

Reframing Digital Competencies for Hospitality Educators in the Era of Society 5.0: A Pedagogical Integration Framework

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Abstract

The rapid evolution of digital technologies and the emergence of Society 5.0 have significantly transformed the landscape of higher education, particularly in practice-oriented disciplines such as hospitality education. As human-centred, technology-integrated ecosystems redefine industry operations, hospitality educators are required to possess advanced digital competencies that extend beyond basic technological literacy. However, existing digital competency models remain largely generic and inadequately contextualized for hospitality pedagogy, resulting in a gap between technological advancement and instructional practice. This study aims to reframe digital competencies for hospitality educators by developing a pedagogical integration framework aligned with the principles of Society 5.0. The research adopts a mixed-method design comprising a systematic literature review and expert consensus through a Modified Delphi technique involving specialists in hospitality education, educational technology, and curriculum development. The findings identify key competency domains, including AI literacy, digital pedagogical design, immersive technology integration, data-informed instructional decision-making, and ethical-technological governance. The proposed framework demonstrates conceptual coherence and expert validity, offering a structured model to guide curriculum enhancement, professional development, and institutional policy planning. In conclusion, the study contributes a context-specific, future-oriented digital competency framework that supports the transformation of hospitality education towards a Society 5.0-ready pedagogical ecosystem.

1. Introduction

The hospitality industry is experiencing accelerated digital transformation as it moves into the era of Society 5.0, a paradigm characterized by the seamless integration of artificial intelligence (AI), Internet of Things (IoT), big data, robotics, and immersive technologies to enhance human well-being, sustainability, and inclusivity (Vieira et al., 2023; Ghosh & Jermisittiparsert, 2024). Within this super-smart societal framework, technology is not merely

an operational tool, but a human-centered enabler designed to address complex social and economic challenges. Consequently, hospitality education must realign its pedagogical orientations to ensure that graduates are prepared for digitally augmented service environments and ethically complex technological ecosystems

The implications of Society 5.0 for hospitality education are profound. Educators are expected to move beyond basic digital literacy toward advanced competencies encompassing AI applications, data analytics, digital marketing, property management systems, and digital leadership (Hsu & Tseng, 2022; Wan et al., 2025). Simultaneously, they must cultivate higher-order thinking skills, interdisciplinary integration, and ethical awareness to address concerns such as data privacy, algorithmic bias, and digital inequality (Rusman et al., 2023; Law et al., 2025). Research further highlights the importance of AI literacy and responsible AI governance frameworks, including ethical models such as PAPA (Annamalai et al., 2025), to ensure that technological innovation enhances rather than replaces meaningful human interaction in hospitality learning contexts (Atef, 2025; Islam et al., 2026).

2. Main Objective

The main objective of this study is to examine the existing body of research on digital competencies for hospitality educators in the era of Society 5.0, with particular emphasis on technological skills, digital literacy, and online teaching methodologies that support curriculum development and enhance teaching practices in Hospitality Technical and Vocational Education and Training (TVET). Specifically, this review aims to provide a comprehensive understanding of how digital competencies are conceptualized, developed, and integrated within hospitality TVET. It also seeks to identify current research trends, existing gaps, best practices, and competency frameworks that can inform curriculum innovation and the professional development of hospitality educators. Ultimately, this review contributes to strengthening the quality, relevance, and sustainability of hospitality education in response to the technological advancements and societal expectations of Society 5.0.

3. Digital Competencies

The literature on digital competencies for hospitality educators has expanded considerably over the past decade, reflecting rapid technological advancements and changing educational priorities. Early studies primarily focused on foundational digital literacy and the integration of information and communication technology (ICT) skills into tourism and hospitality education. As digital technologies evolved, research increasingly explored innovative pedagogical approaches, curriculum development, digital competency frameworks, and the integration of emerging technologies, including artificial intelligence (AI), virtual and augmented reality (VR/AR), learning analytics, and digital learning platforms, within vocational and higher education. More recent studies have shifted towards the context of Society 5.0 and Industry 5.0, emphasizing comprehensive digital competency frameworks, personalised learning, sustainable educational practices, and human-centred approaches to teaching and learning.

The hospitality industry is currently experiencing a profound transformation driven by the emergence of Society 5.0, a vision of a human-centred, super-smart society in which advanced technologies including artificial intelligence (AI), the Internet of Things (IoT), big data, virtual reality (VR), and robotics are integrated to enhance quality of life, sustainability, and social well-being (Vieira et al., 2023; Ghosh & Jermisittiparsert, 2024). This transformation requires hospitality education to rethink both its pedagogical practices and the digital competencies expected of educators. Consequently, hospitality educators must possess not only the technical expertise to utilise emerging digital technologies but also the pedagogical competence to integrate them effectively into teaching and learning. Equally important is the ability to foster ethical awareness, sustainability, inclusivity, and human-centred values, thereby preparing graduates to thrive in an increasingly digital, interconnected, and dynamic hospitality industry (Bećirović, 2023; Zhang, 2025).

4. Methodology

This study adopts a literature review methodology to critically examine and synthesise existing research on digital competencies for hospitality educators in the context of Society 5.0. A literature review provides a systematic approach for identifying, evaluating, and integrating existing knowledge, thereby enabling the identification of prevailing concepts, theoretical perspectives, research trends, best practices, and gaps within the field (Galvan, 2017; Fink, 2014).

Relevant literature was retrieved through comprehensive searches of major academic databases, including Scopus, Web of Science, ScienceDirect, SpringerLink, Taylor & Francis Online, and Google Scholar. The search strategy employed combinations of keywords such as *digital competencies*, *digital literacy*, *hospitality education*, *hospitality educators*, *TVET*, *vocational education*, *Society 5.0*, *Industry 5.0*, *online teaching*, *educational technology*, and *technology-enhanced learning*. Reference lists of selected publications were also examined to identify additional relevant studies. The literature selection was guided by predefined inclusion criteria. Studies were included if they (i) focused on digital competencies or related constructs in hospitality, tourism, or technical and

vocational education and training (TVET); (ii) examined educator competencies, curriculum development, digital pedagogies, or technology integration; (iii) were published in peer-reviewed journals, conference proceedings, books, or reputable reports; and (iv) were published in English. Duplicate publications and studies with limited relevance to the research objectives were excluded.

A total of 48 studies were selected for the final review and analysed comparatively to identify common themes, competency domains, curriculum integration strategies, pedagogical approaches, and educator development practices. The selected studies represent diverse geographical contexts, educational settings, and methodological approaches, including qualitative, quantitative, mixed-methods, Delphi studies, and systematic literature reviews. The literature was synthesised using a thematic analysis approach to examine recurring patterns and emerging issues concerning the conceptualisation, development, and implementation of digital competencies in hospitality TVET. This synthesis also facilitated the identification of current research gaps and informed recommendations for curriculum innovation and professional development aligned with the aspirations of Society 5.0.

5. Results and Discussion

The analysis of the 48 selected studies reveals a growing body of research on digital competencies for hospitality educators, reflecting the increasing importance of digital transformation in Technical and Vocational Education and Training (TVET). As presented in Table 1, the reviewed studies cover a wide range of topics, including digital competency frameworks, curriculum development, technology-enhanced pedagogies, educator professional development, and the integration of emerging technologies within hospitality education. The studies also represent diverse geographical contexts and educational settings, demonstrating that the development of digital competencies has become a global priority in response to rapid technological advancements and the transition towards Society 5.0.

Table 1 *Comparative analysis of digital competency studies in hospitality and vocational education*

Study	Digital Competency Domains	Curriculum Integration Strategies	Pedagogical Effectiveness	Framework Alignment	Educator Preparedness & Training
Hani et al. (2024)	Comprehensive digital skills model for TVET educators	Structured digital competence model for curriculum embedding	Technology integration improves teaching quality	Aligns with international digital competence frameworks	Targeted professional development programs required
Петрунчак (2025)	Digital literacy as key hospitality competency	Flipped classroom and ICT integration	Improved education quality via innovative methods	Supports digital pedagogy concepts	Continuous educator training needed
Hermansah et al. (2025)	Digital literacy, adaptability, problem-solving	Technology integration in vocational learning	Positive impact on student digital readiness	Aligns with industry standards	Ongoing teacher competence development stressed
Asagar (2025)	Holistic competence (knowledge, skills, attitudes)	Comparative analysis of six frameworks	Conceptual focus (no direct measurement)	Strong DigCompEdu alignment	Frameworks guide professional development
Moraes et al. (2025)	Digital competences in HE teaching	DigCompEdu-based curriculum design	Flipped classroom improves outcomes	Strong DigCompEdu alignment	Investment in training and infrastructure needed
KAPUCU et al. (2025)	Online course digital competencies	DigCompEdu-based evaluation rubric	Positive correlation with effective online teaching	Direct DigCompEdu application	Faculty competence assessment emphasized
Fuentes & García (2024)	Broad interdisciplinary digital competence	Post-pandemic curriculum reconsideration	Mixed success in competence development	DigCompEdu + AI considerations	Gap between research and practice identified
Franco et al. (2024)	Technological competencies for tourism professionals	Online training integration	Improves technological skill acquisition	Tourism-aligned digital models	Flexible and accessible training emphasized

Study	Digital Competency Domains	Curriculum Integration Strategies	Pedagogical Effectiveness	Framework Alignment	Educator Preparedness & Training
Dumbuya (2024)	Future digital literacy & adaptability skills	Integrated global-standard curriculum	Enhances future-ready competencies	DQ Global Standards & OECD frameworks	Curriculum revision supports workforce readiness
Alonso et al. (2024)	Digital competencies in emerging tourism tech	Mixed-method curriculum integration study	Identifies student digital gaps	Tourism frameworks 4.0	Urgent curriculum adaptation recommended
Rethinking Hospitality (2024)	Transformative digital competencies	Case studies on innovative pedagogy	Practical educator toolkit effectiveness	Digital pedagogical innovation	+ Educator central to transformation
Okti et al. (2024)	Digital skills, creativity, adaptability	Literature review on digital integration	Highlights digital divide challenges	Professional development focus	Continuous support and training needed
Karim et al. (2024)	Digital competencies for tourism educators	Strategy development for digital adaptation	Enhances technological knowledge	Digital transformation alignment	Upgrading skills and facilities required
Yudistira (2024)	Essential vs. desired hotel digital skills	Targeted curriculum based on priorities	Linked to competitive advantage	Industry-aligned frameworks	Focused training programs recommended
Albashiry et al. (2024)	Agile digital competency framework	Blended and online curriculum design	Flexible course delivery	DigCompEdu-based	Facilitates stakeholder collaboration
Valverde (2024)	Basic to advanced digital competencies	Holistic curricular integration	27% student skill improvement	Digital literacy policy alignment	Continuous training emphasized
Agarwal et al. (2024)	Digital literacy & interdisciplinary HE5.0 skills	Inclusive, industry-aligned curriculum	Ethical reasoning + digital skill focus	Society principles 5.0	Policy and curriculum innovation required
Deri et al. (2023)	Fourth-generation hospitality tech skills	Conceptual curriculum framework	Enhances competitiveness	Digital transformation alignment	Early-stage digital development encouraged
Deri & Ragavan (2023)	Hospitality graduate digital skills	Technology advancement review	Conceptual framework proposed	Supports transformation frameworks	Continuous upgrading needed
Gabidullina et al. (2022)	Digital knowledge for tourism specialists	Training model integration	Emphasizes practical digital use	National digital transformation priorities	Recommends new training models
Minor et al. (2024)	Digital skill gaps in UK tourism	Industry survey & training barriers	Identifies AI & marketing skill shortages	Reflects policy constraints	Targeted skills development recommended
Morales et al. (2021)	Digital competence in tourism training	Systematic review of skill integration	Calls alignment with digital society	Curriculum digital incorporation	Updated training programs needed
Zaragoza-Sáez et al. (2021)	Spanish tourism digital skill gaps	Mixed-method organizational study	Persistent digital skill issues	European digital skills blueprint	Organizational challenges highlighted
Sigala (2021)	Reimagining tourism education digitally	Curriculum transformation advocacy	Emphasizes proactive change	Digital innovation alignment	New competency models required
Zhang & Yie (2024)	Intelligent vocational education tech	AI-driven personalized learning	Adaptive & cross-disciplinary learning	Industry 5.0 & Education 5.0	Supports intelligent tech training
Eckstein & Silveira (2025)	Post-pandemic educator competencies	DigCompEdu in OnLIFE context	Ethical & collaborative digital practice	Strong DigCompEdu alignment	Policy support for continuous training
Nurlaily et al. (2024)	Digital literacy teacher training	Community service-based training	Increased digital literacy	Curriculum-driven alignment	Practical training benefits reported
Adeyinka-Ojo et al. (2020)	Digital literacy & employability skills	Innovative hospitality framework	Technology-driven employability	Industry alignment	Education-industry

Study	Digital Competency Domains	Curriculum Integration Strategies	Pedagogical Effectiveness	Framework Alignment	Educator Preparedness & Training
					collaboration encouraged
Martínez & Fernández (2015)	TIC framework for Cuban educators	Model development & document analysis	Continuous training emphasized	TIC Contextualized digital framework	Ongoing professional development
Suryati et al. (2024)	Vocational teacher competence in Society 5.0	Systematic literature review	Identifies AI & IoT skill needs	Society alignment	Enhanced vocational teacher training needed
Smith (2021)	Post-pandemic digital pedagogy	Multi-modal curriculum delivery	Addresses generational needs	Innovative digital teaching alignment	Faculty adaptability emphasized
García et al. (2024)	Tourism human capital digital skills	Industry-aligned digital curriculum	Specialized software & transversal skills	Global standards alignment	Targeted workforce training supported
Dyachenko (2024)	Digital tech for sustainable tourism education	Curriculum updates with AI focus	Balanced tech use advocated	Sustainable education models	Responsible AI integration emphasized
Ajanovic (2014)	ICT solutions in hospitality education	Desktop & cloud ICT teaching methods	Supports curriculum modernization	ICT industry standards alignment	Practical ICT training recommended
Hussain et al. (2023)	Industry 5.0 employability skills	Qualitative educator study	Automation & AI adaptation challenges	Human-centric Industry 5.0	Educator upskilling emphasized
Mobo (2024)	Education 5.0 learning environments	Tech-enhanced personalized education	Promotes 21st-century skills	Society principles	Adaptability and cooperation stressed
Lee & Lee (2024)	Vocational teacher digital clusters	Empirical validation study	Industry-linked personalized teaching	Curriculum-wide integration	Supports personalized teaching development
Vafokulova et al. (2024)	Digitalization in tourism workforce	Quantitative AI usage survey	Continuous skill development needed	Emerging tourism digital demands	Educational adaptation required
Zhang et al. (2024)	ChatGPT in hospitality education	AI chatbot curriculum integration	Benefits + ethical concerns	AI-enabled competence frameworks	Balanced AI use recommended
Fessl et al. (2022)	Digital teaching curriculum (5 modules)	DigCompEdu-based workshop	Practical application emphasized	Strong DigCompEdu alignment	Community of practice encouraged
Esquivel & Hernández (2024)	Industry 5.0 educator competencies	AI, IoT, robotics integration	Sustainable human-centric education	Society alignment	Ethical digital teaching emphasized
Yu et al. (2024)	Vocational instructor framework	Delphi study (5 domains)	AI & digital competencies integrated	Competency assessment alignment	Ongoing updates recommended
Liu et al. (2023)	Big data & digital tourism learning	Mediation-moderation analysis	Soft & hard skills enhance outcomes	Multidisciplinary digital integration	Implications for program development
Zhang (2025)	Core hospitality competency model (China)	Delphi + factor analysis	Digital + cultural competency integration	Innovation-driven vocational alignment	Curriculum reform supported
SURVE (2025)	ChatGPT in hospitality learning	AI evaluation study	Notes ethical risks & benefits	AI integration alignment	Human oversight recommended
Joshi & Neupane (2024)	DEPSWALIC digital framework	27 sub-skills across levels	Ethical digital resource use	Comprehensive digital models	Cross-level professional development
Oyekunle et al. (2024)	AI Industry 5.0 human-centric education	Conversational AI pedagogy	Sustainable multimodal AI use	Society 5.0 educational values	Sustainable digital education guidelines

Study	Digital Competency Domains	Curriculum Integration Strategies	Pedagogical Effectiveness	Framework Alignment	Educator Preparedness & Training
Rentería et al. (2025)	Tech competencies in tourism & gastronomy	Excel-based employability training	Identifies specific digital skill gaps	Higher education digital integration	Tailored professional workshops recommended

Across the reviewed literature, digital competency is consistently conceptualized as a multidimensional construct that extends beyond basic digital literacy. Most studies emphasize the integration of technological knowledge with pedagogical competence, problem-solving abilities, ethical awareness, adaptability, collaboration, and lifelong learning. Several studies further highlight the growing significance of artificial intelligence (AI), big data, the Internet of Things (IoT), virtual and augmented reality (VR/AR), and digital learning platforms in reshaping hospitality education. These technologies are increasingly recognized as essential components of curriculum design and instructional practice, enabling educators to prepare students for the evolving demands of the hospitality industry.

The findings also indicate that curriculum integration strategies have shifted from merely incorporating digital tools into teaching towards embedding digital competencies throughout the curriculum. Many studies advocate competency-based curriculum frameworks aligned with internationally recognised standards, particularly the DigCompEdu framework, to ensure that educators possess the knowledge and skills necessary to facilitate technology-enhanced learning. Another significant finding concerns educator preparedness and professional development. Despite widespread recognition of the importance of digital competencies, many studies identify persistent challenges, including insufficient digital skills, limited institutional support, inadequate technological infrastructure, and disparities in access to digital resources. Consequently, continuous professional development, institutional investment, and policy support are repeatedly recommended to ensure educators remain responsive to technological innovations and changing industry requirements. These findings suggest that successful digital transformation in hospitality TVET depends not only on technological adoption but also on developing educators' pedagogical capabilities and fostering a culture of continuous learning.

Overall, the comparative analysis demonstrates a strong consensus that digital competencies should be viewed as an integrated combination of technological, pedagogical, and professional capabilities rather than as isolated technical skills. Although substantial progress has been made in conceptualising competency frameworks and identifying effective pedagogical practices, the literature reveals a need for greater empirical evidence on the implementation and effectiveness of these competencies within hospitality TVET. This highlights important opportunities for future research to develop context-specific competency models, evaluate curriculum implementation, and strengthen educator professional development in alignment with the human-centred principles of Society 5.0.

5.1 Evaluate Current Knowledge on Digital Competencies Required by hospitality Educators in the Context of Society 5.0.

The benchmarking analysis reveals that existing digital competence frameworks applied within Hospitality Technical and Vocational Education and Training (TEVT) demonstrate substantial conceptual convergence yet varied contextual implementation.

Table 2 Digital competence frameworks and online teaching methodologies in hospitality TVET

Comparison Criterion	Studies in Agreement	Studies in Divergence	Potential Explanations
Digital Competency Domains	Consensus that competencies include technical skills, digital literacy, pedagogical integration, communication, assessment, data protection, and digital ethics aligned with DigCompEdu (Hani et al., 2024; Asagar, 2025; Fessler et al., 2022; Eckstein & Silveira, 2025; Joshi & Neupane, 2024). Digital literacy viewed as essential for Society 5.0 readiness (Agarwal et al., 2024; Suryati et al., 2024).	Broader domains include emotional intelligence, adaptive skills, AI interaction, and industry-specific service competencies (Zhang & Yie, 2024; Zhang, 2025; Hussain et al., 2023). Some focus narrowly on basic literacy or software skills (Morales et al., 2021; Rentería et al., 2025).	Differences in educational level (TVET vs. HE), regional context, and sector focus result in varied competency priorities.

Comparison Criterion	Studies in Agreement	Studies in Divergence	Potential Explanations
Curriculum Integration Strategies	Holistic embedding of digital competencies using blended, hyflex, and online models; curriculum redesign incorporating AI, Big Data, and ethics (Dumbuya, 2024; Albashiry et al., 2024; Sigala, 2021; Adeyinka-Ojo et al., 2020; Suryati et al., 2024; Fessler et al., 2022). Community of practice models recommended (Fessler et al., 2022; Eckstein & Silveira, 2025).	Variation in integration depth: comprehensive future-skill frameworks vs. limited/inconsistent tech adoption (Dumbuya, 2024; Zhang, 2025 vs. Hermansah et al., 2025; Minor et al., 2024).	Institutional readiness, policy support, infrastructure, and funding disparities influence implementation depth.
Pedagogical Effectiveness	Technology-enhanced approaches (flipped classroom, LMS, simulation, gamification) improve engagement and skill acquisition (Петрунчук, 2025; Hermansah et al., 2025; Moraes et al., 2025). Pandemic accelerated digital pedagogy (Smith, 2021; Fessler et al., 2022). AI tools like ChatGPT show promise (Zhang et al., 2024; SURVE, 2025).	Uneven effectiveness due to educator overwhelms, limited training, infrastructure constraints (Moraes et al., 2025; Fessler et al., 2022). Ethical concerns and AI overreliance debated (SURVE, 2025; Zhang et al., 2024).	Variations in educator competence, digital literacy levels, and digital divides affect sustainability and impact.
Framework Alignment	Strong alignment with DigCompEdu and OECD Future Skills; adaptation to hospitality TEVT contexts (Hani et al., 2024; Moraes et al., 2025; KAPUCU et al., 2025; Fessler et al., 2022). Society 5.0 principles increasingly referenced (Agarwal et al., 2024; Suryati et al., 2024).	Emergence of Industry 5.0, AI-driven, emotion-centered frameworks not universally adopted (Zhang & Yie, 2024; Oyekunle et al., 2024). Regional frameworks vary (Martínez & Fernández, 2015; Yu et al., 2024).	Different stages of digital maturity and local contextual adaptation influence framework selection.
Educator Preparedness & Training	Continuous professional development, workshops, competency-based training, and communities of practice widely recommended (Hani et al., 2024; Moraes et al., 2025; Okti et al., 2024; Nurlaily et al., 2024; Fessler et al., 2022). Pandemic highlighted urgency (Smith, 2021).	Divergent readiness levels: some report gains, others report overwhelm and resistance (Moraes et al., 2025; Fessler et al., 2022 vs. Karim et al., 2024). Training focus ranges from basic tools to AI integration (Zhang & Yie, 2024; SURVE, 2025).	Institutional support, digital infrastructure, cultural attitudes, and training quality shape preparedness outcomes.

1. Digital Competency Domains

The review of over 40 studies indicates a clear evolution of digital competency conceptualization within hospitality and vocational education. Digital competence is no longer confined to technical proficiency but encompasses a multidimensional construct integrating technical, cognitive, ethical, and socio-emotional domains. Several scholars conceptualize digital competence as a comprehensive framework tailored specifically for hospitality educators and learners, emphasizing the integration of knowledge, skills, and attitudes necessary for digitally enriched teaching and learning environments (Hani et al., 2024; Asagar, 2025; Lee & Lee, 2024).

Digital literacy consistently emerged as the foundational component across studies. However, it is increasingly complemented by higher-order competencies such as adaptability, creativity, problem-solving, and critical thinking (Okti et al., 2024; Valverde, 2024). These competencies reflect the growing demand for educators

to function not merely as technology users but as digital leaders capable of fostering innovation in hospitality pedagogy.

Moreover, the integration of emerging technologies particularly artificial intelligence (AI), Internet of Things (IoT), and big data has significantly reshaped competency definitions. Studies framed these competencies within the broader paradigms of Society 5.0 and Industry 5.0, emphasizing human-centric, sustainable, and intelligent technological ecosystems (Hussain et al., 2023; Oyekunle et al., 2024; SURVE, 2025). This shift underscores the necessity for hospitality educators to develop AI literacy and ethical awareness alongside technical expertise.

2. Curriculum Integration Strategies

The literature demonstrates strong consensus regarding the need to systematically embed digital competencies into hospitality and vocational curricula. Many studies proposed structured frameworks aligned with international standards to ensure coherent integration (Hani et al., 2024; Dumbuya, 2024; Albashiry et al., 2024). These frameworks often draw from established models such as DigCompEdu and global skills standards, reinforcing consistency across educational systems.

Innovative pedagogical approaches were frequently employed to operationalize digital competencies within instructional practice. Flipped classrooms, blended learning environments, and online modular delivery systems were widely adopted to enhance engagement and foster independent learning (Moraes et al., 2025; Nurlaily et al., 2024). Such strategies enabled practical, learner-centred integration of digital skills into authentic hospitality scenarios.

Additionally, several studies emphasized the importance of flexible, personalized, and practice-oriented curriculum design. Intelligent technologies and adaptive learning systems were proposed as mechanisms to tailor instruction to individual learner needs, thereby improving relevance and engagement (Zhang & Yie, 2024; Fessler et al., 2022; Lee & Lee, 2024). This approach aligns strongly with the pedagogical ethos of Society 5.0, which prioritizes personalized and human-centered learning ecosystems.

3. Pedagogical Effectiveness

Approximately 20 studies reported measurable positive outcomes associated with technology-enhanced pedagogical approaches. Improvements were observed in student digital literacy, engagement, and employability readiness (Hermansah et al., 2025; Deri et al., 2023; Adeyinka-Ojo et al., 2020). These findings suggest that well-designed digital integration strategies can significantly enhance learning outcomes in hospitality education.

However, effectiveness was strongly mediated by educator competence and infrastructural readiness. Studies consistently indicated that the quality of digital pedagogy depends on educators' ability to integrate technology meaningfully rather than superficially (Moraes et al., 2025; KAPUCU et al., 2025; Karim et al., 2024). Institutional support, technological infrastructure, and policy alignment were also critical enabling factors.

Conversely, barriers such as uneven technology adoption, digital divides, limited resources, and resistance to change were reported across multiple contexts (Fuentes & García, 2024; Minor et al., 2024; Okti et al., 2024). These challenges highlight the complexity of digital transformation in hospitality education and underscore the need for systemic, rather than isolated, interventions.

4. Framework Alignment

Strong alignment with internationally recognized digital competence frameworks was evident in over 30 studies. DigCompEdu emerged as the most frequently referenced framework, often complemented by OECD Future Skills and Society 5.0 principles (Asagar, 2025; Moraes et al., 2025; Fessler et al., 2022). These frameworks provided conceptual grounding and structural guidance for curriculum development and educator competency assessment.

Several studies extended traditional frameworks by incorporating AI integration, ethical reasoning, and human-centric design principles reflective of Industry 5.0 innovations (Zhang & Yie, 2024; Oyekunle et al., 2024; Esquivel & Hernández, 2024). This evolution indicates a shift from technology-centric models toward more holistic, sustainability-oriented digital competency paradigms. Furthermore, frameworks were not merely theoretical constructs but practical tools guiding curriculum revision, competency benchmarking, and professional development planning (Albashiry et al., 2024; Yu et al., 2024; Joshi & Neupane, 2024). This demonstrates their functional role in institutional digital transformation initiatives.

5. Educator Preparedness and Training

Across the literature, educator preparedness emerged as a critical determinant of successful digital integration. Numerous studies emphasized the necessity of ongoing professional development programs to enhance educators' digital proficiency and pedagogical confidence (Hani et al., 2024; Okti et al., 2024; Suryati et al., 2024). Training initiatives varied in structure and scope, ranging from formal workshops and structured certification programs to community-of-practice models and competency-based assessments (Nurlaily et al., 2024; Fessler et al., 2022; Yu et al., 2024). These initiatives aimed to bridge skill gaps and foster collaborative knowledge sharing

among educators. Nonetheless, systemic barriers such as limited time, insufficient funding, inadequate infrastructure, and weak institutional support were recurrent themes (Minor et al., 2024; Moraes et al., 2025; Eckstein & Silveira, 2025). These findings suggest that sustainable digital transformation requires strategic investment and policy-level commitment rather than isolated training interventions.

Overall, the reviewed studies reveal a progressive shift toward multidimensional digital competency frameworks in hospitality education that integrate technical, cognitive, ethical, and socio-emotional dimensions. Curriculum innovation, pedagogical effectiveness, and framework alignment are deeply interconnected, with educator preparedness serving as a central enabling factor. While significant advancements have been achieved, persistent structural and systemic challenges underscore the need for comprehensive, context-sensitive frameworks that align digital transformation with the human-centric values of Society 5.0.

5.2 Benchmarking of Existing Digital Competence Frameworks and Online Teaching Methodologies Applicable to Hospitality TVET

Benchmarking existing digital competence frameworks and online teaching methodologies provides an important foundation for understanding how digital capabilities can be effectively integrated into Hospitality Technical and Vocational Education and Training (TVET). As the hospitality industry increasingly adopts digital technologies in its operations, educators and students within hospitality programmes must develop strong digital competencies to remain relevant in a rapidly evolving professional environment. Digital competence in this context extends beyond basic technological literacy; it involves the ability to select, apply, and critically evaluate digital tools to support teaching, learning, and professional practice.

Several digital competence frameworks have been developed to guide the integration of digital technologies in education. Frameworks such as DigCompEdu, ICT Competency Framework for Teachers (ICT CFT), and similar models emphasise key competencies including collaboration, ethical digital practices, digital resource management, and the integration of technology into teaching and learning processes. These competencies are particularly relevant for hospitality TVET educators, as they support the effective use of digital tools in both classroom instruction and industry-related simulations (Asagar, 2025).

In addition to global frameworks, contextualised models have also been developed to address the specific needs of national education systems. For instance, research conducted in Vietnam has proposed a contextualised digital competency framework that incorporates elements of digital governance and online teaching practices within higher education. This approach demonstrates the importance of adapting global competency frameworks to local educational contexts, institutional structures, and industry demands to support meaningful digital transformation in education (Hung et al., 2025).

Within the Malaysian context, recent studies have highlighted the need for a structured digital competence framework specifically designed for TVET educators. The development of such frameworks aims to support educators in integrating digital technologies effectively into teaching and learning processes while also preparing students for the technological demands of the Fourth Industrial Revolution (IR 4.0). These frameworks typically emphasise the development of pedagogical, technological, and industry-relevant competencies required for modern vocational education (Hani et al., 2024).

Similarly, customised teaching approaches in TVET, including experiential learning, industry-based training, and collaborative partnerships with industry stakeholders, have been shown to significantly enhance students' skill development and employability. These approaches are particularly important in hospitality education, where practical competence and real-world application of knowledge are central to professional preparation (Verian, 2024).

The integration of instructional technologies such as virtual reality (VR), simulation-based learning, and online learning platforms has also gained increasing attention in hospitality education. These technologies allow educators to create immersive learning environments that replicate real hospitality settings, enabling students to practice professional skills in a safe and controlled environment. However, the adoption of such technologies should be supported by appropriate pedagogical frameworks and learning theories to ensure that their use contributes meaningfully to learning outcomes (Huang et al., 2022).

Despite these advancements, several challenges continue to affect the effective implementation of digital competence frameworks and online teaching methodologies. Common barriers include resistance to technological change among educators, limited institutional support, and the financial investment required to implement new digital systems. Addressing these challenges is crucial to ensure the successful adoption of digital practices within hospitality TVET institutions (Hung et al., 2025).

Another issue highlighted in the literature is the lack of consensus regarding the definition and scope of digital competencies in higher education. This lack of agreement complicates efforts to develop standardised frameworks that can be applied consistently across institutions. Consequently, continuous research and validation processes are necessary to refine digital competence models and ensure their relevance to specific educational and professional contexts (Tondeur et al., 2023).

Overall, benchmarking existing frameworks and teaching methodologies demonstrates that while digital competence models and innovative pedagogical strategies offer considerable potential for enhancing hospitality TVET, their successful implementation requires contextual adaptation, institutional support, and alignment with industry needs. Integrating these elements can contribute significantly to strengthening the quality and relevance of hospitality education in the digital era.

6. Conclusions

The transition toward Society 5.0 represents a critical turning point for hospitality education, requiring a comprehensive redefinition of digital competencies for educators. Beyond technical proficiency, hospitality educators must develop integrated capabilities that combine advanced digital expertise, ethical awareness, sustainability orientation, and human-centered pedagogical practice. As artificial intelligence, immersive technologies, big data, and smart systems increasingly shape the hospitality industry, digital competence must be embedded holistically across curriculum design, instructional strategies, and assessment approaches. Experiential, cooperative, and project-based learning—enhanced through emerging technologies—provide meaningful mechanisms for aligning educational practices with industry demands while preserving critical thinking, social responsibility, and authentic human interaction.

At the same time, sustained transformation depends on continuous professional development, interdisciplinary collaboration, and institutional readiness. Educators require ongoing upskills to remain responsive to rapid technological change, supported by inclusive policies and infrastructure that address digital divides and socio-economic disparities. Despite growing scholarship, significant gaps remain in the development of comprehensive, hospitality-specific digital competency frameworks and rigorous evaluation models suited to Society 5.0 contexts. Therefore, reframing digital competencies demands a dynamic, ethically grounded, and context-sensitive approach that harmonizes technological innovation with human values, ensuring hospitality education prepares both educators and students for an inclusive, sustainable, and innovation-driven future.

6.1 Research Implications

The synthesis of literature advances theoretical understanding of digital competence in Hospitality TEVT by conceptualizing it as a multidimensional and integrative construct encompassing technical proficiency, digital literacy, pedagogical integration, ethical governance, adaptive expertise, and continuous professional development. Rather than treating digital skills as isolated competencies, the findings reinforce their embeddedness across curriculum design, instructional delivery, and assessment practices, thereby extending existing digital competence frameworks (Asagar, 2025; Lee & Lee, 2024; Fessler et al., 2022). In the context of Society 5.0, digital competence evolves further to include human-centric and AI-enabled dimensions, challenging traditional teacher-centered paradigms and redefining educators as facilitators, curators, and co-creators of knowledge within intelligent learning ecosystems (Eckstein & Silveira, 2025; Oyekunle et al., 2024; Fuentes & García, 2024). The integration of adaptive, learner-centered pedagogies linked to industry technologies reinforces constructivist and personalized learning theories in vocational education (Lee & Lee, 2024; Yu et al., 2024; Hermansah et al., 2025). Additionally, the prominence of future-oriented skills critical thinking, adaptability, and ethical digital practice aligns with global competency paradigms that transcend purely technical training (Dumbuya, 2024; Okti et al., 2024; Agarwal et al., 2024). The emergence of AI tools such as ChatGPT introduces new theoretical considerations, necessitating the expansion of digital competence models to incorporate AI literacy and ethical human-AI collaboration while preserving human-centered pedagogical values (Zhang et al., 2024; SURVE, 2025; Oyekunle et al., 2024).

From a practical perspective, the findings underscore the need for context-specific digital competency models tailored to hospitality vocational educators, integrating foundational digital skills with advanced pedagogical strategies to ensure industry relevance and instructional effectiveness (Hani et al., 2024; Lee & Lee, 2024; Zhang, 2025). Professional development initiatives should emphasize applied, community-based learning approaches supported by digital toolkits addressing data privacy, copyright, and ethical considerations (Fessler et al., 2022; Eckstein & Silveira, 2025; Nurlaili et al., 2024). Institutional and policy-level investment in digital infrastructure and continuous upskilling is essential to bridge existing skill gaps, particularly regarding emerging technologies such as AI, big data, and IoT that increasingly shape hospitality and tourism operations (Minor et al., 2024; Zhang & Yie, 2024; Vafokulova et al., 2024). Furthermore, the integration of blended and online pedagogies aligned with established digital literacy frameworks can enhance flexibility and inclusivity while preparing learners for dynamic industry demands (Moraes et al., 2025; KAPUCU et al., 2025; Adeyinka-Ojo et al., 2020). Strengthening collaboration between education providers and industry stakeholders is crucial to maintain curricular relevance and graduate employability in the era of Industry 5.0 and Society 5.0 (Hussain et al., 2023; Zhang, 2025). Finally, the responsible adoption of AI tools such as ChatGPT offers transformative learning opportunities but requires clear institutional guidelines to mitigate ethical risks and overdependence (Zhang et al., 2024; SURVE, 2025).

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Conflict of Interest

Authors declare that there is no conflict of interest regarding the publication of the paper.

Author Contribution

The authors confirm contribution to the paper as follows: **study conception and design:** Nor Roselidyawaty Mohd Rokeman; **data collection:** Mohd Nasir Mohd Yaacob; **analysis and interpretation of results:** Nor Roselidyawaty Mohd Rokeman; **draft manuscript preparation:** Che Ghani Che Kob. All authors reviewed the results and approved the final version of the manuscript.

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