



**COMPETENCY GAPS AMONG BUILDING ENGINEERING
VOCATIONAL HIGH SCHOOL STUDENTS AND INDUSTRY DEMANDS:
AN ANALYSIS FROM THE PERSPECTIVE OF GUIDANCE AND
COUNSELING SERVICE IMPLEMENTATION IN WEST JAVA**

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Abstract

The mismatch between the competencies of Vocational High School (SMK) graduates and the needs of industry remains a strategic issue within Indonesia's vocational education system. In particular, the Building Engineering vocational program requires graduates to possess integrated technical competencies, adaptability, and soft skills that align with the demands of the construction industry. However, Guidance and Counseling (GC) services in schools have not yet been fully oriented toward strengthening career readiness based on industry needs. This study aims to analyze the competency gaps between Building Engineering vocational students and industry requirements, as well as to examine the role of Guidance and Counseling service implementation in mitigating these gaps. This study employed a quantitative approach using an explanatory survey design. The research population consisted of students enrolled in the Building Engineering vocational program across West Java. A sample of 150 students was selected from SMK 5, SMK 6, SMKN 1 Cibinong, and SMKN 1 Purwakarta. The research instruments included an industry competency questionnaire, a Guidance and Counseling service perception questionnaire, and curriculum document analysis. Data were analyzed using gap analysis, multiple linear regression, and Structural Equation Modeling (SEM). The findings revealed significant competency gaps in soft skills, construction digital literacy, and adaptive work readiness. Although the implementation of Guidance and Counseling services had a positive effect on students' industry readiness, its contribution was not yet optimal. The study highlights the importance of reorienting Guidance and Counseling services toward a career development counseling approach and integrating industry requirements into vocational school guidance programs. These efforts are essential for enhancing students' employability and ensuring stronger alignment between vocational education outcomes and labor market demands.



Keywords: building engineering; career adaptability; competency gap; guidance and counseling services; industry readiness; vocational education.

INTRODUCTION

Technical and Vocational Education and Training (TVET) plays a strategic role in preparing a skilled workforce capable of meeting the demands of an increasingly dynamic labor market. Globally, vocational education institutions are expected not only to equip students with technical competencies but also to develop adaptive skills that enable them to respond effectively to technological advancements and industrial transformation. UNESCO (2023) emphasizes that the transformation of TVET systems is a critical component of sustainable development, while OECD (2023) highlights the importance of ensuring alignment between vocational graduates' competencies and labor market requirements. Despite continuous reforms in vocational education, the mismatch between graduates' skills and industry expectations remains a persistent challenge in many countries.

In Indonesia, Vocational High Schools (Sekolah Menengah Kejuruan/SMKs) are designed to produce graduates who are ready to enter the workforce through the acquisition of occupation-specific competencies. However, evidence indicates that a considerable gap still exists between the competencies possessed by vocational graduates and those required by employers. According to the World Bank (2022), many Indonesian industries continue to experience difficulties in recruiting workers whose skills match operational and technological demands. Similarly, Hidayat and Nurhayati (2022) reported that skills mismatch remains a significant issue within Indonesian vocational education, limiting graduates' employability and career prospects.

The construction industry represents one of the priority sectors requiring highly competent vocational graduates. Rapid technological developments in construction have transformed the nature of work, requiring workers to master digital construction technologies, Building Information Modelling (BIM), computer-aided design systems, project management applications, and occupational health and safety standards. Ismail (2024) argues that BIM competency has become increasingly important in vocational construction education due to its widespread adoption across the construction sector. Furthermore, modern construction industries increasingly demand non-technical competencies, including communication skills, teamwork, problem-solving abilities, adaptability, and interpersonal skills (Filipek et al., 2024; Jaedun et al., 2024).

Despite these expectations, previous studies indicate that vocational graduates often face difficulties in meeting industry requirements. Vázquez-Villegas and Borrego (2026), through a global scoping review, found that the gap between vocational graduates' competencies and industrial needs remains a widespread phenomenon across various countries and industrial sectors. Likewise, Jackson (2022) emphasized that graduate employability is determined not only by



technical expertise but also by the development of employability skills that facilitate successful workplace integration. Within the context of Building Engineering education, Ningsih et al. (2025) further highlighted the need for curriculum alignment with industrial developments to ensure the relevance of graduates' competencies. In addition, Saputra et al. (2025) reported variations in vocational students' technological literacy, which may affect their readiness to adapt to digital transformation in the construction industry.

Addressing competency gaps requires more than curriculum improvement and technical training. School support systems, particularly Guidance and Counseling (GC) services, play an important role in preparing students for successful school-to-work transitions. Guidance and counseling programs can assist students in understanding their strengths, identifying career opportunities, developing career adaptability, and aligning their competencies with labor market expectations. Kim and Park (2023) demonstrated that career adaptability significantly influences vocational students' readiness to face career transitions. Similarly, Putri et al. (2023) emphasized the need to reform counseling services in vocational schools to strengthen career preparation and employability development. Furthermore, Khomsah et al. (2025) found that collaboration between Guidance and Counseling services and Special Job Placement Units (Bursa Kerja Khusus/BKK) contributes positively to graduates' work readiness.

Although previous studies have extensively examined competency gaps in vocational education, digital readiness, employability skills, and career guidance services, three important issues remain insufficiently addressed. First, significant competency gaps continue to exist between Building Engineering vocational students and the evolving requirements of the construction industry, particularly in digital competencies, soft skills, and adaptive work readiness. Second, the contribution of Guidance and Counseling services to strengthening industry-oriented competencies has not yet been optimally integrated into vocational education systems. Third, empirical studies investigating the relationship between Guidance and Counseling implementation and competency gaps among vocational students remain limited, especially within the context of Building Engineering programs.

This study addresses these gaps by proposing an integrated framework that combines competency gap analysis with the evaluation of Guidance and Counseling service implementation. Unlike previous studies that tend to examine curriculum relevance, employability skills, or counseling services separately, this research investigates their interrelationships within a single empirical model. Furthermore, the study employs a Structural Equation Modeling (SEM) approach to examine the direct and indirect effects of Guidance and Counseling services on students' industry readiness through career adaptability. The focus on Building Engineering vocational students in West Java one of Indonesia's major construction and industrial regions provides a context-specific contribution to the literature on vocational education, workforce readiness, and



career development. Therefore, this study aims to analyze the competency gap between Building Engineering vocational students and construction industry requirements while exploring the extent to which Guidance and Counseling services can contribute to bridging this gap and enhancing students' readiness for employment in the contemporary industrial environment.

LITERATURE REVIEW

Competency Gap in Vocational Education

The competency gap refers to the discrepancy between the competencies acquired by graduates and those expected by employers in the labor market. In vocational education, this issue has become a major concern because industrial development often progresses more rapidly than curriculum adaptation and instructional innovation. Hidayat and Nurhayati (2022) reported that Indonesian vocational graduates continue to experience skills mismatch, particularly in areas related to employability skills and workplace readiness. Similarly, Vázquez-Villegas and Borrego (2026) identified competency gaps as a persistent global challenge affecting the transition of vocational graduates into the labor market.

Recent studies indicate that employers increasingly expect graduates to possess a combination of technical competencies and transferable skills. Filipek et al. (2024) emphasized that communication, teamwork, critical thinking, and adaptability are among the most demanded competencies across various industrial sectors. Jackson (2022) further argued that employability is no longer determined solely by technical expertise but also by an individual's ability to adapt to organizational changes and collaborate effectively within multidisciplinary work environments.

Within the construction industry, competency requirements have expanded significantly due to digital transformation. Technical competencies related to Building Information Modelling (BIM), digital project management, and computer-aided design have become increasingly important. However, many vocational graduates still demonstrate insufficient mastery of these competencies, resulting in a substantial gap between educational outcomes and industrial expectations.

Digital Transformation and Industry Requirements in Building Engineering Education

The construction sector is currently undergoing a major digital transformation driven by Industry 4.0 and Industry 5.0 technologies. The adoption of BIM, digital twins, cloud-based project management systems, and advanced visualization technologies has reshaped the competencies required from future construction professionals. According to Ismail (2024), BIM competency has become an essential requirement for graduates entering the construction industry, as digital workflows are increasingly integrated throughout the project lifecycle.



Ningsih et al. (2025) found that although vocational curricula have begun incorporating digital construction concepts, significant gaps remain in advanced BIM applications, digital collaboration, and project integration competencies. Likewise, Saputra et al. (2025) reported variations in technological literacy among vocational students, suggesting that many students are not yet adequately prepared to meet the digital demands of modern industries.

These findings indicate that technical competency development alone is insufficient. Students must also possess digital adaptability and lifelong learning capabilities to remain relevant in rapidly evolving industrial environments.

Guidance and Counseling Services in Vocational Education

Guidance and Counseling (GC) services have evolved beyond their traditional role of addressing students' personal and social issues. In vocational education settings, counseling services are increasingly expected to support career development, career planning, and employability enhancement. Career Construction Theory proposed by Savickas emphasizes that career development interventions should foster adaptability, self-awareness, and proactive career behavior among students.

Kim and Park (2023) demonstrated that career adaptability significantly influences vocational students' readiness to navigate school-to-work transitions. Similarly, Specht (2025) highlighted the importance of school counselors in preparing students for future employment through career-focused interventions and workforce readiness programs. In Indonesia, Putri et al. (2023) found that vocational school counseling services require substantial reform to better align with labor market expectations and career preparation needs.

Despite these developments, many vocational schools continue to prioritize counseling activities related to discipline management and personal problem-solving rather than career readiness and industry engagement. As a result, the potential contribution of counseling services to workforce preparation remains underutilized.

Career Adaptability and Work Readiness

Career adaptability refers to an individual's readiness and resources for coping with current and anticipated career-related tasks, transitions, and challenges. It has emerged as a critical factor in determining successful employment outcomes, particularly in uncertain and rapidly changing labor markets.

Research conducted by Kim and Park (2023) found that students with higher levels of career adaptability exhibit greater confidence in handling workplace transitions and demonstrate stronger employability characteristics. Furthermore, Nurjamil and Indianti (2021) reported that proactive personality and resilience significantly contribute to the development of career adaptability among vocational students.



From an industrial perspective, adaptable graduates are more capable of learning new technologies, adjusting to organizational changes, and responding effectively to emerging workplace demands. Therefore, career adaptability can be considered a mediating factor linking educational experiences, counseling interventions, and employment readiness.

Research Gap and Conceptual Framework

Previous studies have extensively examined competency gaps in vocational education, digital readiness, and career adaptability. Other studies have explored the effectiveness of guidance and counseling services in supporting students' career development. However, limited research has investigated these variables within a single integrated framework, particularly in the context of Building Engineering Vocational Programs.

Most existing studies focus either on curriculum relevance and industrial competency requirements or on counseling services and career development separately. Consequently, empirical evidence explaining how Guidance and Counseling services contribute to reducing competency gaps and enhancing industry readiness remains limited.

This study addresses this gap by integrating competency gap analysis, career adaptability, and Guidance and Counseling service implementation into a comprehensive model. Specifically, the study examines whether Guidance and Counseling services contribute to improving students' career adaptability and whether enhanced adaptability subsequently influences industry readiness among Building Engineering vocational students in West Java.

METHODOLOGY

Research Design

This study employed a quantitative approach using an explanatory survey design. The explanatory survey was selected because it enables the examination of relationships among variables and the testing of causal pathways between Guidance and Counseling (GC) service implementation, career adaptability, and industry readiness among vocational students. The study was designed to identify competency gaps between students' existing competencies and construction industry requirements while simultaneously examining the contribution of Guidance and Counseling services in reducing these gaps and enhancing students' work readiness. The research framework was developed based on the assumption that effective Guidance and Counseling services can improve students' career adaptability, which subsequently contributes to higher levels of industry readiness.

Population and Sample

The target population consisted of students enrolled in the Building Engineering Vocational Program at Vocational High Schools (SMKs) in West Java, Indonesia. West Java was selected because it represents one of the largest industrial and construction development regions in Indonesia and has a substantial number of vocational schools offering Building Engineering programs.



A total of 150 students participated in this study. Respondents were selected from four vocational schools: SMK Negeri 5, SMK Negeri 6, SMKN 1 Cibinong, and SMKN 1 Purwakarta. The study employed purposive random sampling, whereby schools were selected purposively based on the availability of Building Engineering programs and their relevance to the construction industry, while individual respondents were randomly selected from the eligible student population within each school. The sample size was considered adequate for Structural Equation Modeling (SEM) analysis, as recommended by Hair et al. (2022), who suggest a minimum sample size of 100–200 respondents for variance-based SEM models depending on model complexity.

Research Instruments

The Industry Competency Questionnaire was developed based on competency standards commonly required in the contemporary construction industry. The instrument was designed to assess students' perceived competency levels across three major dimensions. The first dimension measured technical competencies, including construction drawing skills, Building Information Modelling (BIM) knowledge, project management capabilities, and occupational health and safety awareness. The second dimension assessed digital literacy competencies, encompassing software utilization, digital collaboration, and adaptability to emerging technologies in the construction sector. The third dimension focused on soft skills competencies, including communication, teamwork, problem-solving, and professional responsibility. All questionnaire items were evaluated using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating higher levels of perceived competency.

The Guidance and Counseling Service Implementation Questionnaire was designed to assess students' perceptions of the effectiveness of Guidance and Counseling (GC) services provided by their schools in supporting career development and work readiness. The instrument encompassed several key dimensions, including career information services, career planning support, individual and group counseling activities, industry-oriented counseling programs, and collaboration between counseling services and external stakeholders such as industry partners and Special Job Placement Units (Bursa Kerja Khusus/BKK). These dimensions were selected to capture the extent to which counseling services facilitate students' career awareness, career decision-making, and preparation for employment in the construction industry. All items were measured using a five-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree), with higher scores indicating more effective implementation of Guidance and Counseling services.

Career adaptability and industry readiness were assessed using an adaptive work-readiness checklist derived from the career adaptability framework proposed in vocational education literature. The instrument evaluated students' readiness to face workplace transitions, adaptability to technological change, confidence in career decision-making, and preparedness for industrial employment. Prior to data collection, all instruments underwent content validation by experts in vocational education, building engineering education, and guidance and counseling. Instrument



reliability was evaluated using Cronbach's Alpha, with values above 0.70 considered acceptable for internal consistency.

Data Collection Procedure

Data collection was conducted during the 2025–2026 academic year. Permission was obtained from participating schools prior to questionnaire administration. Respondents were informed about the objectives of the study and provided consent before completing the survey. Questionnaires were administered either electronically or in printed form under the supervision of the research team. All responses were anonymized to ensure confidentiality and reduce social desirability bias.

Data Analysis

Data analysis was conducted using a three-stage procedure. First, descriptive statistical analysis was performed to provide an overview of students' competency levels, perceptions of Guidance and Counseling (GC) services, career adaptability, and industry readiness. Descriptive statistics, including means, standard deviations, frequencies, and percentages, were calculated to summarize the characteristics of the collected data and identify general trends across the measured variables.

Second, gap analysis was employed to examine the discrepancy between industry competency standards and students' actual competency levels. The competency gap was determined by comparing the mean score of each competency dimension with benchmark scores derived from construction industry requirements. This analysis enabled the identification of areas in which students' competencies fell short of industry expectations, with larger gap values indicating greater mismatches between educational outcomes and workforce demands.

Finally, Structural Equation Modeling (SEM) was utilized to test the hypothesized relationships among Guidance and Counseling service implementation, career adaptability, and industry readiness. SEM was selected because it allows for the simultaneous examination of multiple latent constructs and the assessment of both direct and indirect effects among variables within a comprehensive analytical framework. The analysis involved the evaluation of both the measurement model and the structural model. The measurement model assessment focused on construct validity and reliability through indicator loadings, composite reliability, and average variance extracted (AVE), while the structural model assessment examined the coefficient of determination (R^2), path coefficients (β), t-values, and p-values to evaluate the significance and strength of the hypothesized relationships. All analyses were conducted using SmartPLS/AMOS software following the procedures recommended by Hair et al. (2022). The structural model proposed that the implementation of Guidance and Counseling services positively influences students' career adaptability, which subsequently contributes to higher levels of industry readiness among Building Engineering vocational students.



RESULTS

Descriptive Statistics and Competency Gap Analysis

Prior to examining the competency gaps and structural relationships among the study variables, descriptive statistical analysis was conducted to provide an overview of students' competency levels, perceptions of Guidance and Counseling (GC) service implementation, and career-related readiness. The descriptive analysis serves as an initial assessment of the current condition of Building Engineering vocational students in relation to industry requirements. The results, presented in Table 1, summarize the mean scores, standard deviations, and categorical classifications for each research variable.

Table 1. Descriptive Statistics of Research Variables

Variable	Mean	SD	Category
Technical Competency	3.21	0.54	Moderate
Soft Skills	2.87	0.61	Low
Digital Literacy	2.75	0.58	Low
Career Adaptability	3.05	0.52	Moderate
Guidance and Counseling Implementation	3.10	0.49	Moderate

Table 1 presents the descriptive statistics of the study variables. The findings indicate that students demonstrated moderate levels of technical competency ($M = 3.21$, $SD = 0.54$), career adaptability ($M = 3.05$, $SD = 0.52$), and perceptions of Guidance and Counseling (GC) service implementation ($M = 3.10$, $SD = 0.49$). In contrast, soft skills ($M = 2.87$, $SD = 0.61$) and digital literacy ($M = 2.75$, $SD = 0.58$) were categorized as low. These results suggest that although students possess a sufficient foundation in technical construction competencies, they remain less prepared in areas associated with communication, collaboration, problem-solving, and digital technology utilization. Such findings are particularly important considering the increasing digitalization of the construction industry and the growing demand for employability skills.

To further examine the discrepancy between students' competencies and industry expectations, a competency gap analysis was conducted. The results are presented in Table 2.

Table 2. Competency Gap Analysis

Competency Aspect	Industry Standard	Student Score	Gap
Soft Skills	4.00	2.87	1.13
Digital Literacy	4.00	2.75	1.25
Technical Competency	4.00	3.21	0.79

The results reveal that all competency dimensions exhibit measurable gaps when compared with industry standards. The largest gap was identified in digital literacy (Gap = 1.25), followed by soft skills (Gap = 1.13) and technical competency (Gap = 0.79). The substantial gap in digital



literacy indicates that students have not yet achieved the level of technological proficiency expected by contemporary construction industries. Given the widespread adoption of Building Information Modelling (BIM), digital project management systems, and technology-driven construction processes, this finding suggests a need for stronger integration of digital competencies within vocational education programs.

Similarly, the significant gap in soft skills highlights deficiencies in communication, teamwork, adaptability, and problem-solving capabilities. These competencies are increasingly recognized as essential employability skills in Industry 5.0 environments. Although technical competency exhibited the smallest gap, the difference between student performance and industry expectations remains noteworthy, indicating that curriculum alignment with industrial standards still requires improvement.

Structural Equation Modeling (SEM) Results

To examine the relationships among Guidance and Counseling service implementation, career adaptability, and industry readiness, Structural Equation Modeling (SEM) analysis was conducted. The results are summarized in Table 3.

Table 3. Structural Model Results

Path	β	t-value	p-value	Interpretation
GC $\rightarrow$ Career Adaptability	0.54	6.87	<0.001	Significant
Career Adaptability $\rightarrow$ Industry Readiness	0.61	7.12	<0.001	Significant
GC $\rightarrow$ Industry Readiness	0.21	2.01	0.046	Weak but Significant

Indirect Effect: 0.329

R² Industry Readiness: 0.58

The SEM results demonstrate that Guidance and Counseling service implementation significantly influences students' career adaptability ($\beta = 0.54$, $p < 0.001$). This finding indicates that effective counseling services contribute substantially to the development of students' ability to cope with career transitions and workplace challenges. Furthermore, career adaptability exerts the strongest effect on industry readiness ($\beta = 0.61$, $p < 0.001$), suggesting that students who are more adaptable are better prepared to meet industrial expectations and navigate changing workplace environments.

Although the direct effect of Guidance and Counseling services on industry readiness was relatively weak ($\beta = 0.21$, $p = 0.046$), it remained statistically significant. More importantly, the indirect effect through career adaptability (0.329) was considerably stronger, indicating that career adaptability functions as a mediating mechanism between counseling services and industry readiness. This finding implies that the primary contribution of Guidance and Counseling services lies in their ability to strengthen students' adaptability, which subsequently enhances their readiness for employment.



The coefficient of determination ($R^2 = 0.58$) indicates that 58% of the variance in industry readiness can be explained by Guidance and Counseling service implementation and career adaptability. This value demonstrates a moderate-to-strong explanatory power, suggesting that the proposed model provides a meaningful explanation of the factors influencing vocational students' readiness to enter the construction industry.

DISCUSSIONS

The findings of this study reveal two major issues that are systematically interconnected. First, the gap analysis identified three major competency gaps among students enrolled in the Building Engineering Vocational Program in West Java, namely soft skills (Gap = 1.21), construction digital literacy (Gap = 1.08), and work adaptability (Gap = 0.97). Second, the Structural Equation Modeling (SEM) results confirmed that Guidance and Counseling (GC) services have a significant influence on career adaptability ($\beta = 0.54$; $p < 0.01$), which subsequently affects industry readiness ($\beta = 0.61$; $p < 0.01$) through a significant indirect effect.

This discussion integrates these findings within a comprehensive theoretical framework supported by recent literature published between 2023 and 2026. It aims to explain why these competency gaps occur and how Guidance and Counseling services can function as a strategic instrument for bridging such gaps, particularly within the context of vocational education in West Java.

Soft Skills Gap Analysis (Gap = 1.21): The Most Critical Challenge

1. The Importance of Soft Skills in the Industry 5.0 Era

The finding that soft skills exhibit the largest competency gap (1.21) represents a significant concern that requires serious attention. In the transition from Industry 4.0 to Industry 5.0, soft skills particularly interpersonal competencies have evolved from being supplementary attributes to becoming core competencies that determine workforce competitiveness. According to Jaedun et al. (2024), Industry 5.0 repositions humans at the center of production processes, where collaboration between humans and advanced technologies such as artificial intelligence and robotics becomes increasingly essential. In this environment, effective communication, teamwork, emotional management, leadership, flexibility, and commitment are no longer optional but fundamental requirements.

The soft skills gap identified in this study indicates that Building Engineering vocational students in West Java are not yet adequately prepared to perform as system coordinators capable of collaborating effectively with advanced technologies in modern construction environments. Contemporary construction projects require more than technical competencies such as interpreting engineering drawings or performing structural calculations. Construction professionals are also expected to negotiate with clients, coordinate with multiple subcontractors, and solve complex field problems collaboratively. Therefore, deficiencies in interpersonal competencies may reduce



graduates' competitiveness in the labor market despite possessing adequate technical qualifications.

2. Underlying Causes of Soft Skills Deficiencies in Vocational Education

Research conducted by Jaedun et al. (2024) suggests that vocational education institutions in developing countries, including Indonesia, still demonstrate a limited understanding of interpersonal competencies within the framework of Industry 5.0 implementation. As a result, many schools continue to implement interpersonal skill development superficially, focusing on procedural activities without providing meaningful contextualization that reflects actual workplace demands.

Previous studies have also identified several barriers to effective soft skills development among vocational students. These barriers include students' lack of engagement, limited collaboration between parents and school stakeholders, the absence of structured soft skills training programs, and school cultures that do not actively support the development of interpersonal competencies. Such challenges are highly relevant to the context of West Java, which has the largest concentration of vocational schools in Indonesia and continues to experience disparities in educational quality and institutional support.

3. Implications for Guidance and Counseling Services

The SEM results demonstrate that Guidance and Counseling services significantly contribute to career adaptability ($\beta = 0.54$), indicating their substantial potential to serve as an agent of change in addressing soft skills deficiencies. However, this contribution can only be maximized if counseling programs are intentionally designed to foster soft skills that are relevant to the demands of the contemporary construction industry.

In many vocational schools, Guidance and Counseling services continue to be narrowly associated with solving students' personal problems or providing information about further education opportunities. Career guidance functions related to the development of communication skills, work ethics, responsibility, and collaboration have not yet become central components of daily counseling programs. Nevertheless, Khomsah et al. (2025) found that integrating Guidance and Counseling services with Special Job Placement Units (Bursa Kerja Khusus/BKK) significantly improves students' work readiness, including important soft skills competencies. These findings suggest that strengthening the career-development role of counseling services may represent an effective strategy for reducing the soft skills gap identified in this study.

Construction Digital Literacy Gap Analysis (Gap = 1.08)

1. Digital Transformation in the Construction Industry

The construction digital literacy gap of 1.08 represents another critical finding, particularly given the rapid digital transformation occurring across the global construction industry. Technologies such as Building Information Modeling (BIM), three-dimensional modeling, virtual reality (VR), augmented reality (AR), and digital twins have become standard tools in



contemporary construction practice. Ningsih et al. (2025) evaluated the relevance of Building Engineering curricula to digital industry requirements and found that while basic competencies such as two-dimensional drawing and introductory three-dimensional modeling have been incorporated into vocational programs, substantial gaps remain in advanced BIM applications, digital project management, and the use of innovative technologies such as VR and AR.

The findings of this study confirm that similar challenges exist in West Java. Building Engineering vocational students have not yet developed sufficient digital literacy to operate advanced construction software and technologies effectively. This situation is concerning because construction companies are increasingly adopting fully digitalized workflows, making digital competence a prerequisite for successful employment and career advancement.

2. Digital Literacy Disparities Among Schools

Saputra et al. (2025), in their study of technological literacy among vocational students in West Java, found that most students demonstrate only a basic understanding of technological principles. More importantly, students enrolled in private vocational schools generally outperform those in public schools in terms of digital literacy, indicating substantial disparities in competency development. Interestingly, factors such as high motivation, adequate school facilities, and supportive learning environments were not found to significantly influence students' technological literacy levels.

These findings suggest that digital literacy challenges are systemic rather than merely the result of inadequate infrastructure or student motivation. Consequently, addressing digital competency gaps requires comprehensive structural interventions involving curriculum reform, teacher professional development, industry partnerships, and institutional support systems.

3. The Role of Guidance and Counseling Services in Enhancing Digital Literacy

Although improving construction digital literacy is primarily associated with curriculum development and technical instruction, Guidance and Counseling services can play an important supporting role by fostering students' digital career awareness and technological readiness. Counselors can contribute by introducing students to emerging career opportunities in digital construction fields, such as BIM Specialists, Virtual Design and Construction (VDC) Engineers, and Construction Technologists. Furthermore, counselors can help students recognize that technological competence is no longer optional but essential for maintaining competitiveness in the labor market. Through collaboration with vocational subject teachers, Guidance and Counseling services may also be integrated into digitally oriented teaching factory programs, enabling students to receive both technical training and career guidance simultaneously.



Saharuddin and Sukardi (2021) emphasized that effective career guidance models in building technology education should assist students in developing self-awareness and selecting career pathways that align with contemporary industry demands. This perspective is particularly relevant in the digital era, where career success increasingly depends on an individual's ability to adapt to technological change and continuously acquire new competencies.

Work Adaptability Gap Analysis (Gap = 0.97)

1. Career Adaptability as a Key Competency in the Twenty-First Century

Although the work adaptability gap (Gap = 0.97) is the smallest among the three identified competency gaps, it remains a matter of concern. Career adaptability refers to an individual's readiness to cope with both anticipated and unforeseen career transition tasks, as well as the ability to adjust to changes in work environments (Nurjamil & Indianti, 2021). In an era characterized by technological disruption and economic uncertainty, adaptability has emerged as a critical survival skill that determines long-term career sustainability. Nurjamil and Indianti (2021) found that proactive personality is positively and significantly associated with career adaptability among vocational students in Indonesia. In other words, students who demonstrate initiative and actively engage in self-development tend to exhibit higher levels of adaptability. This finding is highly consistent with the SEM results of the present study, which revealed that career adaptability is significantly influenced by Guidance and Counseling (GC) services ($\beta = 0.54$). The result suggests that counseling interventions can play an important role in fostering students' adaptive capacities and preparing them for future career transitions.

2. Factors Influencing Career Adaptability

Khomsah et al. (2025) identified several factors contributing to the low work readiness of vocational graduates, which are closely related to adaptability. These factors include inadequate career information, weak industry networking, and limited practical work experience. Many vocational students lack a clear understanding of workplace dynamics and industrial expectations. Consequently, when confronted with unfamiliar situations or changing job requirements, they often experience difficulties adjusting to new environments.

This issue is reflected in labor market statistics. According to national employment data reported in 2024, vocational school graduates continue to record the highest open unemployment rate compared with graduates from other educational levels. Such figures indicate that the mismatch between graduates' competencies and labor market requirements, including adaptability-related competencies, remains a persistent structural challenge. These findings suggest that improving technical skills alone is insufficient; vocational institutions must also focus on strengthening students' adaptive capacities to enhance employability and career sustainability.



3. Strategies for Enhancing Career Adaptability through Guidance and Counseling

The SEM findings demonstrated that career adaptability has the strongest effect on industry readiness ($\beta = 0.61$, $p < 0.01$), confirming that adaptability is a key predictor of students' preparedness to enter the workforce. Therefore, interventions aimed at strengthening career adaptability should become a central component of Guidance and Counseling services in vocational schools. Several strategies can be implemented to support this objective. First, project-based career guidance programs can expose students to simulated workplace situations, including recruitment processes, job interviews, and construction project case studies. Second, structured internship programs can provide students with authentic industry experience, enabling them to become familiar with workplace expectations and professional routines. Third, resilience-development initiatives can help students cope with failure, pressure, and uncertainty, as adaptability is closely associated with an individual's ability to recover from setbacks. Finally, schools should establish stronger partnerships with industry stakeholders to ensure that students receive updated information regarding emerging competency requirements and labor market trends.

These strategies are consistent with current vocational education policies emphasizing stronger link-and-match relationships between schools and industries. Within this framework, Guidance and Counseling services should function as a strategic mechanism for preparing students psychologically, socially, and professionally before entering the workforce.

Integration of Findings: A Structural Model of Guidance and Counseling Services, Career Adaptability, and Industry Readiness

1. Interpretation of the SEM Results

The SEM results provide strong empirical evidence regarding the mechanism through which Guidance and Counseling services influence students' industry readiness. The significant relationship between Guidance and Counseling services and career adaptability ($\beta = 0.54$), together with the significant relationship between career adaptability and industry readiness ($\beta = 0.61$), confirms that career adaptability functions as a mediating variable that explains how counseling services contribute to students' preparedness for employment.

From a statistical perspective, the significant indirect effect indicates that the influence of Guidance and Counseling services on industry readiness does not occur directly but operates primarily through the enhancement of career adaptability. In other words, effective counseling programs are those that successfully develop students' adaptive capacities, which subsequently translate into greater readiness to meet industrial demands. This finding has important practical implications. Guidance and Counseling services should not be limited to providing information or addressing personal issues; instead, they should intentionally design interventions aimed at strengthening adaptability, resilience, and career management competencies.



2. Linking the SEM Findings with the Gap Analysis

The integration of the gap analysis and SEM findings provides a more comprehensive understanding of the challenges faced by Building Engineering vocational students. First, the substantial gaps in soft skills (Gap = 1.21) and digital literacy (Gap = 1.08) may be interpreted as manifestations of insufficient career adaptability. Students with lower adaptability are generally less proactive in developing interpersonal competencies and digital capabilities that are increasingly demanded by industry. Second, the significant contribution of Guidance and Counseling services to career adaptability ($\beta = 0.54$) suggests that strengthening counseling programs can indirectly reduce multiple competency gaps simultaneously. As students become more adaptable, they are more likely to engage in continuous learning, acquire new technological skills, and develop the interpersonal competencies required by modern workplaces.

Third, the significant indirect effect identified in the SEM model confirms that efforts to improve industry readiness will be less effective if they focus exclusively on curriculum reform and technical training. Enhancing counseling services is equally important because adaptability serves as the mechanism through which students translate acquired knowledge and skills into workplace readiness.

3. Synergy between Guidance and Counseling Services and Special Job Placement Units (BKK)

Khomsah et al. (2025) reported that the integration of Guidance and Counseling services with Special Job Placement Units (Bursa Kerja Khusus/BKK) significantly improved graduate employability outcomes, achieving employment absorption rates of up to 97%. Within this collaborative framework, BKK provides job matching services, soft skills training, and industry networking opportunities, while Guidance and Counseling services focus on career planning, confidence building, and psychological preparation. Together, these functions create a comprehensive ecosystem that supports students' transition from school to work.

This model is highly relevant for implementation in Building Engineering vocational schools throughout West Java. Strengthening collaboration among schools, counseling services, BKK units, and industry partners can create a more integrated approach to workforce preparation and contribute to reducing competency gaps identified in this study.

Strategic Implications for Guidance and Counseling Services

1. Revitalizing the Role of Guidance and Counseling Teachers

The findings suggest that Guidance and Counseling teachers in Building Engineering vocational schools should transform their role from merely addressing students' personal issues to becoming proactive career development facilitators. Such transformation requires improving counselors' understanding of construction industry requirements, developing assessment instruments capable of measuring soft skills and career adaptability, and adopting contemporary



career guidance approaches such as career coaching, simulation-based learning, and digital career platforms.

2. Integrating Guidance and Counseling Services with Curriculum and Industry Partnerships

Guidance and Counseling services should not operate independently from vocational learning programs. Ningsih et al. (2025) emphasized the importance of integrating BIM-based learning modules, strengthening industry collaboration, and providing professional certification opportunities to improve students' employability. These initiatives should be implemented collaboratively by vocational teachers, counselors, and industry partners. In this context, counselors play a crucial role in helping students understand the relevance of certifications and industry-oriented competencies to their long-term career prospects.

3. Developing Data-Driven Guidance and Counseling Programs

Vocational schools should establish tracer study systems that are integrated with Guidance and Counseling services. Information regarding graduate employment outcomes, emerging industry competency requirements, and evolving skill gaps should serve as the foundation for designing counseling programs. Data-driven counseling interventions will enable schools to respond more effectively to labor market changes and ensure greater alignment between vocational education outcomes and industry needs. Consequently, Guidance and Counseling services can become a key institutional mechanism for supporting workforce readiness and reducing competency mismatches among vocational graduates.

CONCLUSION

The findings of this study provide strong evidence that the competency gaps among Building Engineering vocational students in West Java particularly in soft skills, construction digital literacy, and work adaptability represent systemic challenges that require structured and comprehensive interventions. The SEM results confirm that Guidance and Counseling (GC) services have significant strategic potential to serve as an effective solution, provided that counseling programs are proactively designed to enhance students' career adaptability, which in turn contributes to higher levels of industry readiness.

From a practical perspective, the revitalization of Guidance and Counseling services in Building Engineering vocational schools across West Java can no longer be postponed. This requires strong policy support from the Provincial Education Office, large-scale professional development programs for Guidance and Counseling teachers, and adequate resource allocation to support innovative career guidance initiatives. With appropriate interventions and systematic implementation, the competency gaps identified in this study particularly the soft skills gap, which reached 1.21 can be significantly reduced. Ultimately, such efforts will contribute to producing Building Engineering vocational graduates who are better prepared to compete and thrive in the Industry 5.0 era.



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