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RESEARCH ARTICLE

REVISED Systematic Literature Review (SLR) for the development of a Competence Framework on Entrepreneurship: The case of the EICAA-Competence Framework

[version 2; peer review: 2 approved]

Jaume Teodoro

Tecnocampus, Universitat Pompeu Fabra, Barcelona, Catalonia, 08301, Spain

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Abstract

This article describes the research conducted to establish the Competency Framework for the EICAA project (EICAA-CF) before the development of an open online platform for entrepreneurship promotion. EICAA stands for the Entrepreneurial and Intrapreneurial Competences Assessment Alliance. It is an Erasmus+ project that aims to bridge the gap between tools that assess individuals' entrepreneurial competencies and the adoption of tailored training actions. To achieve this objective, it was decided to use Entrecomp as a reference, as it is a framework of competencies currently in force in Europe, promoted by the European Commission's Joint Research Centre. However, since it was developed a decade ago, it requires revision. To this end, a two-part investigation was conducted. In the first part, which forms the bulk of the research, a Systematic Literature Review on entrepreneurial competencies is undertaken. In the second part, a prospective analysis using the Delphi method is employed to conclude from the previously obtained results. The results of the first part, as is typical of any systematic literature review (SLR), include relevant references from the literature, which are quantified in tables included in this study. These tables help confirm some findings and address questions or supplement others by the subsequent Delphi process.

In conclusion, the competency framework ultimately adopted in the project above is presented. This framework is an evolution of Entrecomp, with some key aspects highlighted at the end of this article. In the 'Ideas and Opportunities' area of competencies, the concept of design was included. In the "Resources" area, the notion of

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1. **Orestis Terzidis**, Karlsruhe Institute of Technology, Karlsruhe, Germany

2. **Francisco Banha**, University of Algarve, Faro, Portugal

Any reports and responses or comments on the article can be found at the end of the article.

digital competencies was introduced. Finally, in 'Into Action', the concept of process management was incorporated.

Keywords
Entrepreneurship; Entrepreneurship Education; Entrepreneurial Competences; Competence Framework; Competence-based learning (CBL); Systematic Literature Review (SLR); Delphi;



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REVISED **Amendments from Version 1**

Following the reviewer's suggestions, the reader will observe notable improvements in this revised version. These include: i) a clarification of the scope of WP2 and, specifically, the SLR study conducted by the author- in the Introduction section-; ii) more precise details regarding the SLR sample; iii) more rigorous details about the Delphi process used for validation; iv) explanations of the meaning of the coded contextual factors; v) a reference to Table IV, giving the reader access to all the sources that contributed to its creation; vi) a discussion section, previously absent, highlighting the limitations of the work and outlining future research directions; and vii) new references that offer a more comprehensive understanding of the work within its current context.

Any further responses from the reviewers can be found at the end of the article

Introduction

The ability to act and think entrepreneurially is a crucial endowment in today's knowledge-based society (Acemoglu, 2009; Acs *et al.*, 2008; Audretsch, 2007; Baumol & Strom, 2007; Osipovskaya *et al.*, 2024; Rațiu *et al.*, 2023). Thus, higher education institutions (HEIs) across Europe have been called upon to offer entrepreneurship education, stimulate entrepreneurial competencies among students, and become more entrepreneurial (European Commission, 2013b; European Commission, 2015; Teodoro & Bernadó, 2025; Wilson & Vyakarnam, 2009). To facilitate this, the Joint Research Centre of the European Commission (European Commission, 2025) has provided educators and trainers with a "reference methodology" that is based on a broad entrepreneurship definition ("creating value for others") – the European Entrepreneurship Competence Framework–EntreComp (Bacigalupo *et al.*, 2016). This competency framework (CF) is a structured model that outlines the competencies required for effective entrepreneurial performance, providing a list of competencies (and sub-competencies, referred to as threads) necessary for successful performance. Developing a competency framework (CF) is essential for any training plan and is especially necessary for competency-based training strategies. However, an operational setting that allows for the "capture" of entrepreneurial competence profiles of learners has not been established yet. As a result, Higher Education Institutions (HEIs) and businesses lack a coherent, instrumental basis for assessing individual entrepreneurial competencies and accurately addressing specific competence development needs through education and training interventions in response to the assessment results.

The EICAA project aimed to bridge this gap. The EICAA was developed under Erasmus+ project funding (European Commission). It was realised as an interdisciplinary 3-year University-Business collaboration (four HEIs, four enterprises, and one research institute). It was expected to unfold an impact in five EU countries by reaching out to 15,000+ students, 30+ educators, and 150+ employees (EICAA's primary target groups). EICAA is an online platform for entrepreneurial education that provides a validated entrepreneurship survey. Educators analyse the stage of development of their group's entrepreneurial competencies and obtain recommendations for teaching modules tailored to the group. In short, it is an initiative grounded in research on entrepreneurship and intrapreneurship, aiming to teach, guide, and coach students or employees in developing entrepreneurial competencies (Teodoro *et al.*, 2022).

The first milestone of the project involved identifying the key entrepreneurial competencies and modelling them into the "EICAA Competence Framework" (EICAA-CF). To ensure this framework is rigorously designed, remains current, and remains aligned with the latest developments, a systematic literature review (SLR) was conducted. This article reports, analyses, and synthesises the results from Work Package 2 (WP2) of the EICAA cited project (Teodoro & Bernadó, 2023) —specifically, the Systematic Literature Review (SLR) and the subsequent Delphi validation—conducted under the author's scientific responsibility. A general overview of the project is provided in previous documents (Anand *et al.*, 2023; Teodoro *et al.*, 2022), while the present paper focuses specifically on WP2 EICAA-CF.

An SLR is a way of synthesising scientific knowledge to answer a particular research question in a way that is transparent and reproducible while seeking to include relevant published evidence on the topic and appraising the quality of this evidence. In this case, the SLR was developed using the EntreComp framework, which was introduced in 2015 as part of Europe's New Skills Agenda, as a reference. The EICAA-CF aimed to build on what had already been developed and proven useful. Table 1 summarises this requirement and the other design principles for establishing the EICAA-CF.

This paper presents the methods, results, and conclusions of a systematic literature review (SLR)-based research study on entrepreneurship competencies conducted using scientific papers and grey literature.

The remainder of this paper is organised as follows. After this introduction, which aims to situate the topic and its motivation, the theoretical foundations related to entrepreneurship issues were developed. The data and methodology section then explains the research process as it was carried out. The Results section presents the findings, which are based on the project report document (Teodoro & Bernadó, 2023). Finally, the conclusions reveal the EICAA-CF.

Theoretical background

To frame the topic correctly, this section is organised into four parts. First, the concept of entrepreneurship is developed, followed by a conceptualisation of the meaning of competencies. In the third part, the Competence Framework (CF) on entrepreneurship aims to situate competence in entrepreneurship education. Finally, Entrecomp CF is presented, as it serves as a reference for the development of the present systematic literature review (SLR).

Table 1. Design principles for EICAA-CF.

Target	Primary target groups: • Education: university educators and senior officials. • Business: heads of human resources departments, project leaders, senior management. Secondary target groups: • Individuals (e.g., students, employees, entrepreneurs, would-be entrepreneurs) • Researchers • Policy makers (in the area of education and training)
Purpose	• **[Educators]** Assessing the entrepreneurial competences of a group of students to design or improve a course. Use the Intervention repository based on the result. • **[Intrapreneurship]** Assessing the entrepreneurial competences of their employees or teams to design proper training, and/or to identify new roles that the team needs to acquire. Use the Intervention repository based on the result. • **[Researcher]** Perform investigations on entrepreneurial competence development or progress of a group of individuals (transversal or longitudinal). • **[Individual]** Assess their own competences. No tailored intervention repository (IR). • **[Team]** Evaluate the coverage of competences in a team of entrepreneurs and identify the role that each member of the team can play, based on each one's strengths.
Structure	• EICAA-CF has to add new perspectives to EntreComp according to state of the art in 2022–23, keeping its structure in areas, competences and threads. • Areas are groupings of competences. • Threads are like "sub-competences". Competences and threads might be overlapping. • Threads or learning outcomes might be rephrased according to literature review. • New additions or deletions are considered at the thread level, when possible. • If a new thread needs greater importance, it might be leveraged/promoted to competence level. • EICAA-CF will keep the neutrality towards theories and methods, although it will introduce some concepts from current practitioner approaches. • Introduction of Intrapreneurship perspective as an adaptation to the context of entrepreneur as an agent of change in stablished organizations.

Entrepreneurship

In the Schumpeterian economy (Schumpeter, 1950), new value is created through "creative destruction," in which the entrepreneur plays a key role in detecting opportunities and undertaking the risk to tackle them in a new company (McMullen & Shepherd, 2006). This brings us to the classic concept of entrepreneurship, which is primarily associated with driving economic growth through innovation. Kirzner (1973; 1999) was the first to propose alertness to new opportunities as the key entrepreneurial characteristic that individuals must possess to succeed in setting up new ventures. Kirzner's theory was further extended to include skills such as creativity (Kirzner, 2009) and self-awareness (Gaglio, 2004). Later, Tang *et al.* (2012) extended previous theories on what could be called entrepreneurial skills and proposed that alertness, along with creativity and self-awareness, form the basic entrepreneurial skills setup. This definition has predominated within the positivist socio-economic paradigm of entrepreneurship. (Chell, 2013)

This literature reflects a limited understanding of entrepreneurship, often oversimplified as the creation of start-ups. Nowadays, the concepts of entrepreneurship and entrepreneurial activities have spilt over from their original economic domains (Komarkova *et al.*, 2015). A broader understanding of entrepreneurs, as adopted by EntreComp, is approached as "when you act upon opportunities and ideas and transform them into values for others. The value created can be financial, cultural, or social in nature. Therein, entrepreneurs are understood as agents of change across all spheres of life" (Bacigalupo *et al.*, 2016).

Beyond entrepreneurship, intrapreneurship is also an associated term. Intrapreneurs, also known as corporate entrepreneurs, are considered essential for the growth of organisations (Kuratko & Audretsch, 2013). Corporate entrepreneurs have proven crucial for a company's internationalisation, new product development, and definition of new business models (Ireland *et al.*, 2009). As Martiarena (2013) describes, an intrapreneur, as opposed to an entrepreneur, exhibits significant risk aversion, has a lower level of opportunity recognition, and believes that their skills are inferior to those of an entrepreneur. Lackéus (Lackéus *et al.*, 2020) defines an entrepreneurial employee as "someone who cares so much about an issue that she takes collaborative action despite inherent uncertainty and risk, trying to create something new envisioned to be of significant value for others, and who does this in a process characterised by trial-and-error-based learning. (Hisrich *et al.*, 2007) defined intrapreneurs or corporate entrepreneurs as those who exhibit innovative and

enterprising behaviour within an existing organisation. They add a distinction between entrepreneurship and intrapreneurship: the former is for self-gain and the latter for organisational gain.

As mentioned and justified in this section, our approach to entrepreneurship in EICAA-CF is a broader understanding of entrepreneurship, where entrepreneurial activity aims to provide value to others". Since our departure point is this broader understanding of entrepreneurship, our systematic literature review encompasses articles that comprehensively research entrepreneurship and intrapreneurship and then examine the factors or dimensions that are relevant drivers of entrepreneurial activity.

Competences

The concept of competence has been defined in several ways (Eraut, 1997; Hunt, 1998; Lizzio & Wilson, 2004; Tillema *et al.*, 2000; Titus, 1994). A common notion in most descriptions of competence is that it comprises interconnected pieces of knowledge, skills, and attitudes that can be used to solve problems adequately. Hunt, as cited by Mitchelmore and Rowley (Mitchelmore & Rowley, 2010a), suggests that "competent behaviour results from a variety of factors including an individual's motivation, personality traits, self-concept, knowledge or skill and it is perhaps therefore not surprising that the boundaries and relationships between these terms are ill-defined." The European Parliament and Council (European Parliament & Council, 2006) published key competencies for lifelong learning, in which competencies are defined as a set or combination of skills, knowledge, and attitudes appropriate to the context. The European Commission has widely adopted this approach, which is often referred to as the K-S-A framework. An approach like the conceptualisation of competence has been adopted by the European Qualification Framework (EQF) (European Parliament and Council, 2008). The EQF defines competence as the "proven ability to use knowledge, skills, and personal, social, and/or methodological abilities in work or study situations and professional and personal development". The EQF is based on learning outcomes and describes knowledge, skills, and competencies against eight reference levels. Komarkova (Komarkova *et al.*, n.d.) compared the differences between the two perspectives. Thus, in the K-S-A framework, competence is a combination of knowledge, skills, and attitudes, whereas, in EQF, competence refers to the ability to apply knowledge and skills in specific situations (a narrower understanding of competence).

In this study, we use the definition provided by Eraut, as it incorporates both aspects. They define competence by describing competent professional behaviour within a range of relevant job situations and the knowledge, skills, and attitudes it requires. To this end, our approach utilises the definition of competence as outlined in the K-S-A framework, as it provides a broader perspective and aligns with the approach taken by EntreComp.

Competence Frameworks (CFs) on entrepreneurship

A competency framework (CF) is a structured (often hierarchical) model that outlines the specific competencies required for effective performance in an educational or professional setting. A competence framework provides a list of the competencies required by an individual or group to perform successfully in each domain. Developing CF is essential for any training plan. Therefore, it is especially necessary to develop competency-based training strategies. Competency-based learning (CBL) is a pedagogical model in the teaching-learning process that focuses on the competencies acquired by students, tailored to their specific needs and motivations, thereby enhancing their autonomy and responsibility (Henri *et al.*, 2017; Scott, 1982, n.d.). It is based on a teaching-learning system that progressively develops students' autonomy and ability to learn how to learn. It is a pedagogical approach based on the connection and interrelation of subjects that contribute by providing scientific or technical knowledge and developing both generic and specific skills, in which students are the true driving force of their learning. For this CBL, a Competence Framework is required for its implementation (Henri *et al.*, 2017).

The basic elements of competence frameworks are a list of competencies, competence descriptors, and a categorisation or grouping of competencies according to specific criteria. Competence frameworks may also translate competencies into learning outcomes, and they can be complemented with assessment tools.

Many competence frameworks in different domains serve as inspiration. (Boyatzis & McClelland, 1982) developed a model of managerial competencies composed of 100 competencies observed in a sample of over 2.000 managers, organised into four domain clusters and three levels. DigComp (European Commission, 2013a) is another example that serves as a case in point. It serves as the reference framework for Digital Competences for Citizens, supported by the European Union. It is based on five competence areas, 21 competencies, and a progression model comprising eight levels. An interesting contribution of DigiComp is its examples of use, which provide specific examples of behaviours linked to competencies in two scenarios: employment and learning. This could be adapted for EICAA-CF to provide examples of use in various types of entrepreneurship (e.g., educational contexts, social entrepreneurship, and intrapreneurship).

Regarding the specific entrepreneurial competence framework, some cases deserve attention and serve as inspiration. One of these is early work on the identification of entrepreneurial competencies (Bird, 1988; Bird, 2019). Bird reviewed the entrepreneurial competencies existing in the literature and whether they had empirical support. She recognises that many of the entrepreneurial competencies identified at that time were derived from studies on managerial competencies. She reviews the work by Boyatzis by identifying the entrepreneurial competencies at the three levels he identified: *motives and traits* of the successful entrepreneur, *social role and self-concept*, and *skills and behaviours*. She then classifies the competencies according to these three levels and according to whether there is empirical support. Subsequently, (Mitchelmore & Rowley, 2010b) a review of the academic literature on entrepreneurial competencies was conducted (Mitchelmore & Rowley, 2010b). They acknowledge that competencies comprise components

that are deeply rooted in the individual's background (traits, personality, attitudes, social role, and self-image), as well as those that can be acquired through training, education, and work experience (skills, knowledge, and experience). They categorised competencies into four groups: entrepreneurial, managerial, human relations, and conceptual and relationship competencies.

Regarding the methodology, they did not conduct a systematic literature review (SLR) but rather a review of the most common frameworks of entrepreneurship competencies found in the literature, as well as the relationship between entrepreneurial competence and business performance. Another study that deserves attention is that by Morris *et al.* (Morris *et al.*, 2013). This study distinguishes between managerial and entrepreneurship competencies. The authors acknowledge that specific types of entrepreneurship may require other competencies. Some examples include balancing commercial and social objectives in social entrepreneurship, navigating *politics* in corporate entrepreneurship, and understanding cultural contexts in international entrepreneurship. Finally, we focus on the recent work by Tittel and Terzidis (Tittel & Terzidis, 2020). This framework is derived from a systematic literature review (SLR) that searched several databases using terms related to entrepreneurship and competence during the decade 2008–2018. The final sample of articles, after filtering by title, eliminating duplicates, and excluding papers related to personality traits and other categories unrelated to entrepreneurial competence, consisted of 32 papers. From this list, they obtained 57 competencies, which were also matched with another list of 32 competencies identified in other frameworks of the most cited authors.

Entrecomp competence framework

EntreComp is a competence framework for entrepreneurship established to support individuals, groups, and organisations in actively participating in society and providing value to others. It was designed using a mixed-model approach comprising a literature review, studies of various initiatives, case studies, and expert consultations. Entrepreneurship in EntreComp is understood as a transversal competence. This is defined as follows:

> "Entrepreneurship is when you act upon opportunities and ideas and transform them into value for others. The value created can be financial, cultural, or social in nature.

The EntreComp conceptual model is composed of three competence areas: 'Ideas and opportunities,' 'Resources', and 'Into action.' Each of these areas comprises five distinct competencies, totalling 15 competencies. The conceptual model is supplemented with a "competence progression model," which consists of four competence levels (foundation, intermediate, advanced, and expert), each divided into two sublevels. The deployment of competencies along the progression and sublevels resulted in a list of 442 learning outcomes.

According to the expert working groups, EntreComp originates from three closely intertwined competence areas, with entrepreneurship as the primary competence that stands above all three. The 15 competencies are interrelated and interconnected and should be regarded as parts of a whole. This implies that entrepreneurship as a competence comprises 15 building blocks. Figure 1 illustrates the general structure of this framework, encompassing its three areas and all 15 competencies.

The EntreComp model is theoretical and has few empirical validations to date (Osipovskaya *et al.*, 2024; Raţiu *et al.*, 2023). As stated in the document, this framework may need amendments or refinements when tested by practitioners and end-users ten years after its launch.

Methodology

The goal of this research is to identify the competencies that align with the EICAA Competence Framework. To proceed, we follow a two-step methodology.

1. **SLR itself:** In the first step, we performed competency mapping and matching using a systematic literature review (SLR) strategy. These SLR results are presented in a competency table organised according to the Entrecomp framework, which includes information on the relevance of different competencies in terms of the quantity and quality of studies that cite them. In addition, this table contains, under the "other" group, all findings related to competencies and dimensions that are equally relevant but not included in the Entrecomp framework, which must be analysed through prospective analysis.
2. **Validation.** In the second step, validation was carried out using the Delphi methodology. This step aims to

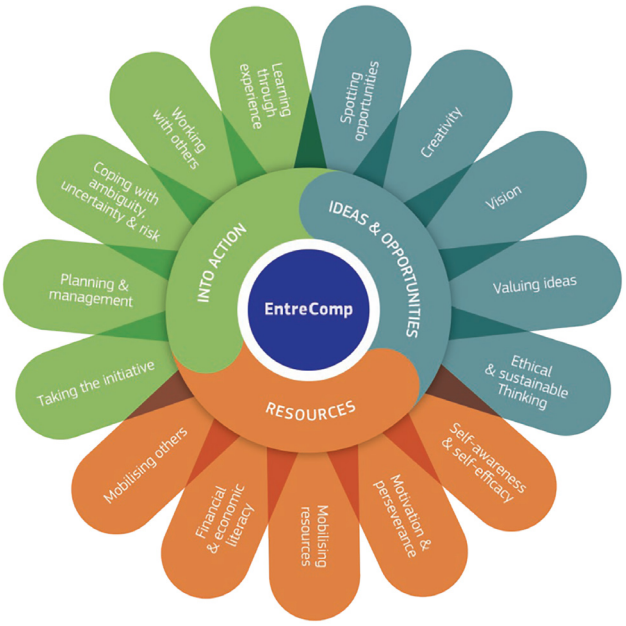


Figure 1. EntreComp model with the three competence areas and 15 competencies. Source: European Commission (2018).

synthesise the information, make decisions, and establish a framework based on the systematic literature review (SLR).

Step 1: SLR itself

The purpose of this step was to identify competencies and relate them to the Entrecomp competency framework. The identification process, known as **competence mapping**, is used to determine the essential attributes (knowledge, skills, and attitudes) required to perform the job effectively. It consists of breaking a given role or job into its constituent tasks or activities and identifying the competencies (technical, managerial, behavioural, conceptual, etc.) needed to perform the same successfully." (Chouhan & Srivastava, 2014) The current SLR identifies what an entrepreneur does, particularly what an individual is doing when undertaking (*providing value to others*), and then identifies the relevant competencies associated with performing such activities. Thus, this is the process of competency mapping. However, rather than performing this process from scratch, the identified competencies are matched with the competencies already existing in the cited EntreComp framework. This enables a better understanding, operationalisation, and validation of EntreComp competencies, as documented in the literature, and the identification of potential new competencies not currently covered by such a framework. Thus, our method is a mixed approach that combines competence mapping and **competence matching**. The matching process provides evidence and contextual information on the relevance of the related competencies. Additionally, we will assess the completeness of EntreComp and determine whether any new additions are necessary.

Thus, this systematic literature review (SLR) work is guided by the following research question: (i) What does an entrepreneur or intrapreneur do, and what factors lead to successful entrepreneurship or intrapreneurship? (mapping); and ii) How well does EntreComp capture these factors? (matching). In the SLR, we adopted the guidelines and best practices for conducting a systematic literature review (Snyder, 2019). In this sense, once the research question is defined and the sample is determined, the analysis is carried out to organise and codify the knowledge based on the identified content. Below, we explain the SLR process in two parts:

Sample of documents. The sample consisted of research papers obtained through a systematic search of the Web of Science, Scopus, and Inform/ProQuest. The search terms were combinations of the terms entrep* or intrap*, appearing as a topic of the paper. We did not restrict the search to articles that were already addressing competencies but instead chose a broader scope, considering entrepreneurial activity from different approaches and perspectives. This allowed us to investigate not only papers that explicitly addressed competencies but also articles on what entrepreneurs and intrapreneurs do, thereby enabling answers to research question 1.

Given the vast literature on entrepreneurship and skills, we initially used a high-citation-count filter (>100 citations) as a seeding heuristic to efficiently identify influential review articles. This threshold was not applied as a strict inclusion rule or as a quality indicator. When the selected reviews pointed to recent primary studies with fewer than 100 citations or to emerging conceptual work, these additional publications were examined and, where relevant, included in the analysis. To broaden perspectives beyond highly cited academic work, we also incorporated 54 grey literature documents (e.g., European Commission policy reports and practitioner frameworks), as recommended by some authors (Briner & Denyer, 2012). In this study, citation counts are therefore used descriptively to characterise the corpus, rather than as a rigid exclusion criterion; the potential bibliometric and language bias introduced by this heuristic is explicitly acknowledged in the Limitations.

The database search results were merged and duplicates removed. After screening titles and abstracts against the inclusion criteria, 84 academic papers were retained for full-text analysis. Together with the 54 grey literature documents, this yielded a final corpus of 138 papers that were coded in NVivo.

Analysis of the sample. To analyse the relevant factors that lead to successful ventures, a content analysis protocol was established and implemented using NVivo. The software enables researchers to select text fragments from a given paper and label them according to a specified category or a category chosen from a predefined set of categories (or codes). Categories can also be created inductively while reading the paper. Once the paper coding is completed, the researcher can easily identify texts that are labelled under the same category and analysis.

The content analysis protocol is based on a combination of deductive and inductive coding. We initially defined a set of 15 codes representing the 15 competencies of EntreComp, which were grouped into competence areas, namely "Ideas & opportunities", "Resources, and "Into action". This allowed researchers to identify the factors or dimensions of successful entrepreneurship that could be attributed to one of the existing competencies of EntreComp. If any of the competencies of EntreComp did not address the factors or dimensions identified in the literature, the researcher could create a new category, which meant that a potential new competence could be considered in later stages of the analysis.

Because a team of researchers performed the coding, we controlled the variability of code induction by working on an initial sample of 15 papers. The reviewers coded an initial sample of 15 random papers and suggested new subcodes (or subcategories). After agreeing on the names and descriptions of the new subcategories, they were included in the existing code set under the category "Other." Subsequently, another sample of 15 papers was distributed, and each paper was assigned to a team of two reviewers for coding and evaluation. The intercoder reliability of the pairs of teams was measured, and in cases of discrepancies, these were discussed and resolved in several meetings. After the second round, there were no significant additions to the subcategories. The remaining papers were distributed to a team of researchers. Once the researchers completed their reviews, the results were sent and collected for the master review project. The coding was reviewed and fine-tuned by a lead team of senior researchers. This ensured the consistency of the content analysis throughout the entire set of articles. The final codebook is presented in Table 2.

Table 2. Codebook used in the content analysis.

1. IDEAS&OPPORTUNITIES 1.1. Spotting opportunities 1.2. Creativity 1.3. Vision 1.4. Valuing ideas 1.5. Ethical and sustainable thinking	3. INTO ACTION 3.1. Taking the initiative 3.2. Planning & management 3.3. Coping with uncertainty, ambiguity & risk 3.4. Working with others 3.5. Learning through experience
2.RESOURCES 2.1. Motivation & perseverance 2.2. Self-awareness & self-efficacy 2.3. Mobilising resources 2.4. Financial & economic literacy 2.5. Mobilising others	4. OTHER 4.1. Individual demographics 4.2. Psychological factors 4.3. Experience & prior knowledge 4.4. Problem solving 4.5. Life Cycle 4.6. Contextual factors 4.7. Narrative factors 4.8. Intrapreneurship-specific factors 4.9. Miscellaneous

As mentioned, EntreComp served as the primary reference structure for the codebook, providing the 15 baseline competences grouped into three areas. In addition, other competence frameworks and reviews for entrepreneurship and management were consulted (Bird, 2019; Boyatzis, 2008; Mitchelmore & Rowley, 2010a; Morris *et al.*, 2013; Tittel & Terzidis, 2020; Vuorikari *et al.*, 2022). These sources inform the interpretation of competences and the identification of gaps.

Once the coding was completed, the next phase consisted of reading the fragments of the coded text under each competence. The protocol for the review and content analysis was written, shared, and refined prior to coding commencement. The review team regularly shared updates on progress and addressed any doubts or inconsistencies that arose during the process. The composition of the review team was heterogeneous, as it consisted of researchers from different age groups, backgrounds, nationalities, and affiliations with five universities and companies. This allowed for a varied set of perspectives that greatly enriched the analysis and minimised potential biases, as suggested by Kraus (Kraus *et al.*, 2020). To proceed in this direction, they relied on the data coded in the SLR within the "other" groups. This group includes all factors not included in the initial codebook. Relevance in terms of their appearance motivates their introduction into the codebook. The results of this analysis are presented in the results section using a table that adds metrics to each element of the codebook.

Step 2: validation

It is a synthesis process in which the goal is to determine which competencies will be included in the competency framework. It consists of several rounds of a Delphi process with experts.

The starting point is the gross result of the SLR, where each competence is coded and quantified. These coding results enabled us to identify the factors or dimensions of successful entrepreneurship that could be attributed to the existing competencies in EntreComp, as well as to pinpoint potential new competencies not previously covered. In this step, decisions are made focusing on the following aspects: a) definition of competence according to the literature, b) comparison of competence in the literature concerning that in EntreComp, and c) insights, that is, findings from the literature that could lead to a new competence or a refinement of existing competencies.

At this stage, the research team made crucial decisions about the appropriateness of maintaining and introducing new competencies into the competency framework based on the gross data coded in the systematic literature review (SLR). The codes were classified as they appear in EntreComp, grouped under three areas: *Ideas and opportunities*, *Resources,* and *Into Action*. A category named "Other" was also included to define potential new codes, such as *Individual demographics* and *psychological factors*. This group encompasses all factors that were not initially included. Relevance in terms of their appearance drives the validation process using the Delphi method. The Delphi method is a systematic method of predictive analysis based on an organised collection of expert opinions (Linstone & Turoff, 1975). The objective is to achieve consensus on a topic based on interactive discussions among experts (Kavoura & Andersson, 2016)

In the EICAA project, the Delphi process involved a panel of 14 experts, each proposed by a different consortium partner, and was conducted once the SLR was completed, at the end of 2002 and the beginning of 2023. The panel included academics and university researchers in entrepreneurship education, as well as professors with extensive experience in higher education. A questionnaire was developed to assess and comment on the competences identified in the SLR. After each round, the answers were compiled into an anonymous summary, organising the main arguments for and against specific competences and threads. This summary was shared with all participants, and an online discussion session was held to seek consensus. Three online rounds were conducted. Although no formal statistical threshold was imposed in advance, the expert panel agreed that values ≥75% in favour of a competence would indicate consensus. When this level of agreement was not reached,

additional arguments and discussion were invited, and in some cases, items were reformulated. The outcome of this process was a provisional version of the EICAA-CF, which was then used in a pilot test with the primary target groups. The pilot test generated further feedback and discussions within the expert panel, after which the final competence framework was agreed. Similar Delphi-based procedures and subsequent pre-tests also underpinned the development of the subsequent EICAA rubric system and the EICAA Competence Monitor (CM), which builds on the framework reported in this article.

Results

Table 3 summarises the results of the coding performed on the full sample of documents (also referred to as gross results). For every competence (code), we display the number of coding references (i.e., the number of text fragments coded under

Table 3. Coding results of the SLR.

Codes	Number of coding references	Aggregate number of coding references	Number of items coded	Aggregate number of items coded
1. IDEAS & OPPORTUNITIES		**1498**		**99**
1.1. Spotting opportunities	**641**	42,8%	86	
1.2. Creativity	235	15,7%	55	
1.3. Vision	201	13,4%	34	
1.4. Valuing ideas	238	15,9%	32	
1.5. Ethical and sustainable thinking	183	12,2%	17	
2. RESOURCES		**851**		**96**
2.1. Motivation & perseverance	243	28,6%	51	
2.2. Self-awareness & self-efficacy	183	21,5%	39	
2.3. Mobilising resources	210	24,7%	52	
2.4. Financial & economic Literacy	92	10,8%	28	
2.5. Mobilising others	123	14,5%	35	
3. INTO ACTION		**1652**		**115**
3.1. Taking the initiative	223	13,5%	53	
3.2. Planning & management	300	18,2%	54	
3.3. Coping with uncertainty, ambiguity & risk	303	18,3%	71	
3.4. Working with others	376	22,8%	73	
3.5. Learning through experience	**450**	27,2%	59	
4. OTHER		**3628**		**129**
4.1. Individual demographics	74	2,2%	24	
4.2. Psychological factors	**910**	27,1%	76	
4.3. Experience & prior knowledge	246	7,3%	55	
4.4. Problem solving	91	2,7%	19	
4.5. Life cycle	484	14,4%	60	
4.6. Contextual factors	554	16,5%	66	
4.7. Narrative factors	111	3,3%	13	
4.8. Intrapreneurship-specific factors	178	5,3%	39	
4.9. Miscellaneous	715	21,3%	61	

Notes: The table summarises the number of coding references (i.e., cited paragraphs) and several items coded (i.e., documents) for each competence of EntreComp, using the full sample of documents (those selected for the SLR and those added as "other" relevant by the researchers).

that competence) and the number of items (or documents). The unit "text fragments" was agreed to be the paragraph. Thus, if a paragraph contained several sentences, we coded the whole paragraph for that competence. This means that one paragraph can have several competencies, and, at the same time, competence can appear in several paragraphs of the same document. The number of coded references provided us with a general idea of the relevance of competence in the literature. Thus, the competence area "*Into action"* receives more attention in the literature than the other two areas, although it is closely related to the competence area "*Ideas & opportunities*."

When examining the competence level, *Spotting Opportunities* receives the highest attention, with 641 coded references and 86 documents referencing it. This emphasises the relevance of the literature on entrepreneurship to opportunity recognition. The second most important competence was *Learning through experience*, with 450 references and 59 documents. The following three relevant competencies, categorised under the area "Into Action", received between 300 and 376 references: working with others, coping with uncertainty, ambiguity, and risk, and planning and management. By examining these highly cited competencies, we can provide a first approach to the question, "What does an entrepreneur do?" Based on these results, the answer would be that the entrepreneur mostly spots opportunities copes with uncertainty, works with others, learns through experience, plans, and manages. In a way, this supports the emphasis in the literature on the entrepreneur as an individual who recognises opportunities and can bring these ideas into value.

If we examine the "*other"* category, we observe that the literature emphasises the relevance of entrepreneurs' psychological factors. This is a comprehensive "big box" containing all references to various psychological traits, such as personality, emotional intelligence, and cognitive factors. Another relevant area mentioned in the literature is competencies related to the life cycle, specifically those involved in bringing an idea into reality. A code labelled "Contextual factors" (Table 2, group 4.6) was developed inductively to capture environmental conditions—such as policy frameworks, support structures, entrepreneurial ecosystems, and resource accessibility—that inspire effectuation-oriented perspectives. The literature on entrepreneurship consistently highlights the importance of such contextual enablers and constraints (Komarkova *et al.*, 2015; Kuratko & Audretsch, 2013; Mansoori & Lackéus, 2020; Sarasvathy, 2001). These elements were coded separately as they inform about specific skills needed to navigate, leverage, or compensate for these contextual conditions. Special mention should be made of the "miscellaneous" subgroup within the "other" group, which contained 715 references. These references, along with the others in this same group, are the ones that concentrate most of the discussions among the group of experts conducting the Delphi process. This discussion focuses not only on competencies but also on threads (in the Entrecomp language), which, like sub-competencies, make up the CF. In this sense, the results of the validation process, also based on movements at this level, suggest four major modifications: design, digital, enterprise literacy, and process management.

The addition of competence "Design" assumes that design is not equivalent to creativity. EntreComp has a design thread that is integral to competence, "Creativity." However, by leveraging "Design" as one of the competencies in this area, we aim to help entrepreneurs develop a design mindset, which involves the ability to immerse themselves with customers, using creativity to provide value, developing prototypes, and testing these prototypes with or on the customers. This also includes the ability to co-create with customers and other stakeholders. Two of the reviewed entrepreneurial competence frameworks also include competence frameworks also include the competence "Design." (Bird, 2019; Tittel & Terzidis, 2020) Design competence receives consensus in the validation process within the expert group, taking into account previous arguments.

Nevertheless, the confirmatory analysis in the pilot test revealed two distinct factors, which were addressed by splitting the design competence into two: "Design Orientation" and "Design Validation". Thus, the competence "Design Orientation" is included in the group "Ideas and Opportunities" and contains threads related to identifying needs through immersion with users, including design focus and user immersion. On the other hand, competence "Design Validation" entails the threads related to validating the new venture through prototyping, testing, and co-creating with users: Prototype, experiment, test, and Co-create. Since these aspects are strongly connected with the competencies related to the development of the new venture, this competence was moved to the area "Into Action." Additionally, the thread "Experiment & test", which initially belonged to competence "Coping with uncertainty, ambiguity and risk" was moved to this new competence due to its strong correlation with thread prototypes and co-creation.

The following change concerned digital competence. The literature reviewed provides a wealth of information regarding this competency, regardless of the industry in which the venture is conducted (Alenezi *et al.*, 2023; Decuypere *et al.*, 2021; Greenhill, 2010; van Laar *et al.*, 2017). Therefore, in the validation process, this competency was added to the resource group. EntreComp did not mention digital competencies within the framework. There is only one thread under competence, "mobilising others," that refers to the use of media to communicate with others. Thus, by examining how digital competencies are addressed in other competence frameworks, the decision was made to include digital competence in EICAA-CF**,** which encompasses the basic skills that any professional should possess today and that entrepreneurs should have to start successfully in today's digital world. Adding **digital competencies** to EICAA-CF aims to recognise the importance of digital competencies in today's world and for any new venture. These competencies have been recently listed in specific frameworks such as DigComp 2.2 ("The Digital Competence Framework for Citizens"). Digital competencies, artificial intelligence, and big data technologies are receiving increasing

interest in entrepreneurship and entrepreneurship education (Obschonka & Audretsch, 2020; Secundo *et al.*, 2020). Adding this competence to EICAA-CF aligns with today's rapid technological developments and the increasing need for entrepreneurs to know, manage, and maximise the benefits of technologies for new ventures.

Regarding aspects of corporate culture, the work carried out also suggests updates (Baum & Locke, 2004; Kuratko, 2005; Mitchelmore & Rowley, 2010b; Morrison, 1998). Specifically, it involves changing the competence "Mobilising Resources" into "Mobilising (financial) resources" and adding the competence "Entrepreneurial Literacy" in the competence area "Resources." Therefore, the threads most closely related to the aspect of acquiring resources together were grouped: acquiring resources (both material and non-material), utilising the most limited resources, budgeting, funding, and understanding taxation. On the other hand, the threads that deal with the knowledge of different business and enterprising operations were grouped under a new competence labelled "Enterprising Literacy": Understanding economic and financial concepts, Understanding marketing and sales concepts, and Enterprising literacy and Technical-legal aspects.

Finally, because of the findings in the SLR, a discussion was held in the validation process about the "Process view," which led to the incorporation of the "process management" competency "into action," which is complementary to the existing "planning & management" planning and management competency. "Entrepreneurship as a process" refers to the dynamic nature of entrepreneurial activity, which consists of distinct phases from the early start-up to maturity, requiring different entrepreneurial competencies in each phase (Lackéus & Middleton, 2015; Mansoori & Lackéus, 2020; Ries, 2011; Teodoro, 2021). This perspective counterbalances the traditional approach of planning and management, often under the requirement of writing a solid business plan. The uncertainty present in entrepreneurial contexts makes planning either a challenging task or one that requires constant revision. Thus, EICAA-CF emphasises the need to adapt to changes, work in small increments, measure progress, and adjust the strategy of the new venture as necessary. Entrepreneurs need to take ownership of the process as well, which means that they should manage the entire process rather than being passive (or reactive) actors during the process.

Figure 2 shows a graphical representation of the competence framework, which can be compared with the previous figure that shows Entrecomp. Additionally, Table 4 provides a detailed overview of the final version of the EICAA-CF, which was developed as a result of this research.

The full details of the results presented in the previous results synthesis elements (Figure 2 and Table IV) can be accessed online in the freely available 168-page document (Teodoro & Bernadó, 2023).

Discussion

This article presents the SLR and Delphi research undertaken within the EICAA-WP2 (EICAA-CF definition) framework, leading to an evolution of EntreComp that foregrounds design orientation and validation, digital competence, enterprising literacy, and a process-management view of entrepreneurship. The coding evidence shows a strong emphasis on spotting opportunities, learning from experience, working with others, and coping with uncertainty, consistent with how entrepreneurship is framed in recent research and practice. In this sense, the EICAA-CF confirms the central role of opportunity recognition and collaborative, experiential learning in entrepreneurial activity, while adding dimensions that are underrepresented in the original EntreComp framework.

From an applied perspective, the EICAA-CF offers several implications. For educators and HEIs, the framework clarifies learning outcomes that can be translated into course-level rubrics and modules, thus supporting competence-based curriculum design and assessment-driven teaching. For organisations and employers, the framework underpins assessment tools—such as the EICAA Competence Monitor—that help diagnose students' and employees' competence profiles and design tailored training interventions. For researchers, the explicit list of competences and threads provides a structured basis for developing measurement instruments and for conducting longitudinal or comparative studies on entrepreneurial competence development.

The EICAA-CF aligns with the European Union's vision of entrepreneurship as a key competence for lifelong learning (Council of the European Union, 2018) and with the ongoing policy uptake of EntreComp. Recent national initiatives illustrate



Figure 2. EICAA-CF.

Table 4. The final version of the EICAA Competence Framework (EICAA-CF).

Area	Competence	Definition	Threads
1. Ideas and Opportunities	1.1 Spotting opportunities	Ability or capacity to perceive changed conditions and overlooked possibilities in the environment that represent potential sources of value to a venture.	• Analyse the context/Scan the environment • Identify, recognise challenges • Identify, create and seize opportunities
	1.2 Design orientation	Ability to interact and immerse with customers (and other stakeholders) to identify their needs and design an offer that satisfy the identified needs.	• Design focus • Immerse with your users • Identify needs
	1.3 Creativity	Ability to discover and create ideas and opportunities; to combine knowledge, experience and personal resources from different areas in new ways.	• Act creatively/Be curious and open • Solve problems creatively • Generate ideas • Be innovative
	1.4. Vision	A projected mental image or visualized representation that an entrepreneur or intrapreneur creates for themselves and their new venture. It serves as a guiding framework that shapes their aspirations, goals, and actions.	• Imagine/build a vision for the new venture and oneself • Think strategically • Guide action
	1.5 Valuing ideas	Process of evaluating and selecting high quality opportunities and ideas and acting on them to provide value to others.	• Recognise the value of ideas • Share and protect ideas
	1.6 Ethical and sustainable thinking	Ability to conduct oneself and the new venture at hand in a social and environmental conscious manner.	• Behave ethically • Think sustainably • Assess impact • Be accountable
2. Resources	2.1 Self-awareness and self-efficacy	The individuals' conscious belief in their own ability to bring about desired results in the performance of a particular task (Bandura, 1997)	• Follow your aspirations • Identify your strengths and weaknesses • Believe in your ability • Shape your future
	2.2 Motivation and perseverance	Perseverance: Ability to sustain goal-directed action and energy when confronting difficulties and obstacles that impede goal achievement (Morris *et al.*, 2013).	• Maintain focus *(consistency of interest)* • Stay motivated and passionate • Persevere/Tenacity/Don't give up • Be resilient
	2.3 Mobilising resources	Ability to acquire and systematize the operating resources needed to start and grow an organization (Baum & Locke, 2004).	• Acquire resources (material and non-material) • Make the most of limited resources • Budget • Find funding • Understand taxation
	2.4 Enterprising literacy	Knowledge about the business functions and processes to develop the value creating activity efficiently.	• Understand economic and financial concepts • Understand marketing and sales concepts • Enterprising literacy • Technical-legal aspects
	2.5. Mobilising others	Ability to involve others in the entrepreneurial project (stakeholders) in a way that generates participation and adherence to the initiative.	• Inspire and get inspired • Persuade and negotiate • Communicate effectively • Use media effectively
	2.6. Digital competence	Confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society	• General digital competences at work • Digital competences for the new venture • Information and data literacy • Safety and cybersecurity

Area	Competence	Definition	Threads
3. Into Action	3.1 Taking the initiative	Ability to initiate and sustain the actions required to operate and manage the new venture, while taking full responsibility for one's own actions.	• Take responsibility • Work independently • Take action
	3.2 Planning and management	Process of systematically developing a strategic roadmap and implementing effective organizational practices to ensure the successful launch, operation, and growth of the venture.	• Define goals • Plan and organise conscientiously • Define priorities • Make the most of your time (time management) • Define and develop sustainable business plans
	3.3 Process management	Ability to lead, monitor and redirect the strategy of the new venture as it evolves in response to internal and external factors.	• Monitor progress • Be flexible and adaptive to changes • Redirect your strategy • Manage transitions • Work agile
	3.4 Coping with uncertainty, ambiguity and risk	Ability to effectively manage and navigate situations that involve unknown outcomes, unclear information, and potential hazards or challenges.	• Cope with uncertainty and ambiguity • Calculate risk • Manage risk
	3.5 Design validation	Implementing strategies to prototype, test and experiment with the users, including strategies to include the users in the design processes (users as co-creators).	• Prototype • Experiment and test • Co-create
	3.6 Working with others	Ability to understand and work with other people, both individually and in groups.	• Accept diversity (people's differences) • Develop emotional intelligence • Listen actively • Team up • Work together • Manage instrumental relationships • Get support and build a network • Expand your network
	3.7 Learning through experience	Process of acquiring knowledge, skills and attitudes about something from practice and experience, including learning from failures.	• Reflect • Learn to learn • Learn from experience

how competence frameworks are interpreted and embedded in curricula. For example, Banha (Banha *et al.*, 2025) critically analyse the Portuguese framework for entrepreneurship education in relation to EntreComp, highlighting translation choices, implementation challenges and opportunities for refinement. Such work underscores the need for operational frameworks that remain interoperable with EntreComp while responding to current educational and labour-market demands. In this regard, EICAA-CF's emphasis on design orientation and validation, digital competence, process management and enterprising literacy can support policy-to-practice alignment by offering assessable competences and threads that can be directly used in programme and course design.

Several limitations should be acknowledged. First, the SLR reflects the EICAA WP2 project window and its ≤2021 cut-off. As such, it does not capture all developments in subsequent years and cannot, by itself, claim to represent the full current state of knowledge. Instead of altering the protocol ex post, this article provides a narrative post-2021 context and identifies the need for a separate update. To maintain topical relevance without retrofitting the protocol, the manuscript draws on selected post-2021 publications and policy documents to situate the findings in current debates—for example, recent bibliometric reviews of EntreComp in university settings and analyses of national competence frameworks. These newer sources are broadly consistent with—and often reinforce—the rationale for the additional competences and restructurings proposed in the EICAA-CF. Second, the initial screening used high-citation review articles as a seeding heuristic, which may bias the corpus towards older, English-language and mainstream literature and under-represent emerging or critical perspectives. This risk was mitigated by integrating a substantial set of grey-literature sources (particularly EU policy and practitioner documents), by consulting relevant lower-cited publications highlighted in those reviews, and by employing an "Other" code family and a Delphi process that explicitly considered constructs beyond the original EntreComp framework. Nonetheless, some bibliometric and language bias may remain. Third, although calibration, paired coding and consolidation of the master NVivo project were applied, qualitative coding inevitably involves judgement. In the same way, the Delphi relied on a panel of experts nominated by consortium partners; while diverse in background, its size and composition may limit the generalis ability of the consensus reached. The competences added or restructured in EICAA-CF are therefore theory-informed and expert-validated, but they still require more exhaustive empirical testing.

These limitations suggest several directions for future research. A priority is to conduct a living-review update that extends the SLR beyond 2021, uses citation-agnostic screening, broadens language coverage and relies on backward/forward citation chasing, while tracking national implementations of entrepreneurship competence frameworks. Future work should also conduct psychometric validation (factor structure, reliability, invariance) of the instruments that operationalise the newly added competences. In addition, longitudinal studies could link competence development to educational and workplace outcomes, and comparative studies could examine the convergent and discriminant validity of EICAA-CF relative to other frameworks. Finally, there is scope for research on policy translation and curriculum alignment in HEIs and corporate training, including differential effects across sectors and countries.

Conclusions

This research presents the definition of the EICAA-CF process, which establishes a comprehensive set of competencies that entrepreneurs and intrapreneurs should possess to transform opportunities into ideas and subsequently deploy and grow value-creating activities.

The final EICAA-CF presented in this document is the result of a rigorous methodology based on a systematic literature review and several rounds of a Delphi process with experts. The first step of the methodology, the systematic literature review, included 138 highly cited publications. A content analysis method was followed using the NVivo software tool, where Entrecomp three areas corresponded to three categories in the codebook, namely 'Ideas & opportunities', 'Resources' and 'Into action.' The coding framework allowed us to identify the factors or dimensions of successful entrepreneurship that could be attributed to the existing competencies in EntreComp and the identification of potential new competencies not previously covered by EntreComp.

EICAA-CF largely relies on EntreComp, an entrepreneurial competence framework developed by the European Commission. EICAA-CF maintains the same three competence areas of EntreComp ("Ideas and Opportunities," "Resources," and "Into Action") as well as the underlying competencies therein. However, it also introduces new competencies, restructures existing ones, and suggests adjustments to thread levels. Thus, the final framework has the following competencies in each of the three competence areas:

1) **Competence area 'Ideas and Opportunities'**: It comprises six competencies, with the addition of the competence 'Design orientation.' Based on the systematic literature review and the Delphi process, we estimated that a competence "Design" was significantly different from creativity. The confirmatory analysis further confirmed the need for splitting the design into two competencies. The first one, "Design orientation", refers to identifying the customer needs and designing an offer tailored to these needs. The second, "Design validation, refers to the design of experiments to validate the offer, and it has been moved to the competence area "Into action".

2) **Competence area "Resources":** It contains six competencies, with the addition of competence "Enterprising literacy" and "Digital Competence." Based on a systematic literature review and the Delphi process, we estimated that the inclusion of digital competence was relevant given the current need for digital competencies in any workplace, including entrepreneurship. Next, the confirmatory analysis further identified inconsistent items in competencies such as "Mobilising resources" and "Financial literacy", which led to the shifting of threads and the renaming of one of the competencies. The result of these changes implied that the threads directly related to financial issues stayed in competence "Mobilizing (financial) resources," and the remaining enterprising skills were allocated in the renamed competence "Enterprising literacy."

3) **Competence area "Into Action":** It contains seven competencies, with the addition of two new competencies: "Process management" and "Design validation". Based on a systematic literature review and the Delphi process, we included the competence "Process management" to capture the need for any entrepreneur to lead, monitor, and redirect the strategy of the new venture as it evolves in response to internal and external factors, as emphasised in the literature we reviewed. The second new competence, "Design validation", was the result of competence "Design," according to the confirmatory analysis. "Design validation" entails skills related to validating the new venture through prototyping, testing, and co-creating with users. The addition of this competence to this area fully captures the emphasis of the new entrepreneurship methods on validating the offer by designing prototypes and conducting experiments.

The final framework validates the exhaustivity and completeness of EntreComp while also incorporating up-to-date competencies derived from the literature and expert consultations. Structure-wise, the final EICAA-CF has the following features: i) preservation of the structure of EntreComp in areas-competences-threads; ii.) Inclusion of definitions and conceptualisations of competencies and threads according to the literature; and iii.) Addition of new competencies and splitting of existing competencies within a validated structure.

The entrepreneur who is assessed and trained under EICAA will get the following:

- Stronger focus on design and customer discovery: customer discovery, co-creation, and market view of the new venture.
- Agile and incremental entrepreneurship: This approach focuses on testing and experimentation, recognising

that a new venture is based on hypotheses or assumptions that need to be continuously tested and revised.

- Digital competencies associated with the creation of new ventures.
- Process view of entrepreneurship: iterative cycles, adaptability to phases, and management of the process itself.
- Awareness of the entrepreneur's development and the new venture's development are two dimensions that are highly intertwined, but both play a crucial role in the success of the new venture.

As with any attempt to establish a competency framework, EICAA-CF remains a project that can only be fully validated by its implementation. This limitation is due to the heuristic nature of its concept, despite being based on scientific methods that aim to reduce research bias. For this reason, the EICAA-CF will need to stay up-to-date to remain relevant for educators and learners over time. Thus, EICAA-CF, as much as its predecessor EntreComp, can provide the best guidance for aligning curricula to the competence demands of today and tomorrow's world of work–and of society at large–only if new competence trends or requirements are carefully and regularly considered. Therefore, while we invite you to utilise EICAA-CF for practical education and training, we also ask that you continuously challenge and validate the framework to ensure its structure and content remain evidence-based and up-to-date.

Ethics and consent statement

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Data availability statement

No data are associated with this article.

Author contributions (CRediT)

Conceptualisation; Methodology (SLR & Delphi); Software/Data curation (NVivo project consolidation); Formal analysis; Investigation; Visualisation; Writing – original draft; Writing – review & editing;

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Open Peer Review

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Version 2

Reviewer Report 26 December 2025

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✔ **Francisco Banha**
University of Algarve, Faro, Portugal

I do not have any specific comment regarding any specific correction.
My comment to the new version provided by the author is general.
I formally approve this paper, although I will leave to the scientific community to evaluate it true validity.

Competing Interests: No competing interests were disclosed.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Version 1

Reviewer Report 15 October 2025

https://doi.org/10.21956/openreseurope.22073.r60020

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✘ **Francisco Banha**
University of Algarve, Faro, Portugal

The manuscript presents the results of a systematic literature review (SLR) of existing review papers on entrepreneurial competences, complemented by the inclusion of grey literature—mainly documents from the European Commission—and by the use of the Delphi

methodology to validate and refine the resulting framework. The paper is clearly written, with its theoretical foundation solidly grounded in established frameworks such as *EntreComp* and *EICAA*. The author's ambition to bridge the theoretical, methodological, and practical dimensions of entrepreneurship education is noteworthy.
The combined use of an SLR and the Delphi method provides a coherent research design: the SLR establishes an evidence base, while the Delphi rounds add expert judgement and interpretive depth. The inclusion of grey literature strengthens the article's purpose, partly mitigating the consequences of the SLR's literature selection having been concluded before 2021. It also has the merit of linking conceptual discussions with policy realities and practical implementation.
Despite these merits, there are serious **structural and ethical issues** that need to be addressed before this article can remain available online in its current form. As indicated in the ethics statement, a large portion of the material derives from the **EICAA project**, coordinated by a consortium. A closer analysis of the project's outcomes—particularly the WP2 deliverables, including *The Systematic Literature Review of Existing Tools for Entrepreneurial Assessment and Inventory of Tools* and *The EICAA Competence Framework*—shows that substantial parts of the information presented here already appear in those publicly available documents.
This raises several concerns:

1. **Lack of explicit acknowledgment of project sources**
   The EICAA project and its deliverables are not cited in the text or listed in the bibliography, even though the author contributed to these documents. This omission compromises transparency and represents a serious ethical breach. The introduction must clearly situate the article within the EICAA project and properly acknowledge its intellectual and documentary sources.
2. **Relevance and currency**
   The EICAA project dates back to 2021, and the SLR conducted as part of that project—and now forming the basis of this article—only considers literature published up to that year. For a study submitted in 2025, this temporal gap significantly undermines its relevance, particularly in a fast-evolving field such as entrepreneurship education and competence frameworks. As already noted, the use of grey literature partly mitigates this limitation, but it remains advisable to undertake a more robust search, even within grey sources, to update and complement the findings with studies published since 2021, ensuring that the paper reflects the current state of knowledge.
3. **Overlap with previously published or presented work**
   The paper *"The EICAA Competence Framework: A Suggestion for EntreComp 2.0"* (EAIR 45th Annual Forum, 2023) presents content and arguments that closely resemble sections of the current article. This overlap requires explicit acknowledgement. The author is not listed among the contributors of that 2023 paper, yet the similarities suggest extensive use of shared or derivative material.
4. **Authorship and originality**
   Given that the literature review and the EICAA framework were produced collaboratively across partner institutions, the article must clarify whether it contains any original research conducted solely by the author. The absence of co-authors should be justified, and the manuscript should explicitly delineate which sections represent the author's individual contribution.

If these issues are fully addressed, several additional academic points also require attention.

1. Structure and missing sections
The article does not follow a conventional academic format. Sections discussing the implications of

the findings, the limitations of the study, and directions for future research are absent. These omissions make the manuscript resemble a project deliverable rather than a research article. The author should include these sections to align the paper with accepted academic standards.

2. Outdated and incomplete references
The reference list relies heavily on older sources, many of which are more than ten years old. More recent research on entrepreneurial competences should be incorporated.

- For example, the statement *"The ability to act and think entrepreneurially is a crucial endowment in today's knowledge-based society"* is supported by references more than thirteen years old.
- The following statements lack references altogether:
  - *"However, an operational setting that allows for the 'capture' of entrepreneurial competence profiles of learners has not been established yet."*
  - *"As a result, Higher Education Institutions (HEIs) and businesses lack a coherent, instrumental basis for assessing individual entrepreneurial competences and accurately addressing specific competence development needs through education and training interventions in response to the assessment results."*
- Similarly, these important definitions require supporting citations:
  - *"A competence framework (CF) is a structured (often hierarchical) model that outlines the specific competences required for effective performance in an educational or professional setting. A competence framework provides a list of the competences required by an individual or group to perform successfully in each domain. Developing CF is essential for any training plan. Therefore, it is especially necessary to develop competence-based training strategies."*
- The document cited regarding entrepreneurship as a key competence dates from 2006, although a more recent and authoritative source exists: *Council of the European Union (2018). Key Competences for Lifelong Learning: A European Reference Framework. Official Journal of the European Union, 2.* This 2018 document should replace or supplement the outdated reference.
- Furthermore, *EntreComp* is only cited later in Figure 1, although it is discussed earlier. The first citation should appear at the initial relevant mention.
- In Table 4, each item should be supported by references, as in sections 2.1 to 2.3 and in the equivalent table from the EICAA deliverable.

3. Reference to contextual factors
The section on contextual factors requires clearer explanation. The **sources of the competence structures** used in the analysis must be explicitly referenced so that readers can trace how these frameworks were selected, adapted, and interpreted.

4. Timeliness of the SLR
As noted, the SLR concludes in 2021. The author must clarify whether the findings have been updated or revalidated with more recent sources. A systematic review that omits four years of potentially significant developments cannot credibly claim to represent the current state of knowledge.

5. Scope and inclusiveness of the SLR
The decision to restrict the corpus to review papers with more than 100 citations is methodologically problematic. Although the intention may have been to focus on influential

studies, this criterion conflates citation frequency with quality, introducing a clear bibliometric bias.
Such an approach privileges older, English-language, and mainstream studies while marginalising newer or less cited works that might offer innovative or critical insights. Consequently, the SLR—and the subsequent Delphi process based on it—risks reinforcing established paradigms rather than broadening conceptual diversity.
The author should explicitly acknowledge this limitation and, ideally, relax or remove the citation threshold. Citation counts should serve a descriptive purpose only, not as inclusion criteria. Addressing this issue would significantly strengthen the paper's methodological and epistemological robustness.

6. Methodological transparency
The paper would benefit from a more detailed description of the **SLR and Delphi procedures**. Missing information includes:

- the period during which the Delphi panels were conducted;
- the number and expertise of the participants;
- the number of rounds carried out;
- the criteria used to determine consensus; and
- the specific protocols used for coding and content analysis.

For instance, the paper notes that the content analysis protocol in *NVivo* was written, shared, and refined before coding began, yet it provides no details about the researchers involved, their profiles, or the nature of the decisions taken. Likewise, the questionnaire used to interpret competences identified through the SLR should be made available—either as an appendix or as supplementary material.
It is also worth noting that the document *"The EICAA Competence Framework: A Suggestion for EntreComp 2.0"* (EAIR 45th Annual Forum, 2023) presents a far more detailed account of the adopted Delphi procedures than the author provides here. To quote:
"To ensure clarity and coherence in the rubric statements, we engaged in multiple online Delphi rounds involving all consortium partners, supplemented by offline inputs. Each change was subjected to deliberation, discussion, and voting. Ultimately, decisions were taken by majority vote or deferred to the analysis of the forthcoming pre-test (PT1). By following a rigorous methodology and harnessing the expertise of various stakeholders, including senior researchers, we successfully developed and enhanced the rubric system. This system then served as the foundation for designing a self-assessment survey of entrepreneurial competences (the EICAA Competence Monitor, CM), which was refined in several iterations following a Delphi process and multiple pre-tests."
Including a comparable level of methodological detail in the present paper would significantly enhance its transparency and credibility.

7. Engagement with recent and policy-relevant literature
The review would be considerably strengthened by engaging more directly with **current European policy debates** on entrepreneurship education. In particular, *Banha et al.* (2025), *"A critical analysis of the Portuguese Framework for Entrepreneurship Education considering the EntreComp competence framework"* (*European Journal of Innovation and Entrepreneurship*), provides an up-to-date example of how competence frameworks are being interpreted and implemented in national contexts. Incorporating this work would situate Teodoro's analysis within ongoing European policy discussions and reinforce its practical and comparative relevance.

8. Final assessment
This article has the potential to make a valuable contribution, and its publication in this outlet would be welcome. However, substantial **academic, methodological, and ethical revisions** are required before it can be considered suitable for indexing.
Given the current overlap with previous project outputs, the lack of acknowledgement of co-authorship, the outdated evidence base, and the incomplete methodological description, the paper in its present form warrants **major revisions.**

Is the work clearly and accurately presented and does it engage with the current literature?
No

Is the study design appropriate and is the work technically sound?
Partly

Are sufficient details of methods and analysis provided to allow replication by others?
Partly

Are all the source data and materials underlying the results available?
Partly

If applicable, is the statistical analysis and its interpretation appropriate?
Not applicable

Are the conclusions drawn adequately supported by the results?
No

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Entrepreneurship; entrepreneurship education; economics; management; accounting.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to state that I do not consider it to be of an acceptable scientific standard, for reasons outlined above.

Author Response 06 Nov 2025

Jaume Teodoro

Dear Reviewer, First, thank you for taking the time to review my article. The depth and detail with which you have done so clearly demonstrate your dedication and commitment to improving the publication. I have carefully addressed each point you raised in your review, and I am responding to each so you can see for yourself. I have uploaded a new version of the article that includes all the changes you mentioned. The latest version is an improvement on the previous one, and I can only express my gratitude and respect for your consideration. Sincerely,

1.

1. *Lack of explicit acknowledgement of project sources*
   The EICAA project and its deliverables are not cited in the text or listed in the bibliography, even though the author contributed to these documents. This omission compromises transparency and represents a serious ethical breach. The introduction must clearly situate the article within the EICAA project and properly acknowledge its intellectual and documentary sources.

Response. We agree that transparent provenance is essential. For clarity, the manuscript **already cites and acknowledges** the EICAA project and its outputs:

- *Teodoro & Bernadó (2023)* — the official **EICAA WP2 deliverable (EICAA Competence Framework)** — is cited in the **Methodology** and listed in the **References**. *The present paper offers a scholarly synthesis of those WP2 results—specifically, the **Systematic Literature Review (SLR)** and the subsequent **Delphi** validation—conducted under the author's scientific responsibility.*
- *Teodoro et al. (2022)* (Education Sciences, MDPI) — which offers a project **overview** of EICAA and lists all partners involved — is cited in the **Introduction** and **References**. There, the roles of the different partners are explained, identifying Jaume Teodoro, the principal author of this 2022 paper, as the leading researcher responsible for the SLR on which the present paper is based.
- The Acknowledgements at the end of this article explicitly list the consortium partners and individual contributors.
- The **Ethics and consent statement** identifies EICAA, specifies that this article reports **WP2 results**, and states that dissemination was agreed under a **CC BY-NC-SA 4.0 open licence**, with links to the project's public results page.

To avoid any residual ambiguity, we have **strengthened the manuscript.** I **improved the Introduction, emphasising EICAA/WP2 authorship by adding an explicit paragraph at the end of the article (before references) with the epigraphs "Consent and Ethics statement" and "Acknowledgements".**

1. *Relevance and currency*
   The EICAA project dates back to 2021, and the SLR conducted as part of that project—and now forming the basis of this article—only considers literature published up to that year. For a study submitted in 2025, this temporal gap significantly undermines its relevance, particularly in a fast-evolving field such as entrepreneurship education and competence frameworks. As already noted, the use of grey literature partly mitigates this limitation, but it remains advisable to undertake a more robust search, even within grey sources, to update and complement the findings with studies published since 2021, ensuring that the paper reflects the current state of knowledge.

Response. Thank you for this comment. The systematic literature review reported in this article is the EICAA WP2 SLR, conducted under a predefined project window and completed in 2023. We do not re-run or re-date the SLR post hoc, because changing the cut-off after completion would alter the protocol and impair the comparability and auditability of the WP2 results. This is the reason why the SLR is reported as completed within the project timeline. The WP2 SLR covers literature up to **2021** because the review was conducted throughout **2022**, the EICAA project **closed in 2023**, and dissemination proceeded in phases in line with **Erasmus+ dissemination requirements**: (i) partial dissemination through

conference presentations during the project, and (ii) full journal write-up after project closure. The present article was developed in **2024** , just after the end ot the project, and then submitted to ORE. This staged trajectory—project work → conference dissemination → science journal article—is standard for multi-year, grant-funded projects. The project—in line with other grants from the same cohort—received an administrative extension due to COVID-19–related disruptions, and closed in 2023-24. That said, the manuscript does engage with literature published after 2021, where relevant (including 2023–2025 items), to contextualise the WP2 findings. We explicitly distinguish between:

- the core WP2 SLR (fixed, protocol-bound, up to the project cut-off), and
- a narrative context that references later publications and policy documents to situate the results in current debates.

We have clarified this distinction in the Methods and Limitations sections. Additionally, we indicate in the Discussion how post-2021 sources support and extend the results (in fact, in Block B, as you suggest, I also refer to the authors' contributions 2022-2025). In the discussion, I also refer to this limitation in line with the agenda of a 4-year project.

1. *Overlap with previously published or presented work*
   The paper "The EICAA Competence Framework: A Suggestion for EntreComp 2.0" (EAIR 45th Annual Forum, 2023) presents content and arguments that closely resemble sections of the current article. This overlap requires explicit acknowledgement. The author is not listed among the contributors of that 2023 paper, yet the similarities suggest extensive use of shared or derivative material.

Response. Thank you for raising this point. Regarding the mentioned EAIR 45th Annual Forum (2023) paper *"The EICAA Competence Framework: A Suggestion for EntreComp 2.0"*:

- My name appears explicitly among the acknowledged contributors in that document for my role in WP2 and in the development of the EICAA Competence Framework.
- Although I did not personally attend the conference due to other commitments, my intellectual contribution was formally recognised. It is essential to note that this conference was a general presentation of the project before its end. It is just a 5-page brief on the project, covering general issues, mostly drawn from the previous paper (Teodoro et al., 2022), which I presented at the OpenU conference in Paris-IV La Sorbonne in November 2022, before the mentioned EAIR 45th forum (see: https://openu-project.eu/conference/topics). In such a case, the same dissemination protocol for the project was applied, as mentioned in the previous section, and all contributions were recognised throughout the Open U Conference.
- The EAIR paper was a consortium-level dissemination output that summarised findings and developments in a very general way. In contrast, this Open Research Europe article is the author's academic paper based on the specific research work the author led. For complete transparency, the EAIR dissemination paper is now explicitly cited in the Introduction section of the manuscript.

1. *Authorship and originality*
   Given that the literature review and the EICAA framework were produced collaboratively across partner institutions, the article must clarify whether it contains any original research conducted solely by the author. The absence of co-authors should be justified, and the manuscript should explicitly delineate which sections represent the author's individual contribution.

Response. I appreciate you asking for clarification. The authorship is justified as follows:

- Scope and responsibility. Within EICAA WP2, I served as the scientific lead for the Systematic Literature Review (SLR) and the Delphi validation. I designed the SLR protocol and search logic, coordinated screening and inclusion decisions, defined and refined the NVivo codebook, consolidated the master NVivo project, led the Delphi rounds and integrated the outputs into the final framework. For this reason, my copyright (authorship) appears in the WP2 report (page 4), as can be checked online on the EICAA WP2 available online. Coding assistance and expert opinions from consortium partners are credited in the Acknowledgements of this paper and also in the WP2 deliverable cited. These contributions, while valuable, do not overlap with the author's scientific responsibility for developing this paper.
- Why single authorship? In line with common authorship standards (CRediT/ICMJE spirit), the person who conceived, analysed, interpreted, and drafted the scholarly article, and who takes full accountability, is listed as the author; others who contributed to data collection/coding or advisory input are acknowledged. This is reflected in this paper.

To avoid any ambiguity, the manuscript has been updated to explicitly delineate roles (see "Author contributions" and Seed CrediT inclusion). B)

1. 1. *Structure and missing sections*

   The article does not follow a conventional academic format. Sections discussing the implications of the findings, the study's limitations, and directions for future research are absent. These omissions make the manuscript read more like a project deliverable than a research article. The author should include these sections to align the paper with accepted academic standards.

Response. Thank you for this helpful suggestion. I have revised the manuscript to conform to the conventional academic format you indicated, despite the original research following a design-science orientation structure (It develops and validates an artefact (the EICAA Competence Framework) through an evidence base (SLR) and an expert validation (Delphi).). To align with common expectations, we now present the work in an IMRAD-compatible structure, while keeping the propositional nature of the contribution. That said, to maximise clarity and align with conventional academic standards, we improve the manuscript in an IMRaD-compatible structure—including in Discussion the limitations, and the directions for future research—

2. Outdated and incomplete references

The reference list relies heavily on older sources, many of which are more than ten years old. More recent research on entrepreneurial competencies should be incorporated.

- *For example, the statement "The ability to act and think entrepreneurially is a crucial endowment in today's knowledge-based society" is supported by references more than thirteen years old.*
- *The following statements lack references altogether:*
  - *"However, an operational setting that allows for the 'capture' of entrepreneurial competence profiles of learners has not been established yet."*
  - *"As a result, Higher Education Institutions (HEIs) and businesses lack a coherent, instrumental basis for assessing individual entrepreneurial competences and accurately addressing specific competence development needs through education and training interventions in response to the assessment results."*

- *Similarly, these important definitions require supporting citations:*
  - *"A competence framework (CF) is a structured (often hierarchical) model that outlines the specific competences required for effective performance in an educational or professional setting. A competence framework provides a list of the competences required by an individual or group to perform successfully in each domain. Developing CF is essential for any training plan. Therefore, it is especially necessary to develop competence-based training strategies."*
- *The document cited regarding entrepreneurship as a key competence dates from 2006, although a more recent and authoritative source exists: Council of the European Union (2018). Key Competences for Lifelong Learning: A European Reference Framework. Official Journal of the European Union, 2. This 2018 document should replace or supplement the outdated reference.*
- *Furthermore, EntreComp is only cited later in Figure 1, although it is discussed earlier. The first citation should appear at the initial relevant mention.*
- *In Table 4, each item should be supported by references, as in sections 2.1 to 2.3 and in the equivalent table from the EICAA deliverable.*

Response. Thank you for drawing attention to the references' recency and completeness. I have undertaken a thorough revision of the literature base and implemented the following changes:

1. Update and balance the reference list.
   I have incorporated more recent work on entrepreneurial competences and EntreComp (e.g. Raţiu et al., 2023; Osipovskaya et al., 2024; Banha et al., 2025), alongside the foundational sources that originally motivated the study. This provides a better balance between classic and up-to-date references.
2. Support for the statement on the importance of acting and thinking entrepreneurially.
   The sentence *"The ability to act and think entrepreneurially is a crucial endowment in today's knowledge-based society"* is now supported not only by earlier macro-level works (e.g. Acemoglu, 2009; Acs et al., 2008; Audretsch, 2007; Baumol & Strom, 2007) but also by more recent syntheses that document the centrality of entrepreneurial competences in higher education and policy (e.g. European Commission, 2015; Raţiu et al., 2023; Osipovskaya et al., 2024).
3. Citations added to previously uncited statements.
   I have inserted explicit references for the two statements that previously lacked citations:
   - On the absence of an operational setting to capture entrepreneurial competence profiles, I now refer to European Commission (2015) and Raţiu et al. (2023), which all highlight the gap between competence frameworks and practical assessment tools.
4. Citations for competence framework definitions.
   The paragraph defining a competence framework (CF) is now supported by references to Henri et al. (2017), the European Commission (2013a, DigComp), and the Council of the European Union (2018), which exemplify structured competence frameworks and competency-based learning strategies.
5. 2006 vs 2018 EU Key Competences.
   The 2006 recommendation on key competences has been supplemented with the

updated Council of the European Union (2018) Recommendation, which is now cited at the first relevant mention and used as the primary policy reference.

6. EntreComp cited at first mention.
   Bacigalupo et al. (2016) is now cited in the Introduction at the initial mention of EntreComp, not only in the figure caption.
7. Table 4 sourcing.
   To comprehensively reference all the findings in Table 4, we have referenced the full 160-page document, which is available free online. It permits researchers to go into detail in line with open-science best practices.

3. Reference to contextual factors

*The section on contextual factors requires clearer explanation. The sources of the competence structures used in the analysis must be explicitly referenced so that readers can trace how these frameworks were selected, adapted, and interpret*ed.

Response. I have revised the manuscript to c**larify what is meant by "contextual factors"** Also I **Explicitly reference the sources of the competence structures** used in the analysis, so that readers can trace how these frameworks were selected, adapted and interpreted.

- In the **Methods** section I now state other influential competence frameworks and reviews such as **Bird (1988, 2019)**, **Mitchelmore & Rowley (2010)**, **Morris et al. (2013)** and **Tittel & Terzidis (2020)**, together with EU frameworks like **DigComp (European Commission, 2013a)**. These sources are explicitly named and cited.
- I clarify that the **"Contextual factors"** code family (Table 2, group 4.6) emerged **inductively** from the literature as a separate level of analysis, capturing environmental and organisational conditions (policies, ecosystems, corporate culture, support structures, venture life cycle, etc.) that **shape but are not themselves competences**. The literature on corporate entrepreneurship and ecosystems consistently highlights the importance of such contextual enablers and constraints (Komarkova et al., 2015; D. Kuratko & Audretsch, 2013; Mansoori & Lackéus, 2020; Sarasvathy, 2001). I explain that in our analysis, these elements were coded separately from individual competences. Still, they provided an interpretation of which competences are needed to navigate, leverage, or compensate for these contextual conditions. This information is now added in the **results** section.

4. Timeliness of the SLR

As noted, the SLR concludes in 2021. The author must clarify whether the findings have been updated or revalidated with more recent sources. A systematic review that omits four years of potentially significant developments cannot credibly claim to represent the current state of knowledge.

Response. The SLR reported in this paper is the EICAA WP2 review, conducted under a predefined project window and therefore has a fixed cut-off at 2021. It was executed during 2022 (and Delphi in 2023), and the project—like other grants from the same cohort—received an administrative extension due to COVID-19, closing in 2023-24. For reasons of protocol integrity and auditability, I do not re-run or retroactively extend the SLR in this article. Instead, I now:

- Clarify in Methods that the SLR corresponds to the original WP2 protocol with its ≤2021 cut-off, completed before project closure and subsequently disseminated first in conference presentations and then in this journal article.

- Acknowledge in Limitations that the SLR does not claim to cover developments after 2021 and therefore cannot by itself represent the current state of knowledge.
- Use post-2021 sources narratively in the Discussion (e.g. Raţiu et al., 2023; Osipovskaya et al., 2024; Banha et al., 2025) to contextualise and corroborate the WP2 findings rather than to modify the review retrospectively.
- Propose, in Directions for future research, a living-review update that would extend coverage beyond 2021 using a citation-agnostic and broader screening strategy.

The revised text therefore distinguishes clearly between (i) the time-bounded WP2 SLR and (ii) the subsequent literature context, and it avoids claiming that the SLR alone represents the complete current state of knowledge.

5. Scope and inclusiveness of the SLR

The decision to restrict the corpus to review papers with more than 100 citations is methodologically problematic. Although the intention may have been to focus on influential studies, this criterion conflates citation frequency with quality, introducing a clear bibliometric bias.

Such an approach privileges older, English-language, and mainstream studies while marginalising newer or less cited works that might offer innovative or critical insights. Consequently, the SLR—and the subsequent Delphi process based on it—risks reinforcing established paradigms rather than broadening conceptual diversity.

The author should explicitly acknowledge this limitation and, ideally, relax or remove the citation threshold. Citation counts should serve a descriptive purpose only, not as inclusion criteria. Addressing this issue would significantly strengthen the paper's methodological and epistemological robustness. Response. Thank you for this methodological remark. I agree that citation counts are imperfect proxies and may introduce biases in bibliometrics and language. In the revision, I have:

1. Clarified the role of the ">100 citations" criterion.
   The threshold was used as a pragmatic seeding heuristic rather than a strict inclusion rule. It served to identify initially highly cited review articles. I have clarified this explicitly in the Methods section and removed any wording that could suggest a hard exclusion based solely on citation counts.
2. Documented mitigation strategies and residual bias.
   The SLR already complements citation-based seeding with a substantial corpus of grey literature (54 documents, including EU policy reports) and an "Other" code family that inductively captured constructs beyond EntreComp. The subsequent Delphi process was explicitly used to test and discuss these non-mainstream constructs (e.g. design orientation/validation, process management, digital competence, enterprising literacy). I now make these safeguards explicit and, in the Discussion/Limitations section, acknowledge that some bibliometric and language bias may nonetheless remain. Also in discussion/ directions for future research, I propose a living-review update that will adopt a citation-agnostic screening strategy, broaden language coverage and rely on snowballing (backward/forward citation chasing) to increase conceptual diversity.

6. Methodological transparency Delphi

The paper would benefit from a more detailed description of the SLR and Delphi procedures. Missing information includes:

- *the period during which the Delphi panels were conducted;*

- *the number and expertise of the participants;*
- *the number of rounds carried out;*
- *the criteria used to determine consensus; and*
- *The specific protocols used for coding and content analysis.*

Response. Thank you for this comment. I have expanded the description of the Delphi procedures in step2: validation by indicating the dates (2022-23), the number and profiles of participants (14 experts, nominated by consortium partners, including university academics/researchers in entrepreneurship education, experienced educators and practitioners from industry), the number of rounds (three online rounds with anonimised feedback), he consensus rule (≥75% agreement at competence/thread level; otherwise majority vote or deferral to pilot testing) and the protocols (⋯) Top of Form Bottom of Form Bottom of Form

7. Engagement with recent and policy-relevant literature

The review would be considerably strengthened by engaging more directly with current European policy debates on entrepreneurship education. In particular, Banha et al. (2025), "A critical analysis of the Portuguese Framework for Entrepreneurship Education considering the EntreComp competence framework" (European Journal of Innovation and Entrepreneurship), provides an up-to-date example of how competence frameworks are being interpreted and implemented in national contexts. Incorporating this work would situate Teodoro's analysis within ongoing European policy discussions and reinforce its practical and comparative relevance.

Response. I appreciate this suggestion. In the revised manuscript, I now engage more explicitly with **current European policy debates** on entrepreneurship education and with national implementations of competence frameworks:

- I have **added a discussion of Banha et al. (2025)**, which analyses the Portuguese framework for entrepreneurship education vis-à-vis EntreComp, as an example of how competence frameworks are translated into national policy and curriculum practice.
- I also strengthen the link to EU-level policy by explicitly connecting EICAA-CF to the **EU Recommendation on Key Competences for Lifelong Learning (Council of the European Union, 2018)** and to recent reviews of EntreComp uptake in higher education.

These additions are included in the Introduction and **Discussion** sections and help situate the EICAA-CF within ongoing European debates, thereby reinforcing the study's practical and comparative relevance.

8. Final assessment

This article has the potential to make a valuable contribution, and its publication in this outlet would be welcome. However, substantial academic, methodological, and ethical revisions are required before it can be considered suitable for indexing.

Given the current overlap with previous project outputs, the lack of acknowledgement of co-authorship, the outdated evidence base, and the incomplete methodological description, the paper in its present form warrants major revisions. With these comprehensive revisions, the manuscript now **meets academic structure standards**, **documents provenance and authorship transparently**, **details methods**, **updates and contextualises the literature**, discusses limitations and **addresses inclusiveness and policy relevance**. Thank you. **To the readers of 2nd version.** Following the reviewer's suggestions, the reader will observe

notable improvements in this revised version. These include: i) a clarification of the scope of WP2 and, specifically, the SLR study conducted by the author- in the Introduction section-; ii) more precise details regarding the SLR sample; iii) more rigorous details about the Delphi process used for validation; iv) explanations of the meaning of the coded contextual factors; v) a reference to Table IV, giving the reader access to all the sources that contributed to its creation; vi) a discussion section, previously absent, highlighting the limitations of the work and outlining future research directions; and vii) new references that offer a more comprehensive understanding of the work within its c

Competing Interests: No competing interests were disclosed.

Reviewer Report 25 August 2025

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Orestis Terzidis
Karlsruhe Institute of Technology, Karlsruhe, Germany

Summary: This article describes the research conducted to establish the Competency Framework for the EICAA project (EICAA-CF). EICAA stands for the Entrepreneurial and Intrapreneurial Competences Assessment Alliance. It is an Erasmus+ project that aims to bridge the gap between tools that assess individuals' entrepreneurial competencies and the adoption of tailored training actions.
To achieve this objective, it was decided to use EntreComp as a reference, as it is promoted by the European Commission’s Joint Research Centre. However, since EntreComp was developed a decade ago, it requires revision. To this end, a two-part investigation was conducted. In the first part, a Systematic Literature Review (SLR) on entrepreneurial competencies was undertaken. In the second part, a prospective analysis using the Delphi method was employed to build on the previously obtained results. The results of the first part include relevant references from the literature, which are quantified in tables included in this study. These tables help confirm some findings and address questions or supplement others by the subsequent Delphi process.
In conclusion, the modified competency framework is presented. This framework is an evolution of EntreComp, with some key aspects highlighted at the end of the article. In the ‘Ideas and Opportunities’ area of competencies, the concept of design was included. In the “Resources” area, the notion of digital competencies was introduced. Finally, in ‘Into Action’, the concept of process management was incorporated.

To the authors: Thank you for submitting this paper. The approach of reviewing the literature and combining this with expert input in the context of a Delphi study is adequate and balanced. As far as I saw, the deductive coding to the EntreComp Framework was comprehensible. Still, when looking at some of the assignments to categories, one may ask whether a more inductive

approach would have yielded additional insights about potential alternative categorizations. I understand that you avoided such an inductive approach as you wanted to respect the original categories of the EntreComp Framework. I still suggest mentioning this choice (even more) explicitly and making it a topic in a limitations paragraphs of the paper. After all, the literature discusses several alternative category systems (e.g., the categories for self competences, social competences, and domain competences). Apart form this limitation, your research suggests new aspects (design competence, digital competence, and process competence) that are without doubt of eminent importance - these are indeed intersting findings.
Overall, the paper makes a relevant and solid contribution.

Is the work clearly and accurately presented and does it engage with the current literature?
Yes

Is the study design appropriate and is the work technically sound?
Yes

Are sufficient details of methods and analysis provided to allow replication by others?
Yes

Are all the source data and materials underlying the results available?
Partly

If applicable, is the statistical analysis and its interpretation appropriate?
Not applicable

Are the conclusions drawn adequately supported by the results?
Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Entrepreneurship

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Author Response 18 Sep 2025

Jaume Teodoro

Dear Reviewer,
First, I would like to thank you for your contribution to the review process of my article, resulting from the Erasmus+ EICAA project. Thank you for the conciseness and detail in your explanation. I agree with you that an inductive approach could have revealed alternative competency categorizations beyond those of the EntreComp Framework. Personally, I must say that there is sufficient evidence in the academic literature to suggest alternative forms that may be equally or more suitable. Particularly in the field of entrepreneurship education at universities, my research experience suggests other possibilities. However, since the

objective of this work was to update and expand EntreComp, rather than develop a completely new framework, we deliberately chose to apply a deductive coding strategy aligned with the existing EntreComp categories. In the revised version of the manuscript, I will better explain this decision based on your comments. In the new text, I will add it to the discussion in the limitations section, reiterating that this deductive approach, while ensuring comparability with the original framework, could have limited the emergence of alternative categorical systems (such as personal, social, or domain competencies) or even masked certain competencies. In my view, and based on what has already been discussed, a more "design process" approach would have suggested other competency relationships and a more focused approach to practices such as challenge-based learning (CBL). I will do so. I thank the reviewer for highlighting this point, which helps clarify the methodological scope and limits of the study, and I remain at your disposal for any further assistance. Thank you very much. Jaume Teodoro.

Competing Interests: No competing interest.