution. University Entrepreneurship, in turn, emerges as a key driver of economic growth, confirming the strategic role of higher education institutions in innovation-driven development. Collectively, these results reveal an interconnected pathway in which digital learning strengthens human capital, which subsequently fosters institutional entrepreneurship and contributes to broader economic advancement.

From a broader perspective, this study concludes that digital transformation in education should not be viewed solely as a technological upgrade, but as a long-term investment in human capital and institutional capability. Universities that integrate digital learning into their strategic framework are better positioned to generate entrepreneurial outcomes and act as engines of regional and national development.

Despite its contributions, this study is not without limitations. The cross-sectional design restricts causal inference, and future research may employ longitudinal or experimental approaches to capture dynamic changes over time. Additionally, further studies could explore contextual differences across countries, types of institutions, and policy environments. Future research may also incorporate additional mediating and moderating variables, such as organizational culture, leadership styles, or digital readiness, to deepen understanding of the mechanisms linking digital learning and economic outcomes.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGY IN THE WRITING PROCESS

During the preparation of this article, the author utilized ChatGPT to assist with language editing. The author subsequently reviewed and edited the manuscript and takes full responsibility for its content.

AUTHOR CONTRIBUTIONS

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Writing – review & editing: Eka Pariyanti.

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APPENDIX A. Questionnaire

Dear Respondents,
With respect,

I, Zulkifli Sultan, a Lecturer at Universitas Terbuka, would like to request your participation and assistance in completing all the questions in this questionnaire.

The data collected will be used to develop research related to the theme “The Digital Canvas Learning Model: The Key to Entrepreneurial University Success in Driving the Economy.” Therefore, we kindly request that you, the respondents, provide truthful answers (as names will be kept anonymous) to assist in the completion of this research.

Thank you for your time and willingness. I hope this research is beneficial and serves as a reference for scientific and policy development in Indonesia.

Instructions for Completing

I am kindly requested to provide an appropriate response to the following statements by selecting the score provided by clicking on one of the answer alternatives:

Answer Score: 5 – Strongly Agree, 4 – Agree, 3 – Fair, 2 – Disagree, 1 – Disagree.

Table A1. Questionnaire statement

Section	Statement	1	2	3	4	5
Digital Learning	Digital media facilitates understanding of the components of Business Model Canvas (BMC).					
	Digital-based BMC learning makes business idea discussions and explorations more interactive.					
	Digital platforms help simplify the preparation and presentation of BMC.					
Human Resource Development	Students and lecturers have good opportunities for professional and academic development.					
	Feedback on academic activities is provided clearly and constructively.					
	Training and competency development activities are routinely carried out to improve individual capacity.					
	Higher Education Institutions provide support for academic and professional development.					
University Entrepreneurship	Achievements of the academic community receive appropriate recognition and assessment.					
	Campus policies support the implementation of entrepreneurial activities.					
	The campus environment provides opportunities for students and lecturers to start a business.					
	Access to information on business funding or capital is well available for students and lecturers.					
	Campus programs provide knowledge and information about entrepreneurship.					
	Students and lecturers have the potential to start and manage a business.					
	An entrepreneurial culture has developed within Higher Education Institutions.					
Economic Growth	Education provided by the campus fosters an entrepreneurial spirit.					
	Economic activities around the campus show positive development.					
	Employment opportunities and economic participation of the community, including graduates, continue to increase.					
	The campus and surrounding communities are experiencing a gradual improvement in quality of life.					
	The campus plays a role in improving human resource quality to support regional and national development.					
	Campus infrastructure supports academic activities and the regional economy effectively.					