



DOI: <https://doi.org/10.38035/dijms.v8i1>
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The Influence of Internal and External Factors on Graduate Fit with Industry Needs through Vocational Training as a Mediating Variable

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Abstract: Vocational institutions are expected to bridge the mismatch between graduate competencies and industry requirements, yet evidence on how internal and external antecedents jointly shape this alignment through training itself remains limited in Indonesia's public vocational training centers. This study examines the influence of internal factors (motivation, work readiness) and external factors (instructor competence, curriculum, facilities, industry partnership) on graduate competency fit with industry needs, with vocational training as a mediator, using 90 alumni of Balai Besar Pelatihan Vokasi dan Produktivitas (BBPVP) Bekasi. Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with 5,000-subsample bootstrapping. Results show internal and external factors significantly influence vocational training ($\beta = 0.511$ and 0.335), and training significantly influences competency fit ($\beta = 0.463$), while internal and external factors show no significant direct effect on competency fit. Training fully mediates the effect of internal factors on competency fit (indirect effect = 0.237 ; $p = 0.027$) but not external factors ($p = 0.102$). Descriptive analysis reveals that although competency fit is rated favorably, 23.33 percent of alumni work outside their trained field, indicating a horizontal mismatch despite full employment absorption. Training quality, not facility completeness, is the primary lever for closing the graduate-industry competency gap.

Keyword: Vocational Training, Internal Factors, External Factors, Competency Fit, Mediation, PLS-SEM.

INTRODUCTION

The Future of Jobs 2025 report by the World Economic Forum projects that nearly 40 percent of workers' core competencies will change by 2030, while workforce upskilling and reskilling have become a strategic priority across nearly all industry sectors (World Economic Forum, 2025). Meanwhile, the International Labour Organization notes that young people's transition from education or training into the world of work remains slow and uneven in many developing countries (International Labour Organization, 2024). Data from Statistics Indonesia (Badan Pusat Statistik, 2025) further show that the national open unemployment rate in August 2025 still corresponded to more than 7.4 million unemployed people, with a significant

proportion coming from vocational education graduates. These conditions confirm that the existence of vocational training institutions does not yet fully guarantee alignment between graduate competencies and industry needs, even when the training process has been structurally organized.

Balai Besar Pelatihan Vokasi dan Produktivitas (BBPVP) Bekasi is one of the technical implementation units of the Ministry of Manpower of the Republic of Indonesia that plays a strategic role in producing skilled workers in the Greater Jakarta (Jabodetabek) area. Recent studies on similar vocational training centers show that the institutional role of such centers is substantial in opening career opportunities for alumni, with a high rate of placement success (Nawari et al., 2025). However, aggregate employment absorption success does not necessarily reflect competency fit or field-of-work fit with the vocational specialization pursued, so this phenomenon needs to be tested empirically at the level of individual training participants.

Studies on the gap between vocational graduate competencies and industry needs have been widely conducted, but generally focus on measuring the mismatch itself as the outcome variable. Paramitasari et al. (2024) found that job-education mismatch among vocational high school graduates in Indonesia is influenced by regional economic agglomeration factors, while Maryanti et al. (2025) showed that educational mismatch affects graduates' income prospects and job satisfaction. In the international context, Al Shuaili (2025) found a gap between vocational education graduate competencies in Oman and labor market needs, while Gusti et al. (2026) demonstrated that the implementation of link and match policy affects the capability and employability of vocational graduates. These studies consistently confirm the existence of a gap, but have not extensively examined the mechanism within the training process itself as the pathway bridging participants' individual characteristics, training delivery quality, and the final outcome of competency fit.

On the other hand, research on the antecedents of vocational graduates' work readiness has largely highlighted the influence of individual-level factors. Supriyanto et al. (2023) demonstrated that internship experience and work motivation significantly influence vocational students' work readiness using PLS-SEM, while Taufan et al. (2025) found that self-efficacy and motivation explain more than 60 percent of the variance in polytechnic students' work readiness. Both studies confirm the important role of internal factors, but have not integrated the external factors of training providers (instructor competence, curriculum, facilities, and industry partnership) into a single joint model, nor tested whether the influence of internal and external factors on the final outcome of competency fit is direct or must be fully channeled through the training process as a mediator. The application of human capital theory in the context of training management (Supraptika et al., 2025) asserts that individual investment only generates organizational added value when converted through an appropriate competency development process, a theoretical proposition that has not been widely tested empirically using a mediation approach in government-owned vocational training institutions in Indonesia.

Based on this research gap, the novelty (state of the art) of this study lies in integrating internal and external factors into a single structural model that positions vocational training as a mediating variable for graduate competency fit with industry needs, tested at a high-achieving vocational training center (overall champion of the 13th WorldSkills ASEAN Singapore 2023) so that findings regarding the gap that still occurs cannot be solely attributed to low provider quality. Based on this description, the research problems are formulated as follows.

1. Do internal factors influence vocational training?
2. Do external factors influence vocational training?
3. Do internal factors influence graduate fit with industry needs?
4. Do external factors influence graduate fit with industry needs?
5. Does vocational training influence graduate fit with industry needs?
6. Does vocational training mediate the effect of internal factors on graduate fit with industry needs?

7. Does vocational training mediate the effect of external factors on graduate fit with industry needs?

The objective of this study is to answer these seven questions through testing a PLS-SEM-based structural model, while also providing recommendations for BBPVP Bekasi and national vocational training policymakers.

METHOD

This study uses a quantitative approach with an explanatory design to test the causal relationships between variables in the research model (Sugiyono, 2013). The study population consists of BBPVP Bekasi alumni who completed training in the Tourism, Information and Communication Technology (ICT), and Refrigeration vocations. The sample size was determined based on the minimum sample size rule for a model with 4 variables and 16 indicators (4×4), namely a minimum of $16 \times 5 = 80$ respondents. Data were collected through a closed-ended questionnaire using a 1–5 Likert scale distributed to training alumni from 2023–2024, with part of the data collected in a first stage and the remainder in a second stage after the collection procedure was refined, resulting in 90 respondents who met the analysis requirements.

The research variables consist of internal factors (X1), covering motivation, work readiness, and willingness to develop competency; external factors (X2), covering instructor competence, curriculum relevance, practice facilities, and industry partnership; vocational training (Z) as the mediating variable; and graduate fit with industry needs (Y) as the dependent variable, which at the structural model testing stage is operationalized through the competency fit dimension. All indicators were adapted from relevant prior studies (Simanjuntak, 1985; Stewart, 1997, as cited in Totanan, 2004; Mayo, 2000; Fitz-enz, 2009) and measured using a Likert scale from 1 (strongly disagree) to 5 (strongly agree).

Data were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with the aid of SmartPLS software, following the two-stage procedure recommended by Hair et al. (2021). The first stage, measurement model (outer model) evaluation, includes convergent validity testing (outer loading and Average Variance Extracted), reliability testing (Cronbach's alpha and Composite Reliability), and discriminant validity testing (cross loading, the Fornell-Larcker criterion, and the Heterotrait-Monotrait Ratio/HTMT). The second stage, structural model (inner model) evaluation, includes the coefficient of determination (R^2), predictive relevance (Q^2) through the blindfolding procedure, effect size (f^2), multicollinearity testing (Inner VIF), and the Standardized Root Mean Square Residual (SRMR) as a model fit measure (Ghozali & Latan, 2015). Hypothesis testing, for both direct and mediation (indirect) effects, was conducted through a bootstrapping procedure with 5,000 subsamples at a 5 percent significance level (one-tailed), with the hypothesis-acceptance criteria of T-statistic > 1.64 and P-values < 0.05 .

RESULTS AND DISCUSSION

Result

Evaluation of the Measurement Model (Outer Model)

Measurement model evaluation was conducted to assess the validity and reliability of the indicators in reflecting the constructs measured. Test results show that of the 16 initial indicators, 13 indicators had an outer loading above 0.40 and were retained in the final model, while 3 indicators with low loadings were removed from the model to improve convergent validity.

Table 1. Reliability and Convergent Validity Test Results

Variable	Cronbach's Alpha	Composite Reliability	AVE	Description
Internal Factors (X1)	0.7104	0.8464	0.6481	Met
External Factors (X2)	0.5097	0.7238	0.4079	Not yet met

Vocational Training (Z)	0.6089	0.7717	0.4619	Not yet met
Graduate Fit (Y)	0.4920	0.7970	0.6627	Met

Source: Primary data processed, SmartPLS (2026).

Table 1 shows that all constructs have a Composite Reliability above 0.70, so reliability is considered adequate, although the Cronbach's alpha values for the External Factors and Graduate Fit constructs are below 0.60. The Average Variance Extracted (AVE) value meets the 0.50 threshold for the Internal Factors and Graduate Fit constructs, but has not been met for the External Factors (0.4079) and Vocational Training (0.4619) constructs, indicating that the convergent validity of these two constructs still needs to be strengthened in future research.

Discriminant validity testing through cross loading shows that all indicators have the highest correlation with their own construct compared to other constructs, so this criterion is met. However, the Fornell-Larcker criterion, which requires the square root of a construct's AVE to be greater than its correlation with other constructs, is only met for the Internal Factors construct ($\sqrt{\text{AVE}} = 0.8050$) and the Graduate Fit construct ($\sqrt{\text{AVE}} = 0.8141$); the External Factors construct ($\sqrt{\text{AVE}} = 0.6387$) and the Vocational Training construct ($\sqrt{\text{AVE}} = 0.6796$) are exceeded by their correlations with other constructs. The Heterotrait-Monotrait Ratio (HTMT) test shows a consistent pattern, with all six construct pairs above the 0.90 threshold (ranging from 0.9047–1.2693). Discriminant validity is therefore not yet fully met, indicating a tendency toward common method bias in the instrument, whose items are uniformly worded and centered on the evaluation of a single provider institution. This limitation is discussed further in the Limitations section.

Structural Model Test Results (Inner Model)

Structural model evaluation was conducted to test the strength of the relationships between constructs as hypothesized. The R-Square value is used to assess the ability of the exogenous variables to explain the endogenous variable (Ghozali & Latan, 2015).

Table 2. R-Square Test Results

Endogenous Variable	R Square	Description
Vocational Training (Z)	0.6168	Moderate
Graduate Fit (Y)	0.4104	Moderate

Source: Primary data processed, SmartPLS (2026).

Table 2 shows that Internal Factors and External Factors jointly explain 61.68 percent of the variance in Vocational Training, while Internal Factors, External Factors, and Vocational Training jointly explain 41.04 percent of the variance in Graduate Fit. The predictive relevance (Q^2) value of 0.2680 for Vocational Training and 0.2433 for Graduate Fit indicates that the model has good predictive relevance. The largest effect size (f^2) value is obtained on the path from Internal Factors to Vocational Training ($f^2 = 0.3368$), while the effect of External Factors on Graduate Fit has a very small effect size ($f^2 = 0.0008$). All Inner VIF values are below 3.0 (ranging from 2.0251–2.7072), so the model is free from multicollinearity problems. The SRMR value of 0.1219 is above the recommended 0.08 threshold, indicating that the overall model fit still needs to be improved in future research.

Hypothesis Testing

Hypothesis testing was conducted by examining the significance of the structural paths through a bootstrapping procedure with 5,000 subsamples. T-statistic and P-value figures were used to determine whether a hypothesis was supported or not supported.

Table 3. Hypothesis Testing Results (Direct and Mediation Effects)

Hypothesis	Variable Relationship	Original Sample (O)	T Statistics	P Values	Decision
H1	Internal Factors → Vocational Training	0.5112	4.082	<0.001	Supported
H2	External Factors → Vocational Training	0.3347	2.488	0.0129	Supported
H3	Internal Factors → Graduate Fit	0.2427	1.105	0.2692	Not Supported
H4	External Factors → Graduate Fit	-0.0327	0.188	0.8505	Not Supported
H5	Vocational Training → Graduate Fit	0.4631	2.527	0.0115	Supported
H6	Internal Factors → Vocational Training → Graduate Fit	0.2368	2.218	0.0266	Supported
H7	External Factors → Vocational Training → Graduate Fit	0.1550	1.635	0.1020	Not Supported

Source: Primary data processed, SmartPLS, 5,000-subsample bootstrapping (2026).

Table 3 shows that of the seven hypotheses tested, four are supported (H1, H2, H5, and H6) and three are not supported (H3, H4, and H7). Internal and external factors are shown to significantly influence vocational training, and vocational training is shown to significantly influence graduate fit, but internal and external factors have no significant direct effect on graduate fit. Because the direct effect of internal factors on graduate fit is not significant while its indirect effect (H6) is significant, vocational training is shown to fully mediate the effect of internal factors on graduate fit. Conversely, vocational training does not significantly mediate the effect of external factors on graduate fit (H7 not supported), although the direction of its effect is consistent with the mediation found for internal factors.

Further descriptive analysis reveals a divergence within the graduate fit variable. The competency fit dimension, measured through the alignment of competency with industry needs, obtains a mean score above 3.8 on a scale of 5, while the field-of-work fit dimension with the training vocation obtains a mean score below 3.0 and correlates negatively with the competency fit dimension. Descriptively, 21 of 90 respondents (23.33%) reported that their job did not match their training field, even though all respondents had been absorbed into employment with a waiting period of less than three months. This finding illustrates a horizontal mismatch phenomenon (field-of-specialization mismatch), not a vertical mismatch (skill-level mismatch).

Discussion

The Effect of Internal Factors on Vocational Training

The results confirm that internal factors have a positive and significant effect on vocational training, with the largest effect coefficient among all direct paths in the model ($\beta = 0.5112$). This finding is consistent with Taufan et al. (2025), who demonstrated that self-efficacy and motivation can explain more than 60 percent of the variance in vocational students' work readiness, and is in line with the human capital proposition that individual investment in the form of motivation and work readiness is the fundamental capital that determines the quality of participant engagement during the competency development process (Supraptika et al., 2025).

The Effect of External Factors on Vocational Training

External factors are also shown to have a positive and significant effect on vocational training, although with a smaller magnitude of effect than internal factors ($\beta = 0.3347$ versus 0.5112). This finding supports Gusti et al. (2026), who demonstrated that the implementation of link and match policy, reflecting the quality of institutional support in the form of curriculum and industry partnership, affects vocational training program outcomes. The smaller effect of

external factors indicates that the completeness of facilities and instructor competence alone is not sufficient to drive training quality without being accompanied by participants' own readiness.

The Effect of Internal Factors on Graduate Fit

In contrast to findings in a number of work-readiness studies that found a direct effect of individual motivation on final outcomes (Supriyanto et al., 2023), this study did not find a significant direct effect of internal factors on graduate fit with industry needs ($p = 0.2692$). This difference is reasonable because work readiness and competency fit with industry needs are distinct constructs; participants' motivation does not automatically convert into industry-relevant competency without going through a structured training process.

The Effect of External Factors on Graduate Fit

External factors also show no significant direct effect on graduate fit ($p = 0.8505$), even with a negative, albeit very small, coefficient direction. This finding reinforces Maulana's (2023) argument that optimizing vocational education and training in Indonesia cannot rely solely on the completeness of facilities and curriculum, but must ensure these are genuinely converted into meaningful learning experiences for participants.

The Effect of Vocational Training on Graduate Fit

Vocational training is shown to have a positive and significant effect on graduate fit with industry needs ($\beta = 0.4631$; $p = 0.0115$). This result is consistent with studies on similar vocational training centers, which show that the institutional role of training centers contributes substantially to alumni career-opportunity success (Nawari et al., 2025), and reinforces the view that vocational training is a conversion mechanism that transforms individual capital and institutional support into industry-absorbable competency (Supraptika et al., 2025).

The Mediating Role of Vocational Training in the Effect of Internal Factors

Mediation test results confirm that vocational training fully mediates the effect of internal factors on graduate fit (indirect effect = 0.2368; $T = 2.218$; $p = 0.0266$). Because the direct effect of internal factors is not significant while its indirect effect is significant, this pattern is classified as full mediation. This finding reinforces the logic of training-mediation research in the context of employee performance, which shows that a process variable (in this case, training) serves as the mandatory pathway from individual factors to final outcomes (Maulani & Rachmawati, 2026), while also empirically confirming the human capital proposition that individual motivation only generates value when converted through a structured competency development process.

The Mediating Role of Vocational Training in the Effect of External Factors

In contrast to internal factors, vocational training does not significantly mediate the effect of external factors on graduate fit (indirect effect = 0.1550; $T = 1.635$; $p = 0.1020$), although the direction of its effect is consistent with the mediation found for internal factors. This pattern is consistent with findings that graduate mismatch (job-education mismatch) in Indonesia is more strongly explained by structural factors beyond the control of training providers, such as regional labor market conditions (Paramitasari et al., 2024) and industry demand characteristics (Maryanti et al., 2025), so that strengthening facilities and curriculum alone is not sufficient to guarantee graduate fit unless accompanied by strengthening on the industry demand side.

The novelty of this research is that vocational training is shown to fully mediate only the internal-factors path, but not the external-factors path, a differential mediation pattern not widely revealed in previous literature, which generally tests internal and external factors

separately (Supriyanto et al., 2023; Taufan et al., 2025) or tests mismatch as an outcome variable without tracing its mediating mechanism (Al Shuaili, 2025; Paramitasari et al., 2024). An additional finding, namely the horizontal mismatch that persists among 23.33 percent of alumni despite favorably rated competency fit and 100 percent employment absorption, further shows that the success of vocational training needs to be measured separately across the competency dimension and the field-of-work fit dimension, as the two do not always move in the same direction.

CONCLUSION

Conclusion

Based on the findings of this study, the following conclusions can be drawn. 1. Internal factors have a positive and significant effect on vocational training ($\beta = 0.5112$; $p < 0.001$). 2. External factors have a positive and significant effect on vocational training ($\beta = 0.3347$; $p = 0.0129$). 3. Internal factors have no significant effect on graduate fit ($p = 0.2692$). 4. External factors have no significant effect on graduate fit ($p = 0.8505$). 5. Vocational training has a positive and significant effect on graduate fit ($\beta = 0.4631$; $p = 0.0115$). 6. Vocational training fully mediates the effect of internal factors on graduate fit (indirect effect = 0.2368; $p = 0.0266$). 7. Vocational training does not significantly mediate the effect of external factors on graduate fit ($p = 0.1020$).

Limitations

This study has several limitations. First, discriminant validity is not yet fully met (HTMT for all construct pairs above 0.90; SRMR = 0.1219), indicating a risk of common method bias in the instrument, so path coefficients should be interpreted with caution. Second, data collection was conducted in two separate stages, so the collection stage itself partly explains the variance of each variable, and the path coefficients should be regarded as an upper bound rather than a precise point estimate. Third, this study uses cross-sectional data, so it only tests correlational patterns rather than providing direct evidence of causal ordering. Fourth, the scope of the study is limited to BBPVP Bekasi across three vocational clusters, so generalization of the results to other vocational training institutions should be made with caution.

Recommendations

Based on the research findings, BBPVP Bekasi and similar vocational training institutions are advised to strengthen the initial selection and preparation of participants to improve work readiness, given that internal factors are shown to have the largest effect, while also making the training process the primary focus of quality assurance because of its role as a full mediator. For the Ministry of Manpower, vocational training institution performance indicators should incorporate a measure of placement-field linearity, not merely the employment absorption rate, given that 100 percent absorption can still coexist with a field mismatch above 20 percent. Future researchers are advised to refine the instrument so it can more clearly distinguish between constructs, collect data in a single stage using a uniform procedure, and consider a longitudinal design to strengthen the basis for causal inference.

Author Contributions

The author was responsible for research conceptualization, data collection, data analysis using PLS-SEM, and manuscript preparation, carried out under the guidance of the thesis supervisor. The author has read and approved the final version of the manuscript for publication.

Acknowledgment (Optional)

The author would like to thank all BBPVP Bekasi alumni who participated as respondents, the management of BBPVP Bekasi for granting permission and providing support

throughout the data collection process, and the thesis supervisor, Dr. Rudi Bambang Trisilo, S.E., M.M., for guidance throughout the research and manuscript preparation.

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