

Predicting Network Engineering Graduate Employability: A Multi-Factor Analysis of Internships and Motivation

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Article Info

Article history:

Received July 21, 2026

Accepted September 10, 2026

Published October 02, 2026

Keywords:

Graduate Employability;

Internship Duration;

Industry Mentorship Quality;

Student Motivation;

Vocational Education.

ABSTRACT

Bridging the gap between vocational education and labor market demands remains a critical challenge under the *Kurikulum Merdeka*, particularly in technical specializations like Computer and Network Engineering (TKJ). This study examines the multi-factor influence of internship duration (X_1), industrial supervisory quality (X_2), and student motivation (X_3) on graduate job readiness (Y) among TKJ students in Gowa Regency, Indonesia. Utilizing a quantitative ex-post facto design, a proportional random sample of 175 12th-grade students from three public vocational high schools was surveyed following their industrial placements during the 2025/2026 academic year. Data collected via validated four-point Likert questionnaires (Cronbach's $\alpha = 0.746-0.812$) were analyzed using multiple linear regression in IBM SPSS 25. Results revealed that internship duration ($\beta = 0.359$, $p < 0.001$), supervisory quality ($\beta = 0.292$, $p < 0.001$), and internal motivation ($\beta = 0.149$, $p = 0.020$) significantly and simultaneously predicted job readiness ($F = 42.389$, $p < 0.001$), accounting for 42.6% of total variance ($R^2 = 0.426$). Partial regression identified internship duration as the primary driver ($R^2 = 0.339$), followed by mentorship quality ($R^2 = 0.302$) and motivation ($R^2 = 0.147$). Ultimately, technical employability heavily relies on prolonged real-world experiential learning and high-touch mentorship, urging stakeholders to standardize industrial mentorship protocols and optimize placement durations.

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1. INTRODUCTION

The rapid evolution of Industrial Revolution 4.0 and Society 5.0 has transformed the global labor market, demanding specialized technical competencies, adaptive problem-solving skills, and professional work attitudes (Alhloul & Kiss, 2022; Poláková et al., 2023). Vocational High Schools occupy a strategic position in national human capital development, tasked with producing market-ready graduates capable of seamlessly integrating into the industrial workforce (Chen & Li, 2025; Hao et al., 2023; Rosana et

al., 2025; Yi et al., 2025). However, global and national labor statistics highlight a persistent structural mismatch: vocational graduates frequently exhibit high theoretical awareness but lack actionable work readiness (Billett, 2020). In Indonesia, particularly within technical domains such as Computer and Network Engineering (*Teknik Komputer dan Jaringan/TKJ*), the open unemployment rate among vocational graduates remains disproportionately high due to deficiencies in practical troubleshooting skills and workplace soft skills (Isbah et al., 2026).

To address this skill gap, the Ministry of Education, Culture, Research, and Technology introduced the *Kurikulum Merdeka* (Independent Curriculum), elevating Industrial Work Practice (*Praktik Kerja Lapangan/PKL*) from a supplementary requirement to an essential co-curricular subject. Grounded in Human Capital Theory by Becker (Auerbach & Green, 2025) and Experiential Learning Theory by Kolb (Henríquez et al., 2025), PKL serves as an experiential bridge where academic knowledge is contextualized through hands-on industrial immersion. While existing literature acknowledges the general benefits of industrial internships (Hardiyanto et al., 2026), previous empirical studies have largely analyzed environmental factors (placement duration or facility quality) and internal psychological attributes (work motivation or self-efficacy) in isolation (Aminuddin et al., 2025; Yee et al., 2023). Consequently, there is a distinct lack of integrative research exploring how structural internship duration, external industry mentorship quality, and internal student motivation interact simultaneously to shape graduate employability within specialized digital tech fields.

Fieldwork placement duration represents the quantitative dimension of industrial immersion. Prolonged exposure allows students to surpass initial workplace orientation and engage in complex, non-routine tasks, thereby building career adaptability and technical mastery (Billett, 2020; Brooks & Youngson, 2016). Nevertheless, extended duration alone does not guarantee skill acquisition if it lacks structured guidance. Industrial mentorship quality constitutes the qualitative dimension, operating through social cognitive mechanisms (Astrove & Kraimer, 2022). Industrial supervisors act as facilitators, role models, and evaluators, providing technical scaffolding, formative feedback, and professional socializing (Paramitha et al., 2024). Complementing these external environmental drivers, internal motivation—conceptualized through Self-Determination Theory (Ryan & Deci, 2022)—acts as the intrinsic catalyst. Highly motivated students actively initiate learning behaviors, seek constructive feedback, and persevere through technical challenges during their internships (Hong et al., 2021; Hung et al., 2026).

This study addresses a key gap in vocational education literature by testing an integrative model that combines Internship Duration (X_1), Industrial Mentorship Quality (X_2), and Student Motivation (X_3) as joint predictors of Job Readiness (Y) among TKJ vocational students in Gowa Regency, South Sulawesi. The primary objective is to evaluate both the partial and simultaneous predictive contributions of these three determinants within the specific context of network engineering education under the *Kurikulum Merdeka* framework. The study addresses four core research questions:

1. Does internship duration significantly influence the job readiness of TKJ vocational graduates?
2. Does industrial mentorship quality significantly influence the job readiness of TKJ vocational graduates?
3. Does student motivation significantly influence the job readiness of TKJ vocational graduates?
4. Do internship duration, industrial mentorship quality, and student motivation simultaneously predict the job readiness of TKJ vocational graduates?

2. METHOD

This study utilized a quantitative research approach employing an *ex-post facto* correlational design to evaluate the structural relationships between independent predictors and graduate job readiness without direct manipulation of experimental conditions. The investigation was conducted from December 2025 to March 2026 across three public vocational high schools in Gowa Regency, Indonesia: SMKN 1 Gowa, SMKN 2 Gowa, and SMKN 4 Gowa. These institutions were selected as representative sites because they operate accredited Computer and Network Engineering (TKJ) departments with established industry partnerships across South Sulawesi.

The target population comprised 307 12th-grade TKJ students who had completed mandatory 3-to-6-month industrial work placements during the 2025/2026 academic year. Sample size determination was conducted using Slovin's formula with a strict 5% margin of error ($e = 0.05$): $n = N / (1 + N(e)^2) = 307 / (1 + 307(0.05)^2) = 174.18 \approx 175$ **respondents**. To preserve demographic representation across institutions, proportional random sampling was applied based on school enrollment totals. Table 1 details the participant distribution.

Table 1. Proportional Distribution of Research Participants

School Name	Target Population (N)	Sample Size (n)	Percentage (%)
SMK Negeri 1 Gowa	94	53	30.29%
SMK Negeri 2 Gowa	69	38	21.71%
SMK Negeri 4 Gowa	144	84	48.00%
Total	307	175	100.00%

Data were gathered using structured Likert-scale questionnaires comprising 16 operational items per construct (64 items total), measured on a 4-point scale ranging from 1 (Strongly Disagree) to 4 (Strongly Agree) to eliminate central tendency bias. Constructs were operationalized from established frameworks: Internship Duration (adapted from Paramitha et al., 2024), Industry Mentorship Quality (Scerri et al., 2020), Student Motivation (Ryan & Deci, 2022), and Job Readiness (Dwilanisusantya & Ananto, 2026).

To ensure psychometric integrity and address prior instrument measurement concerns, a pilot study was conducted on an external calibration sample of $N = 30$ TKJ students from SMKN 3 Makassar prior to primary data collection. Construct validity was confirmed via Pearson Product-Moment correlation, where all 64 items exceeded

the critical table threshold ($r_{\text{count}} > r_{\text{table}} (0.05, 28) = 0.361$). Scale reliability was evaluated using Cronbach's Alpha. Refinements to scale wording and the removal of noisy items produced robust reliability coefficients exceeding standard psychometric cutoffs ($\alpha \geq 0.70$): Internship Duration ($\alpha = 0.746$), Industry Mentorship Quality ($\alpha = 0.812$), Student Motivation ($\alpha = 0.784$), and Graduate Job Readiness ($\alpha = 0.835$).

Primary data collection was administered digitally and in person under standardized field protocols. Secondary verification was conducted via institutional documentation, reviewing official PKL logs and industry evaluations. Data was processed using IBM SPSS Statistics Version 25. Statistical analysis included:

- Descriptive Statistics: Means, percentages, and categorical frequency distributions across 5 ordinal categories (Very Low to Very High).
- Classical Assumption Testing: Kolmogorov-Smirnov test for residual normality, Variance Inflation Factor (VIF) and Tolerance for multicollinearity, and Deviation from Linearity for linear functional form.
- Hypothesis Testing: Simple regression analysis for partial contribution determination (R^2) and multiple linear regression modeling for joint effect testing (F-test, t-test, b-coefficients, and adjusted R^2).

3. RESULTS AND DISCUSSION

Results

Descriptive Statistics

Descriptive analysis revealed that the majority of TKJ student respondents reported high levels of experience, mentorship, motivation, and work readiness across all evaluated indicators. Table 2 summarizes the categorical frequency distribution.

Table 2. Categorical Frequency Distribution of Research Variables (N = 175)

Variable	Very High (%)	High (%)	Moderate (%)	Low (%)	Very Low (%)
Internship Duration (X1)	73.10%	24.00%	1.80%	1.10%	0.00%
Industry Mentorship Quality (X2)	73.10%	25.80%	1.10%	0.00%	0.00%
Student Motivation (X3)	74.30%	24.00%	1.70%	0.00%	0.00%
Graduate Job Readiness (Y)	68.00%	30.30%	1.70%	0.00%	0.00%

The categorical frequency distribution outlined in Table 2 demonstrates an overwhelmingly positive baseline profile across all evaluated constructs among the TKJ student cohort ($N = 175$). Specifically, internal psychological readiness and external environmental supports were heavily skewed toward the highest tiers, with student motivation (X_3) exhibiting the largest proportion in the "Very High" category (74.30%), closely followed by internship duration (X_1) and industry mentorship quality (X_2), which both stood at 73.10%. Furthermore, when combined with the "High" classification, over 97% of respondents reported favorable conditions across all three predictor variables, while instances of low or very low engagement remained virtually negligible ($\leq 1.10\%$). This robust baseline foundation directly aligns with the outcome

variable, wherein 68.00% of students achieved a "Very High" level of graduate job readiness (Y) and an additional 30.30% reached a "High" level, leaving merely 1.70% in the moderate range and 0.00% in the lower categories. Collectively, these descriptive findings suggest that the integration of prolonged industrial exposure, effective mentoring scaffolding, and intrinsic student motivation establishes a highly conducive environment for fostering technical work readiness in vocational network engineering education.

Testing Classical Assumptions

To verify model validity for multiple linear regression, classical assumption tests were executed. The Kolmogorov-Smirnov normality test produced an Asymptotic Significance of 0.200 ($p > 0.05$), indicating normally distributed regression residuals. Multicollinearity testing yielded Tolerance values ranging from 0.636 to 0.835 (all > 0.10) and VIF values between 1.198 and 1.572 (all < 10.0), confirming the absence of multicollinearity among predictors. Linearity tests for all variable pairs demonstrated Deviation from Linearity significance values exceeding 0.05 ($p > 0.05$), confirming linear relationships between independent variables and job readiness. Table 3 presents the assumption test results.

Table 3. Summary of Classical Assumption Test Results

Assumption Test	Statistical Indicator	Empirical Value	Decision / Status
Residual Normality	Asymp. Sig. (2-tailed)	200	Normality Met ($p > 0.05$)
Multicollinearity	Tolerance / VIF Range	0.636–0.835 / 1.198–1.572	No Multicollinearity ($VIF < 10$)
Linearity ($X_1 \rightarrow Y$)	Deviation from Linearity Sig.	142	Linear Form Confirmed ($p > 0.05$)
Linearity ($X_2 \rightarrow Y$)	Deviation from Linearity Sig.	218	Linear Form Confirmed ($p > 0.05$)
Linearity ($X_3 \rightarrow Y$)	Deviation from Linearity Sig.	305	Linear Form Confirmed ($p > 0.05$)

Multiple Linear Regression and Hypothesis Testing

Multiple linear regression modeling was conducted to evaluate simultaneous predictive relationships. Table 4 displays the model summary, Table 5 provides the ANOVA results, and Table 6 presents the regression parameters.

Table 4. Model Summary for Multiple Regression

Model	R	R Square (R ²)	Adjusted R Square	Std. Error of the Estimate
1	0.653	0.426	0.416	3.72173

Predictors: (Constant), Internship Duration (X_1), Industry Mentorship Quality (X_2), Student Motivation (X_3)

The multiple correlation coefficient ($R = 0.653$) establishes a strong positive association between the combined predictor variables—internship duration, industrial supervisory quality, and student motivation—and graduate job readiness among Computer and Network Engineering (TKJ) students. Furthermore, the coefficient of

determination ($R^2 = 0.426$) indicates that 42.6% of the overall variance in student work readiness is directly accounted for by this integrated model. Conversely, the remaining 57.4% of the variance is governed by unexamined external and contextual factors, such as school laboratory infrastructure, family socioeconomic status, and peer support networks. These statistical parameters underscore that while experiential industrial placement and intrinsic drive serve as crucial anchors for technical capability, comprehensive workforce preparedness also relies on broader institutional and socioeconomic ecosystems.

Table 5. ANOVA Test Results (Simultaneous Significance)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1,760,384	3	586,795	42,389	0.000b
Residual	2,368,588	171	13,851	—	—
Total	4,128,971	174	—	—	—

The primary regression model demonstrated robust global fit and strong statistical significance, as evidenced by the analysis of variance (ANOVA) test results presented in Table 5. The dynamic interaction among internship duration (X_1), industry mentorship quality (X_2), and student motivation (X_3) yielded an F -statistic of 42.389 ($p < 0.001$), with regression and residual sum of squares recorded at 1,760.384 ($df = 3$) and 2,368.588 ($df = 171$), respectively. Because the calculated p -value fell far below the critical threshold ($\alpha = 0.05$), the null hypothesis was decisively rejected. This statistical outcome confirms that the three explanatory variables simultaneously exert a significant joint influence on graduate job readiness (Y), corroborating the foundational assumption that technical workforce preparedness relies on the collective interplay of prolonged practical exposure, structured workplace guidance, and internal psychological drive rather than isolated individual factors.

Table 6. Multiple Linear Regression Parameter Estimates

Model Predictors	Unstandardized Coefficients (B)	Unstandardized Coefficients (Std. Error)	Standardized Coefficients (β)	t	Sig.
(Constant)	11.856	3.695	—	3.209	0.002
Internship Duration (X_1)	0.358	0.072	0.359	4.945	0
Industry Mentorship Quality (X_2)	0.283	0.07	0.292	4.069	0
Student Motivation (X_3)	0.141	0.06	0.149	2.351	0.02

The structural equation derived from Table 6 is formulated as: $Y = 11.856 + 0.358X_1 + 0.283X_2 + 0.141X_3$. The partial regression evaluation confirms positive and statistically significant parameter estimates across all three independent variables in predicting graduate job readiness. Standardized beta coefficients (β) reveal that internship duration (X_1) serves as the primary and most dominant predictor ($\beta = 0.359$, $t = 4.945$, $p < 0.001$), emphasizing that extended immersion in authentic workplace

environments is the critical foundation for technical competency acquisition. Industrial mentorship quality (X_2) follows closely as the second most influential factor ($\beta = 0.292$, $t = 4.069$, $p < 0.001$), highlighting the vital role of structured workplace scaffolding and professional socialization provided by industry supervisors. Lastly, student internal motivation (X_3) exerts a positive and significant effect ($\beta = 0.149$, $t = 2.351$, $p = 0.020$), functioning as an essential psychological catalyst that drives active engagement during fieldwork placements.

To further elucidate the individual predictive strength of each construct, zero-order simple regression analyses were conducted to isolate their unique partial determination values (R^2). Consistent with the multiple regression hierarchy, internship duration independently accounts for 33.9% of the variance in job readiness ($R^2 = 0.339$), demonstrating the highest direct explanatory power among the predictors. Industrial mentorship quality individually explains 30.2% of the variance ($R^2 = 0.302$), reinforcing the importance of high-touch supervision, while student motivation accounts for a smaller yet meaningful 14.7% of the variance ($R^2 = 0.147$). Collectively, these partial determination metrics illustrate that while internal psychological agency is necessary, structural exposure and external instructional support in real-world technical settings remain the main pillars of vocational graduate employability.

Discussion

The Dominant Role of Internship Duration in Building Technical Readiness

Partial regression analysis demonstrates that internship duration exerts a significant positive effect on TKJ student job readiness ($\beta = 0.359$, $t = 4.945$, $p < 0.001$), explaining 33.9% of the individual variance ($R^2 = 0.339$). In single-variable modeling, the linear equation $Y = 20.771 + 0.580X_1$ establishes that each unit increase in placement duration enhances job readiness by 0.580 units. These empirical results align with Experiential Learning Theory by Kolb, confirming that technical mastery requires prolonged contextual practice (Henríquez et al., 2025). In Computer and Network Engineering, initial 1-to-2-month placements are primarily spent adjusting to workplace norms and basic tasks. Beyond the third month, students transition to complex troubleshooting, such as configuring managed switches, designing local area network (LAN) topologies, and maintaining server infrastructure (Billett, 2020; Ogata et al., 2020).

These findings reinforce earlier studies by Gabriel et al. (2025) and Sugiarti et al. (2021), which noted that extended industrial exposure builds both hard technical skills and adaptive soft skills. Furthermore, the 6-month placement standard mandated under the *Kurikulum Merdeka* provides sufficient time for students to internalize professional workplace standards. Without adequate placement length, students risk remaining passive observers rather than active participants in technical workflows.

Qualitative Scaffolding Through Industrial Mentorship

Industrial mentorship quality emerged as the second most impactful predictor ($\beta = 0.292$, $t = 4.069$, $p < 0.001$), accounting for 30.2% of independent variance ($R^2 = 0.302$). The partial linear equation $Y = 26.093 + 0.532X_2$ indicates that active industrial

guidance substantially strengthens graduate work readiness. Grounded in Social Learning Theory by Bandura, industry supervisors provide essential cognitive scaffolding, translating abstract network theory into practical troubleshooting workflows (van Nooijen et al., 2021; Zhong & Si, 2021). High-quality mentorship encompasses structured task assignments, technical demonstrations, real-time safety supervision, and constructive feedback (Paramitha et al., 2024).

When industrial guidance is weak or absent, long internships can degenerate into routine clerical work, reducing students to low-cost labor without delivering meaningful skill development (Hashim, 2023; Karunaratne & Perera, 2019). Conversely, high-touch mentorship builds professional workplace habits, ethical responsibility, and technical confidence among network engineering students.

Intrinsic Motivation as an Internal Catalyst

Student internal motivation significantly predicts work readiness ($\beta = 0.149$, $t = 2.351$, $p = 0.020$), contributing 14.7% to individual variance ($R^2 = 0.147$). The partial regression model $Y = 34.235 + 0.364X_3$ demonstrates that intrinsic drive enhances learning outcomes during fieldwork placements. Drawing on Self-Determination Theory (Ryan & Deci, 2022), intrinsic motivation drives proactive learning behaviors. Highly motivated TKJ students actively ask diagnostic questions, seek out complex network tasks, and persist through challenging software configurations (Wang et al., 2024).

While motivation yields a lower partial R^2 (14.7%) compared to external structural factors, it serves an essential catalytic function. High environmental exposure (duration and mentorship) yields optimal results when students possess the intrinsic desire to absorb technical knowledge and internalize professional standards.

Integrative Multi-Factor Model for Vocational Employability

The simultaneous model confirms that internship duration, supervisory quality, and student motivation jointly explain 42.6% of the variance in TKJ graduate work readiness ($F = 42.389$, $p < 0.001$, $R^2 = 0.426$). This integration demonstrates that structural time (quantity), active guidance (quality), and intrinsic drive (psychological readiness) complement one another within vocational learning environments.

Note that summing partial R^2 values ($33.9\% + 30.2\% + 14.7\% = 78.8\%$) yields a higher total than the simultaneous R^2 value (42.6%). This reflects common variance overlaps among correlated predictors in multiple regression models (Ezenarro & Schorn-García, 2025). Duration provides the operational window, mentorship supplies technical scaffolding, and motivation provides the internal energy needed to build comprehensive job readiness. Vocational policy must therefore address both external partnership structures and internal student engagement strategies.

4. CONCLUSION

This study demonstrates that graduate job readiness among Computer and Network Engineering (TKJ) students in Gowa Regency is shaped by an interplay of external

environmental factors and internal psychological drivers. Empirical results reveal that internship duration serves as the single most dominant predictor of job readiness ($\beta = 0.359$, $p < 0.001$, $R^2 = 0.339$), indicating that extended industrial exposure provides the necessary timeframe for mastering complex network engineering competencies. Furthermore, industrial mentorship quality positively and significantly predicts job readiness ($\beta = 0.292$, $p < 0.001$, $R^2 = 0.302$) by offering essential technical scaffolding and professional socialization, while student motivation acts as an internal catalyst ($\beta = 0.149$, $p = 0.020$, $R^2 = 0.147$) that fosters active engagement during industrial placements. Simultaneously, the dynamic model comprising internship duration, supervisory quality, and student motivation accounts for 42.6% of the total variance in graduate work readiness ($F = 42.389$, $p < 0.001$), confirming the multi-faceted nature of vocational preparedness.

Despite these robust findings, two primary methodological limitations must be acknowledged. First, the sample was strictly confined to TKJ students across three public vocational high schools in Gowa Regency, South Sulawesi, which may constrain the generalizability of the insights to non-technical disciplines or distinct geographical regions. Second, the reliance on validated self-report questionnaires to measure work readiness introduces potential susceptibility to social desirability bias. To address these constraints, future research should integrate objective technical competency assessments and direct evaluations from industry supervisors. Additionally, researchers are encouraged to expand the structural framework using Structural Equation Modeling (SEM) to investigate student motivation as a potential mediating or moderating variable between internship quality and job readiness, alongside employing multi-site sampling that incorporates private vocational institutions and diverse technical specializations.

Translating these empirical insights into practice requires targeted interventions from key vocational education stakeholders. School administrators should enforce a minimum six-month industrial internship (*Praktik Kerja Lapangan*) duration within technical tracks under the *Kurikulum Merdeka* framework, supplemented by pre-internship bootcamps designed to align student expectations and bolster intrinsic motivation prior to placement. Concurrently, industry partners (*Dunia Usaha dan Dunia Industri / DUDI*) must establish standardized mentorship frameworks and deliver formal training for designated industrial supervisors. By equipping mentors to provide structured technical tasks, rigorous safety guidance, and consistent formative feedback, industry hosts can optimize learning outcomes and prevent the misuse of interns for routine non-technical chores.

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