

Analysis of the Impact of Industrial Work Practices on the Development of Professional Competencies and Entrepreneurial Spirit of Students

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ABSTRACT

Industrial work practice (Prakerin) is a key component of vocational education that links academic learning with real-world industrial experience. This study aims to analyze the impact of Industrial Work Practice (Prakerin) on the development of Professional Competency and Entrepreneurial Spirit among students of the Building Engineering Education Study Program at Makassar State University. A quantitative evaluative research design was employed using Structural Equation Modeling based on Partial Least Squares (SEM-PLS) analyzed with SmartPLS software. Respondents were students who had completed the Prakerin program, selected through purposive sampling. The research model consists of Prakerin (X1) as the independent variable, Professional Competency (Y1) and Entrepreneurial Spirit (Y2) as dependent variables. The measurement model showed all indicators have outer loading values above 0.70, with Cronbach's Alpha, Composite Reliability above 0.70, and AVE above 0.50, confirming reliability and validity. Discriminant validity was confirmed using the Fornell-Larcker Criterion. The structural model results indicate that Prakerin has a significant positive effect on Professional Competency ($\beta = 0.388$, $T = 6.944$, $p < 0.001$) and on Entrepreneurial Spirit ($\beta = 0.511$, $p < 0.001$). Furthermore, Entrepreneurial Spirit significantly influences Professional Competency ($\beta = 0.318$, $T = 6.258$, $p < 0.001$). The model fit indicators (SRMR = 0.040, NFI = 0.898) confirm adequate model fit. These findings highlight that Prakerin not only strengthens students' professional competencies but also cultivates an entrepreneurial mindset, establishing a mutually reinforcing relationship between entrepreneurial spirit and professional competency in the context of vocational education.

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1. INTRODUCTION

Vocational education is a level of higher or secondary education that focuses on mastering specific applied skills corresponding to chosen areas of expertise [1]. It emphasizes practical training that closely approximates real-world working conditions, serving as a critical element in the national education system for producing competent and industry-ready human resources [2]. In the era of globalization and the Industrial Revolution 4.0, the quality of vocational education has become increasingly crucial in producing graduates who are competitive in the labor market [3].

The construction industry in Indonesia has experienced significant growth in recent decades, demanding a skilled and competent workforce proficient in technological innovation and project management

[4]. However, Indonesia still faces challenges in providing adequately trained construction workers, particularly as Industry 4.0 drives the need for workers with both strong technical skills and entrepreneurial mindsets [5]. The revitalization of vocational education, as mandated by Presidential Instruction Number 9 of 2016, underscores the urgency of aligning educational programs with industry needs, including the implementation of Industrial Work Practice (Prakerin) programs [6].

Industrial Work Practice (Prakerin) is an educational and training activity organized by vocational institutions to provide students with practical experience and real-world industrial insights [7]. This program not only fulfills curricular requirements but also aims to develop professional competencies encompassing technical and non-technical skills, build professional networks, and prepare students for entry into the workforce [8]. In the context of building engineering education, professional competency involves not only technical design and construction abilities, but also workplace safety, project management, environmental sustainability, and technological innovation [9].

Beyond professional competency, exposure to the industrial environment during Prakerin has been associated with the stimulation of entrepreneurial mindsets among students [10]. Entrepreneurial spirit encompasses creativity, risk-taking willingness, innovation capacity, and the ability to identify business opportunities [11]. The development of entrepreneurial spirit within vocational education is increasingly recognized as essential, given the need for graduates who are not only employable but also capable of creating new economic value [12].

Previous studies have examined the effects of Prakerin on student competencies in various vocational disciplines, yet research focusing specifically on building engineering education programs remains limited. Moreover, the interrelationship between entrepreneurial spirit and professional competency as co-outcomes of Prakerin has not been thoroughly explored [13]. This study therefore aims to analyze the impact of Industrial Work Practice on both Professional Competency and Entrepreneurial Spirit among students of the Building Engineering Education Study Program at Makassar State University (Universitas Negeri Makassar), while also examining the relationship between these two dependent variables, using SEM-PLS methodology.

2. METHOD

2.1 Research Design

This study employs a quantitative approach with an evaluative research design, aimed at analyzing the impact of Industrial Work Practice (Prakerin) on the development of Professional Competency and Entrepreneurial Spirit among students of the Building Engineering Education Study Program at Makassar State University. The quantitative approach was chosen because this study aims to empirically test the relationships between research variables through statistical analysis of data collected from respondents [14].

The Structural Equation Modeling (SEM) method based on Partial Least Squares (PLS) was used to analyze the relationships between variables in the research model. The SEM-PLS method was selected because it can analyze complex relationships between latent variables and is suitable for predictive and exploratory research [15]. Data analysis was performed using SmartPLS software. The research model consists of three main variables: Prakerin (X1) as the independent variable, Professional Competency (Y1) and Entrepreneurial Spirit (Y2) as the dependent variables.

2.2 Population and Sample

The population in this study comprised students of the Building Engineering Education Study Program at Makassar State University who had participated in the Industrial Work Practice (Prakerin) program. Purposive sampling was employed, selecting students who had direct interaction with the industrial world through the Prakerin program, ensuring that the data obtained comprehensively represents students' perceptions of the impact of Prakerin [16]. This sampling approach is aligned with research that emphasizes user-centered data collection from those with relevant practical experience [17].

2.3 Research Instrument

The research instrument used was a questionnaire developed based on the theories of Prakerin, Professional Competency, and Entrepreneurial Spirit, using a Likert scale of 1 to 4. The Prakerin (X1) variable instrument consisted of 14 items measuring student experiences, technical skills, adaptability, and competency mastery during Prakerin in the industrial environment [18]. The Professional Competency (Y1) variable instrument consisted of 15 items measuring mastery of subject matter, analytical and problem-solving abilities, technical skills, and professional attitudes [9]. The Entrepreneurial Spirit (Y2) variable instrument consisted of 20 items measuring entrepreneurial interest, creativity, innovation, ability to identify business opportunities, and risk-taking courage [11].

2.4 Data Analysis

Data analysis was conducted using the SEM-PLS method with SmartPLS software. The analysis procedure consisted of: (1) Measurement Model (Outer Model) evaluation through testing of outer loading, Cronbach's Alpha, Composite Reliability, Average Variance Extracted (AVE), and discriminant validity using the Fornell-Larcker Criterion; and (2) Structural Model (Inner Model) evaluation through analysis of path coefficients, T-statistics, P-values, R-Square (R^2), and Model Fit indices to assess overall model adequacy [19].

3. RESULTS AND DISCUSSION

3.1 Measurement Model (Outer Model)

3.1.1 Outer Loading

Measurement model (outer model) evaluation was conducted to determine the validity of indicators in measuring each construct. An indicator is considered to have good convergent validity if the outer loading value exceeds 0.70, indicating that the indicator adequately represents the measured latent variable [20].

Table 1. Outer Loading

Indicator	Prakerin (X1)	Professional Competency (Y1)	Entrepreneurial Spirit (Y2)
X_1	0.733		
X_2	0.770		
X_3	0.713		
X_4	0.711		
X_5	0.795		
X_6	0.782		
X_7	0.799		
X_8	0.847		
X_9	0.859		
X_10	0.819		
X_12	0.809		
X_13	0.833		
X_14	0.769		
X_15	0.814		
Y1_1		0.728	
Y1_2		0.771	
Y1_3		0.777	
Y1_4		0.792	
Y1_5		0.844	
Y1_6		0.814	
Y1_7		0.780	
Y1_8		0.790	
Y1_9		0.765	
Y1_10		0.838	
Y1_11		0.830	
Y1_12		0.798	
Y1_13		0.805	
Y1_14		0.810	
Y1_15		0.755	
Y2_1			0.795
Y2_2			0.835
Y2_3			0.844
Y2_4			0.766
Y2_5			0.801
Y2_6			0.807
Y2_7			0.834
Y2_8			0.756
Y2_9			0.808
Y2_10			0.841
Y2_11			0.812
Y2_12			0.798
Y2_13			0.811

Y2_14	0.862
Y2_15	0.825
Y2_16	0.787
Y2_17	0.800
Y2_18	0.825
Y2_19	0.825
Y2_20	0.831

Based on Table 1, all indicators in the study have outer loading values above 0.70. Indicators for the Prakerin variable (X1) range from 0.711 to 0.859, for Professional Competency (Y1) from 0.728 to 0.844, and for Entrepreneurial Spirit (Y2) from 0.756 to 0.862. These results confirm that all indicators meet convergent validity criteria and are capable of adequately representing the respective latent constructs.

3.1.2 Construct Reliability and Validity

Construct reliability and validity testing was conducted to evaluate the consistency of indicators in measuring the research constructs. A construct is considered reliable if its Cronbach's Alpha and Composite Reliability values exceed 0.70, and the recommended AVE value is greater than 0.50 to confirm convergent validity [21].

Table 2. Construct Reliability and Validity

Variable	Cronbach's Alpha	rho_A	Composite Reliability	AVE
Prakerin (X1)	0.930	0.932	0.940	0.626
Professional Competency (Y1)	0.955	0.956	0.961	0.631
Entrepreneurial Spirit (Y2)	0.967	0.968	0.970	0.662

Based on Table 2, all research variables have Cronbach's Alpha values above 0.70 and Composite Reliability values above 0.70. Furthermore, all AVE values exceed 0.50, confirming convergent validity. These results indicate that the instruments used in the study reliably and consistently measure their respective constructs.

3.1.3 Discriminant Validity

Discriminant validity testing was conducted using the Fornell-Larcker Criterion, which compares the square root of the AVE for each construct against inter-construct correlations. A construct is considered to have good discriminant validity when its square root of AVE exceeds its correlations with other constructs [22].

Table 3. Result of Fornell-Larcker Criterion

Variable	Entrepreneurial Spirit (Y2)	Professional Competency (Y1)	Prakerin (X1)
Entrepreneurial Spirit (Y2)	0.814		
Professional Competency (Y1)	0.515	0.794	
Prakerin (X1)	0.509	0.550	0.791

Based on Table 3, the square root of AVE for each construct exceeds its correlation with other constructs. Entrepreneurial Spirit (Y2) has a square root of AVE = 0.814, Professional Competency (Y1) = 0.794, and Prakerin (X1) = 0.791. All values are greater than the inter-construct correlations, confirming that discriminant validity is satisfied and each construct is distinct.

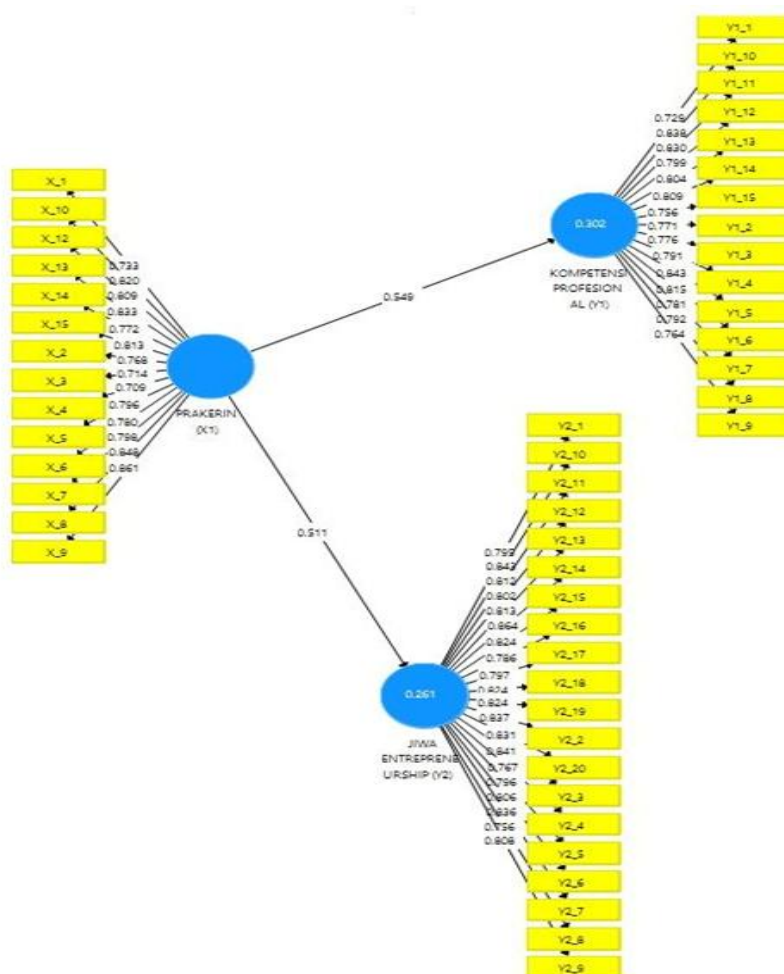


Figure 1. SEM-PLS Model (SmartPLS Output)

3.2 Structural Model

3.2.1 Path Coefficient

The structural model evaluation was conducted to determine the relationships between variables using bootstrapping in SmartPLS. A relationship is considered significant if T-statistics > 1.96 and P-values < 0.05 [23].

Table 4. Result of Path Coefficient

Variable	Original Sample (O)	T Statistics (O/STDEV)	P Values	Hypothesis
Entrepreneurial Spirit (Y2) → Professional Competency (Y1)	0.318	6.258	0.000	Significant
Prakerin (X1) → Professional Competency (Y1)	0.388	6.944	0.000	Significant
Prakerin (X1) → Entrepreneurial Spirit (Y2)	0.511	-	-	Significant

Based on Table 4, Prakerin (X1) has a significant positive effect on Professional Competency (Y1) with T-statistics = 6.944 and P-value = 0.000, with an original sample value of 0.388. Prakerin (X1) also has a significant positive effect on Entrepreneurial Spirit (Y2) with an original sample value of 0.511, representing the strongest influence in the model. Additionally, Entrepreneurial Spirit (Y2) significantly influences

Professional Competency (Y1) with T-statistics = 6.258 and P-value = 0.000, and original sample = 0.318. All hypotheses in this study are supported.

3.2.2 Goodness of Fit

Table 5. R Square

Variable	R Square	R Square Adjusted
Professional Competency (Y1)	0.377	0.373
Entrepreneurial Spirit (Y2)	0.261	-

The R-Square value for Professional Competency (Y1) is 0.377, indicating that Prakerin (X1) and Entrepreneurial Spirit (Y2) together explain 37.7% of the variation in Professional Competency, while the remaining 62.3% is explained by factors outside the model. The R-Square value for Entrepreneurial Spirit (Y2) is 0.261, indicating that Prakerin (X1) explains 26.1% of the variation in Entrepreneurial Spirit. According to Hair et al., values around 0.25 are classified as weak predictive power, indicating that while the model explains meaningful variance, other contextual factors also contribute significantly [24].

Table 6. Model Fit

Indicator	Saturated Model	Estimated Model
SRMR	0.040	0.040
d_ ULS	1.973	1.973
d_ G	0.852	0.852
Chi-Square	1362.074	1362.074
NFI	0.898	0.898

Table 6 shows that the SRMR value of 0.040 is well below the recommended maximum of 0.08, indicating a good model fit. The NFI value of 0.898, close to 1.00, further confirms model fit. The Chi-Square and d_ ULS values are consistent between the Saturated and Estimated Models. Overall, the model fit indices confirm that the research model has an adequate and acceptable level of fit.

3.3 Discussion

3.3.1 Effect of Prakerin on Professional Competency

The results show that Prakerin (X1) has a significant positive effect on Professional Competency (Y1) with T-statistics = 6.944 and P-value = 0.000, and an original sample value of 0.388. This finding aligns with the theoretical basis that Prakerin provides direct industrial experience contributing to students' mastery of both technical and non-technical competencies. Students who are actively engaged during Prakerin gain practical skills that cannot always be acquired in academic settings, thereby directly enhancing their professional readiness [7]. This result is consistent with studies demonstrating that industrial internship programs significantly improve vocational students' professional competencies [9][13].

3.3.2 Effect of Prakerin on Entrepreneurial Spirit

Prakerin (X1) has a significant positive effect on Entrepreneurial Spirit (Y2) with an original sample value of 0.511, representing the strongest effect in the model. This indicates that direct student interaction with the industrial environment during Prakerin effectively cultivates an entrepreneurial mindset. During Prakerin, students are exposed to real business dynamics, identify innovation opportunities, and learn directly from industry practitioners. This experience stimulates an entrepreneurial thinking pattern encompassing creativity, risk-taking, and the ability to create value [10][11]. The R-Square value of 0.261 suggests that 26.1% of the variation in Entrepreneurial Spirit is explained by Prakerin, supporting findings from entrepreneurship education literature that work-based learning experiences are key triggers for entrepreneurial intention development [12].

3.3.3 Effect of Entrepreneurial Spirit on Professional Competency

Entrepreneurial Spirit (Y2) significantly influences Professional Competency (Y1) with T-statistics = 6.258, P-value = 0.000, and original sample = 0.318. This finding indicates that students with a higher entrepreneurial spirit tend to demonstrate stronger professional competency. An entrepreneurial mindset motivates students to continuously learn, innovate, and proactively develop themselves, ultimately strengthening their professional competencies. This finding reinforces the understanding that entrepreneurial spirit and professional competency are mutually reinforcing constructs within the context of vocational education [8][25].

4. CONCLUSION

This study analyzed the impact of Industrial Work Practice (Prakerin) on the development of Professional Competency and Entrepreneurial Spirit among students of the Building Engineering Education Study Program at Makassar State University using SEM-PLS methodology. The results confirm that all measurement indicators met validity and reliability criteria, and that the overall model demonstrates adequate fit (SRMR = 0.040, NFI = 0.898).

The structural model results indicate three significant relationships: (1) Prakerin has a positive and significant effect on Professional Competency ($\beta = 0.388$, $T = 6.944$, $p < 0.001$); (2) Prakerin has the strongest positive and significant effect on Entrepreneurial Spirit ($\beta = 0.511$, $p < 0.001$); and (3) Entrepreneurial Spirit significantly influences Professional Competency ($\beta = 0.318$, $T = 6.258$, $p < 0.001$). These findings highlight that Prakerin is not only a platform for developing technical and professional competencies, but also an effective catalyst for cultivating the entrepreneurial spirit of vocational students.

Practically, these findings imply that building engineering education programs should not only optimize the quality and intensity of Prakerin to enhance professional competencies, but should also intentionally design Prakerin programs to stimulate and develop students' entrepreneurial spirit. The mutually reinforcing relationship between entrepreneurial spirit and professional competency suggests that integrated competency and entrepreneurship development should be a strategic priority in vocational higher education. Future research is recommended to involve a more diverse range of respondents, examine additional factors such as perceived usefulness, mentoring quality, and industry partnership intensity, and to conduct studies on fully implemented systems rather than programs under evaluation.

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7. CONFLICT OF INTEREST STATEMENT

The author declares no conflicts of interest regarding the publication of this research. There are no known financial, personal, professional, or academic relationships that could be construed as influencing the work reported in this paper.

8. INFORMED CONSENT

Informed consent was obtained from all participants prior to data collection. All respondents participated voluntarily and were informed about the study's purpose, procedures, and the use of collected data for research purposes. Participants agreed to provide their responses through the questionnaire after being informed that their data would be used anonymously and solely for academic research.

9. ETHICAL APPROVAL

This research involving human participants was conducted in accordance with relevant national regulations and institutional policies at Makassar State University. All research procedures adhered to ethical standards for research involving human subjects and were conducted in accordance with the principles of the Declaration of Helsinki.

10. DATA AVAILABILITY

The data supporting the findings of this study are available from the corresponding author upon reasonable request. The dataset consists of questionnaire responses collected from participants during the Prakerin evaluation process. Due to privacy and confidentiality concerns, the data are not publicly available.

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