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REVIEW PAPER

Career guidance and workforce readiness in TVET: Lessons from Germany, Japan, and Indonesia

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Abstract
This study examines the role of career guidance systems in enhancing workforce readiness within Technical and Vocational Education and Training (TVET). Increasing global challenges such as skills mismatch, youth unemployment, and rapid digital transformation have intensified the need for effective career guidance as a bridge between education and labor market demands. However, significant disparities remain across countries in how career guidance is structured and implemented. This study addresses the research question on how career guidance systems in Germany, Japan, and Indonesia contribute to workforce readiness, and what best practices can be identified. This study contributes to the literature by offering a comparative and integrative perspective on career guidance systems, moving beyond fragmented approaches that focus solely on employability or training systems. It proposes a novel framework that integrates institutional, cultural, and guidance dimensions to explain workforce readiness in TVET. A systematic literature review (SLR) was conducted following the PRISMA framework, analyzing 32 peer-reviewed articles sourced from Scopus, Web of Science, and ScienceDirect (2020–2025). The study employed bibliometric analysis using VOSviewer and thematic comparative analysis to identify key patterns across the selected countries. The findings reveal three dominant models: a system-driven approach in Germany characterized by strong industry integration, a culture-driven approach in Japan shaped by organizational values, and an emerging, fragmented system in Indonesia. Career guidance is identified as a critical intermediary mechanism linking education systems and labor market outcomes. The study concludes that workforce readiness is shaped by the interaction of institutional structures, cultural contexts, and career guidance systems. It highlights the need for integrated, industry-aligned, and data-driven career guidance frameworks, particularly in developing countries, to improve employability and reduce skills mismatch.

Keywords: career guidance, comparative study, employability, TVET, workforce readiness

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INTRODUCTION

Contemporary workforce development is increasingly shaped by interlocking challenges of skills mismatch, persistent youth unemployment, and rapid digital transformation associated with Industry 4.0–type technological change. Recent TVET scholarship emphasizes that the "global technological revolution" has raised the skill thresholds for entry-level work while simultaneously demanding new forms of technological capability and adaptability from graduates, thereby intensifying pressure on education-to-employment pipelines to become more responsive and future-oriented (Wibowo et al., 2022). Systematic evidence from TVET-focused literature reviews similarly underscores that digitalization is not only transforming

occupational profiles but also exposing weak points across TVET "training cycles," particularly in functions that connect le4arning to labour market insertion (e.g., career guidance and job placement) (Zhang, 2021) . In parallel, analyses of technological disruption in Asian labour markets frame skills gaps and mismatches as structural risks that can exacerbate youth unemployment when education and training systems fail to keep pace with shifting demand for digital and cross-cutting competencies (Pan et al., 2021). Against this backdrop, TVET is repeatedly positioned as a strategic instrument for equipping young people with job-relevant skills and supporting national competitiveness, but its effectiveness depends on more than curriculum content alone: career guidance is increasingly recognized as a critical mechanism that translates labour market information into individual educational and occupational choices, thereby facilitating smoother school-to-work transitions and improving the efficiency of skills matching (Fontdevila et al., 2022; Musa, 2022) .

Despite these imperatives, persistent problems in the design and implementation of career guidance systems remain particularly pronounced in developing-country contexts, where provision is often limited, fragmented, or disconnected from employers' evolving skills demands. International policy-oriented analysis of career guidance systems notes that, although many countries treat guidance as a tool to improve transitions, employability, and labour market adaptability, access is frequently constrained and resources rarely match policy expectations especially outside of services targeted to the unemployed (Musa, 2022) . Qualitative evidence from the TVET sector in Nigeria further illustrates an extreme variant of this problem: stakeholders reported an absence of careers advice, guidance, and counselling in TVET institutions, reinforcing concerns that many systems emphasize "schooling" more than career-development support that would enable graduates to navigate complex labour markets (Fassbender, 2022). Within ASEAN, structural constraints are also documented at system level namely insufficient labour market information and weak institutional linkages between TVET and labour market actors which undermine the feedback loops needed to reduce skills gaps (Martínez-Izquierdo & Sánchez, 2022). These systemic deficiencies are directly relevant to Indonesia, where regional assessments of vocational education highlight the continuing need to shift TVET toward demand-driven arrangements through stronger industry participation in curriculum design and more explicit inclusion of workplace-relevant (including soft) skills in assessment and training (Graf & Lohse, 2021). Viewed together, the literature suggests that employability difficulties and inefficient labour market outcomes in developing contexts are not only a matter of skills supply, but also of weak career guidance architectures that fail to coordinate information, employer engagement, and learner decision-making at scale.

A further limitation concerns the orientation of existing research: while employability and skills mismatch are extensively examined, the systemic role of career guidance as an institutional connector between TVET and labour markets is less consistently theorized and empirically assessed, particularly in relation to digital transformation. A large-scale systematic review of ICT-enabled TVET research identifies that the diffusion of ICT innovations remains "very low" in several TVET functions, explicitly including career guidance and job placement, implying that digital-era workforce readiness is being pursued without commensurate analytical attention to the guidance infrastructures that mediate transitions and matching. Complementary conceptual and empirical work on mismatch dynamics argues that demand–supply imbalances are exacerbated by limited interaction between education providers and labour market stakeholders and by students' constrained access to guidance and labour market information that would support informed programme choices. At the same time, cross-national and regional studies tend to emphasize governance, employer engagement, or broad reform trajectories (e.g., within ASEAN or multi-country reform scans), rather than developing a comparative, evidence-based model of career guidance within TVET that can explain why some systems consistently achieve better transition outcomes than others (Luo & Yao, 2023). This article

therefore addresses a clear analytical need by undertaking a comparative examination of Germany, Japan, and Indonesia three cases that are widely discussed in TVET discourse for their differing institutional structures and transition logics to extract theoretically grounded and practice-relevant lessons on how career guidance contributes to workforce readiness under conditions of technological change, evolving employer demand, and persistent mismatch pressures.

Finally, by focusing explicitly on career guidance as a system-level mechanism (rather than treating it as a peripheral service), this study aims to contribute to both TVET theory and reform practice. It responds to documented gaps in access, coherence, and labour market linkage in guidance provision (Saitoh et al., 2022), and to evidence that guidance functions remain underdeveloped within digitally transforming TVET ecosystems (Otaki et al., 2022). Through comparative analysis, the article seeks to clarify which institutional configurations (e.g., employer engagement structures, labour market information feedback mechanisms, and guidance delivery arrangements) appear most consequential for workforce readiness, and which constraints are likely to limit policy transfer without adaptation to local governance and labour market conditions (Watabe, 2021).

Building upon the identified theoretical and empirical gaps, this study seeks to advance the understanding of career guidance as a systemic mechanism underpinning workforce readiness within TVET. While prior research has largely emphasized employability outcomes and skills mismatch dynamics, limited attention has been devoted to unpacking how different institutional configurations of career guidance shape transition efficiency and labour market alignment across national contexts. Addressing this limitation, the present study adopts a comparative perspective to examine three distinct TVET systems Germany, Japan, and Indonesia which represent varying levels of system maturity, governance structures, and integration between education and industry. Through this approach, the study aims to move beyond descriptive comparisons and generate analytically grounded insights into how career guidance contributes to workforce readiness under diverse socio-economic and institutional conditions.

Specifically, the objectives of this study are threefold. First, it aims to analyze the structural and functional characteristics of career guidance systems in Germany, Japan, and Indonesia, with particular attention to their institutional arrangements, stakeholder roles, and integration within TVET frameworks. Second, the study seeks to identify the extent to which these systems contribute to workforce readiness, including their effectiveness in facilitating school-to-work transitions, reducing skills mismatch, and aligning training outcomes with labour market demands. Third, the research intends to extract and synthesize best practices from the comparative analysis in order to inform the development of a more coherent and contextually adaptable career guidance model for TVET, particularly in emerging systems such as Indonesia.

To achieve these objectives, the study is guided by the following research questions. First, what are the defining characteristics of career guidance systems in Germany, Japan, and Indonesia in terms of structure, governance, and implementation? Second, how do these systems contribute to workforce readiness, particularly in relation to employability outcomes and transition efficiency? Third, what are the key differences and systemic gaps across the three countries, and how do these differences influence their effectiveness? Finally, what constitutes an ideal or adaptable model of career guidance that can be applied to strengthen TVET systems in Indonesia, taking into account both global best practices and local contextual constraints.

RESEARCH METHOD

Research type

This study employed a systematic literature review (SLR) design following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework to ensure

transparency, rigor, and reproducibility in the selection and synthesis of relevant studies. The SLR approach was selected to systematically identify, evaluate, and synthesize existing research on career guidance systems and their contribution to workforce readiness in Technical and Vocational Education and Training (TVET). The study focused on comparative insights across Germany, Japan, and Indonesia to develop a theoretically grounded and empirically supported understanding of career guidance mechanisms within different institutional and socio-cultural contexts.

Population and sample

The population of this study comprised scholarly publications addressing career guidance, Technical and Vocational Education and Training (TVET), employability, and workforce readiness. The sample consisted of 32 peer-reviewed articles selected through a rigorous systematic screening process guided by predefined inclusion and exclusion criteria. Data were retrieved from reputable academic databases, including Scopus, Web of Science (WoS), and ScienceDirect, to ensure the credibility and quality of sources. The selection process prioritized recent publications (2020–2025) that provide empirical, conceptual, or review-based insights into career guidance systems, particularly within the contexts of Germany, Japan, and Indonesia. These articles were chosen due to their relevance in explaining institutional structures, industry engagement, and transition mechanisms within TVET systems.

Research context location

As a systematic literature review, this study did not involve a specific physical research site. Instead, the analysis focused on three national contexts Germany, Japan, and Indonesia which were purposively selected to represent diverse models of career guidance systems within TVET. Germany represents a highly institutionalized and industry-driven system, Japan reflects a culturally embedded and organization-oriented model, while Indonesia illustrates an emerging and transitional system. This comparative scope enables a deeper understanding of how different socio-economic, institutional, and cultural conditions influence the effectiveness of career guidance in supporting workforce readiness.

Instruments or tools

This study employed several analytical tools to support systematic data extraction and analysis. First, the PRISMA framework was utilized to guide the identification, screening, and selection of relevant articles, ensuring methodological transparency. Second, a data extraction matrix was developed to systematically record key information from each study, including author(s), publication year, research focus, key findings, moderating factors, and geographical context. Third, VOSviewer software was used to conduct bibliometric analysis, specifically keyword co-occurrence mapping, in order to identify thematic clusters and relationships among research topics. Additionally, a thematic coding framework was applied to categorize findings into core dimensions, including institutional mechanisms, cultural influences, and career guidance practices.

Data collection procedures

The data collection process followed a structured multi-stage procedure aligned with PRISMA guidelines. Initially, a comprehensive search was conducted using predefined keyword combinations such as “career guidance,” “TVET,” “workforce readiness,” “employability,” and country-specific terms (Germany, Japan, Indonesia). This stage resulted in 608 identified records, including both database and supplementary sources. After removing duplicate records (n = 181), a total of 427 articles were screened based on titles and abstracts to assess relevance. Subsequently, 86 full-text articles were evaluated for eligibility using the established inclusion and exclusion criteria. Following this process, 32 articles were selected for final analysis,

representing the most relevant and methodologically robust studies for addressing the research objectives.

Data analysis

The data analysis employed a combination of bibliometric analysis, thematic analysis, and comparative analysis to ensure a comprehensive interpretation of the literature. First, bibliometric analysis using VOSviewer was conducted to visualize keyword co-occurrence and identify dominant research clusters, revealing patterns related to system-based, culture-based, and outcome-based approaches. Second, thematic analysis was applied to synthesize findings across studies, resulting in the identification of three core dimensions: institutional (system-driven mechanisms), cultural (value-based influences), and career guidance (bridging mechanisms). Finally, a comparative analysis was performed to examine similarities, differences, and structural gaps across Germany, Japan, and Indonesia, enabling the development of an integrated conceptual framework for career guidance in TVET. This multi-layered analytical approach enhances the robustness and depth of the study's findings.

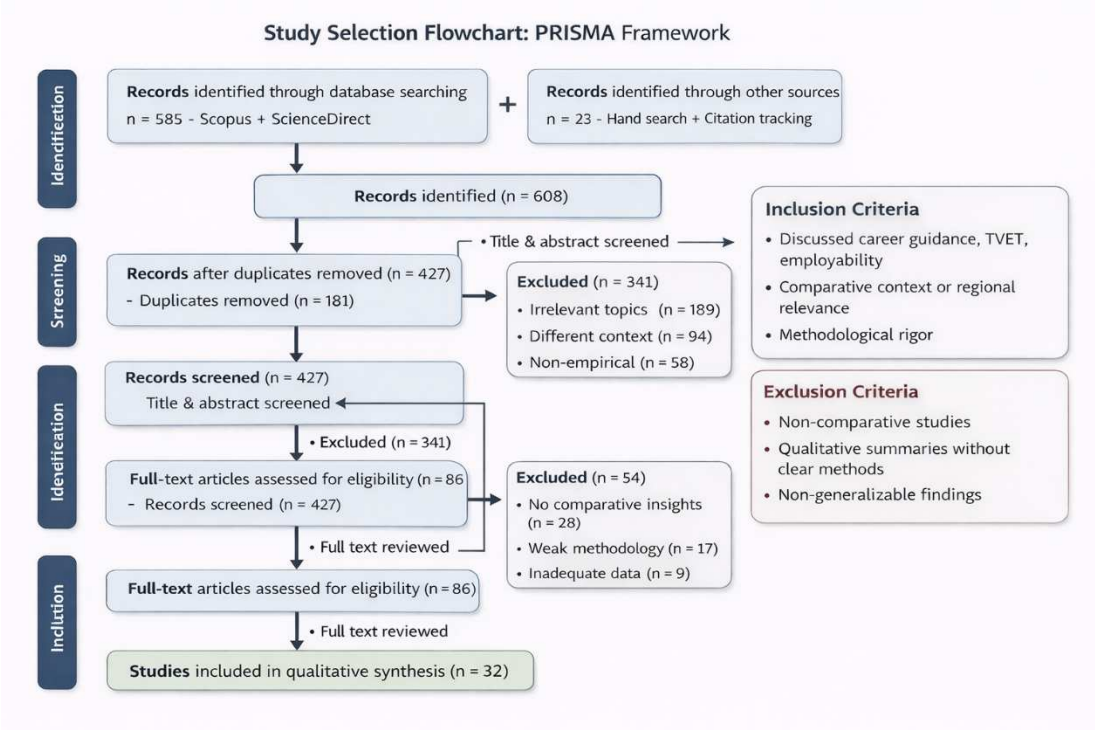

Figure 1. Study selection flowchart: PRISMA framework

RESULTS AND DISCUSSION

This section presents the findings derived from the systematic literature review, synthesizing evidence from the selected 32 peer-reviewed studies on career guidance and workforce readiness within TVET systems. The analysis focuses on identifying key patterns, thematic dimensions, and contextual variations across Germany, Japan, and Indonesia. The reviewed studies highlight the multidimensional nature of career guidance, encompassing institutional structures, cultural influences, and labor market alignment mechanisms. Furthermore, the findings reveal significant variations in how career guidance systems are implemented and how they contribute to workforce readiness outcomes across different national contexts.

Table 1 (See Appendix) summarizes the key findings from the reviewed literature, including study focus, main results, moderating factors, and geographic context. This synthesis provides a

foundation for subsequent thematic and comparative analysis presented in the following sections. Moreover, Figure 2 presents a VOSviewer-based network visualization illustrating the co-occurrence of keywords in the selected literature (n = 32). The map reveals clustered research themes related to career guidance, TVET systems, and workforce readiness across Germany, Japan, and Indonesia. Node size represents keyword frequency, while link strength indicates the degree of association between concepts. Different colors denote thematic clusters.

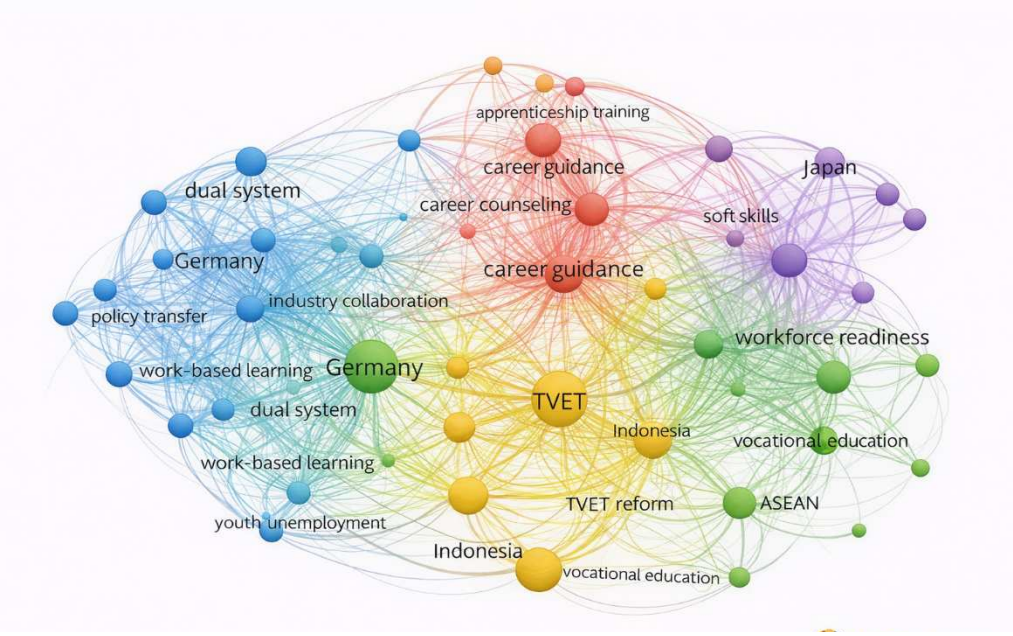

Figure 2. Network visualization of research themes on career guidance and workforce readiness in TVET using VOSviewer

The VOSviewer network visualization demonstrates a structured yet fragmented distribution of research themes within the domain of career guidance and workforce readiness in TVET. The analysis identifies several dominant clusters representing distinct yet interconnected dimensions of the literature. The blue cluster is strongly associated with Germany and highlights system-based elements such as the dual system, apprenticeship, work-based learning, and industry collaboration. This indicates that research in the German context is predominantly structured around institutional mechanisms and formal integration between education and industry, contributing to a highly organized workforce preparation model. The red cluster, positioned centrally, represents the core theme of career guidance and career counseling. Its central location and strong connectivity with other clusters confirm its role as a bridging construct linking TVET systems with workforce readiness outcomes. This suggests that career guidance functions as a key intermediary mechanism in aligning education with labour market demands. The green cluster emphasizes workforce readiness and employability, particularly within developing and ASEAN contexts, including Indonesia. The prominence of keywords such as vocational education and workforce readiness indicates that research in these contexts tends to focus more on outcomes rather than systemic processes, reflecting a results-oriented but less integrated approach. Meanwhile, the purple cluster represents the Japanese context, characterized by themes such as soft skills, work culture, and organizational values. This highlights a culturally embedded model of career development, where workforce readiness is influenced by social norms and lifelong employment practices rather than purely institutional arrangements. Finally, the yellow cluster captures broader TVET reform and development

themes, particularly in Indonesia, indicating an ongoing transition toward more structured and integrated systems.

Career guidance system in Germany

German career guidance within the TVET dual system: structure, integration, and transition mechanisms The German TVET landscape sustains a tightly interwoven career guidance architecture that is inseparable from its renowned dual apprenticeship system. Career guidance in Germany is not a stand-alone service but is embedded in the triadic arrangement of schools, training enterprises, and labour market institutions that together support the school-to-work transition. Vocational schools (Berufsfachschulen and Berufsschulen) provide the formal education component, while Chambers of Industry and Commerce (DIHK) and other social partners coordinate apprenticeship placements, quality assurance, and advisory services, ensuring alignment with labour market needs. Employment agencies (Bundesagentur für Arbeit) and regional labour market information systems supply job- and occupation-specific data that guide students and parents in decision-making, curriculum choices, and application processes. This integrated model is a hallmark of the dual system, facilitating early labor market alignment and continuous guidance across the transition lifecycle rather than episodic counseling at a single stage (Takanuma, 2025) . The literature emphasizes how guidance services are operationalized through joint curricula development, contract-based placements, and employer-educational institution collaboration, illustrating a governance-embedded approach where state regulation, industry input, and social partnership collectively steer the transition from education to work (Kushida et al., 2023). In this sense, career guidance in Germany is not merely information provision but a governance-supported practice designed to signal and shape labour market opportunities to young people, thereby supporting the robust school-to-work transitions that the German system has historically demonstrated (Gessler et al., 2021; Göbel et al., 2024).

Industry's structuring influence on career guidance practices and skills formation A defining feature of Germany's career guidance ecosystem is the centrality of industry in shaping apprenticeship pathways and curricular orientations. Employers actively participate in apprenticeship design, provide on-the-job training, and collaborate with vocational schools to ensure that the competences taught match real-world needs. This industry involvement extends to curriculum design, the establishment of training standards, and ongoing skill formation that integrates workplace learning with classroom instruction, thereby reducing skills mismatches and enhancing workforce readiness (Behle, 2021; Paudel & Eberhardt, 2023). The strong sectoral embeddedness—characterized by a corporatist governance style and the coordinated involvement of social partners and chambers—facilitates a dynamic alignment mechanism: employers articulate demand-side requirements, training providers translate these into curricula and training contracts, and labour market intermediaries monitor outcomes and facilitate transitions. Comparative analyses and governance studies highlight that this co-regulated system supports higher relevance and responsiveness to labour market shifts, contributing to observed reductions in persistent skills gaps and improved employability (Imai et al., 2023). While some literature notes challenges in maintaining alignment during shocks (e.g., pandemic disruptions or rapid Industry 4.0 restructuring), the overarching pattern remains that employer participation is both a driver and a stabilizer of the dual system's vocational training outcomes (Mynbayeva et al., 2025).

Data-driven, labour market-responsive career counseling and employability outcomes Germany's career counseling in TVET is increasingly anchored in labour market information systems and data-driven practices designed to support individualized decision-making. Labour market information (LMI) systems compile occupation forecasts, occupational prerequisites, and sectoral demand indicators that inform students' post-secondary pathways and

apprenticeship opportunities. Counselors integrate LMI with personalized guidance, assisting students to interpret labour market signals, assess their own interests and competencies, and identify viable apprenticeship or training trajectories aligned with current and projected demand. This data-driven counseling is linked to broader policy aims of high employability, as shown by evidence that Germany's VET system with its close employer alignment and robust career guidance infrastructure consistently yields strong labour market outcomes for graduates, including high employment rates and smooth transitions into skilled work (Findeisen & Wild, 2022; Sloane, 2022). Some studies acknowledge the need for ongoing investment in teacher professionalization and the adaptation of guidance practices to Industry 4.0 contexts, but the integrated data-informed approach remains central to supporting students' informed choices and timely entry into the labour market (Heulingn & Wild, 2021; Torggler et al., 2023; Virginia, 2023). Collectively, these practices illustrate a cohesive model in which labor market demands and economic needs guide both the design of VET offers and the individualized counseling that accompanies school-to-work transitions, reinforcing Germany's reputation for high workforce readiness and employability that can serve as a reference point for countries seeking to strengthen TVET in developing contexts (Fuchs et al., 2021).

Career guidance system in Japan

Structure, pathways, and school-to-work transition in Japan's TVET context Japan's career guidance architecture sits within a highly stratified education system that tightly interlocks school-to-work transitions with the country's distinctive TVET pathways. Upper secondary schools and post-secondary vocational institutions offer structured routes that connect academic strands to employment, with longstanding practices of industry-linked placement, internships, and school-recruitment ties designed to channel graduates into firm-specific employment or vocational careers. Recent analyses highlight that career guidance in Japan often operates through a "department-store" model in which teachers provide academic, career, and life counseling within everyday schooling, rather than through a separate professional guidance workforce; this arrangement presumes that teachers staff with ongoing classroom duties—also support students' employment trajectories (Luesia et al., 2023; Mitchell & Buntic, 2022; Ueno, 2022; Zhichun et al., 2021). OECD- and OECD-aligned studies on Japan's vocational education emphasize the embeddedness of school-to-work transitions in sectorally organized TVET with employer involvement, including recruitment systems and formal collaboration between schools and firms to ensure labour market alignment (e.g., industry-informed curricula, internships, and long-term partnerships) (Agiannidou & Bozhkova, 2021; Umar et al., 2020). Empirical work documenting Japan's apprenticeship-like structures underscores the role of school recommendations and company-facing hiring practices as a core mechanism for youth entry into the labor market, reinforcing the view that Japanese TVET relies on tightly coupled education–employer ecosystems to reduce misalignment and support workforce readiness (Noda, 2023). Despite these strengths, evidence also points to tensions between vocational and academic tracks and ongoing debates about the breadth of vocational opportunity, signaling potential rigidity in pathways for non-traditional learners within a rapidly evolving economy (Usman et al., 2021).

Teacher and industry roles: guiding career planning and labor-market alignment The collaboration between teachers and industry in Japan's TVET system is a central mechanism for aligning education with labour market needs. Teachers play an active role in guiding students' career planning and job placement, leveraging long-standing school–firm linkages and recruitment systems that facilitate internships, work placements, and company-sponsored training programs. This arrangement is reinforced by industry–school partnerships and long-term relationships with employers who participate in recruiting cycles, contribute to apprenticeship-like training, and co-develop curricula to reflect current skill demands. Scholarly

work emphasizes that this model yields strong labour market relevance when industry is deeply integrated into curriculum design and placement processes, helping to attenuate skills mismatch and enhance workforce readiness (Wang et al., 2022). However, critics caution that reliance on a department-store guidance model and corporate-dominated pathways may constrain learner agency and limit cross-sector mobility, particularly for students who wish to pursue alternative career trajectories or transition to higher education, suggesting a trade-off between strong employer alignment and broader learning flexibility (Nagai et al., 2023). OECD and international comparisons further indicate that effective industry–education collaboration is a defining feature of successful TVET systems, but requires continuous adaptation to 4IR disruptions and evolving labour markets, lest pathways become overly deterministic (Nakagomi & Hayashi, 2023).

Lifelong employment culture, work values, and evolving guidance practices Japan's traditional lifelong-employment culture shapes career guidance by privileging organizational commitment, discipline, and loyalty as normative career orientations. These cultural values influence students' career choices and the guidance practices that support them, often emphasizing stable entry into firms with long-term prospects and internal training pipelines. Yet globalization and structural labour-market changes such as diversification of employment types, non-regular work growth, and increasing mobility are pressuring the old paradigm and prompting shifts in guidance practices. Recent literature indicates a reconfiguration of ALMPs and labour-market activation policies in Japan vis-à-vis Korea and other OECD economies, with Japan maintaining substantial state involvement in employment services while firms retain a meaningful role in skill formation; nonetheless, rising forms of non-regular employment and changing demographics are challenging the universality of lifelong employment as a guiding frame for career planning (Gunnes et al., 2025; Lee & Nahm, 2024; Sudan, 2021). This tension invites critical reflection on how career guidance can balance the culturally embedded strengths of firm-centric pathways with broader employability capabilities, portable skills, and lifelong learning. From a policy perspective, the literature cautions against over-reliance on traditional norms and highlights the need for flexible qualifications frameworks and robust career guidance that can support diverse trajectories, including transitions to further education and to new industries, in line with OECD recommendations on modernizing TVET to meet 4IR demands (Shvindina et al., 2021). Overall, while Japan's guiding ethos remains influential for workforce readiness, its evolution appears essential to sustaining employability in a dynamically changing global labour market.

Career guidance system in Indonesia

The evolving landscape of career guidance in Indonesia's TVET Indonesia's career guidance system within TVET is widely recognized as still developing and undergoing transformation in response to labor market needs and global competitiveness. In vocational education (SMK), guidance practices are embedded within national policies and sectoral initiatives that aim to link education with employment, yet implementation remains uneven across regions and institutions. Recent studies document policy frameworks such as the "link and match" approach and ministry-level efforts to formalize industry–education collaborations, while also highlighting gaps in systematic guidance provision, coordinating bodies, and data-informed decision making compared with more mature systems (Ahmad et al., 2023; Chookaew et al., 2021). The literature stresses that SMK guidance often relies on ad hoc career information and school-mediated recruitment activities rather than a fully integrated, cross-sector guidance system, contributing to persistent regional disparities in employability outcomes and limited visibility of labour market signals for students (Akgündüz & Mesutoğlu, 2021). OECD- and UNESCO-UNEVOC-aligned analyses further indicate that Indonesian TVET policies increasingly emphasize industry alignment and work-based opportunities, but the vertical and horizontal coherence across

ministries, regional governments, and industry partners remains insufficient to ensure consistent career counseling quality and portability of qualifications across locales (Andresen, 2021). Consequently, although foundational policy support exists, the Indonesian career guidance system requires a more coherent, data-driven framework that coordinates guidance, curricula, and wage- and demand-side signals to reduce regional gaps in workforce readiness (Weber, 2024) .

Key programs bridging education–employment gaps: BKK, PKL, and TEFA in Indonesia Among Indonesian initiatives, Bursa Kerja Khusus (BKK), Praktik Kerja Lapangan (PKL), and Teaching Factory (TEFA) represent the core mechanisms intended to bridge education and employment and to strengthen industry linkages. BKK serves as a centralized job-placement and career information channel linked to SMKs, aiming to improve labor market access by connecting students to job opportunities and employers' expectations; however, research notes variability in BKK implementation quality, outreach, and stakeholder engagement across provinces, limiting its effectiveness as a nationwide career guidance backbone (Hilman et al., 2020). PKL work-based learning placements integrated into the curriculum, offers authentic workplace experiences intended to enhance employability skills and industry familiarity; recent evaluations point to improvements in students' practical competencies but also to challenges in supervision, alignment with learning outcomes, and adequate mentoring from both schools and host companies (Liu et al., 2024). TEFA extends the teaching factory concept into Indonesian TVET, foregrounding production-based learning that merges classroom curricula with industry projects, real orders, and in-factory training; studies indicate TEFA can enhance work readiness by embedding industry standards and hands-on practice, yet sustainability depends on robust industry participation, clear governance, and funding mechanisms to scale beyond pilot sites (Kusuma & Yoto, 2024; Yusop et al., 2022). Collectively, these programs aspire to build a more coherent apprenticeship-like pipeline and to improve employability skills, yet the evidence base underscores implementation variability, regional inequities, and continued need for standardized performance metrics and cross-stakeholder governance to optimize impact (Bonaiuto et al., 2022).

Critical challenges and the path toward an integrated, data-driven, industry-aligned model The Indonesian career guidance system faces substantive challenges rooted in fragmentation, limited industry involvement, and insufficient systematic guidance. Key issues include inconsistent industry participation and unclear delineation of responsibilities among national, provincial, and school-level actors; policy fragmentation across ministries and regional administrations; and uneven access to high-quality career counseling services, particularly in rural or under-resourced districts (Dahmen, 2021). In many contexts, guidance remains primarily information-driven rather than outcomes-driven, with limited use of labour market data to steer curricula, assessments, or student guidance conversations; this undermines the capacity to anticipate skills needs and to facilitate timely transitions into the workforce (Čubela et al., 2023). The literature also calls attention to the risk of reinforcing urban–regional inequalities if industry engagement and TEFA/PKL opportunities remain concentrated in economically dynamic regions, leaving peripheral areas with weaker linkages to employers and limited career guidance pipelines (Klein et al., 2022). To address these gaps, scholars advocate for a holistic, integrated model that combines real-time labour market information, standardized guidance competencies for counselors, scalable TEFA and PKL programs, and formalized, performance-based industry partnerships with clear incentives and accountability. Such a model would align student aspirations with labor market signals, strengthen employer involvement in curriculum design and work-based learning, and support workforce readiness at scale, aligning Indonesia with best-practice TVET reforms emphasized by OECD and UNESCO-UNEVOC recommendations for industry-aligned, data-informed TVET systems (Alicon Auf & Arinaitwe, 2022; Wismansyah et al., 2024).

Comparative analysis

A cross-national comparison of career guidance systems in Germany, Japan, and Indonesia reveals a shared strategic orientation toward enhancing workforce readiness through employability-focused interventions. Across the three contexts, career guidance functions as a critical mechanism for facilitating school-to-work transitions, aligning educational pathways with labour market demands, and equipping learners with relevant competencies for sustainable employment. In all cases, guidance systems are increasingly expected to move beyond traditional information provision toward more integrated, practice-oriented approaches that combine counseling, work-based learning, and industry engagement. This convergence reflects global policy discourses promoted by organizations such as OECD and UNESCO, which emphasize the centrality of career guidance in reducing skills mismatch and improving labour market outcomes within TVET systems.

Despite these commonalities, substantial structural and institutional differences characterize the implementation and effectiveness of career guidance across the three countries. Germany represents a highly institutionalized and industry-driven model, where career guidance is deeply embedded within the dual system and supported by strong coordination among educational institutions, employers, and labour market intermediaries. The system's corporatist governance structure ensures continuous alignment between training provision and economic demand, resulting in a robust transition mechanism and high employability outcomes . In contrast, Japan's model is shaped by strong organizational culture and school-mediated transition pathways, where teachers and firms collaboratively guide students into employment through long-standing recruitment practices. While this system ensures stability and alignment with employer expectations, it is also influenced by cultural norms such as lifelong employment and organizational loyalty, which may constrain flexibility in increasingly dynamic labour markets.

Indonesia, by comparison, exhibits a transitional and less mature career guidance system characterized by fragmentation and uneven implementation. Although initiatives such as BKK, PKL, and Teaching Factory demonstrate efforts to strengthen school-industry linkages, these programs often operate in isolation and lack systemic integration. The absence of a cohesive, data-driven guidance framework, combined with limited industry participation and regional disparities, constrains the effectiveness of career guidance in supporting workforce readiness . Consequently, while Germany and Japan illustrate relatively coherent and institutionalized models, driven respectively by industry structures and cultural-organizational norms, Indonesia highlights the challenges of system-building in emerging TVET contexts, underscoring the need for integrated governance, stronger stakeholder coordination, and alignment with labour market intelligence.

Contribution to workforce readiness

Germany: Dual system, industry integration, and data-driven guidance for workforce readiness

Germany's career guidance system exemplifies a highly institutionalized approach to workforce readiness, anchored in the dual apprenticeship model that systematically integrates school-based learning with firm-based training. The dual system operates through a tripartite governance structure involving vocational schools, chambers of commerce, and employment agencies, ensuring that career guidance is embedded within the school-to-work transition rather than functioning as a peripheral service (Wibowo et al., 2022) . This institutional arrangement facilitates strong industry involvement, as employers actively participate in curriculum design, apprenticeship placements, and competency assessments, thereby aligning skills development with real-time labor market demands (Ramadhani & Rahayu, 2021). Research indicates that such employer engagement reduces skills mismatch by ensuring that training content reflects current occupational requirements, while data-driven career counseling supported by labor market information systems, enables students to make informed decisions about vocational pathways

(Bilqis et al., 2024; Moon & Choi, 2024). The effectiveness of this model is evidenced by smooth school-to-work transitions and high employability outcomes, with comparative studies noting that Germany's collective skill formation regime produces graduates who are immediately productive upon entering the workforce (Bilqis et al., 2024) However, scholars caution that the transferability of this model to other contexts requires careful consideration of institutional preconditions, including robust social partnership structures and sustained employer commitment to training investment (Ramadhani & Rahayu, 2021). Nevertheless, Germany's integration of industry collaboration, structured apprenticeships, and evidence-based guidance represents a benchmark for workforce readiness that developing TVET systems frequently seek to emulate.

Japan: Cultural foundations, teacher-company collaboration, and evolving challenges in workforce preparation

Japan's approach to workforce readiness in TVET is distinctively shaped by cultural values and organizational practices that emphasize discipline, loyalty, and long-term employment relationships. Career guidance in Japanese vocational institutions operates through close collaboration between teachers and companies, with educators actively guiding students' career planning while firms participate through structured recruitment systems, internships, and sustained school-industry partnerships (Sudan, 2023). This arrangement produces strong alignment between educational outcomes and employer expectations, as companies invest in training pipelines that extend from school placement through internal career development. The cultural emphasis on organizational commitment and stability has historically facilitated smooth transitions into employment, with graduates demonstrating high levels of workforce readiness characterized by professional discipline and adaptability to firm-specific practices (Yanindah, 2022). However, contemporary labor market transformations, including the growth of non-regular employment, increased workforce mobility, and globalization pressures are challenging the traditional lifelong employment paradigm that underpins Japanese career guidance (Yanindah, 2022). Research suggests that while the stability-oriented model continues to produce well-prepared graduates for conventional employment pathways, it may inadequately prepare young workers for increasingly diverse career trajectories and cross-sector mobility. Furthermore, the reliance on firm-centric guidance may constrain learner agency for students seeking alternative pathways, indicating a need for more flexible approaches that balance cultural strengths with evolving labor market realities. Thus, while Japan's workforce readiness outcomes remain strong within traditional employment structures, the system faces adaptation pressures that require recalibrating guidance practices to address contemporary employment diversification.

Indonesia: Emerging initiatives, systemic fragmentation, and the path toward integrated workforce readiness

Indonesia's TVET system demonstrates workforce readiness outcomes that remain in an adaptation stage, characterized by promising initiatives alongside significant structural limitations. Programs such as Bursa Kerja Khusus (BKK), Praktik Kerja Lapangan (PKL), and Teaching Factory (TEFA) represent deliberate efforts to bridge education-employment gaps by providing job placement services, work-based learning experiences, and production-oriented training environments (Amaliah & Irfan, 2022; Pradipta et al., 2021; Sariwulan et al., 2020) . Research indicates that TEFA implementation can enhance students' practical competencies and work readiness when effectively integrated with industry partnerships, while PKL offers authentic workplace exposure that develops employability skills (Pradipta et al., 2021; Sariwulan et al., 2020). However, empirical evidence reveals substantial implementation variability, with many vocational schools lacking adequate industry collaboration, modern facilities, and systematic follow-up mechanisms to ensure program effectiveness. The Indonesian TVET

landscape is further constrained by fragmented policy coordination across ministries and regional governments, limited employer engagement in curriculum development, and insufficient data-driven career counseling services (Putra, 2023; Werdiningsih et al., 2021). Studies document that vocational graduates continue to experience high unemployment rates relative to other educational levels, reflecting persistent skills mismatches between training outputs and labor market requirements (Wismansyah et al., 2024). Regional disparities compound these challenges, as urban schools with stronger industry linkages demonstrate better workforce readiness outcomes than their rural counterparts. To strengthen workforce readiness, scholars advocate for a more systematic, data-driven, and industry-aligned approach that standardizes program implementation, enhances employer involvement in training design, and develops robust labor market information systems to guide student career decisions. Such reforms would help Indonesia to leverage its demographic potential while addressing the barriers that currently limit TVET effectiveness in producing employment-ready graduates.

Comparison with previous studies

The findings of this study are broadly consistent with previous research emphasizing the critical role of career guidance in enhancing workforce readiness and facilitating effective school-to-work transitions. Prior studies have demonstrated that well-structured career guidance systems, particularly those integrated with industry needs, significantly improve employability outcomes and reduce skills mismatch. For instance, research on dual-system models highlights the importance of strong institutional coordination and employer engagement in shaping relevant competencies and smooth labor market transitions.

However, this study extends existing literature by providing a comparative perspective across Germany, Japan, and Indonesia, showing that the effectiveness of career guidance is not only determined by structural factors but also by cultural and systemic contexts. While previous studies tend to focus on institutional arrangements and employability outcomes, the present findings suggest that workforce readiness is influenced by the interaction between institutional mechanisms, cultural values, and guidance practices. In contrast to studies that emphasize standardized models of TVET reform, this research highlights that career guidance systems are context-dependent, with Germany reflecting a system-driven model, Japan a culture-driven model, and Indonesia an emerging and fragmented system. These differences underscore the importance of contextual adaptation in transferring best practices across countries.

Limitations and cautions

Despite providing important insights, this study has several limitations that should be acknowledged. First, as a systematic literature review, the study relies on secondary data, which limits the ability to establish causal relationships between career guidance systems and workforce readiness outcomes. Second, the analysis is constrained by the availability and scope of existing literature, which may vary across countries and result in uneven representation of evidence, particularly for developing contexts such as Indonesia. Third, although the study employs a comparative approach, differences in research designs, methodologies, and measurement indicators across the selected studies may affect the consistency and comparability of findings. Additionally, the bibliometric analysis using VOSviewer is limited to keyword co-occurrence patterns, which may not fully capture deeper contextual nuances or policy-level dynamics within each country. Therefore, it should be interpreted with caution, particularly when generalizing across different institutional and socio-economic settings.

Recommendations for future research

Future research should aim to address these limitations by incorporating empirical and mixed-method approaches to validate and extend the findings of this study. Longitudinal research designs are particularly recommended to better understand the causal relationships between

career guidance interventions and workforce readiness outcomes over time. Moreover, future studies should explore the role of emerging factors such as digital transformation, artificial intelligence, and labor market analytics in shaping career guidance systems within TVET. Investigating how data-driven guidance tools and digital platforms can enhance decision-making and transition processes would provide valuable insights for both researchers and policymakers. Expanding research across diverse national and regional contexts is also essential to improve the generalizability of findings and to identify context-specific strategies for strengthening career guidance systems. Finally, future studies are encouraged to develop and empirically test integrative models such as the framework proposed in this study to examine how institutional, cultural, and guidance dimensions interact in influencing workforce readiness in different TVET environments.

CONCLUSION

This study investigated the role of career guidance systems in enhancing workforce readiness within Technical and Vocational Education and Training (TVET) and aimed to analyze and compare their implementation across Germany, Japan, and Indonesia. The findings demonstrated that career guidance plays a pivotal role as a bridging mechanism between education and the labor market, with its effectiveness largely shaped by the interaction of institutional structures, cultural contexts, and industry engagement. Specifically, the results highlight three dominant patterns: a system-driven model in Germany characterized by strong industry integration and structured apprenticeship systems; a culture-driven model in Japan shaped by organizational values and lifelong employment orientation; and an emerging, fragmented model in Indonesia, where career guidance initiatives exist but lack systemic integration.

Notably, this study contributes to the literature by proposing an integrated conceptual framework of career guidance in TVET, positioning career guidance as a strategic intermediary that aligns institutional mechanisms and cultural dimensions to produce workforce readiness outcomes. This integrative perspective advances existing research, which has often examined employability, training systems, or cultural factors in isolation. The findings underscore the importance of developing coherent, data-driven, and industry-aligned career guidance systems, particularly in developing contexts, to reduce skills mismatch and improve school-to-work transition efficiency.

From a practical standpoint, the results suggest that policymakers and educational institutions should prioritize strengthening industry partnerships, enhancing labor market information systems, and institutionalizing career guidance as a core component of TVET. For Indonesia, in particular, the findings highlight the need for a more integrated governance framework that connects programs such as BKK, PKL, and Teaching Factory within a unified career guidance ecosystem.

While this study provides valuable insights into career guidance systems and workforce readiness, several limitations should be acknowledged, including reliance on secondary data, variability in study contexts, and the absence of empirical validation of the proposed model. Future research should focus on empirically testing the conceptual framework using quantitative or mixed-method approaches, as well as exploring the role of digital technologies and artificial intelligence in transforming career guidance systems. Such efforts will further enhance understanding of how integrated career guidance can support adaptive, future-ready TVET systems and inform policy and practice in diverse socio-economic contexts.

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DECLARATION

Author contribution

All authors contribute in the research and/or writing the paper, and approved the final manuscript.

Muhammad Idris Effendi	Conceptualizing the research idea, leading the investigation, setting up the methodology, analyzing the data, and writing the original draft.
Tuwoso	Assisting the investigation, reviewing the validity of the methodology, enriching the data analysis, and approving the final draft.
Fadliyanti Firdausia	Assisting the investigation, reviewing the validity of the methodology, enriching the data analysis, and approving the final draft.

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Conflict of interest

All authors declare that they have no competing interests.

Ethics declaration

We as authors acknowledge that this work has been written based on ethical research that conforms with the regulations of our institutions and that we have obtained the permission from the relevant institutes when collecting data. We support the International Journal on Education Insight (IJEI) in maintaining the high standards of personal conduct, practicing honesty in all our professional practices and endeavors.

The use of artificial intelligence

The authors declare that no generative artificial intelligence (AI) tools were used in the writing, analysis, or preparation of this manuscript. All content presented in this study was developed independently by the authors to ensure originality, academic integrity, and full responsibility for the research findings.

Additional information

Not available.

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APPENDIX

Table 1. Key findings from reviewed literature

No	Author(s)	Year	Study Focus	Key Findings	Moderating Factors	Geographic Context
1	Wibowo et al.	2022	Dual TVET system integration	Dual system strengthens alignment between education and labour market	Institutional readiness	Indonesia
2	Fassbender	2022	Governance of dual system	Strong governance ensures sustainability of apprenticeship system	Economic disruption	Germany
3	Behle	2021	Employability outcomes	Structured VET improves employability outcomes	Labour market demand	Germany
4	Findeisen & Wild	2022	Digital competence	Digital skills enhance workforce readiness	Technology integration	Germany
5	Fontdevila et al.	2022	Skills mismatch	Strong coordination reduces mismatch	Institutional linkage	Europe
6	Noda	2023	Qualification framework	Structured pathways support transition to work	Policy rigidity	Japan
7	Lee & Nahm	2024	Labour market system	Cultural employment systems influence workforce readiness	Lifelong employment norms	Japan
8	Zhichun et al.	2021	Career education	Teacher-centered guidance influences career decisions	Teacher capacity	Japan
9	Ahmad et al.	2023	Employability in TVET	Industry linkage improves employability but uneven	Industry participation	Indonesia
10	Hilman et al.	2020	Work-based learning (PKL)	Practical experience enhances job readiness	Supervision quality	Indonesia
11	Kusuma & Yoto	2024	Collaboration skills	Soft skills critical for Industry 4.0 readiness	Learning environment	Indonesia
12	Pradipta et al.	2021	Teaching Factory	TEFA increases industry relevance	Governance quality	Indonesia
13	Putra	2023	Youth unemployment	Weak alignment contributes to unemployment	Economic structure	Indonesia
14	Werdiningsih et al.	2021	TVET competitiveness	Integrated models enhance relevance	Policy integration	Indonesia
15	Alicon & Arinaitwe	2022	Career guidance comparison	Structured guidance systems improve career decision-making	Institutional framework	Uganda, Germany
16	Andresen	2021	Career development structures	Competence valuation differs across national systems	Organizational culture	Germany, France
17	Bonaiuto et al.	2022	Career tools effectiveness	Career tools improve self-efficacy and employability attitudes	Psychological factors	Europe
18	Čubela et al.	2023	Data-driven learning	Gamification enhances engagement and skill acquisition	Learning approach	Europe
19	Dahmen	2021	Competency formation	Standardized evaluation shapes career readiness	Educational policy	Europe
20	Imai et al.	2023	Teacher career guidance	Teacher training improves career decision support	Teacher competence	Japan

No	Author(s)	Year	Study Focus	Key Findings	Moderating Factors	Geographic Context
21	Klein et al.	2022	Inclusive career guidance	Socio-family background affects access to guidance	Social inequality	Europe
22	Kushida et al.	2023	Professional development	Continuous learning supports career sustainability	Experience level	Japan
23	Liu et al.	2024	Early career systems	Institutional support influences early career development	Organizational structure	Germany
24	Mynbayeva et al.	2025	Comparative career assessment	Cultural differences shape career decision-making	Socio-cultural context	Japan, China
25	Nagai et al.	2023	Work engagement	Personal and professional resources affect workforce readiness	Career stage	Japan
26	Nakagomi & Hayashi	2023	Early career transition	Early career attitudes influence employability	Education background	Japan
27	Otaki et al.	2022	Career aspiration barriers	Structural barriers limit career choices	Institutional constraints	Japan
28	Saitoh et al.	2022	Career transition education	Second-career programs improve employability	Program design	Japan
29	Takanuma	2025	Career consulting	Multicultural competence needed in career guidance	Globalization	Japan
30	Usman et al.	2021	Career choice trends	Youth preferences affect labour supply	Economic conditions	Japan
31	Watabe	2021	Career support systems	Institutional support critical for career development	Resource availability	Japan
32	Weber	2024	Counselor competence	Professional training strengthens career guidance systems	Training quality	Germany

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