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AI Competencies for Future Tourism Professionals: A Competency Framework and Implications for Higher Education

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ABSTRACT
Artificial intelligence (AI), particularly generative AI (GenAI), is transforming tourism-related tasks and creating new competency requirements for future professionals. This conceptual paper synthesises research on AI competencies and contextualises them within tourism occupations. It proposes the Tourism AI Competency Framework, comprising six domains: (1) AI literacy; (2) AI application in tourism; (3) data and analytical literacy; (4) digital customer experience; (5) human–AI collaboration; and (6) responsible AI use. The framework comprises three developmental levels, progressing from awareness to application and AI-augmented professional practice. The paper argues that AI integration should not be reduced to the addition of a standalone technology course. Instead, curriculum redesign should begin with changes in occupational tasks and translate these changes into competencies, learning outcomes, learning activities, and assessment.
Keywords: *Artificial intelligence; AI competency; Tourism education; Curriculum redesign; Tourism workforce; Generative AI.*

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I. INTRODUCTION

Artificial intelligence (AI) is evolving from a specialized technology into an increasingly pervasive component of economic, social, and educational life. In higher education, the emergence of generative AI systems is changing not only learning tools but also the ways in which learners search for, process, create, and evaluate information. Accordingly, UNESCO (2024) emphasizes the need to prepare learners to become responsible users and co-creators of AI. Its framework identifies 12 competencies across four dimensions: a human-centred mindset, AI ethics, AI techniques and applications, and AI system design, with three developmental levels: Understand, Apply, and Create (UNESCO, 2024).

In tourism education, the impact of AI is distinctive because many occupational tasks simultaneously rely on data, technology, service interactions, and human judgement. AI can support market research, marketing content creation, itinerary design, feedback analysis, personalised recommendations, and customer communication. However, the effectiveness of these applications depends on users' ability to define objectives, select appropriate tools, verify outputs, and incorporate AI-generated results into operational contexts. Recent studies in tourism education indicate that ChatGPT use is associated with learning outcomes, with digital literacy playing a mediating role. At the same time, the benefits of personalisation and learning support are accompanied by concerns about information quality, privacy, and the digital divide (Dalgıç et al., 2024; Ray, 2024).

From a curriculum perspective, Başer et al. (2025) analysed 65 undergraduate tourism and hospitality programmemes and gathered the views of 28 scholars. Their findings suggest that emerging technologies can be linked to four skill groups: technical and digital, theoretical, operational, and managerial skills. They also recommend integrating technology-related content into disciplinary areas rather than separating it from the core content of the field (Başer et al., 2025).

These findings suggest that the research gap does not concern the lack of AI tools, but rather the absence of a systematic approach to translating labour-market demands related to AI into occupational competencies and subsequently embedding those competencies in educational programmemes. Based on a synthesis of 29 studies, Chee et al. (2025) proposed an AI literacy framework comprising eight competency groups and highlighted variations across educational levels and fields. In particular, education needs to move beyond teaching how to use AI towards developing the ability to integrate AI critically, strategically, responsibly, and ethically (Chee et al., 2025).

This study addresses three research questions: (1) What groups of AI competencies are required by the tourism workforce? (2) How should generic AI competencies be contextualized for tourism-related occupational tasks? and (3) How can this competency framework be translated into directions for undergraduate curriculum development?

II. THEORETICAL BACKGROUND AND RESEARCH GAP

2.1. From AI Literacy to AI Competency

AI literacy is commonly understood as the ability to understand, use, and evaluate AI systems. However, in career-oriented higher education, the ability to operate a tool represents only an initial requirement. Competency should be demonstrated through learners' ability to mobilize knowledge, skills, attitudes, and judgement to perform a task in a specific context. Chee et al. (2025) show that research on AI literacy has identified multiple components, notably tool operation, data and algorithms, problem-solving, communication and collaboration, AI ethics, occupational competency, and content creation (Chee et al., 2025).

An important distinction is that AI competency is not equivalent to the number of tools a learner knows how to use. A student may quickly generate an itinerary using AI but still lack occupational competency if they cannot identify inaccurate information, assess the feasibility of the route, consider customer needs, or take responsibility for the final decision. Accordingly, this paper adopts a broader understanding of AI competency: the ability to understand, select, use, evaluate, and integrate AI in the performance of occupational tasks by combining disciplinary expertise, data, human judgement, and ethical responsibility.

2.2. The Specific Nature of AI Competency in Tourism Education

Tourism services are intangible, context-dependent, and co-created by multiple stakeholders. Consequently, occupational decisions rely not only on data but also on judgement concerning experience, emotions, culture, seasonality, and operational feasibility.

Research on ChatGPT in tourism education likewise indicates that technology can create learning value, but such value does not automatically arise from tool use. Dalgıç et al. (2024) identify the role of digital literacy in the relationship between ChatGPT and learning outcomes. Zhu et al. (2024) show that perceived usefulness, perceived ease of use, and, in particular, authenticity are associated with tourism and hospitality students' attitudes towards and intentions to use ChatGPT (Dalgıç et al., 2024; Zhu et al., 2024).

A synthesis of these research streams indicates that the current gap is not the absence of general AI competency frameworks, but the distance between interdisciplinary competency frameworks and the competency requirements of tourism occupations.

First, UNESCO (2024) provides a foundational competency structure designed for learners in general, while Chee et al. (2025) also demonstrate that the structure of AI literacy varies across learner groups and fields. This suggests that generic competencies need to be translated into meaningful manifestations within specific occupational contexts (UNESCO, 2024; Chee et al., 2025).

Second, research in tourism education has focused considerably on ChatGPT use, digital literacy, technology acceptance, and the impact of emerging technologies on curricula. Meanwhile, Başer et al. (2025) demonstrate the need to connect technology with occupational skills and roles, but do not provide an integrated AI competency architecture that links occupational tasks to learning outcomes and learning design (Dalgıç et al., 2024; Zhu et al., 2024; Başer et al., 2025).

Third, an approach that takes "occupational tasks" as its starting point remains underdeveloped. Such an approach would identify which tasks are being changed by AI, determine the competencies required to perform those tasks, and then translate these competencies into learning outcomes and training activities. This paper addresses this gap by contextualizing AI competency components within the specific characteristics of tourism occupations and developing a framework that can be used to review undergraduate curricula.

III. RESEARCH METHODOLOGY

The literature search was conducted using reputable international academic databases, including Web of Science, Scopus, ScienceDirect, and Google Scholar, covering the period from 2023 to 2025. The main search strings, combining the Boolean operators AND/OR, included: ("AI competency" OR "AI literacy") AND ("tourism education" OR "hospitality curriculum" OR "tourism workforce") AND ("Generative AI" OR "ChatGPT"). The selection criteria prioritized peer-reviewed research articles directly connecting AI competencies, AI applications in tourism, and undergraduate curriculum design.

This paper adopts a conceptual research approach combined with a focused literature synthesis to develop and substantiate an AI competency framework suitable for tourism education.

The synthesis process comprises four interconnected steps:

(1) Identifying foundational components: extracting competency components from established general AI competency frameworks (UNESCO, 2024; Chee et al., 2025).

(2) Contextualizing the industry: comparing these components with empirical evidence on AI applications and technological transformation in tourism and hospitality education (Başer et al., 2025; Dalgıç et al., 2024; Ray, 2024; Zhu et al., 2024).

(3) Task-based contextualization: translating generic competency components into competency indicators associated with specific tourism-related occupational tasks.

(4) Integration and derivation of implications: synthesizing the components into a two-dimensional competency framework (six domains × three developmental levels), and deriving implications for learning outcomes, course structures, teaching methods, and assessment.

The scope of this study is to develop a literature-grounded conceptual framework; it does not aim to validate a measurement scale or estimate relationships among variables. The competency domains and developmental levels are therefore presented as a proposed structure to support curriculum design and review. Empirical validation may be undertaken in future research through the Delphi method, expert surveys, and learner data. This scope is consistent with the purpose of conceptual research: clarifying the structure and relationships among concepts before developing measurement instruments.

IV. THE AI COMPETENCY FRAMEWORK FOR FUTURE TOURISM PROFESSIONALS

4.1. Definition and Structure of the Framework

The Tourism AI Competency construct is developed at the intersection of three layers of requirements: (1) foundational AI competencies (UNESCO, 2024; Chee et al., 2025); (2) the competencies required to perform tourism-related occupational tasks (Başer et al., 2025); and (3) the specific characteristics of tourism services, which involve data, business objectives, customer experience, and human judgement.

At this intersection, this paper defines Tourism AI Competency as learners' ability to understand, select, use, evaluate, and integrate AI in performing tourism-related occupational tasks, based on the combination of disciplinary knowledge, data, human judgement, customer orientation, and ethical responsibility.

Based on this definition, the six competency domains included in the framework are not six isolated skills. Rather, they are six components that address successive questions in the process of working with AI: how well does the learner understand AI (C1); for which tasks does the learner use AI (C2); what data are used and how are results evaluated (C3); how is value created for customers (C4); how does the learner collaborate with AI while retaining decision-making authority (C5); and within what ethical, legal, and professional boundaries is the entire process conducted (C6)? Accordingly, the competency table below is designed as an integrated structure in which C1–C6 can be developed through individual courses while remaining interconnected when students undertake a complete occupational task.

Table 1. Domains of the Tourism AI Competency Framework

Code	Competency domain	Core manifestations
C1	AI Literacy	Understanding AI concepts, capabilities, limitations, biases, and risks.
C2	AI Application in Tourism	Selecting and using AI for marketing, product design, market research, operations, and content creation.
C3	Data and Analytical Literacy	Reading, processing, interpreting, and evaluating data and AI-supported outputs.
C4	Digital Customer Experience	Analyzing needs, personalisation, interaction, and designing AI-supported experiences.
C5	Human–AI Collaboration	Formulating requirements, verifying, critically evaluating, adjusting, and making decisions based on AI outputs.
C6	Responsible AI Use	Data protection, privacy, transparency, bias identification, and accountability.

Source: Compiled and proposed by the author

4.2. Analysis of the Six Competency Domains

C1 – AI Literacy. This is the foundational layer that enables students to understand what AI can and cannot do, and under what conditions its outputs may be unreliable. This competency includes conceptual knowledge, recognition of model limitations, a general understanding of data, and the ability to identify risks. It is consistent with the components of AI foundations, data and algorithm literacy, and critical judgement in current AI competency frameworks (UNESCO, 2024; Chee et al., 2025).

C2 – AI Application in Tourism. This domain is not about students' familiarity with a large number of tools, but about their ability to select the appropriate tool for a specific operational task, such as developing customer personas, designing itineraries, and analysing customer segments and reviews. This is consistent with the direction proposed by Başer et al. (2025).

C3 – Data and Analytical Literacy. This domain enables students to read and evaluate tourism data, identify anomalies in AI-generated trend reports, and connect AI-supported quantitative data with operational realities. It provides the link between AI literacy and occupational decision-making competency.

C4 – Digital Customer Experience. AI can support personalisation and enhance interaction, but tourism experience cannot be reduced to a set of data variables. Students need to combine AI-generated analytical results with an understanding of customers' needs, emotions, cultures, and contexts. This competency domain therefore places the customer back at the centre of technology application.

C5 – Human–AI Collaboration. This is the most integrative competency domain. It includes the ability to communicate with AI (prompting), provide context (contextualization), critically evaluate outputs, and make combined decisions (human-in-the-loop) (UNESCO, 2024; Chee et al., 2025).
C6 – Responsible AI Use. In tourism, the processing of customer data, personal information, reviews, and behavioural profiles raises privacy and ethical requirements. Students need to understand their responsibilities when using data, the potential biases of systems, transparency requirements, and the limits of automation. C6 is therefore a cross-cutting condition rather than a topic to be taught only at the end of the programmeme.

4.3. Three AI Competency Developmental Levels and an Application Illustration

The competency development pathway is structured vertically, progressing from Awareness to AI-Augmented Professional Practice. The proposed framework's key innovation lies in redefining Level 3: learners should not stop at using AI to produce an output (Create), but must demonstrate the ability to critically evaluate it, integrate disciplinary expertise, and assume professional responsibility for the resulting decision.

Table 2. Developmental Levels of AI Competency in Tourism Professional Practice

Level	Orientation	Competency manifestations
Level 1 – Awareness	Understand	Explains AI and identifies its capabilities, limitations, and risks; uses AI with guidance.
Level 2 – Application	Apply	Selects tools, performs tasks, verifies outputs, and makes adjustments.
Level 3 – AI-Augmented Professional Practice	Create & Integrate	Integrates AI with professional expertise, data, and judgement to solve complex problems and assumes responsibility for decisions.

Source: Compiled and proposed by the author

The three developmental levels are derived from UNESCO's (2024) "Understand–Apply–Create" logic but are reinterpreted in light of the requirements of tourism occupational competency. Level 1 addresses whether learners understand and can recognise AI; Level 2 asks whether they can use and verify AI in a defined task; and Level 3 sets a higher requirement: whether they can integrate AI with professional expertise, data, and judgement to solve complex problems and take responsibility for their decisions. This progression moves from knowing about AI, to working with AI, and finally to performing AI-augmented professional work, while avoiding the equation of AI-generated outputs with genuine occupational competency (UNESCO, 2024; Chee et al., 2025).
Practical illustration of competency development across the three levels:
To demonstrate the applicability of the framework, consider the following occupational task: "Designing a personalised tour programmeme for a group of elderly European tourists visiting Central Vietnam."
Level 1 (Awareness): Students know how to use ChatGPT or Claude to enter a simple prompt, such as: "Give me a four-day, three-night travel itinerary for Da Nang and Hoi An." Students can identify the destinations suggested by AI but cannot yet assess the itinerary's feasibility or its suitability for the health and mobility needs of older travellers.
Level 2 (Application): Students apply advanced prompt engineering techniques and provide detailed context, including the characteristics and preferences of elderly European tourists, a slower travel pace, and dietary requirements. They obtain a detailed itinerary from GenAI and then independently cross-check the actual opening hours of attractions and revise any unsuitable elements.
Level 3 (AI-Augmented Professional Practice): Students combine AI with the analysis of tourist behavioural data and advanced professional judgement. They use AI to generate three alternative optimised itineraries, analyse costs and benefits for the tour operator, assess medical and weather-related risks, incorporate distinctive local cultural values for which AI may lack adequate data, verify the confidentiality of customers' health information, and assume full accountability for the tour's feasibility and quality before managers or customers.

V. IMPLICATIONS FOR THE REDESIGN OF TOURISM EDUCATION CURRICULA

Integrating AI into education should not be achieved by simply adding a standalone technology course. Instead, the entire educational pathway needs to be redesigned in response to changes in occupational tasks. The following table presents a matrix for allocating competencies C1–C6 and developmental Levels 1–3 across a four-year undergraduate tourism programmeme.

Table 3. Matrix for Integrating AI Competencies into the Curriculum, Teaching Methods, and Assessment

Code	Suggested courses	Developmental level	Teaching methods	Assessment methods
C1	Introduction to Tourism / Applied Informatics / Digital Transformation	Years 1–2 (Level 1)	Interactive lectures; discussion of AI case studies.	Knowledge tests; short essays analysing AI risks.
C2	Digital Tourism Marketing / Tour Design and Operations	Years 2–3 (Level 2)	Project-Based Learning (PBL); practical work in a tourism technology lab.	Assessment of AI-generated products accompanied by real-world verification reports.
C3	Tourism Market Research / Tourism Data Analytics	Years 2–3 (Level 2)	Hands-on processing of tourist data using AI analytics.	Data-report analysis assignments; verification of errors and biases.
C4	Customer Experience Management (CX) / Tourism CRM	Year 3 (Levels 2–3)	Role-play; development of personalised journey solutions.	Assessment of interaction scenarios and digital customer journey maps.
C5	Professional Internship / Graduation Thesis / Capstone Project	Year 4 (Level 3)	Work-Integrated Learning (WIL); solving business problems.	Competency portfolio; project defence; justification of professional decisions.
C6	Tourism Law and Ethics / Embedded across courses	Throughout all four years (Levels 1–3)	Discussion of real incidents involving data leaks and copyright infringement.	Assessment of ethical and confidentiality criteria in all learning outputs.

Source: Compiled and proposed by the author

Regarding teaching methods and assessment, the educational process should shift decisively towards learner-centred approaches, such as Project-Based Learning (PBL), Problem-Based Learning, and Work-Integrated Learning (WIL). Learning outcomes should not be assessed solely by grading the "final product" generated by AI; assessment should also examine the "thinking process" (process-oriented assessment): how students formulate prompts, verify information, and take responsibility for their professional outputs. Assessment should simultaneously consider professional quality, the use and verification of data, the extent to which AI outputs are critically evaluated, accountability, and ethical responsibility.

Theoretically, the proposed framework contextualizes AI competency from the general educational domain to the performance of tourism-related tasks, thereby connecting AI literacy with occupational competency. In practical terms, the framework provides an evidential basis for educational institutions to identify competency gaps, allocate competencies across courses, and design learning outcomes along a progression from awareness to AI-augmented professional practice. For businesses, this approach provides a basis for participating in the identification of AI-supported tasks, common errors, and the entry-level competency requirements for new employees. The framework therefore does not replace existing AI competency frameworks; rather, it makes them more operationally applicable to tourism education.

VI. CONCLUSION

AI is fundamentally changing the structure of occupational tasks in the tourism industry, requiring a corresponding transformation in higher education. The central issue is not how many AI tools students know how to operate, but whether they can collaborate with AI to solve occupational problems effectively, creatively, and responsibly.

This paper contributes an integrated Tourism AI Competency Framework comprising six domains (C1–C6) operating across three developmental levels (Levels 1–3), and illustrates its application through a tourism-related occupational task. A key implication for higher education institutions is the need to redesign curricula using an occupational task-based approach, allocate competencies across a four-year course matrix, and systematically renew teaching and assessment methods.

Limitations and future research: This study is limited to the development of a conceptual framework based on a literature review. Future studies should empirically validate the framework using the Delphi method, involving tourism experts and university lecturers, and should develop a measurement scale and test it using confirmatory factor analysis (CFA) with a sample of tourism students.

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