

Competency-Based Vocational Education and Training in Hospitality and Tourism: A Systematic Review of Workforce Development and Digital Transformation

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ABSTRACT

The hospitality and tourism industry is undergoing rapid transformation, requiring a workforce equipped with digital, sustainable, and competency-based skills. Competency-based vocational education and training (CBT-VET) has become central to preparing graduates for evolving industry demands, yet challenges persist in aligning training with technological innovation and sustainability imperatives. This study presents a systematic literature review (SLR) of 27 peer-reviewed articles published between 2022 and 2024, retrieved from Scopus and Web of Science. The review adheres to the PRISMA protocol to ensure transparency in the identification, screening, and synthesis of relevant studies. The findings are classified into four thematic domains: workforce competency development, digital transformation in training, policy frameworks in vocational education, and sustainability integration. The analysis reveals that while CBT-VET significantly enhances employability and job readiness, the integration of digital tools, such as artificial intelligence, virtual reality, and blockchain, remains uneven. Moreover, sustainability-oriented education is still emerging, and policy inconsistencies across regions limit the standardization of training models. Industry-academic collaboration is also fragmented, affecting the delivery of relevant and adaptable skill sets. This review presents a structured synthesis of recent CBT-VET developments in hospitality and tourism, with a focus on the intersection of digital and sustainability competencies. It offers practical implications for educators, policymakers, and industry leaders to modernize training curricula and institutional strategies. Future research should focus on empirical validation and comparative case studies to assess the real-world impact of digitally enabled, sustainable, and competency-based training approaches.

Keywords: competency training, workforce development, vocational education, digital training, sustainability education

INTRODUCTION

The hospitality and tourism industry is a key driver of global economic growth, employing millions worldwide and generating significant revenue (Carlisle et al., 2022). As the industry evolves, it demands a workforce equipped with relevant skills, including customer service expertise, digital literacy, and sustainable tourism practices (Birendra, 2024; Phuong et al., 2024). Vocational education and training (VET) play a critical role in developing industry-ready professionals by emphasizing competency-based training (CBT) to bridge the gap

between theoretical knowledge and practical application (Ajambo et al., 2024). Unlike traditional academic education, CBT is structured around measurable competencies, ensuring that graduates meet the specific demands of employers in the hospitality and tourism sectors (To & Leung, 2024). However, despite its widespread adoption, challenges persist in aligning training curricula with industry needs, addressing skill gaps, and adapting to technological advancements (Ivanova et al., 2022). A clearer understanding of how competency-based models adapt to digitalization and sustainability remains underexplored in previous systematic reviews, highlighting a gap in integrated analyses. This paper builds upon prior literature by focusing specifically on how CBT frameworks incorporate emerging technologies, sustainability mandates, and policy mechanisms in hospitality and tourism education between 2022 and 2024.

Competency-based training in hospitality and tourism has evolved to address industry challenges, including high employee turnover, inconsistent service quality, and digitalization (Choy & Yeung, 2024; Manfreda et al., 2024). Recent studies have emphasised the importance of vocational training institutions incorporating innovative pedagogical approaches, including digital learning platforms, simulation-based training, and experiential learning, to enhance student employability and professional competency (Ivanova et al., 2022). The European Skills Agenda, for instance, emphasizes the importance of soft skills such as communication, adaptability, and problem-solving, alongside technical expertise, to meet industry demands (Carlisle et al., 2022). Additionally, sustainability concerns have driven training programs to incorporate environmental management practices, fostering green skills among hospitality professionals. However, discrepancies between educational offerings and employer expectations remain a key challenge. Employers frequently report deficiencies in leadership, digital literacy, and problem-solving capabilities, indicating a need for revised competency frameworks (Han, 2024; Phuong et al., 2024).

The theoretical framing of this review draws upon workforce development theory and innovation diffusion concepts to explain how CBT-VET evolves in response to digital and environmental disruptions. Given the rapid transformation of the hospitality and tourism industry, particularly with the rise of digital technologies and post-pandemic workforce restructuring, vocational training frameworks must be reassessed (Qin, 2023; To & Leung, 2024). The integration of artificial intelligence (AI), automation, and data-driven decision-making in hospitality operations necessitates a paradigm shift in vocational education (Ivanova et al., 2022). Additionally, the increasing focus on workforce diversity and inclusion necessitates training programs tailored to individuals from diverse socio-economic backgrounds, including those with disabilities (Phuong et al., 2024). This systematic review aims to synthesise existing literature on competency-based vocational education in hospitality and tourism, evaluating its effectiveness in workforce development, the role of digitalisation in training delivery, and potential policy implications for enhancing vocational training outcomes. By critically analysing existing competency frameworks and industry-aligned training strategies, this study contributes to advancing knowledge on how vocational education can better support the hospitality and tourism workforce in a rapidly changing global landscape.

Therefore, this systematic literature review (SLR) aims to assess how competency-based vocational education supports workforce development, responds to digital transformation, integrates sustainability, and operates within evolving policy frameworks in the hospitality and tourism sectors. This paper is structured as follows: Section 2 outlines the methodology in accordance with PRISMA standards; Section 3 presents the thematic findings; Section 4 discusses key insights and implications; and Section 5 concludes with research recommendations and future directions.

MATERIAL AND METHODS

A Systematic Literature Review (SLR) is a rigorous research approach designed to systematically collect, analyse, and synthesise existing literature on a specific topic. This review adheres to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines (Moher et al., 2009), ensuring transparency in the identification, screening, and synthesis of articles. In the context of Vocational Education and Training (VET) in the Hospitality and Tourism Industry, this systematic literature review (SLR) examines

competency-based training (CBT) models and their effectiveness in enhancing workforce readiness by equipping professionals with industry-specific skills. It evaluates the impact of VET programs on employability, career progression, and industry alignment, identifying key strengths and limitations. Additionally, the study explores the role of digital transformation in vocational training, assessing the adoption of e-learning, artificial intelligence (AI), and virtual simulations in competency-based education. Given the increasing reliance on technology, the review will investigate opportunities and challenges, including digital skill gaps, technological accessibility, and educator readiness.

Furthermore, the SLR examines policy implications for optimizing VET programs, identifies gaps in institutional frameworks, and proposes strategies to strengthen collaboration between educational institutions and industry stakeholders. By systematically synthesizing research findings, this study aims to provide actionable insights into improving competency-based vocational education, ensuring that training programs effectively meet the evolving demands of the hospitality and tourism sector. Therefore, the following research questions are proposed:

- How does competency-based vocational education and training (CBT-VET) influence workforce readiness in the hospitality and tourism industry?
- How does digital transformation impact competency-based vocational training in the hospitality and tourism industry?
- What policy frameworks support the effectiveness of competency-based vocational education and training in the hospitality and tourism industry?
- How is sustainability integrated into competency-based vocational education and training in the hospitality and tourism industry?

Identification

A systematic literature search was conducted using the Scopus and Web of Science databases. These databases were selected because of their extensive and complementary coverage of internationally peer-reviewed research in hospitality, tourism, vocational education, workforce development, management, and the social sciences. The final database search was conducted in February 2025. Database-specific search strings were developed using Boolean operators to combine terms related to competency-based education, vocational training, workforce development, hospitality, hotel management, and tourism. In Scopus, the search was conducted within the title, abstract, and keyword fields. In Web of Science, the search was conducted within the topic field. Filters were applied according to publication year, language, document type, publication status, and relevant subject areas. The complete search strings are presented in Table 1. The review was restricted to studies published between 2022 and 2024 to capture recent post-pandemic developments in hospitality workforce restructuring, digital transformation, competency-based training, and sustainability-oriented vocational education. The search identified 636 records from Scopus and 156 records from Web of Science, resulting in a total of 792 records. One duplicate was removed, leaving 791 unique records for screening.

Table 1. The search strings

Scopus	TITLE-ABS-KEY ("competency-based education" OR "competency-based training" OR "skills-based education" OR "vocational training") AND ("hospitality management" OR "hotel management" OR "hospitality industry") AND PUBYEAR > 2021 AND PUBYEAR < 2025 AND (LIMIT-TO (SUBJAREA, "SOCP") OR LIMIT-TO (SUBJAREA, "BUSI")) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (SRCTYPE, "j")) AND (LIMIT-TO (PUBSTAGE, "final")) Date of Access: February 2025
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WoS	TS= (“competency-based education” OR “vocational training” OR “skills training” OR “workforce development”) AND TS=(“hospitality” OR “hotel management” OR “tourism”) and 2024 or 2023 or 2022 (Publication Years) and Article (Document Types) and English (Languages) and Education Educational Research or Social Sciences Other Topics or Business Economics (Research Areas) Date of Access: February 2025
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Screening

Following duplicate removal, the titles and abstracts of 791 records were screened against the predefined eligibility criteria presented in Table 2. A total of 596 records were excluded because they did not meet the publication-period, language, document-type, publication-status, subject-area, or topical relevance requirements. Records were also excluded when they were not directly related to hospitality and tourism, competency-based education, vocational education and training, workforce competency development, digital training, policy frameworks, or sustainability-related skills. Consequently, 195 articles were retained for full-text assessment.

Table 2. Eligibility Criteria for Study Selection

Criterion	Inclusion criteria	Exclusion criteria
Publication period	Articles published from January 2022 to December 2024	Articles published before 2022 or after 2024
Language	Studies published in English	Studies published in languages other than English
Publication type	Peer-reviewed journal articles reporting original empirical research	Conference papers, books, book chapters, reviews, editorials, commentaries, reports and opinion papers
Publication status	Articles published in their final form	In-press, incomplete or unpublished manuscripts
Research context	Hospitality, tourism, hotel management, vocational education or closely related workforce-development settings	Studies unrelated to hospitality, tourism, hotel management or hospitality workforce development
Research focus	CBT-VET, competency development, vocational training, employability, workforce readiness, digital training, work-integrated learning, policy frameworks or sustainability competencies	Studies without a direct focus on vocational education, training, competency development or workforce preparation
Subject area	Social Sciences; Business, Management and Accounting; Education and Educational Research; Business Economics; hospitality and tourism	Subject areas without a direct relationship to hospitality, tourism, vocational education or workforce development
Evidence type	Qualitative, quantitative or mixed-method empirical studies with identifiable methods and findings	Non-empirical, conceptual, commentary or opinion-based publications
Accessibility	Full text available for eligibility and methodological assessment	Full text unavailable

Eligibility and Study Inclusion

During the eligibility stage, the full texts of 195 articles were assessed against the objectives and eligibility criteria of the review. A total of 168 articles were excluded because they were outside the hospitality and tourism context, lacked a direct focus on CBT-VET or competency development, contained no identifiable vocational-

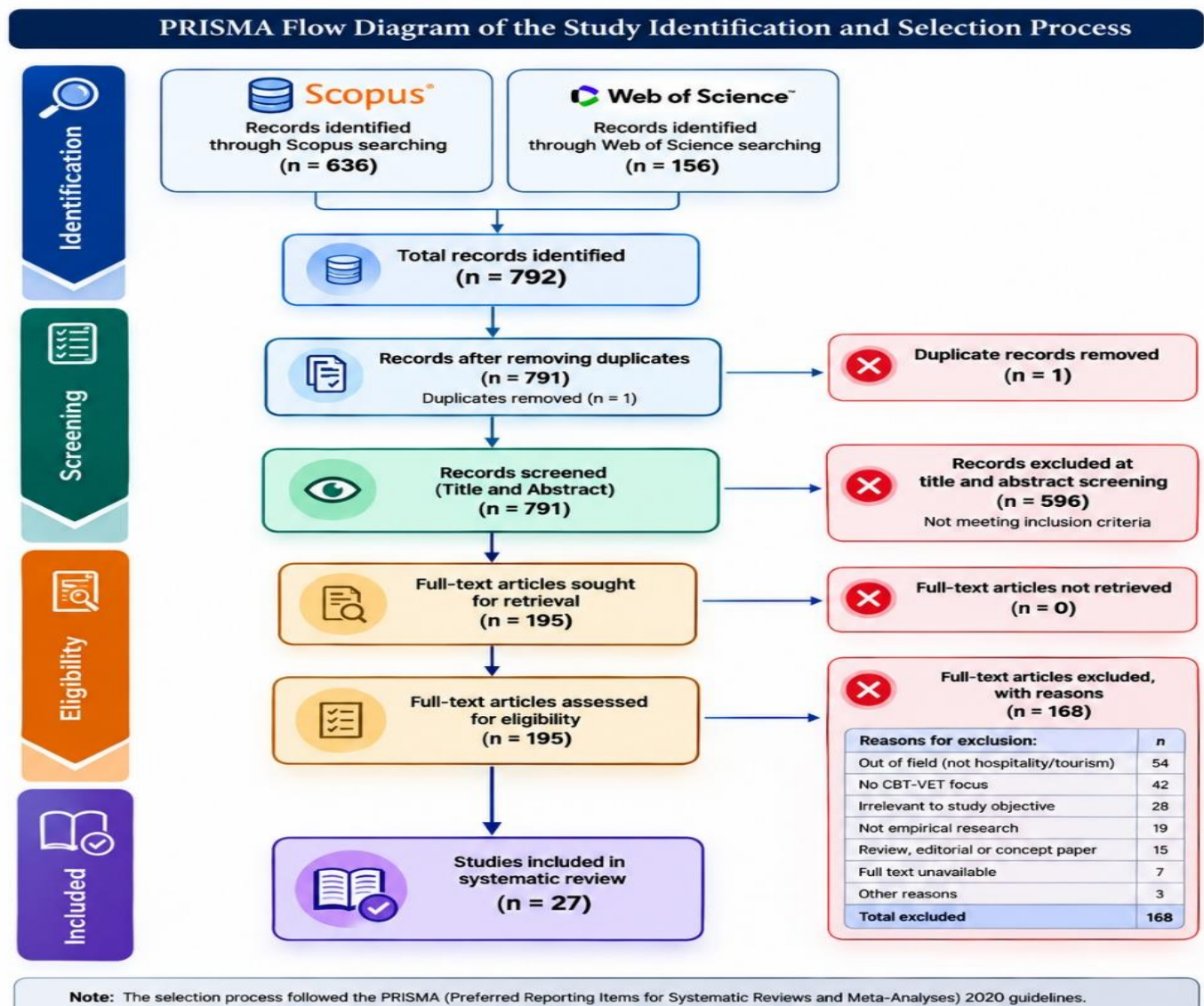
training component, were not sufficiently aligned with the research questions, or were unavailable in full text. Following the eligibility assessment, 27 studies met all inclusion requirements and were included in the qualitative synthesis. To minimise selection bias, two reviewers independently conducted the title and abstract screening and the full-text assessment. Disagreements concerning study eligibility were resolved through discussion and consensus. Where consensus could not be reached, the article was referred to a third reviewer for a final decision.

Methodological Quality Assessment

The methodological quality of each eligible study was evaluated using a structured appraisal checklist. The assessment examined the clarity of the research objectives, appropriateness of the research design, transparency of the sampling and data-collection procedures, suitability of the data-analysis method, evidential support for the findings, reporting of limitations, and relevance to CBT-VET outcomes. Each study was independently assessed by two reviewers, and disagreements were resolved through discussion. The appraisal results were documented in a quality-assessment matrix and considered when interpreting the strength and reliability of the reviewed evidence.

Data Extraction and Synthesis

Figure 1. Flow diagram of the proposed searching study (Moher et al., 2009)



An integrative analysis approach was employed to synthesize qualitative and quantitative research designs, ensuring a comprehensive evaluation of skill-based education and training in the hospitality and tourism industry (Figure 1). Data were extracted using a predefined matrix that recorded the authors, publication year, country, hospitality or tourism context, research objectives, study design, sample characteristics, competency or training focus, digital-transformation component, policy context, sustainability component, principal findings, methodological limitations, and assigned thematic category. Because the included literature comprised qualitative, quantitative, and mixed-method studies with heterogeneous objectives and outcome measures, a narrative thematic synthesis was used. The extracted findings were reviewed, coded, compared across studies, and grouped into conceptually related categories. The categories were subsequently refined into four overarching themes: workforce competency development, digital transformation in training, policy frameworks in vocational education, and sustainability integration. The themes corresponded with the research questions while also allowing recurrent findings and differences across the studies to emerge. Cross-referencing was undertaken to identify areas of convergence, contradiction, and contextual variation among the included studies.

A validation phase was incorporated through expert reviews by social sciences and hospitality management specialists. These experts evaluated the thematic clarity, conceptual alignment, and relevance of the findings to vocational education and workforce development. Their feedback strengthened the analytical framework by refining categorizations and ensuring methodological soundness. This expert validation enhanced the study's credibility and reinforced its contribution to understanding skill-based education and training.

The resulting thematic framework provides a structured and methodologically rigorous synthesis, reinforcing the study's contribution to competency-based training and workforce development in the hospitality and tourism industry. By integrating empirical evidence with theoretical insights, this approach offers a comprehensive understanding of vocational education trends, challenges, and opportunities in an evolving industry landscape.

RESULT AND FINDING

A comparative overview of the selected studies reveals thematic disparities in research focus. Workforce competency development and digital transformation are the dominant themes in the literature, collectively accounting for over 50% of the reviewed articles. These themes often intersect, particularly in studies that address how digital technologies enhance competency acquisition. In contrast, policy frameworks and sustainability integration are comparatively underexplored, with fewer empirical studies offering practical policy evaluations or sustainability-based training models. While digitalization is widely discussed, there is considerable variability in the depth of analysis, especially regarding the adoption of emerging technologies such as blockchain or AI. Sustainability, though acknowledged as a priority, is often treated as a secondary concern rather than an integrated competency. These thematic imbalances highlight the need for more holistic and cross-cutting research that bridges workforce training, digital tools, institutional policy, and environmental goals in hospitality vocational education.

The thematic classification of the selected studies followed a structured process to ensure a comprehensive synthesis of competency-based vocational education and training in the hospitality and tourism industry. Articles were categorized based on their primary research focus, aligning with four key themes: workforce competency development, digital transformation in training, policy frameworks in vocational education, and sustainability in skill-based education. This classification enabled a systematic analysis of how competency-based training influences workforce readiness, the role of technology in vocational learning, the impact of policy on training effectiveness, and the integration of sustainability principles into hospitality education. The selected studies were retrieved from Scopus and Web of Science, ensuring methodological rigour and relevance. Table 3 presents a detailed summary of the 27 articles included in the review, listing their themes, titles, authors, publication years, key findings, and sources. This thematic organization provides a solid foundation for analysing trends, identifying gaps, and drawing meaningful insights into the effectiveness of competency-based vocational education and training in the hospitality and tourism sector.

Table 3. The research article findings based on the proposed searching criteria

No.	Theme	Article Title	Author(s)	Year	Findings	Source
1	Workforce Competency Development	The interconnection between training and job performance in hotel organizations	Kovaçi & Tahiri	2024	Training positively influences job performance in hotel organizations.	Scopus
2	Workforce Competency Development	Predicting career success in the hospitality industry of Cyprus: A competency-based approach	Papageorgiou et al.	2024	Identifies key competencies (e.g., communication, HR, IT) crucial for career success.	Scopus
3	Workforce Competency Development	Identifying the job competencies of Generation Z hotel employees in an intelligent environment in China	He et al.	2024	Develops competency framework for Gen Z hotel employees in intelligent environments.	Scopus
4	Workforce Competency Development	Exploring hospitality graduates' competencies in Malaysia for future employability using Delphi method	Shariff & Abd Razak	2022	Uses Delphi method to determine 69 competencies required in hospitality industry.	Scopus
5	Workforce Competency Development	Chefs' competencies: A stakeholder's perspective	Marinakou & Giousmpasoglou	2022	Identifies leadership, operational, and emotional intelligence competencies for chefs.	Scopus
6	Workforce Competency Development	Tackling the hospitality industry's contentious issue of employee retention: A close look into the influence of staff training	Utete	2024	Training positively impacts retention; coaching and mentoring are highly effective.	Scopus
7	Workforce Competency Development	An exploration of teachers and trainers' use of instruction practices in hospitality training: The Ugandan perspective	Ajambo et al.	2024	Instructional practices enhance interpersonal abilities but face challenges.	Scopus
8	Workforce Competency Development	Career Change of Young Talent and the Influence of Knowledge Transfer on Vocational Commitment	Schmidt et al.	2022	Knowledge transfer enhances vocational commitment among hospitality apprentices.	Scopus
9	Digital Transformation in Training	Organisational learning and sustainable tourism: the enabling role of digital transformation	Schönherr et al.	2023	Digital transformation in the tourism industry fosters organizational learning, supporting sustainable tourism through knowledge creation and digital technologies.	Scopus
10	Digital Transformation in Training	Implementation of Digital Competency-Based Assessment in Turndown Service in the Hospitality Industry	Jubaedah et al.	2022	Digital competency assessment enhances vocational training efficiency.	Scopus
11	Digital Transformation in Training	Digital skills gaps in the Bulgarian tourism industry	Ivanova et al.	2022	Identifies gaps in digital skills, with AI and VR	Web of Science

					skills being least available.	
12	Digital Transformation in Training	Impact of tourism companies' digital transformation on employment: Some evidence from China	Xu et al.	2022	Digitalization affects employment structure in the tourism sector.	Scopus
13	Digital Transformation in Training	Blockchain technologies and digitalization in function of student work evaluation	Bjelobaba et al.	2024	Blockchain enhances student assessment and workforce integration.	Scopus
14	Digital Transformation in Training	A Case Study in Hong Kong – Developing Qualification Framework for Hotel Frontline Staff	Sun et al.	2024	Qualification frameworks improve frontline hospitality staff competency.	Scopus
15	Policy Frameworks in Vocational Education	Delivering the European Skills Agenda: Importance of social skills in hospitality	Carlisle et al.	2023	Emphasizes need for holistic social skills training.	Web of Science
16	Policy Frameworks in Vocational Education	Analysis of training effectiveness from the perspective of managers and employees in the Colombian hospitality industry	Gil et al.	2023	Managers view knowledge enhancement as key, while employees prioritize skills improvement.	Scopus
17	Policy Frameworks in Vocational Education	Tourism vocational education: Relations of input and output	Choy & Yeung	2024	Examines link between career interest, attitude, and employability.	Scopus
18	Policy Frameworks in Vocational Education	Post-pandemic education: Hospitality program revisit	Ka Leong et al.	2024	Hospitality education must adapt to post-pandemic skill needs.	Scopus
19	Policy Frameworks in Vocational Education	An audit of tourism and hospitality-related qualifications in universities of technology in South Africa	Bob	2023	Assesses effectiveness of tourism and hospitality qualifications.	Scopus
20	Policy Frameworks in Vocational Education	Perceptions of industry engagement in tourism and hospitality studies in South Africa	Daniels et al.	2022	Industry collaboration enhances student employability and skills.	Scopus
21	Policy Frameworks in Vocational Education	Vocational education in tourism at schools and colleges of Himachal Pradesh, India	Gangotia et al.	2022	Identifies challenges faced by tourism vocational trainers in India.	Scopus
22	Sustainability in Skill-Based Education	Teaching innovation and teaching-learning methods for sustainable tourism education	Pelegrín Entenza et al.	2024	Innovative teaching enhances sustainability education in tourism.	Scopus
23	Sustainability in Skill-Based Education	Sustainable Human Resource Management Practices in Achieving	Chin et al.	2023	HR practices influence task and relational sustainability performance.	Scopus

		Employees' Sustainable Performance				
24	Sustainability in Skill-Based Education	Cognitive, affective, and behavioral repercussions of perceived quality in tourism vocational education	Silva et al.	2024	Quality perception affects student satisfaction and commitment.	Scopus
25	Sustainability in Skill-Based Education	Environmental skills gaps in tourism and hospitality organizations: Evidence from Europe	Schmidt et al.	2022	Highlights lack of environmental training in hospitality education.	Web of Science
26	Sustainability in Skill-Based Education	Pedagogy in operationalizing sustainable development goals	Zhang et al.	2024	Teaching sustainability in tourism requires experiential learning.	Web of Science
27	Sustainability in Skill-Based Education	The pedagogy of hospitableness: A transformative approach for hospitality workforce development	Marrero-Rodríguez et al.	2023	Pedagogical strategies to enhance hospitableness skills in workforce training.	Web of Science

The thematic classification of the 27 selected studies corresponds directly to the four research questions posed in this review. Studies under Theme 1 (Workforce Competency Development) address RQ1 on the impact of CBT-VET on workforce readiness. Theme 2 (Digital Transformation in Training) aligns with RQ2, examining how digital tools reshape training delivery. Theme 3 (Policy Frameworks in Vocational Education) addresses RQ3 by examining how institutional and government policies impact training effectiveness. Lastly, Theme 4 (Sustainability in Vocational Education) directly reflects RQ4, focusing on the integration of sustainability competencies into vocational training programs. This thematic structure ensures comprehensive coverage and alignment between research questions and reviewed literature.

Theme 1: Workforce Competency Development in the Hospitality and Tourism Industry

As highlighted by multiple studies, the development of workforce competencies remains a critical aspect of vocational education in the hospitality and tourism industry. Training programs are fundamental in improving employee performance, enhancing career prospects, and addressing workforce gaps. Kovaçi and Tahiri (2024) emphasize that professional training significantly influences job performance, with employees who receive structured training demonstrating higher levels of motivation, dedication, and productivity. Similarly, Papageorgiou et al. (2024) propose a competency-based framework that identifies six essential skills—communication, operational knowledge, cultural diversity, human resource management, leadership, and information technology—as key predictors of career success in hospitality settings. The findings align with the research of He et al. (2024), who developed a competency framework specifically for Generation Z hotel employees, highlighting the role of intelligent environments in shaping job competencies. These studies collectively reinforce the importance of structured competency development programs in ensuring workforce preparedness in the evolving hospitality sector.

Staff training has also been identified as a key factor in employee retention, particularly in industries with high turnover rates. Utete (2024) highlights that hospitality organizations face challenges with employee retention due to inadequate staff training programs, prompting employees to seek better training opportunities elsewhere. The study further identifies coaching and mentoring as the most effective training strategies for enhancing employee retention, as these methods provide hands-on guidance and promote long-term professional development. A similar concern is raised by Ajambo et al. (2024), who explore how instructional practices impact the development of interpersonal skills among hospitality students. Their study finds that while discussion-based learning and mentorship programs enhance interpersonal competencies, student passiveness

and lack of engagement hinder optimal learning outcomes. These findings suggest that organizations must prioritize comprehensive and adaptable training methods to cultivate a skilled workforce that can meet industry demands.

The role of competency-based education in enhancing employability is another recurring theme in workforce development studies. Shariff and Abd Razak (2022) employ the Delphi method to identify 69 competencies essential for hospitality graduates, categorizing them into the workplace, personal effectiveness, management, and academic clusters. Their findings underscore the need for stronger collaboration between academia and the hospitality industry to ensure graduates possess the skills to succeed in competitive job markets. Marinakou and Giousmpasoglou (2022) further emphasize the importance of leadership, operational, and emotional intelligence competencies in culinary professions, advocating for curriculum redesigns that integrate these skills into chef training programs. The research highlights the disconnect between industry needs and academic training, suggesting that hospitality education institutions must refine competency-based models to align with workforce expectations.

Theme 2: Digital Transformation in Training for the Hospitality and Tourism Industry

Integrating digital technologies into vocational training has significantly reshaped the hospitality and tourism industry, enhancing skill acquisition and workforce development. Ivanova et al. (2022) highlight the digital skills gap within the tourism sector, noting that while basic digital literacy skills such as operating system navigation and software use are widely available, advanced competencies in artificial intelligence (AI), virtual reality (VR), and blockchain remain underdeveloped. Xu et al. (2022) emphasize that work-integrated learning (WIL) models, which combine classroom instruction with digital simulations and industry placements, play a crucial role in developing these missing competencies. Similarly, Jubaedah et al. (2022) suggest that digital competency-based assessments in hospitality training enhance vocational learning efficiency, allowing students to develop job-relevant skills in controlled, simulated environments. These findings suggest that a structured approach to digital integration in training programs is necessary to bridge the current skill gaps in the industry.

Blockchain technology has also emerged as a tool for training assessment and workforce integration. Zhang et al. (2024) propose a Collaborative Learning and Student Work Evaluation (CLSWE) model that utilizes blockchain technology to securely store student performance data securely, thereby improving transparency and collaboration between educational institutions and employers. Bjelobaba et al. (2022) reinforce this perspective, arguing that blockchain-enhanced work-integrated learning frameworks help increase employability by providing verifiable, immutable records of students' practical training experiences. The findings suggest that incorporating blockchain into competency-based training can enhance credential verification, reduce fraudulent certifications, and facilitate seamless industry-academic collaboration in hospitality institutions.

Despite the advantages of digital transformation in training, challenges persist in implementation, particularly in emerging markets. Ivanova et al. (2022) report that nearly half of hospitality companies surveyed provide no digital training, limiting employees' ability to adapt to technological advancements. Xu et al. (2022) also identify resistance from educators and industry practitioners, as traditional training methods remain dominant in many vocational institutions. The findings suggest that policy interventions and increased investment in digital training infrastructure are necessary to support a seamless transition toward technology-driven, competency-based education.

While digital transformation is widely acknowledged as crucial to vocational education, findings across studies reveal notable inconsistencies. For instance, some studies (e.g., Jubaedah et al., 2022; Xu et al., 2022) report positive outcomes from integrating AI, blockchain, or simulation-based training, suggesting these tools enhance employability and learner engagement. However, other studies (e.g., Ivanova et al., 2022) highlight widespread digital skill gaps and resistance to the adoption of technology, particularly in developing regions. There is also disagreement on institutional readiness: while some institutions have successfully implemented digital assessments, others lack basic infrastructure or staff digital literacy. These conflicting findings suggest that while digital innovation holds promise, its practical implementation is uneven and heavily dependent on context. These

findings underscore the need for localized strategies and capacity-building efforts tailored to each region's digital maturity.

Theme 3: Policy Frameworks in Vocational Education for the Hospitality and Tourism Industry

Implementing effective policy frameworks in vocational education is critical for addressing workforce skill gaps and ensuring alignment between training programs and industry needs. Carlisle et al. (2023) emphasise the importance of social skills training in competency-based education, highlighting that soft skills, such as communication, adaptability, and teamwork, are essential for employability. Similarly, Choy and Yeung (2024) examine the relationship between vocational education inputs, such as curriculum structure and industry collaboration, and graduate employability, emphasising that tailored training programs have a significant influence on career readiness. Ka Leong et al. (2024) focus on the post-pandemic evolution of hospitality education, identifying shifts in training priorities towards digital literacy and crisis management as key components of contemporary vocational curricula. These findings suggest that policy reforms prioritise competency-based education models that integrate technical expertise and interpersonal skill development.

Workforce development policies in vocational training increasingly emphasise industry collaboration to bridge skills mismatches. Daniels et al. (2022) assess the effectiveness of tourism and hospitality-related qualifications in South Africa, identifying gaps in curriculum alignment with employer expectations. The study highlights the importance of industry engagement in hospitality training, demonstrating that internship programs and employer partnerships significantly enhance students' preparedness for real-world challenges. Gil et al. (2023) analyse training effectiveness in the Colombian hospitality sector, revealing that managers prioritise knowledge acquisition while employees value hands-on skills development. These studies collectively underscore the need for structured policy interventions that facilitate stronger industry-academic collaboration, ensuring that vocational training aligns with the evolving demands of the workforce.

The role of government and institutional policy frameworks in vocational education has also been a focal point of recent research. Carlisle et al. (2023) advocate for policy-driven skill enhancement programs within the European Skills Agenda, emphasising government-led initiatives that promote continuous learning and professional development. Gangotia et al. (2022) explore the challenges of vocational education in India, identifying insufficient government funding, outdated curricula, and inadequate teacher training as key barriers to effective skill development. These findings align with those of Choy and Yeung (2024), who suggest that reforms in tourism vocational education should address funding allocation, curriculum modernisation, and competency standardisation. This research indicates that policy frameworks should incorporate flexible funding models and continuous curriculum assessment to ensure vocational training remains relevant in a rapidly evolving industry.

Theme 4: Sustainability in Vocational Education for the Hospitality and Tourism Industry

Integrating sustainability principles into vocational education has become essential to workforce training in the hospitality and tourism industry. Pelegrín Entenza et al. (2024) highlight the role of innovative teaching methodologies in sustainability education, emphasizing that experiential learning, simulation-based exercises, and case studies significantly improve students' understanding of sustainable tourism practices. Schmid et al. (2024) identify gaps in environmental skills training across European hospitality organisations, noting that while industry professionals recognise the importance of sustainability, many lack formal training in eco-friendly operations and waste management practices. Similarly, Silva et al. (2024) emphasize that students' perceptions of quality in tourism vocational education are strongly linked to the inclusion of sustainability modules, indicating that environmentally conscious curricula lead to higher engagement and commitment to sustainable practices. These findings underscore the need for standardized sustainability-focused training frameworks in vocational education.

Sustainable human resource management (HRM) practices have also emerged as a critical factor in workforce sustainability. Chin et al. (2023) examine how HR strategies influence employees' long-term sustainability

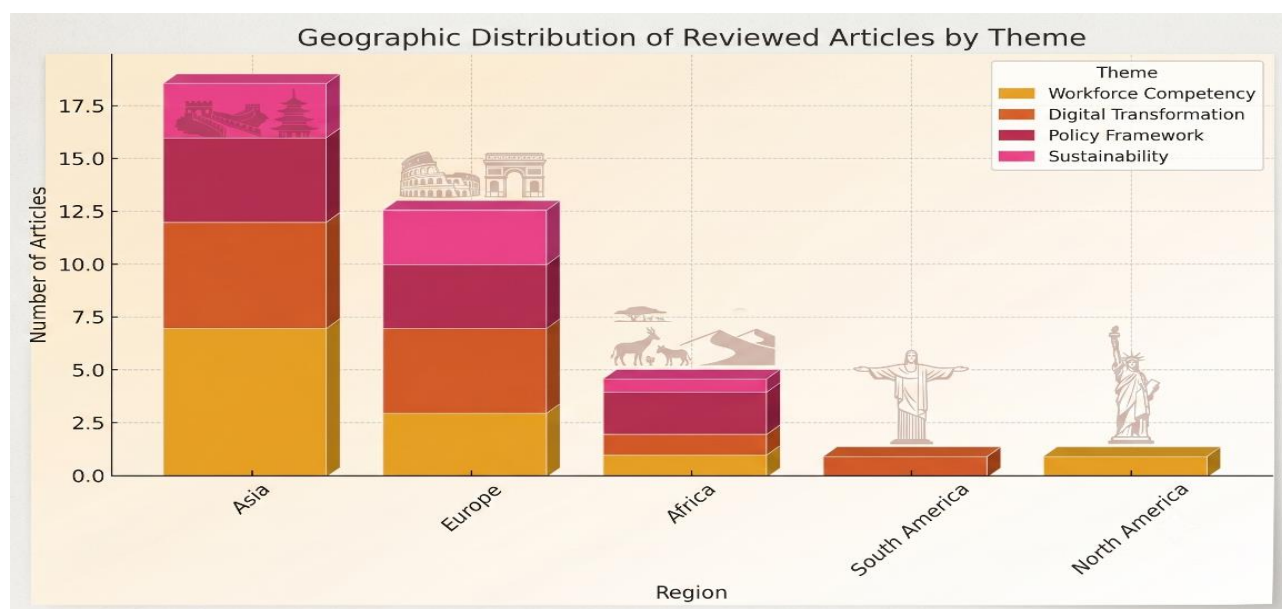
performance, revealing that organizations prioritizing employee well-being, ethical leadership, and green workplace initiatives achieve better workforce retention and environmental compliance. Marrero-Rodríguez and Stendardi (2023) introduce the "pedagogy of hospitableness," a framework designed to enhance social and emotional skills in hospitality training, contributing to a sustainable and service-oriented workforce. Zhang et al. (2024) support these findings by advocating for experiential sustainability learning, arguing that practical training, such as internships in eco-friendly hotels, fosters long-term sustainability competencies among students. These studies suggest that sustainability-oriented human resource (HR) policies and pedagogical strategies should be integrated into vocational training programs to ensure a resilient and adaptable workforce.

Despite progress in sustainability-focused education, challenges persist in operationalising the Sustainable Development Goals (SDGs) within hospitality training. Birendra (2024) examines the role of pedagogy in aligning vocational education with the SDGs, emphasising that a shift in mindset during workforce development is necessary to cultivate sustainability-conscious professionals. Carlisle et al. (2022) report that many hospitality employees lack the technical expertise to implement sustainability initiatives, and limited industry-academic collaboration further exacerbates this issue. Pelegrín Entenza et al. (2024) reinforce this perspective, suggesting that curriculum redesign, industry partnerships, and policy support are crucial for embedding sustainability into hospitality training. These findings underscore the need for policy interventions and industry-academic collaboration to enhance the effectiveness of sustainability education in vocational training.

Geographic Distribution of the Study

A review of the geographic distribution of the 27 selected studies reveals a pronounced regional concentration in Asia and Europe, particularly in China, Malaysia, and several European Union countries. These regions accounted for the majority of research on competency-based training, digital tools, and sustainability in hospitality education. Conversely, there was limited representation from South America and Africa, with only a few studies originating from Uganda, South Africa, or Colombia. The absence of research from many low-income countries suggests a regional gap in understanding how CBT-VET is being implemented across diverse socioeconomic contexts. This imbalance highlights the need for more globally inclusive research, particularly in underrepresented regions where vocational education systems face unique challenges in digital readiness, sustainability, and workforce integration. Figure 2 illustrates the regional distribution of studies by thematic focus.

Figure 2. Geographic Distribution of Reviewed Articles



DISCUSSION AND CONCLUSION

The evolution of vocational education in the hospitality and tourism industry has been shaped by the need to develop a skilled and adaptable workforce. The demand for competency-based training has grown in response to rapid industry transformations, technological advancements, and the increasing emphasis on sustainability. Effective workforce training programs are crucial for bridging skill gaps, enhancing employability, and ensuring alignment between educational institutions and industry requirements. Integrating digital tools, policy interventions, and sustainability principles has further redefined how skill-based education is delivered. A thorough examination of these aspects underscores the need for structured competency models, innovative learning techniques, and enhanced collaboration between stakeholders to improve workforce development in hospitality and tourism.

The development of workforce competencies in the hospitality and tourism industry is closely linked to the effectiveness of vocational training programs. Structured competency-based training significantly enhances employee performance, career development, and overall industry preparedness. Training models incorporating communication, operational knowledge, leadership, and information technology skills have positively shaped workforce competencies. Generation Z employees, in particular, benefit from competency frameworks that integrate digital tools and intelligent environments. Retention challenges in the hospitality sector often stem from inadequate training opportunities, leading employees to seek alternative career paths. Practical training approaches, such as coaching and mentoring, have proven to be effective strategies for improving retention rates and fostering professional growth. However, passive learning methods and disengaged participants hinder optimal competency development. Comprehensive training models must be designed with adaptable learning methodologies to address these limitations, ensuring that professionals are adequately prepared to meet evolving industry standards.

Integrating digital technologies into vocational training has revolutionised competency-based learning in the hospitality and tourism sectors. The increasing reliance on artificial intelligence, virtual reality, and blockchain has created opportunities and challenges in workforce development. Digital competency-based assessment models provide structured learning environments that facilitate skill acquisition in simulated settings. Blockchain applications have also emerged to ensure transparency in credential verification and workforce integration, allowing academic institutions and employers to track student competencies more efficiently. Despite the advantages of digital transformation, implementation remains uneven across different regions, with resistance from traditional educators and limited infrastructure investment serving as primary obstacles. Expanding access to digital training initiatives and fostering industry collaboration are crucial to overcoming these challenges. Investing in digital literacy training and technology-driven learning environments will bridge existing skill gaps and enhance the effectiveness of competency-based vocational education.

The effectiveness of vocational education in the hospitality and tourism sector is primarily influenced by policy frameworks designed to support workforce development. Industry collaborations have been instrumental in aligning training curricula with employer expectations, ensuring hospitality graduates possess skills relevant to the labour market. Policies that emphasise competency-based education models have demonstrated significant improvements in employability rates. Government initiatives have also played a crucial role in strengthening vocational training, with funding models, curriculum modernisation, and institutional partnerships being key elements in policy design. However, the lack of standardised policy frameworks across different regions has led to inconsistencies in vocational training outcomes. Strengthening industry-academic collaboration and implementing structured workforce policies will enhance the efficiency of competency-based education models, ensuring that hospitality professionals are equipped with the necessary skills to succeed in a competitive industry.

Sustainability has become a fundamental aspect of skill-based education in hospitality training programs. Integrating sustainable practices into vocational education requires an experiential learning approach, where students gain firsthand experience in environmentally responsible tourism operations. Practical training models, such as internships in sustainable hotels, allow hospitality students to develop green competencies that align with

industry expectations. Sustainable human resource management practices also play a crucial role in ensuring workforce sustainability by fostering ethical leadership, environmental awareness, and employee well-being. Despite progress in sustainability-focused education, challenges remain in operationalising sustainability principles across training programs. Many hospitality professionals lack specialised training in sustainability management, and limited collaboration between academic institutions and industry stakeholders has slowed the adoption of sustainable practices. Expanding sustainability-oriented policies, fostering cross-sector partnerships, and developing competency-based sustainability curricula are crucial to advancing workforce sustainability in the hospitality and tourism sectors.

Despite the valuable insights provided, this review has limitations. This review is limited by its focus on literature from 2022 to 2024 and its reliance on English-language sources, which may have excluded relevant studies from non-English contexts or earlier foundational works. Additionally, few studies included longitudinal or outcome-based data, which constrains our understanding of the long-term effectiveness of training. Future reviews could expand their scope to include multilingual sources and a broader publication range, thereby building a more comprehensive evidence base.

The transformation of vocational education in hospitality and tourism continues to evolve through advancements in competency development, digital training, policy frameworks, and the integration of sustainability. Workforce readiness depends on the ability of training programs to adapt to technological innovations, address skills gaps, and ensure alignment with industry needs. While significant progress has been made in structuring competency-based education, challenges such as digital literacy deficits, policy inconsistencies, and barriers to sustainability implementation remain prevalent. A more structured, collaborative, and adaptive approach to skill-based education will be crucial in preparing future hospitality professionals to meet the evolving demands of the industry. Key stakeholders need tailored strategies to support this transformation. Policymakers should prioritize investments in digital infrastructure and provide policy incentives for sustainability-focused training initiatives. Educators are encouraged to co-develop CBT frameworks in collaboration with industry partners, ensuring curriculum alignment with the practical demands of the field. Meanwhile, hospitality employers can enhance the impact of training by offering internships and placements that reflect emerging competencies in digital systems and environmental sustainability.

Recommendation for Future Study

Future research should undertake comparative studies of competency-based vocational education and training systems across different countries and regions. The present review reveals a concentration of studies in Asia and Europe, particularly in China, Malaysia, and European Union countries, while evidence from Africa, South America, and many low-income countries remains limited. This geographical imbalance restricts understanding of how different socioeconomic, institutional, and policy environments influence the implementation and effectiveness of CBT-VET in hospitality and tourism.

Cross-national research should examine differences in curriculum design, national qualification frameworks, funding mechanisms, trainer competence, digital infrastructure, industry involvement, work-based learning, competency assessment, and sustainability integration. Such comparisons would help identify practices that are transferable across contexts and those that require adaptation to local workforce conditions. Particular attention should be given to how government policies, institutional capacity, and industry-academic partnerships influence graduate employability, workforce readiness, training quality, and the adoption of digital and sustainable competencies.

Future studies may employ comparative case studies, mixed-method designs, or longitudinal evaluations involving vocational institutions, hospitality employers, educators, trainees, and policymakers. Comparisons between developed and developing economies would be especially valuable for determining how resource availability and policy coordination affect training outcomes. This approach could support the development of evidence-based policy recommendations while avoiding the inappropriate assumption that a single CBT-VET model can be applied uniformly across all national and regional contexts. The need for such research is reinforced

by the uneven implementation of digital training and the lack of standardised vocational-education policies across regions.

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Conflict Of Interest Statement

The authors declared no conflicts of interest regarding this work.

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