



Developing Digital Entrepreneurial Skills among Vocational Students: Evidence from Teaching Factory Based Learning

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Abstract

This research examines the influence of entrepreneurial motivation, digital competence, and self-efficacy, as well as the mediating role of the Teaching Factory, on the development of students' digital entrepreneurship competencies at SMK Negeri 1 Bawang. Employing an explanatory quantitative research design, a sample of 143 respondents was selected using the Slovin formula, and data were collected through a structured questionnaire. Data analysis was conducted using the Partial Least Squares Structural Equation Modeling (PLS-SEM) method with SmartPLS 4. The results demonstrate that entrepreneurial motivation, digital competence, and self-efficacy have a positive and significant effect on digital entrepreneurship competencies. Furthermore, the Teaching Factory mediates the relationships between psychological and technical factors and digital-based marketing competencies. These findings suggest that integrating intrinsic motivation, technological literacy, and industry-based learning enhances students' preparedness for digital entrepreneurship. Theoretically, these results reinforce the competency-based approach in vocational education. Practically, the research offers implications for policymakers in vocational schools to optimize digital-based Teaching Factories by strengthening digital marketing training, utilizing digital business platforms, integrating technology-based business projects, and mentoring sustainable business practices to improve students' digital entrepreneurship experiences in alignment with the demands of the digital economy.

How to Cite

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INTRODUCTION

Digital transformation has fundamentally reshaped the economic, business, and educational ecosystems by integrating technologies such as artificial intelligence, cloud computing, big data, and automation across various industrial and entrepreneurial activities (Gibb et al., 2022). These changes are driving a shift in business models from conventional patterns to a more innovative, adaptive, and technology-driven digital ecosystem (Kraus et al., 2019). In this case, digital entrepreneurship competencies have become a strategic necessity, particularly for vocational education students preparing to face the digital-based world of work and entrepreneurship. These competencies encompass not only the ability to use digital technology but also the ability to develop business innovations, utilize digital platforms, and analyze data to support business decision-making (Vuorikari et al., 2022). Low levels of digital entrepreneurship competency can hinder vocational high school graduates' readiness to meet industry demands and the demands of increasingly competitive digital business environments.

Despite the growing urgency of digital entrepreneurship competencies, empirical research examining their development among vocational high school students, particularly those majoring in marketing, remains relatively limited. Previous studies have focused more on the relationships among digital entrepreneurship education, motivation, digital readiness, and digital entrepreneurial intentions (Alzahrani & Bhunia, 2024; Ratten, 2022). Furthermore, most digital entrepreneurship research in vocational education still focuses on technological literacy and digital adaptation, while studies on the formation of digital entrepreneurial competencies through the integration of psychological factors and industry-based learning environments remain underexplored (Elia et al., 2020). Specifically, research on the influence of entrepreneurial motivation and the implementation of the Teaching Factory on the digital entrepreneurial

competencies of vocational high school students continues to face empirical limitations, especially in the context of industry-based vocational education in Indonesia. However, entrepreneurial motivation and experiential learning through the Teaching Factory have the potential to strengthen students' abilities to face the complexities of digital business in real life (Secundo et al., 2021). Therefore, this study aims to analyze the influence of entrepreneurial motivation and the Teaching Factory implementation on students' digital entrepreneurial competencies in the Marketing program at SMK Negeri 1 Bawang.

This transformation can be reflected concretely in a shift from a retail business model to a digital business model, enabled by e-commerce platforms that offer wider market reach, greater management flexibility, easier access, and more efficient transactions. This phenomenon is evidenced by BPS data, which show a 4.40 million increase in e-commerce in Indonesia in 2024, a 15.30% increase from 2023 (BPS, 2026).

Transformation 4.0 has a significant impact not only on the economy but also on education, especially vocational high schools. In vocational education, this high school faces increasingly complex challenges, as it is required that its graduates be ready to work and even able to create jobs through entrepreneurship. This is in line with the goals of vocational education, as stated by the Ministry of National Education (2003), which states that students are knowledgeable, capable, creative, and independent in fulfilling jobs in the business and industrial worlds as a medium workforce. The current mismatch phenomenon is reflected in Indonesia's high open unemployment rate (TPT). According to BPS data in 2025, Vocational High School graduates have the highest open unemployment rate (TPT) among other educational graduates, at 8.63 percent (BPS, 2026).

In terms of education, transformation 4.0 also poses challenges that ultimately require adjustments to the curriculum, the suitability of majors to the needs of the business and

industrial worlds (DUDI), and improvements in the quality of the learning process (De Souza & Debs, 2024). This increase is carried out to reduce the gap between the competence of graduates and the needs of the increasingly sophisticated industrial world, as well as to be able to produce graduates with skills that are relevant to the demands of the digital-based industrial world and increasingly sophisticated technology in the job market (Of, 2025). The real phenomenon in digital entrepreneurship is the ability to create digital promotional content, use social media effectively, and manage digital marketing creatively (Sulistyanto et al., 2021).

Teaching Factory is a learning model applied in production- or service-based vocational high schools, with standards and procedures aligned with industry standards and implemented in an industry-like atmosphere (Kemendikdasmen, 2019). Teaching factory (TeFa) is closely related to digital entrepreneurship competence, as the era of disruption requires vocational high school graduates to be not only job-ready but also entrepreneur-ready, able to create digital-based economic value (Nambisan, 2017).

Based on data from the 2024 vocational education tracer study by the Ministry of Education and Education, 23.64% of vocational school graduates chose entrepreneurship, 47.63% of graduates who worked, 13.37% continued their studies, 11.12% engaged in other activities, and 4.24% were unemployed (Khurniawan, 2025). Similar data were also observed at the Negeri 1 Bawang Vocational High School (SMK), the only public vocational high school in Banjarnegara with marketing expertise competencies. This school is also known as a pioneer in implementing an online business concentration at the State Vocational School level through marketplace-based learning and digital production unit practice (Dinas Pendidikan Cabang IX Provinsi Jawa Tengah, 2025). On the other hand, based on the tracer study results for SMK Negeri 1 Bawang from 2021 to 2025, the number of graduates who are entrepreneurs remains

very low, namely 15 people (BKK SMK Negeri 1 Bawang, 2025). This phenomenon indicates a lack of courage and a low willingness among vocational school students to become independent entrepreneurs, despite the implementation of entrepreneurship-related subjects and real-world practices in schools.

This situation highlights a gap between the availability of learning facilities and students' achievement of digital entrepreneurship competencies. In Entrepreneurship Education, adequate facilities are intended to promote the development of entrepreneurial competence and readiness through authentic learning experiences. Although the Teaching Factory and advanced digital facilities have been implemented, initial observations indicate that some students lack confidence in starting a business, demonstrate risk aversion, and are unable to fully apply digital competencies in entrepreneurial settings. These observations suggest that internal factors, including entrepreneurial motivation and self-efficacy, remain insufficiently developed. Additionally, the Teaching Factory may not be fully effective in translating digital competencies and psychological attributes into practical digital entrepreneurship competencies. Therefore, further research is necessary to examine how entrepreneurial motivation, digital competence, and self-efficacy interact with the Teaching Factory to influence students' digital entrepreneurship competencies.

Research by Rusmana (2020) found that the application of 21st-century digital skills in entrepreneurship education has a positive, significant influence on improving entrepreneurial competence among vocational school students. Furthermore, research by Bachmann et al. (2024) shows that digital competence does not directly increase entrepreneurial intention but does so through mediating variables, namely self-efficacy and individual entrepreneurial orientation. This study found that having digital skills does not necessarily make a person an entrepreneur, and that psychological factors play a role. The same was also stated in the study by Villagrasa & Donaldson,

(2025) which found that entrepreneurial self-efficacy significantly affects certain entrepreneurial intentions, whereas digital skills do not always have a direct effect on entrepreneurial outcomes.

From several previous studies Rusmana, (2020), Bachmann et al., (2024), Villagrasa & Donaldson, (2025) There is a gap in explanations related to individual (motivational) and technical factors that are transformed into digital-based entrepreneurial behavior or competencies. The gap that arises in this case is relevant to vocational education, which, structurally, provides entrepreneurial learning through real practice, but in reality has not fully developed optimal digital entrepreneurship competencies.

From the perspective of Ajzen (1991) In the Theory of Planned Behavior, actual behavior is reflected by attitudes and perceived behavioral control. In this study, entrepreneurial motivation represents students' positive attitudes towards digital entrepreneurship, while self-efficacy reflects students' confidence in their ability to carry out digital-based business activities. Meanwhile, digital competence reflects students' instrumental ability to use digital technology for marketing activities, business communication, and digital information management. These three variables conceptually shape students' psychological readiness for digital entrepreneurship.

The TPB asserts that psychological readiness alone does not necessarily lead to actual behavior unless accompanied by practical experience and environmental support that enable individuals to enact these behaviors in real-world contexts (Widodo et al., 2025). Within the TPB framework, this dynamic is associated with enhanced perceived behavioral control, defined as the individual's perception of their ability and opportunity to perform a behavior. Consequently, environmental factors serve not only as external contexts but also as mechanisms that facilitate the conversion of psychological readiness into actual capability.

From this perspective, the Teaching Fac-

tory (TEFA) serves as a mediating variable, providing a contextual learning environment that links students' internal factors to the development of digital entrepreneurial competencies. Through activities such as production, digital marketing, transaction simulation, customer service, and the use of digital business platforms, TEFA offers authentic experiences that allow students in the Department of Marketing at SMK Negeri 1 Bawang to apply entrepreneurial motivation, digital competence, and self-efficacy in practical business settings. As a result, TEFA enhances students' perceived behavioral control through industrial practice and authentic learning experiences (Supriadi & Rosmaladewi, 2026)

Supporting this research, Agustiani & Dwikurniangsih (2025), demonstrate that the technopreneurship-based TEFA model effectively enhances the entrepreneurial competence of vocational school students through industry-based contextual learning. Mahmudah et al. (2023), Further indicate that vocational students' digital entrepreneurship competencies are shaped by practical experience and learning environments that facilitate the application of digital skills in business contexts. These conclusions are corroborated by Firmansyah et al. (2026), who assert that practice-based learning is instrumental in converting students' psychological readiness into actual entrepreneurial readiness.

In vocational education, digital entrepreneurship competencies encompass not only knowledge and skill mastery but also students' capacity to implement digital entrepreneurship activities in practice. Accordingly, TEFA serves as a contextual mechanism that translates entrepreneurial motivation, digital competence, and self-efficacy into students' digital entrepreneurship competencies. The designation of TEFA as a mediating variable aligns with the Sustainable Development Goals (SDG) framework, particularly in reinforcing perceived behavioral control in the development of digital entrepreneurship competencies among vocational school students.

The research of Simba et al. (2025),

provides reinforcement for this argument by showing that digital self-efficacy plays a role in bridging the relationship between perceived behavioral control and entrepreneurial behavior in the digital context. Research by Ivanovi et al. (2025) also confirms that digital entrepreneurship competencies are influenced by institutional and contextual factors. This explains that the learning environment is a variable determinant in the process of forming competencies. Nonetheless, a conceptual gap remains in the literature. Most previous studies have examined only the direct influence of psychological factors on digital competencies in entrepreneurship, and very few have integrated psychological factors, digital skills, and vocational learning into a single structural model of SDGs that treats digital entrepreneurship competencies as outcomes. Thus, this study uses this gap by positioning the Teaching Factory as a mediating variable that bridges entrepreneurial motivation, digital skills, and self-efficacy to digital entrepreneurship competence. In this study, the Teaching Factory is not positioned as a learning motif but as a contextual mechanism that facilitates the internalization of attitudes and perceptions of behavioral control in real-world digital entrepreneurship practices, as shown in the following framework.

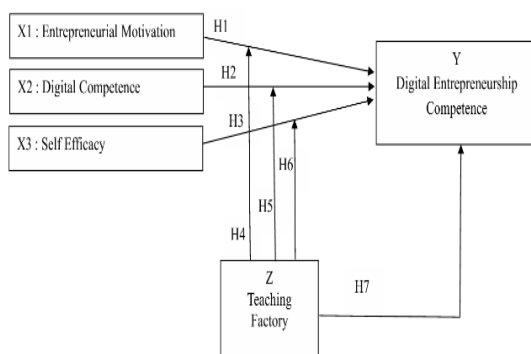


Figure 1. Research Thinking Framework

Based on this structural model, this study aims to examine the influence of entrepreneurial motivation, digital competence, and self-efficacy on digital entrepreneurship skills, both directly and through the mediating role of the Teaching Factory (Tefa) as a contextual learning mechanism in students majoring in marketing at SMK Negeri 1 Bawang.

METHODS

The study focused on students majoring in Marketing at SMK Negeri 1 Bawang. Subject selection was informed by the Education Office's report that SMK Negeri 1 Bawang is the only public vocational school in Banjarnegara Regency with a Marketing Department. The department benefits from the Center of Excellence (CoE) facility, a pioneer in online business learning and the school's oldest expertise program, established in 2000. Despite these advantages, the proportion of graduates who become entrepreneurs remains relatively low, suggesting a disconnect between digital-based learning support and graduates' digital entrepreneurship competencies. Consequently, the Marketing Department at SMK Negeri 1 Bawang provides a relevant context for this research.

The study population comprised all students in the Marketing Department at SMK Negeri 1 Bawang, grades X through XII, specializing in Digital Business and Retail, totaling 214 individuals. A sample of 143 respondents was determined using the Slovin formula with a 5% margin of error. Probability sampling, specifically proportional random sampling, was implemented to achieve proportional representation across grade levels and to reduce research bias. Data were collected using a 5-point Likert scale questionnaire, with response options ranging from strongly disagree to strongly agree.

The research variables in this study are as follows:

Table 1. Table of Variables

Variable	Indicator	Reference Sources
EM/X1	Having a passion and desire to succeed; Having a drive and need for entrepreneurship; Hopes and aspirations for the future; Rewards for entrepreneurship; Entrepreneurial pursuits.	Uno (2008) in (Karibera et al., 2023,p. 189)
DC/X2	Information and Data Literacy; Communication and Collaboration; Digital Content Creation; Safety; Problem Solving.	Santos et al., (2023)
SE/X3	Believe in your own abilities; Dare to express your opinion.	Hadiyati & Fatkhurahman, (2021)
DEC/Y	Ability to utilize digital technology; Digital innovation in business; Digital data analysis capabilities.	(Bacigalupo et al., 2016); (Carretero et al., 2019)
TF/Z	Digital business planning; Implementation of digital practices; Organizing digital teams; Guidance on Teaching Factory practices; Evaluation of digital business performance.	Nur et al., (2025)

Source: Processed Primary Data (2025)

Information :

Entrepreneurial motivation (X1)

The digital competencies (X2)

Self-efficacy (X3)

Digital entrepreneurship competencies (Y) Teaching factory (Z)

The analysis method used is Structural Equation Modeling with Partial Least Squares (SEM-PLS), implemented in SmartPLS 4.0. This method was chosen because the research aims to develop predictive models and analyze relationships between latent variables and complex indicators simultaneously. Furthermore, SEM-PLS is considered suitable for exploratory research and theory development, with data distributions that do not need to be normally distributed, and for use with relatively moderate sample sizes. This research was conducted through two stages of testing: external model analysis (outer model) and internal model analysis (inner model). The external model analysis includes testing item validity, construct reliability, convergent validity, and discriminant validity. Meanwhile, the internal model analysis includes testing the coefficient of determination and hypothesis testing.

RESULTS AND DISCUSSION

The initial stage of data analysis in this study is to analyze the external model before analyzing the inner model and testing the hypothesis. An analysis of the external model was conducted to assess its validity and reliability. The validity of the item is tested by examining the salient outer loading of each item on the measured latent construct. The basis for measuring convergent validity can be seen from the outer loading and Average Variance Extracted (AVE) values. If the outer loading value > 0.7 and $AVE > 0.5$, then the indicator of the latent construct/variable used is valid and consistent (Esposito Vinzi et al., 2022) The results of the convergent validity test are shown in the figure and table below.

Table 2. Outer Loading Output

Variable	Indicator	Outer Loading
EM/X1	X1.1	0.949
	X1.2	0.934
	X1.3	0.928
	X1.4	0.930
	X1.5	0.948
	X1.6	0.933
	X1.7	0.944
	X1.8	0.932
	X1.9	0.935
	X1.10	0.928
	X1.11	0.933
	X1.12	0.929
	X1.13	0.914
	X1.14	0.923
	X1.15	0.920
	X1.16	0.919
	X1.17	0.941
	X1.18	0.917
	X1.19	0.940
	X1.20	0.906
DC/X2	X2.1	0.944
	X2.2	0.954
	X2.3	0.920
	X2.4	0.938
	X2.5	0.937
	X2.6	0.925
	X2.7	0.944
	X2.8	0.923
	X2.9	0.956
	X2.10	0.927
	X2.11	0.937
	X2.12	0.923
	X2.13	0.932
	X2.14	0.939
	X2.15	0.927
	X2.16	0.941
	X2.17	0.934
	X2.18	0.944
	X2.19	0.942
	X2.20	0.950

SE/X3	X3.1	0.943
	X3.2	0.915
	X3.3	0.939
	X3.4	0.930
	X3.5	0.927
	X3.6	0.932
	X3.7	0.907
	X3.8	0.929
DEC/Y	Y.1	0.908
	Y.2	0.917
	Y.3	0.917
	Y.4	0.931
	Y.5	0.900
	Y.6	0.897
	Y.7	0.913
	Y.8	0.904
	Y.9	0.917
	Y.10	0.924
	Y.11	0.921
	Y.12	0.909
TF/Z	Z.1	0.944
	Z.2	0.947
	Z.3	0.931
	Z.4	0.957
	Z.5	0.951
	Z.6	0.945
	Z.7	0.887
	Z.8	0.950
	Z.9	0.948
	Z.10	0.938
	Z.11	0.934
	Z.12	0.920
	Z.13	0.898
	Z.14	0.944
	Z.15	0.944
	Z.16	0.939
	Z.17	0.914
	Z.18	0.941
	Z.19	0.948
	Z.20	0.926

Source: Processed Primary Data (2025)

Based on the data processed above, the output of the outer loading indicates that all items in each variable are >0.70 , so they are declared valid.

Construct reliability is measured using internal consistency and model unidimensio-

nality analyses. Internal consistency analysis assesses the extent to which indicators consistently reflect the latent constructs they measure (Sarstedt & Liu, 2024). In the Partial Least Squares Structural Equation Model (PLS – SEM) approach, internal consistency was me-

asured using Cronbach's Alpha, with a Cronbach value of >0.7 (Latan & Ghazali, 2015) In addition, the Composite reliability (CR)

value is > 0.70 , so it is considered to show adequate reliability (Sarstedt et al., 2021) The test results are shown in Table 2.

Table 3. Construct Reliability and Validity

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	AVE
EM	0.922	0.992	0.992	0.865
DC	0.993	0.993	0.993	0.878
SE	0.977	0.978	0.980	0.861
DEC	0.982	0.983	0.984	0.834
TF	0.992	0.993	0.993	0.875

Source: Processed Primary Data (2025)

Based on Table 3, the composite reliability and Cronbach's alpha for all variables are >0.70 , and the AVE is >0.50 , meeting the requirements.

Discriminant validity is used to test that a latent construct is empirically different from another construct so that it does not overlap with the measurements. A construct is declared valid if its indicators reflect the construct relative to other constructs. The test results are in Tables 4 and 5.

Based on the results shown in Tables 4 and 5, in the Fornell-Lacker test and HTMT, the basic rule is that the AVE must be greater than the construct's correlations with other variables. Just as the value of X1 is 0.930 and the other constructs are smaller, the variable meets the Fornell-Lacker criterion. Variable X2 has a value of 0.937, and the other constructs are smaller, so the variable meets

the Fornell-Lacker criterion. The variable X3 has a value of 0.928, and the other constructs are smaller, so the variable meets the Fornell-Lacker criterion. For variable Y, it has a value of 0.913, and the other constructs are smaller, so the variable meets the Fornell-Lacker criterion. For variable Z, it has a value of 0.935, and the other constructs are smaller, so the variable meets the Fornell-Lacker criterion. The construct is unique and able to explain the phenomenon being measured. Furthermore, this study aims to test the model. Hypothesis testing was conducted to assess the influence of exogenous variables on the endogenous variables under study. In the internal model analysis, the test first checks the coefficient of determination (R-squared), which should be between 0 and 1. The test results are shown in Table 7.

Table 4. Fornell-Larcker criterion

	X1_(EM)	X2_(DC)	X3_(SE)	Y_(DEC)	Z_(TF)
EM	0.930				
DC	0.379	0.937			
SE	0.309	0.358	0.928		
DEC	0.571	0.645	0.545	0.913	
TF	0.613	0.665	0.578	0.745	0.935

Source: Processed Primary Data (2025)

Table 5. Heterotrait-monotrait ratio (HTMT)

	X1_(EM)	X2_(DC)	X3_(SE)	Y_(DEC)	Z_(TF)
EM					
DC	0.380				
SE	0.312	0.382			
DEC	0.574	0.650	0.553		
TF	0.617	0.669	0.585	0.750	

Source: Processed Primary Data (2025)

Table 6. Nilai R- Square

	R-Square	R- Square Adjusted
Teaching Factory	0.675	0.668
Digital Entrepreneurial Competence	0.643	0.635

Source: Processed Primary Data (2025)

Based on Table 5, the R-Square Variable (Y) value of 0.643 indicates a good model fit. The R-Square Variable (Z) value of 0.675 indicates a good model.

Furthermore, the tests of the H1, H2, H3, H4, H5, H6, and H7 hypotheses are shown in the path coefficient results in the table below.

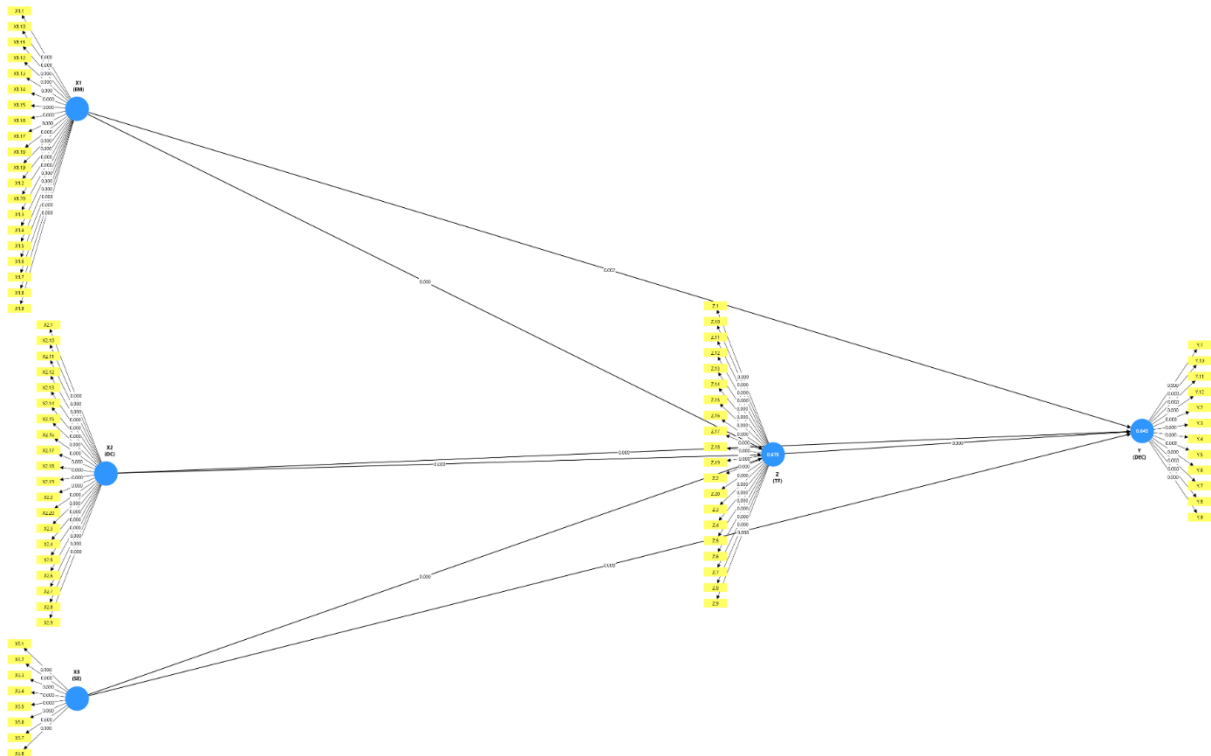


Figure 2. Empirical Model Based on Research Result

Table 7. Output Path Coefficient

	Original Sample (O)	SampleMean (M)	Standard- Deviation (STDEV)	T Statistics (O/STDEV)	P Values
EM -> DEC	0.209	0.213	0.067	3.105	0.002
EM -> TF	0.362	0.363	0.050	7.303	0.000
DC -> DEC	0.281	0.279	0.070	4.048	0.000
DC -> TF	0.410	0.410	0.051	8.120	0.000
SE -> DEC	0.189	0.195	0.071	2.647	0.008
SE -> TF	0.311	0.310	0.061	5.095	0.000
TF -> DEC	0.320	0.316	0.074	4.300	0.000

Source: Processed Primary Data (2025)

Table 8. Output Path Coefficient

	Original Sample (O)	SampleMean (M)	Standard- Deviation (STDEV)	T Statistics (O/STDEV)	P Values
EM -> TF-> DEC	0.116	0.115	0.033	3.564	0.000
DC-> TF-> DEC	0.131	0.130	0.035	3.769	0.000
SE-> TF-> DEC	0.100	0.098	0.030	3.345	0.001

Source: Processed Primary Data (2025)

From Tables 7 and 8, the results of this study indicate that entrepreneurial motivation positively and significantly affects digital entrepreneurship competency. This finding implies that students with higher entrepreneurial motivation demonstrate greater proficiency in utilizing digital technology, developing digital business innovations, and adapting to changes in the digital economy. Entrepreneurial motivation fosters a proactive approach to seeking business opportunities, cultivating creativity, and enhancing preparedness for technology-driven business challenges. This is in line with research conducted by Chen & Ifenthaler (2023); García-cabrera et al. (2023); Apriliana et al. (2025); Arfandi et al. (2025), which show that entrepreneurial motivation plays a crucial role in shaping individual capabilities in digital entrepreneurship activities. Previous research has shown that individuals with high entrepre-

neurial motivation tend to be more adaptable in using digital technology and have a stronger orientation toward innovation-based business development.

Theoretically, these findings can be interpreted using the Theory of Planned Behavior (TPB) proposed by Icek Ajzen. According to the TPB, entrepreneurial motivation encompasses positive attitudes toward entrepreneurship, subjective norms, and perceived behavioral control, all of which encourage engagement in digital entrepreneurial activities. Greater confidence in managing technology-based businesses increases the likelihood of demonstrating digital entrepreneurial competence. Consequently, entrepreneurial motivation serves as a strategic factor in developing digital entrepreneurial competence among vocational high school students, especially amid the ongoing digital economic transformation,

which requires integrating mental readiness, technological skills, and entrepreneurial orientation.

Furthermore, the test results indicate that entrepreneurial motivation has a positive and significant effect on the Teaching Factory. This finding indicates that students with high entrepreneurial motivation tend to be more active and engaged in participating in practice-based learning through the Teaching Factory. Entrepreneurial motivation encourages students to become more involved in production, marketing, problem-solving, and decision-making in a learning environment that resembles the real-world world of work and business. This situation indicates that motivation not only functions as a psychological driver but also strengthens students' active engagement in practice-based learning.

The findings of this study are consistent with the research of Urbano et al., (2019), which shows that institutional and individual factors interact in shaping entrepreneurial behavior and competence. Furthermore, the results of the research of Azmi et al. (2025), show that the project-based teaching factory model significantly increases students' entrepreneurial intention and practical skills, through real practice-based learning, thus showing a strong relationship between motivation and participation in practice and entrepreneurial outcomes. The existence of the teaching factory as an intervening variable has important implications. This means that entrepreneurial motivation not only has a direct effect on digital entrepreneurial competence (Y) but also influences it by increasing the effectiveness of the teaching factory as an intermediary mechanism. In other words, entrepreneurial motivation encourages students to be more active, responsible, and innovative in production and school business practices, thereby further strengthening digital entrepreneurship competencies. Theoretically, the Theory of Planned Behavior (TPB) proposed by Icek Ajzen provides a framework for interpreting these findings. According to TPB, entrepreneurial motivation encompasses positive attitudes

toward entrepreneurial activities, subjective norms, and perceived behavioral control, all of which encourage active participation in practice-based learning environments. Increased confidence in managing business activities and digital technology correlates with greater engagement in the Teaching Factory. Consequently, the Teaching Factory functions as a learning tool that facilitates the transformation of entrepreneurial motivation into practical experience, thereby supporting the development of digital entrepreneurship competencies within vocational education.

The research findings indicate that digital competence positively influences students' digital entrepreneurship competencies. Specifically, students' abilities to use digital technology, manage digital media, and utilize internet-based platforms contribute to the development of entrepreneurial skills relevant to the digital economy. Students who demonstrate proficiency in digital technology are more likely to identify digital business opportunities, implement social media based marketing strategies, and manage business activities with greater adaptability and innovation.

This finding is consistent with research by Singh & Dwivedi, (2022) which shows that mastery of digital skills is directly related to students' ability to identify digital opportunities, conduct online transactions, and manage digital businesses. The real-world practice-based curriculum factor also reinforces this relationship. Furthermore, the results of research by del Mar Sánchez-Vera & López-Vicent (2024), state that digital competence supports individual readiness for the digital business environment, particularly in information management, digital communication, and technology utilization. However, the present study emphasizes that digital competence alone is insufficient without the ability to identify opportunities and practical entrepreneurial experience. According to the Theory of Planned Behavior (TPB) proposed by Icek Ajzen, digital competence can enhance perceived behavioral control, an individual's confidence in their ability to use technology to sup-

port entrepreneurial activities. When students are proficient in operating digital technology, they are more confident in making business decisions, exploiting digital opportunities, and developing business innovations. Thus, digital competence represents not only a technical skill but also a critical asset for developing digital entrepreneurship skills among vocational education students.

Subsequent research demonstrated that digital competence positively influences the implementation of the Teaching Factory. Students with advanced digital skills are better able to engage in practice-based learning, particularly in digital marketing, social media management for business, and the application of technology to production and service processes. Proficiency in digital technology enables students to adapt to learning environments that closely resemble real-world workplaces, thereby enhancing engagement and learning effectiveness within the Teaching Factory framework.

This result is consistent with the findings of Mabotha & Ngcamu (2025), who demonstrated that digital competence is essential for enhancing the effectiveness of both practice-based and technology-based learning. Furthermore, the research of Chrysosouris et al. (2016), found that the success of Teaching Factory implementation depends on students' technological competence. These studies collectively suggest that mastery of digital skills is a critical factor supporting real-world practice-based learning. According to the Theory of Planned Behavior (TPB) proposed by Icek Ajzen, digital competence enhances students' perceived behavioral control regarding the use of technology in learning and business activities. Increased confidence in digital abilities leads to higher engagement in Teaching Factory activities. Thus, digital competence is a significant factor in supporting the effectiveness of practice-based learning within vocational education.

Subsequent research analysis demonstrated that self-efficacy positively influences students' digital entrepreneurship

competencies. This result suggests that students with strong confidence in their abilities are better able to manage digital-based entrepreneurial activities, including business decision-making, digital marketing problem-solving, and technology-based business management. Such self-confidence fosters greater adaptability, risk-taking, and consistency in the development of digital business innovations. This finding is consistent with (Saqib et al., 2025) study found that digital self-efficacy has a significant effect on entrepreneurial behavior in a digitalized environment. In these findings, individuals with higher self-efficacy will be able to manage technological pressure and demonstrate adaptive, innovative entrepreneurial behavior. According to the Theory of Planned Behavior (TPB) proposed by Icek Ajzen, self-efficacy is associated with perceived behavioral control, which refers to an individual's belief in their capacity to perform a specific behavior. Higher confidence in managing digital business activities increases the likelihood that students will exhibit behaviors that support the development of digital entrepreneurship competencies. Consequently, self-efficacy is a critical psychological factor shaping vocational high school students' preparedness to address the challenges of entrepreneurship in the digital economy.

Research findings indicate that self-efficacy positively influences the implementation of the Teaching Factory. Students who demonstrate high confidence in their abilities are more likely to participate actively in practice-based learning. Confidence in managing entrepreneurial tasks, decision-making, problem-solving, and in using digital technology fosters greater involvement in production and business activities within the Teaching Factory.

Taneja et al. (2023), found that entrepreneurial self-efficacy is associated with the ability to recognize opportunities, plan, organize, and allocate resources in business activities. These competencies are directly relevant to operational activities in the Teaching Factory, which require active student participation in real-world, practice-based learning. Further-

more, in the research of Hasan et al. (2024), demonstrated that digital competencies can influence entrepreneurial intentions through self-efficacy and entrepreneurial orientation. Collectively, these findings indicate that students with high self-efficacy are better prepared and more effective in practice- and technology-based learning activities. According to the Theory of Planned Behavior (TPB) proposed by Icek Ajzen, self-efficacy is linked to perceived behavioral control, defined as an individual's belief in their capacity to perform a specific action. Higher levels of student confidence in managing business activities and digital technology are associated with increased engagement in Teaching Factory activities. Therefore, self-efficacy is a critical factor in supporting the effectiveness of practice-based learning within vocational education.

Next, the research results show that the Teaching Factory has a positive effect on students' digital entrepreneurship competencies. This finding indicates that the more effectively practice-based learning is implemented through the Teaching Factory, the greater students' ability to develop digital entrepreneurship. Through real-life business experiences, students not only gain conceptual understanding but also develop digital skills, decision-making abilities, business communication, and adaptability to the needs of the digital industry. This is in line with research conducted by Handito (2025), which explains that the teaching factory is a learning model of vocational education based on industrial practices whose activities strengthen students' active competence through real practice. Furthermore, Imran & Marji (2024) stated that implementing a teaching factory effectively improves students' skills because they are directly involved in the business's operational process. Furthermore, Suryati & Yulastri (2023) explained that entrepreneurship-based teaching factories help improve students' entrepreneurial competence through contextual learning. Thus, the results of this study reinforce previous findings that teaching factories not only improve entrepreneurial competence in

general but also enhance students' digital entrepreneurship competence in vocational education environments. According to the Theory of Planned Behavior (TPB) proposed by Icek Ajzen, Teaching Factories can enhance the development of entrepreneurial behavior by providing hands-on experiences that increase students' confidence and preparedness for digital business activities. Such practical experiences foster greater confidence, adaptability, and engagement in cultivating technology-based entrepreneurial skills. Consequently, Teaching Factories represent a relevant learning strategy for advancing digital entrepreneurial competencies among vocational high school students during the digital economic transformation.

CONCLUSION

Digital entrepreneurship competency is an essential competency that needs to be developed in vocational education to address the challenges of digital economic transformation and the low level of entrepreneurial preparedness of vocational high school graduates in today's era. This study demonstrates that entrepreneurial motivation, digital competency, and self-efficacy have a positive and significant influence on students' digital entrepreneurship competency. Furthermore, the Teaching Factory serves as a practice-based learning mechanism that strengthens the transformation of students' psychological and technical abilities into applicable digital entrepreneurship competency. These findings confirm that the development of digital entrepreneurship competency is influenced not only by individual factors but also by a contextual learning environment that supports real-life business experiences.

Theoretically, this study reinforces Icek Ajzen's Theory of Planned Behavior (TPB), which posits that digital entrepreneurship behavior and competency are shaped by the interaction among motivation, perceived behavioral control, self-efficacy, and practical experience. Practically, the results suggest that schools need to optimize digital-based

Teaching Factory as a systemic strategy within the vocational education curriculum by strengthening digital marketing training, utilizing digital business platforms, integrating technology-based business projects, and providing ongoing business practice mentoring to enable students to gain more applicable digital entrepreneurship experience.

This study still has several limitations. The study was conducted at a single vocational high school and focused on students majoring in marketing, so the results cannot be generalized to all vocational education contexts. Furthermore, this study used a respondent-perception-based instrument, so the interpretation of answers may be influenced by individual experience and understanding of each statement. Therefore, future research is recommended to expand the research object to various institutions and different expertise programs and develop a model that considers other factors that could potentially influence digital entrepreneurship competency, such as entrepreneurial experience, access to technology and business resources, and the influence of the digital business ecosystem on students' entrepreneurial readiness.

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