

Project Report

Online Support for Education in Entrepreneurial and Intrapreneurial Competences: A Proposal for an Assessment Tool and Support for Tailor-Made Training

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Abstract: Higher education institutions across Europe are called to offer entrepreneurship education. Despite the rising interest and the increased offerings in the last decades, entrepreneurship education is yet not as mature as other disciplines, and it is still underdeveloped in some faculties and institutions. One way of embedding entrepreneurship education within different disciplines is to take a broader approach beyond teaching how to start up and focusing on developing the entrepreneurial competences of students, which equip them to provide value to society (either economic, social, or cultural). This article describes an online platform—named EICAA—that supports educators and trainers aiming at teaching/guiding/coaching students or employees in developing entre/intrapreneurial competences. The platform is based on a Competence Framework built upon a systematic literature review, which defines 18 key competences grouped in three competence areas. The platform allows the educator to assess the entrepreneurial competences of a group of students/participants, via the so-called Competence Monitor and provides tailor-made training with the Competence Development Kit. The platform is being used in five European universities and is open to be used by any higher education institution or organisation aiming at developing the entrepreneurial competences of their students and/or employees. Future developments of the tool can be enriched from the experiences of the participant institutions and could become an open collaborative online tool.

Keywords: entrepreneurship education; entrepreneurial competences; intrapreneurship; digital platform; assessment



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1. Introduction

Entrepreneurship and innovation are considered important engines of growth in developed economies. Based on the awareness of this, the formulation of policies and programs that aim to stimulate the creation of new ventures is an objective of roughly every country focussed on the economic development [1–3]. This is the case of the European Union, and initiatives such as fostering the entrepreneurial capacity of European citizens and organizations occupy the central stage of the political agenda [4]. In this vein, the European Commission appointed the key role of higher education institutions (HEIs) in entrepreneurship education (EE) and training.

Thus, HEIs across Europe have been called upon to offer entrepreneurship education, stimulate the entrepreneurial competences among its students, and become more entrepreneurial [5–7]. Although it is true that entrepreneurs learn from multiples sources [8], entrepreneurship education contributes to enhancing the ability to detect opportunities and give creative responses to them [3,9]. It also contributes to the entrepreneurship self-efficacy

(ESA), i.e., the beliefs of individuals about their capacity to start a venture [10–12]. Additionally, several empirical studies [13,14] have found a positive relationship between entrepreneurship education and entrepreneurship intention (EI). Therefore, as ESA and EI are good predictors of entrepreneurship behaviour, the efforts of HEIs to educate and train entrepreneurs—or in a broader perspective, students with entrepreneurial competences—are recognised and well-known.

Nevertheless, despite all the efforts in the last decade [15], education in entrepreneurship is not yet as mature as in other disciplines due to uncertainties in the definition of entrepreneurship itself, the aim of entrepreneurship education, and the variety of contents and teaching methodologies (what needs to be learnt and how) [16,17]. With respect to the definition of entrepreneurship, while pioneer approaches were predominantly framed under a narrow perspective of entrepreneurship as starting up new business, there is an increasing tendency of undertaking broader approaches to entrepreneurship as “providing value to others” [18,19]. That is, in narrow terms, entrepreneurship is understood as an occupational option measured mostly through self-employment of individuals [20], while broader perspectives include a broader set of initiatives defining entrepreneurship, e.g., as “acting upon opportunities and ideas and transform them into (financial, cultural, or social) value for others” [21]. The latter perspective also includes providing value in existing organisations through innovation, a term which is well-known as intrapreneurship [22,23]. Along with this broader perspective, there is a need to devise and implement ways of teaching entrepreneurship as a broad concept within the HEI system which relies on the development of entre/intrapreneurship competences of students [19,24–26] far beyond teaching how to start up a new business. Along with this broader perspective, there is a need to devise and implement ways of teaching entrepreneurship as a broad concept within the HEI system, which relies on the development of entre/intrapreneurship competences of students [19,24–26] far beyond teaching how to start up a new business.

Within this context, the European Commission developed EntreComp (European Entrepreneurship Competence Framework) as the reference framework of competences for entrepreneurship education which was established on the basis of a comprehensive multi-step mixed-method approach [21]. The main theoretical rationale and, ultimately, justification for relying on a broader conceptual view of entrepreneurship in EntreComp, however, has resulted in the study “Entrepreneurship Competence: An overview of existing concepts, policies and initiatives (OvEnt)” [19] funded by the Institute for Prospective Technological Studies of the European Commission’s Joint Research Centre. As a result of this study, entrepreneurship is considered as a “transversal competence, which applies to all spheres of life: from nurturing personal development, to actively participating in society, to (re)entering the job market as an employee or as a self-employed person, and also to starting up ventures (cultural, social or commercial)” [21]. By adhering to this broader perspective, education of entrepreneurship and, thus, of their associated competences, can be better integrated and accepted in educational programs and faculties beyond business schools. For example, students in the humanities are typically more interested in social entrepreneurship, because of the social value and non-profit dimensions [27].

EntreComp is an exhaustive and complete framework encompassing 15 competences, 60 threads, and 442 learning outcomes. It is designed as a reference framework for educators aiming at designing and implementing entrepreneurship educational programs. However, its translation into practical course contents and methods may require some effort and guidance due to its exhaustivity.

Furthermore, the advent of online learning and its rapid acceleration during the COVID-19 pandemic have shown the benefits of online education and have moved students to feel more inclined towards this type of training [28,29]. Online learning offers new opportunities, such as innovative methods of teaching, assessment and monitoring, and personalised education [28]. A recent literature review [29] found three main innovative approaches to online entrepreneurship education: social media (i.e., Wiki), serious games (to engage and motivate students), and Massive Open Online Courses (as a platform of

high-quality educational resources) [30]. Another initiative used an online assessment to examine students' entrepreneurship traits and proved that students became more aware of their developmental needs. In addition, it allowed educators to tailor their teaching approaches to the personality traits of their students [31]. Despite these pioneering and innovative approaches, the offer of online entrepreneurship education is still lower than in other disciplines and it is underreported in scientific publications as well [28]. One of the attributed causes is the belief, supported by evidence, that learning entrepreneurship is better achieved through hands-on activities, experiential approaches, and real-world immersive experiences [32]. However, blended approaches can benefit from both online and experiential approaches and provide enhanced teaching and learning opportunities to educators and students [28,32].

In this contribution, we present the EICAA, an initiative based on the research in entre/intrapreneurship competences that delivers an open online platform for educators and trainers aiming at teaching/guiding/coaching students or employees in developing entre/intrapreneurial competences. EICAA stands for Entrepreneurial and Intrapreneurial Competences Assessment Alliance and is being developed under an Erasmus+ project funding (European Commission). In short, the EICAA provides a revised entrepreneurship competence framework, a self-assessment survey for students or employees, and a competence development kit. The EICAA Competence Framework presents a revised and exhaustive competence framework, built upon a systematic literature review, taking EntreComp as a reference framework and benchmarking with other frameworks [33–36]. The EICAA Competence Framework enhances EntreComp with new competences related to current methods of entrepreneurship and, at the same time, reduces its complexity to make it more accessible to educators. In addition, EICAA provides a validated entrepreneurship survey, where the educator analyses the stage of development of the entrepreneurial competences of their group. Additionally, the educator obtains recommendations of teaching modules which are tailored to the group. These teaching recommendations can be either online or experiential and face-to-face activities, depending on the adequacy of the methodology to the characteristics of every entrepreneurship competence and its learning goals. The platform allows the teacher/trainer the flexibility to use the recommendations or access the full repository of learning modules. Every learning module follows the same design methodology with hands-on activities, resources, and suggestions for competence development and assessment. After some promising pilot tests, the platform is fully deployed and further tested in the winter semester 2022/23 within the five universities that belong to the consortium as well as within businesses associated to the project.

2. Background, Methods, and Objectives

The lack of information on entrepreneurial proficiency levels of learners creates a variety of challenges for HEI educators and trainers with regard to outlining entrepreneurial learning activities appropriately. Knowing which entrepreneurial competences need to be developed, as well as to what level, facilitates the planning of entrepreneurial learning activities and, most likely, increases the efficiency of entrepreneurship education. Without such information, a good match between what is offered by educators and what is needed by learners may be difficult to achieve.

The same is true for determining entrepreneurial competences on an organisational level. Organisations that are knowledgeable of their entrepreneurial competence portfolio are in a better position to identify and address present entrepreneurial skills gaps—within or outside the organisation—as well as to determine whether internal staff development plans with regard to entrepreneurial traits have been achieved.

The EICAA project has been established to address these “black-box-like” phenomena. The underlying logic of the platform is to provide tailored learning recommendations for groups of students/employees based on their current entrepreneurial competence assessment. It builds a digital platform for the assessment and development of entre/intrapreneurial competences. The platform consists of three main components, the

Entrepreneurship Competence Framework, the Competence Monitor, and the Competence Development Kit. By identifying developmental needs of their target group(s) through a competence assessment, the EICAA platform enables educators and trainers to better customize entrepreneurship education activities. Additionally, teachers/trainers can track the progress of their group as well as benchmark different groups. The EICAA Digital Platform suggests entrepreneurial learning interventions upon which the users can improve the proficiency level within the group that underwent the self-assessment. These suggestions are derived from the self-assessment results. Its resources have been designed to be ready for micro-credential uptake, following the guidelines of the European Commission Higher Education Consultation Group [37] and of the OpenU project [38].

The methods followed to build the three components of EICAA Digital Platform are:

1. **Entrepreneurship Competence Framework:** developed after a systematic literature review of a sample of 138 documents, both from scientific literature and grey literature. The review was coded using NVivo software tool and the identified competences were matched with the existing EntreComp framework. Then, the team of researchers studied new additions and simplifications of the EntreComp framework and synthesized a proposal which was refined in several iterations.
2. **Competence Monitor:** consists of a survey for self-assessment of entre/intrapreneurial competences. The development of the EICAA Competence Monitor followed a mixed-method approach. In the first stage, it consisted of the development and iterative refinement of a rubric system. Then, item statements were elaborated and refined using a Delphi process with 15 educational and entrepreneurship researchers and experts. The survey was tested in several rounds with several samples of students.
3. **Competence Development Kit:** the repository of stackable learning modules targeting every competence at basic and advanced levels, designed under the micro-credential guidelines [38].

The objectives of the EICAA Digital Platform are to offer providers of entrepreneurship education (e.g., educators or trainers) and senior management representatives or human resource managers inside and outside higher education the possibility to gain a better understanding of the entrepreneurial proficiency of any group of individuals. It also allows for the exploitation of this knowledge to tailor entrepreneurial teaching activities that better fit the actual learning needs. This facilitates entrepreneurship education and provides an instrumental basis for a more efficient development of entrepreneurial competences inside universities, enterprises, and other types of organisations.

On the long run, EICAA bears the potential to offer guidance for policy makers once a critical mass of organisations has exploited the Digital Platform or are regularly making use of it. This would enable the EICAA consortium to provide (policy) reports that summarise entrepreneurial competence proficiencies on state or country level (e.g., of enterprises or universities) or to compare aggregated entrepreneurial proficiency levels between regions and states.

3. Construction of the Competence Framework, the Competence Monitor, and the Competence Development Kit

As follows, we describe the three components of the EICAA Digital Platform, i.e., the Competence Framework, the Competence Monitor, and the Competence Development Kit.

3.1. Construction of EICAA Competence Framework

The EICAA Competence Framework is built upon a systematic literature review [1,39,40] of entrepreneurial and intrapreneurial competences, taking EntreComp as a reference framework. The aim of the review was to identify the competences of entrepreneurs and intrapreneurs that lead to successful ventures. Throughout the paper, competence refers to the “proven ability to use knowledge, skills and personal, social and /or methodological abilities in work or study situations and in professional and personal development”, as defined by the European Qualification Framework (EQF) [41]. Herein, we understand venture in the broad sense, i.e., as

an initiative that is undertaken by an entrepreneur or intrapreneur to provide value to others. Although it is true that the success of a new venture does depend on many factors—contextual, personal, and circumstantial factors—the literature covers extensive research on the traits and actions of the individual that are mostly related to successful ventures. By identifying these individual competences, educational programs can be aligned and designed to help students and would-be entrepreneurs develop these competences.

The sample consisted of research papers obtained with a systematic search in databases Web of Science, Scopus, and Inform/ProQuest. The search terms were combinations of terms *entrep** or *intrap**, appearing as the topic of the paper. The search was performed as of December 2020, and no limits were set on the year of publication. We narrowed the search by selecting papers of type review and having more than 100 citations. We merged the results from the searches and eliminated duplicates, resulting in a sample of 139 articles. After we screened the title and abstract, 84 relevant papers were ultimately retained. Finally, to include the perspective of relevant bodies, we included grey literature as recommended by some authors [42], such as literature from the European Commission which has published a rich set of documents on entrepreneurship education and competences. Thus, we added a total of 54 additional documents to the initial sample, resulting in a final sample of 138 documents.

To identify the relevant factors that lead to successful ventures, we established a protocol of content analysis which was implemented through the software tool NVivo. The protocol was based on a combination of deductive and inductive coding. We initially defined a set of 15 codes, representing the 15 competences of EntreComp, which are grouped into three competence areas, namely “Ideas & opportunities”, “Resources” and “Into action”, and we added new categories if the factors identified in the literature were not covered by EntreComp.

A team of reviewers supervised by three senior researchers conducted the coding, and intercoder reliability was taken into account by having regular meetings and discussions on potential disagreements. To further confirm the competence framework, the list of competences of EntreComp was compared with six relevant competence frameworks of the literature: Bird (1995/2019) [43], Mitchelmore and Rowley (2010) [44], Morris et al. (2013) [33], Rasmusen and Nybye (2013) [34], Bolzani and Luppi (2020) [35], and Tittel and Terzidis (2020) [36]. All the competences included in these competence frameworks were matched with EntreComp and the competences that were not already covered by EntreComp were considered as new competences (or new threads in the existing competences).

The synthesis phase was performed by the three senior researchers, who put forth a proposal for the competence framework, which was debated in a workshop with the remaining team of researchers and progressively refined in several iterations. The final competence framework is briefly presented in Section 4.1.

3.2. Construction of EICAA Competence Monitor

The EICAA Competence Framework sets the taxonomy (structure and list of competences and threads) that theoretically supports the EICAA Competence Monitor. The development of the EICAA Competence Monitor followed a mixed-method approach [45]. In a first stage, the EICAA Competence Framework was the basis for the development and iterative refinement of a rubric system. A rubric system is a course or curriculum evaluation matrix defining observable aspects of the targeted competences at different proficiency levels. Due to the rubric systems’ high reliance on rich, qualitative descriptions of competence proficiency level attributes, it was instrumental in ensuring content validity of the instrument [46]. To further ensure face validity, effectiveness, and sustainability of the instrument, formulations were further refined using a Delphi process with 15 educational and entrepreneurship researchers and experts in four iterations before consensus was reached.

The rich descriptions of the rubric system then served as a basis to develop alternative survey versions which were validated with an even broader set of 31 educational and

entrepreneurship researchers, teachers, and experts. In total, five versions of the survey were developed: one using shortened versions of the rubric as answer options, one using rich descriptions of a thread as statement and cognitive proficiency levels based on Bloom's taxonomy [47], one employing five EntreComp-inspired proficiency levels (none, basic, intermediate, advanced, and expert), and finally, a streamlined version of the latter. Each version was developed through a combination of at least one focus group with the evaluators and a Delphi process with asynchronous review rounds. In the final version, item statements from the third version were reduced in length and lexically simplified, and, where necessary, a responsive hint was added to clarify the meanings of the terms used.

The fourth version of the survey was subjected to a first quantitative preliminary test round (N = 72). The participants of this test and the one that followed were students across different disciplines and different educational levels (Bachelor's, Master's, and Doctoral programs) at the five higher education institutions of the EICAA Consortium.

During this first test round, one competence was found to exhibit reliability issues and five indicated normality issues. Otherwise, reliability ranged between 0.669 and 0.926 for Cronbach alpha, between 0.610 and 0.918 for split half consistency, and between 0.721 and 0.927 for omega. The result of this round led to the development of the fifth version, which was subjected to a second test round (N = 202), this time including exploratory and confirmatory factor analysis, as well as average variances extracted. In this round, one competence was still investigated further due to potential reliability, and six for normality, or one-dimensionality. Reliability scores in this round for the other competences ranged between 0.651 and 0.914 (Cronbach's alpha), between 0.733 and 0.914 (omega), between 0.656 and 0.915 (split half) and between 0.63 and 0.91 (composite reliability). Moreover, an analysis of the average variance extracted (AVE) resulted in issues for the competences Creativity (AVE = 0.48) and Self Awareness and Self Efficacy (AVE = 0.48).

The results of the second test triggered a last qualitative review round to discuss items that revealed internal consistency issues, as well as preliminary patterns observed in reliability and covariance scores. This last review round also entailed a detailed check of the item formulations with the Competence Framework, as the many iterations of the dialectical Delphi process risked leading to discursive operationalisations that no longer fully reflected the original concept.

3.3. Construction of EICAA Competence Development Kit

The EICAA Competence Development Kit is a catalogue of entrepreneurial learning intervention resources for both HEI teaching interventions targeted at students as well as for enterprise training interventions targeted at employees. The overall aim is to improve performance measures in competence areas where score outcomes in the EICAA Competence Monitor are considered suboptimal through the development of suitable (teaching/learning) intervention resources that promote entrepreneurial and intrapreneurial competence development within HEI study programmes and employee training.

The EICAA Competence Development Kit relies upon the methodological approach of teaching through entrepreneurship [48]. Thus, the teaching interventions are designed as hands-on experiences where the students or employees are immersed in simulated or real-world scenarios tailored to a given competence. These scenarios are associated with the different stages of the entrepreneurial process, such as identifying problems or opportunities in a given domain, generating and valuing ideas, drawing a business plan, and reflecting on the ethical and sustainable issues, among others. By interacting and engaging with these scenarios, the students further develop the associated entrepreneurial competences. "Through" also means that entrepreneurship can be taught/learned through other subjects beyond entrepreneurship courses. The educator or trainer can choose a given learning module in the context of any course to help the students/individuals develop a particular competence (e.g., using module "spotting opportunities" in a course on industrial design).

The logic of the EICAA Competence Development Kit is based on a five-stage process:

1. **Designing:** includes reviewing and analysing findings of the EICAA Competence Framework and the Competence Monitor, as well as screening other EU projects to identify “focus competence(s) (areas)”, then selecting a number of modules (~10+) per side (i.e., HEIs and enterprises).
2. **Developing:** refers to revising the literature, developing resources (modules/units) for the HEI and enterprise side (structure, content, and/or presentation on digital platform) as well as providing module recommendations for users.
3. **Scaling:** points at embedding the EICAA Competence Development Kit as OER (open educational resources) into the digital platform as well as its dissemination.
4. **Sustaining:** relates to sustaining the EICAA Competence Development Kit post-project-lifetime and providing the possibility for other institutions to add resources and share their ideas.
5. **Implementation and reflection:** finally aims at establishing a standardized feedback cycle (subgroups), testing through the application of modules (pilot-testing), and analysing feedback, as well as revising the EICAA Competence Development Kit, where necessary.

The structure is based on a modular approach, with each structured module giving an overview on the following: main competence and additional competences, learning outcomes, target group (students or employees), proficiency level (basic/foundation, intermediate, or advanced), workload (ECTS credits and certificate), assessment, and format. After the module overview, an instructor’s manual describes how the module should be facilitated, including teaching and learning methods and indicating the learning path, contents, learning activity, assignments, and instructions for educators/business trainers. Additionally, we provide resources for educators and enterprise trainers to teach the module, including checklists, literature, links, number of educators/trainers necessary, preparation for educators, room set up, and requirements—flip charts, video projector, etc.

4. Results

4.1. EICAA Competence Framework

The EICAA Competence Framework relies upon the systematic literature review detailed in Section 3.1. It is structured in three competence areas, with a total of 15 competences, each further divided in several threads, which, in turn, are deployed in eight progression levels, resulting in a total of 442 learning outcomes. The EICAA Competence Framework provides an updated version of EntreComp (see Table 1), maintaining the same structure as EntreComp, with the addition of three new competences, the revision of some threads, and the reduction of the progression levels to four.

In summary, the EICAA Competence Framework brings:

- A stronger focus on design and customer discovery: customer discovery, co-creation, and market view of the new venture (or value-creating activity).
- Agile and incremental entrepreneurship: stronger focus on testing and experimentation; and realization that a new venture (or value-creating activity) is based on hypotheses or assumptions that need to be continually tested and revised (i.e., scientific approach to entrepreneurship).
- Digital competences associated with the creation of new ventures (or creation of value), from having basic digital skills to being aware of the safety and privacy issues related to digitalization.
- More emphasis on the process view of entrepreneurship, including iterative cycles and adaptability to the phases; and management of the process of the value creating activity.

Table 1. Structure of EICAA Competence Framework.

Competence Area	Competence
Ideas and opportunities	Spotting opportunities Creativity Vision Valuing ideas Ethical and sustainable thinking Design *
Resources	Self-awareness and self-efficacy Motivation and perseverance Mobilising resources Financial and economic literacy Mobilizing others Digital management *
Into action	Taking the initiative Planning and management Process management * Coping with uncertainty, ambiguity, and risk Working with others Learning through experience

* New competences added in comparison with EntreComp.

The three new competences included in the framework are Design (in competence area “Ideas and opportunities”), Digital management (in competence area “Resources”), and Process management (in “Into action”). These new competences are decomposed into several threads each, following the same structure as EntreComp, and four progression levels:

- Competence “Design” is defined as the ability to interact with customers (or the target group) and other stakeholders to identify needs, prototype, test, and co-create. Thus, it includes threads “Immerse with your users”, “Identify needs”, “Prototype and test”, and “Co-create”.
- “Digital management” involves the confident, critical, and responsible use of, and engagement with, digital technologies for the value-creating activity. It includes the following threads: “General digital competences at work”, “Digital competences for the value creating activity”, “Information and data literacy”, and “Safety and cybersecurity”.
- Competence “Process management” is contextualised under the concept that entrepreneurship is a process which is dynamic, iterative, and feedback-driven [9,19,49,50]. The competence emphasizes the ownership of the process by the entrepreneur. Thus, it includes threads “Monitor progress”, “Be flexible”, “Redirect your strategy”, “Manage transitions”, and “Work agile”.

Figure 1 depicts the visual representation of the EICAA Competence Framework, which holds the idea of the process of entre/intrapreneurship from ideas and opportunities to taking action, by means of a set of resources. EICAA Digital Framework supports the assessment, analysis, and improvement of these competences (the full public report can be accessed through the web site of the project www.eicaa.eu, accessed on 15 September 2022).

4.2. Validation of the Survey

Confirmatory factor analysis was performed using AMOS 28 on each of the three domains separately, as the competences in each domain are expected to show greater internal consistency than between domains. Variable inflation factor (VIF) for all factors were below 0.64, showing no collinearity issues. We built the initial models on the basis of the structure in the Competence Framework, the parameters of which were borderline or not acceptable in some cases. On further modelling, we could identify trends which suggested the trimming or splitting of factors, for example, Design in the domain Ideas and opportunities. Based on original models, Figures 2–4 convey the standardised loadings

(numbers on the one-sided arrows) between the variables and the factors for the three domains, respectively, describing the influence of each variable on their respective factors. The figures also display the estimated variances for each factor (numbers above the factor) and the estimated covariances between factors (numbers on the double-sided arrows). From these, we can foresee improvements to further optimise the models and obtain a better fit, including calibrating each model using a stripping logic, starting from the full hypothetical model, then stripping the nonsignificant paths. This will be further investigated in a follow-up publication.

Appendix A displays the statements of the survey. The complete survey can also be accessed through the web site of the EICAA project (www.eicaa.eu, accessed on 15 September 2022).

4.3. Platform Overview

The EICAA Digital Platform addresses mainly educators of higher education and enterprise trainer/coaches who seek to develop entrepreneurial competences of learners. The platform is developed as a free-of-charge and publicly available instrument. However, all users are required to register before entering the core part of the platform. This core consists of two main components: (a) the EICAA Competence Monitor and (b) the EICAA Competence Development Kit (see above for details). It is recommended that the two components are used sequentially to let the platform unfold its full potential. This means that registered users ought to do the following:

Step 1. Decide whether to create a student or employee self-assessment survey for which a link is created subsequently that can be used to bring participants to the survey.

1. Select a set of survey features as: start/end date from/until the survey is running, name the survey, select a survey language (English, Spanish, French, German, Dutch, Hungarian, and Catalan are currently being planned for availability).
2. Preview the survey prior to sending the survey link to the group of interest.
3. Send the survey out via link to the target group (Figure 5 shows a screen shot of the survey as seen by the participant).
4. While running: track survey performance in terms of completed questionnaires displayed in histogram (y-axis = number of submissions and x-axis = date) and pause, stop, or extend duration of survey (if needed)—see Figure 6.
5. Close the survey (manually or as defined by date).

Step 2. After a survey has been closed, the results dashboard of the Competence Monitor generates:

6. A set of graphically displayed metrics allowing the user to see how the self-assessed group “performed” along the competences of the EICAA Competence Framework.
7. A list of competences that are recommended to be the focus of follow-up learning/training interventions.
8. Suggested teaching/training interventions from the EICAA Competence Development Kit that can be used for that latter purpose.

Step 3. Naturally, it is up to the user whether to follow the recommendations provided by the dashboard of the EICAA Competence Monitor. If the user decides to do so:

9. All details for the recommended interventions are provided within the EICAA Competence Development Kit section of the platform.
10. The user will be directed to respective sections via click on the recommendations of the dashboard (see Figure 7).
11. The user may also navigate freely inside the Competence Development Kit to search for more interventions. The platform will present a variety of filters to facilitate the search for interventions (e.g., competence area, competence, and difficulty of intervention).

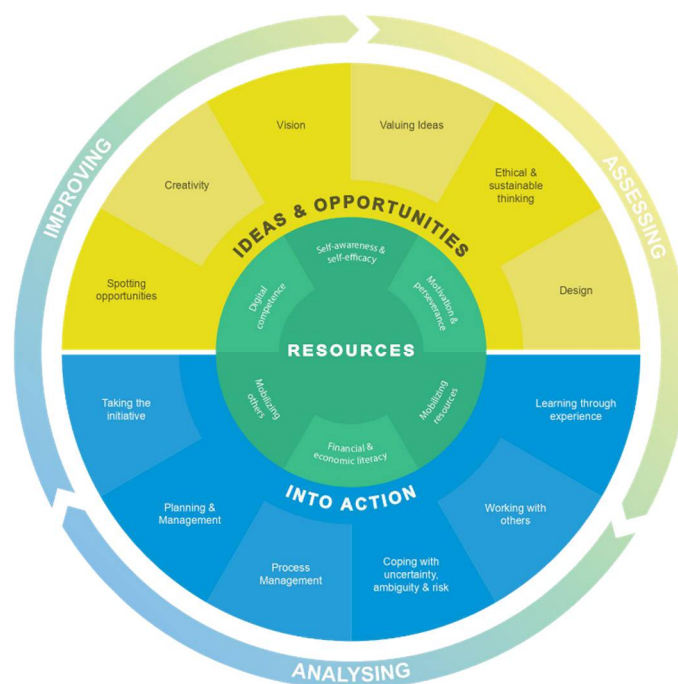


Figure 1. Visual representation of the EICAA Competence Framework.

Essentially, Steps 1 and 2 feature the Competence Monitor and always go together once a user begins and completes a self-assessment of a group. In contrast, the EICAA Competence Development Kit (step 3) can also be exploited autonomously by navigating to it on the platform without prior self-assessment of any group.

Furthermore, users are not limited to creating one self-assessment exercise only. Rather, additional surveys for other groups of learners (or the same group at a different time) can be added at any time. To keep order of all self-assessments, the platform also presents an archive section where all finished surveys and corresponding data can be accessed and downloaded by the user.

The Competence Development Kit (educational intervention) consists of a set of modules with activities that are aimed at developing a given competence, as depicted in Figure 7. Every learning module has the same structure: Overview of the module, Educator Tasks, Resources, and Rating. The Module Overview is structured into learning goals, competences that are developed under this module (main competence and additional competences), target group, students' workload, and format (online or face-to-face activity). The Educator Tasks contains the details of how to conduct the activity (contextualisation of the activity, information and resources for materials and documents necessary to develop the activity, step-by-step process of the activity, and guidelines to grade the students). The Resources section provides links to complementary resources related to the activity or the competence and Rating represents the score of the activity as valued by the educators who had accessed and tested the learning module.

The platform, which will be available in English only (apart from the self-assessment survey), is currently still under development. A beta version is expected by the end of 2022. Once publicly accessible, the platform will be licensed under the European Union Public Licence v.1.2, conditioned by the Commons Clause. The hosting of the platform and storage of all user data is carried out within the European Union under full compliance of the General Data Protection Regulation (GDPR).

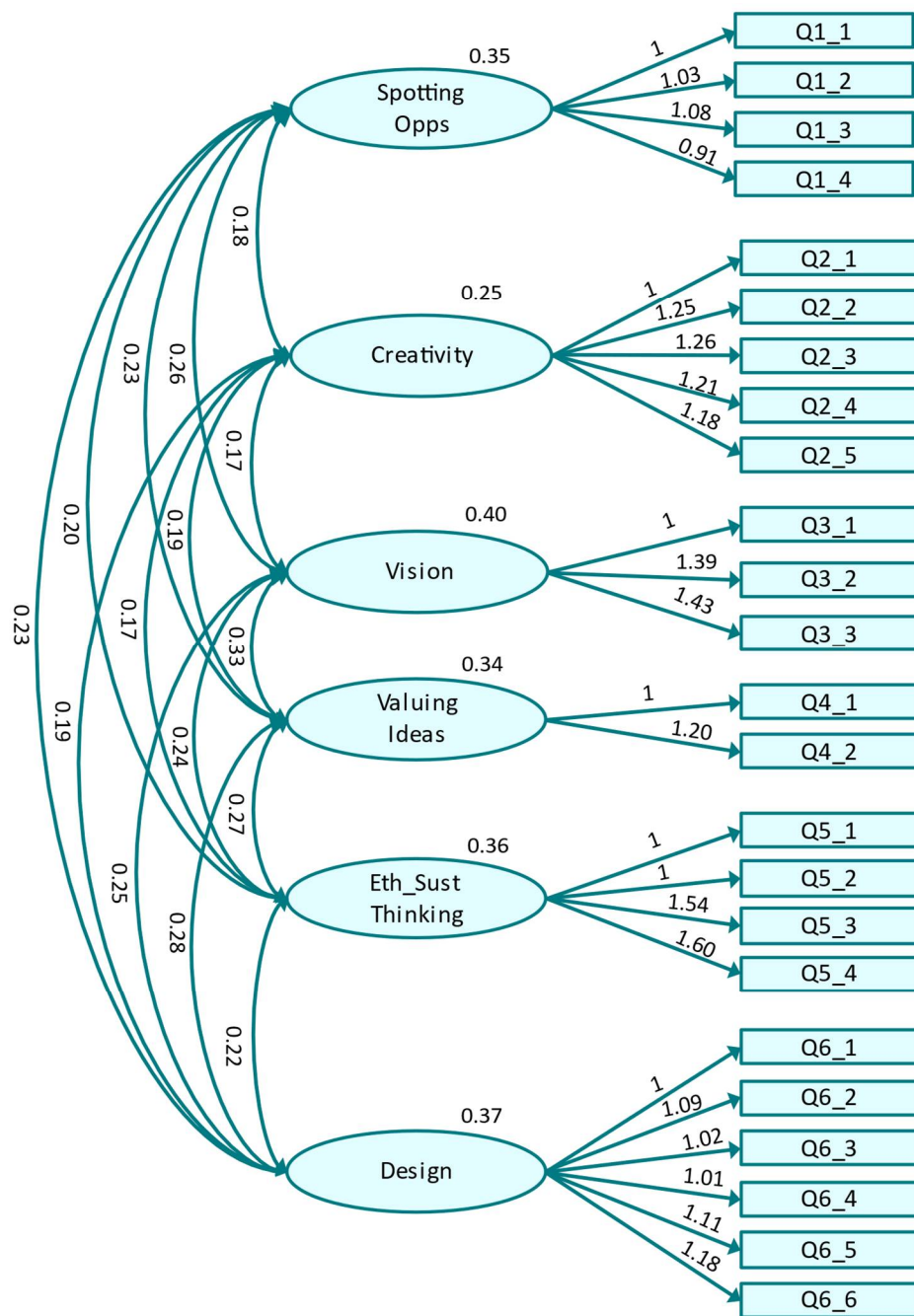


Figure 2. Optimised original path model for domain "Ideas and opportunities".

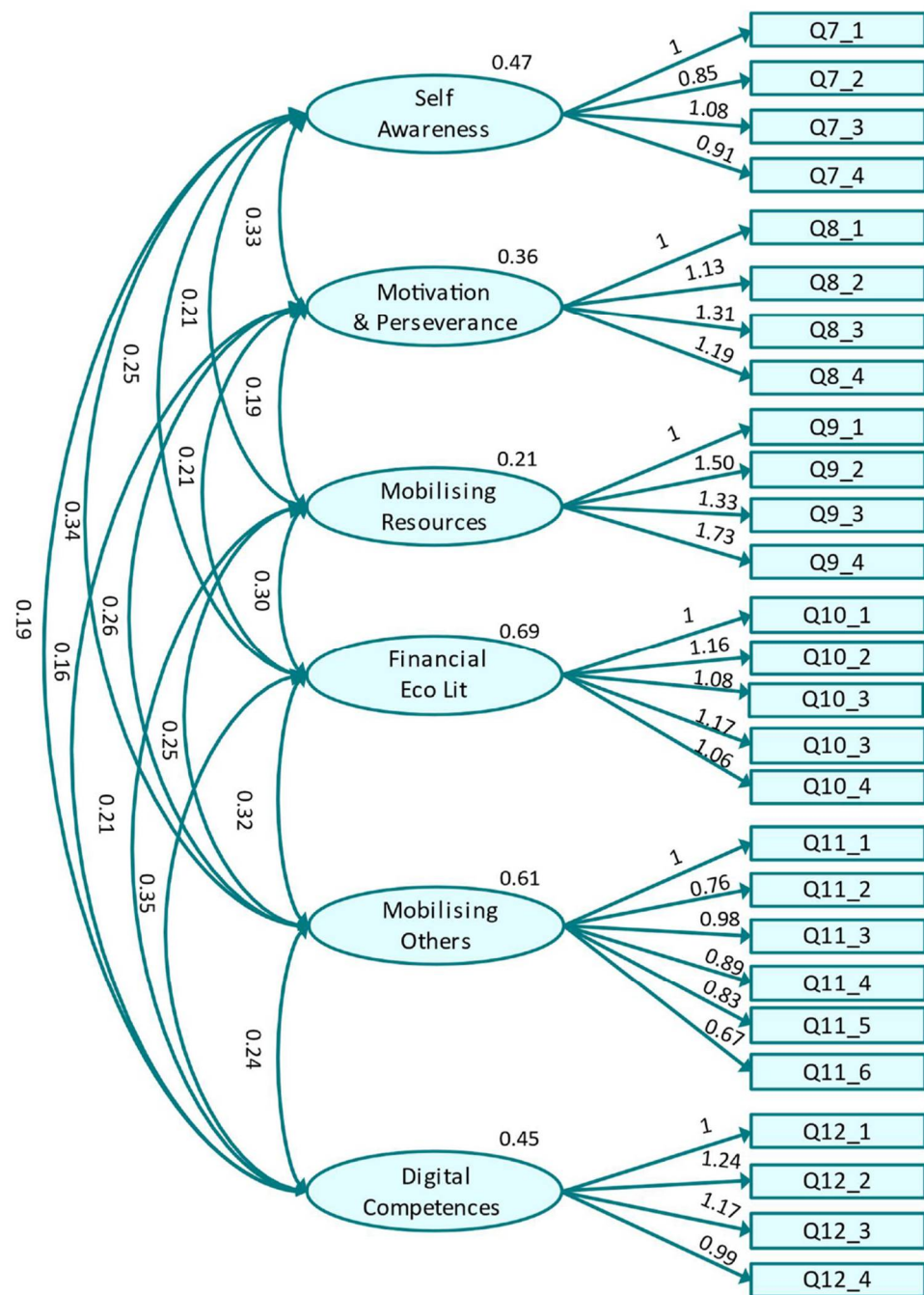


Figure 3. Optimised original path model for domain "Resources".

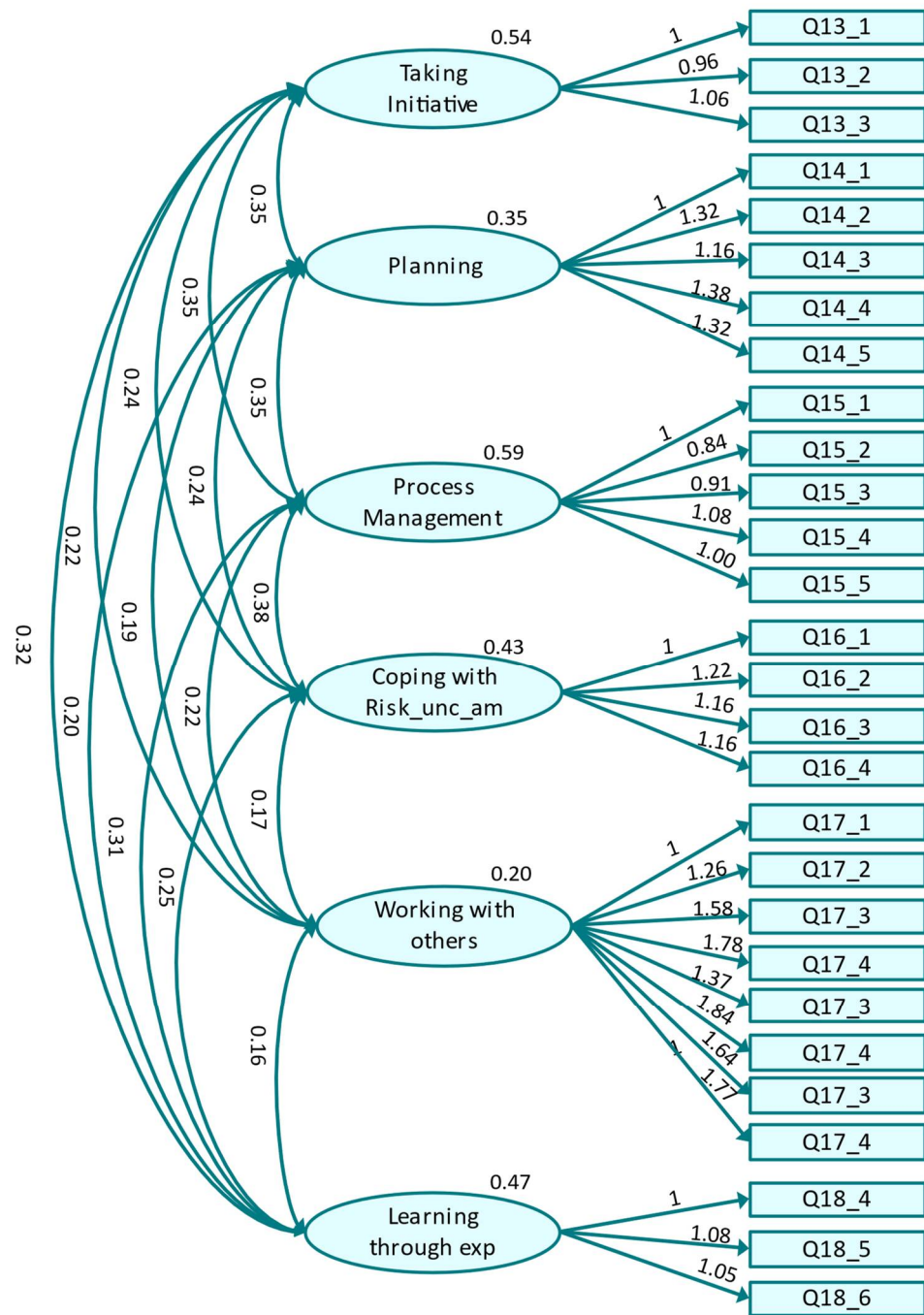


Figure 4. Optimised original path model for domain "Into action".

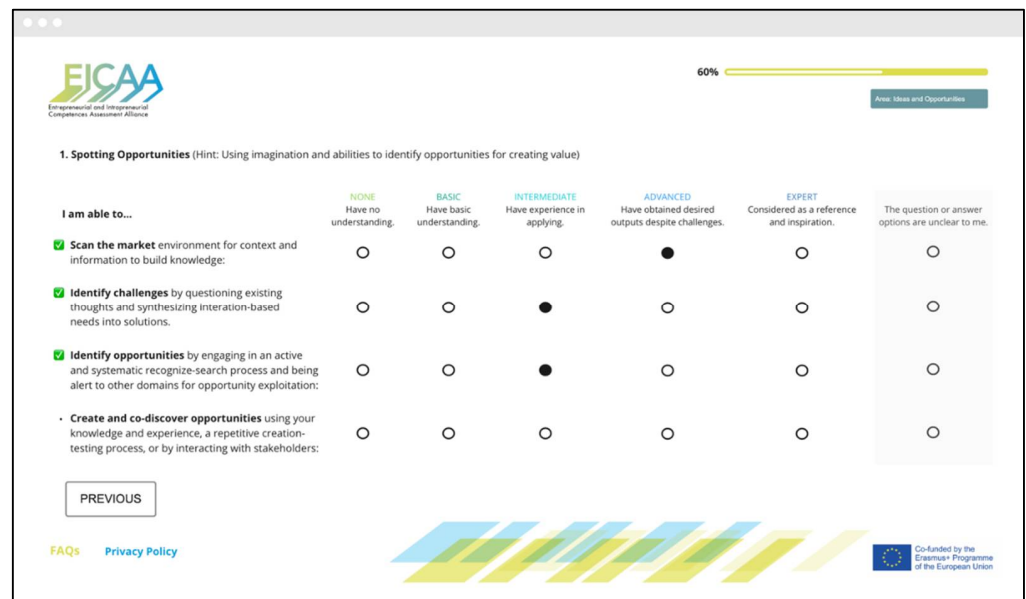


Figure 5. Screenshot of the EICAA Digital Platform with a fragment of the Competence Monitor, as seen by the student/employee.

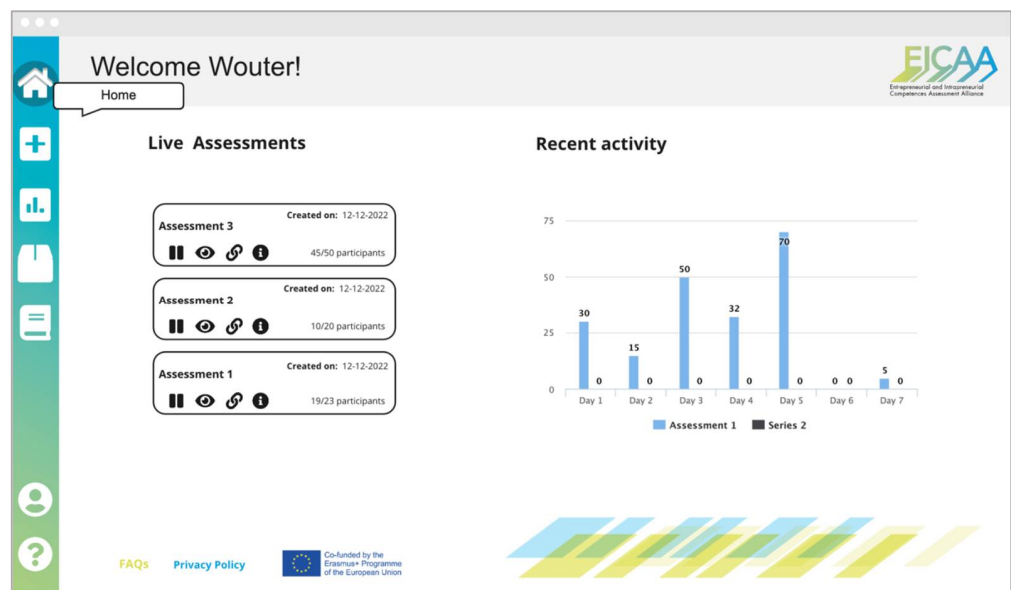


Figure 6. Screenshot of the EICAA Digital Platform with first pilot tests showing survey performance tracking (see text, Step 1, n.4).

The screenshot displays the 'EICAA Development Kit' interface. At the top, a navigation bar shows 'University classroom' (highlighted), 'IDEAS & OPPORTUNITIES', 'CREATIVITY', and 'THE LUCKY FISH'. The main content area is titled 'Module Overview: The Lucky Fish' and includes a sub-description: 'An idea competition for students (employees) where they can demonstrate their entrepreneurial (intrapreneurial) ideas and test for their potential. A jury of independent experts from various fields evaluates all ideas and the best ideas are awarded prizes.' Below this, there are several informational boxes: 'LEARNING GOALS' (three points about interest in idea competitions, elevator pitches, and business planning), 'COMPETENCE(S)' (creativity, ideas & opportunities, advanced proficiency level), 'OUTCOME/WORKLOAD' (50-75 workload hours / 2-3 ECTS), 'FORMAT' (open to all students/study programs, submission period Feb-April, assessment in April), and 'TARGET GROUP' (all study programs and departments, undergraduates & graduates). A 'BRAINSTORMING IDEAS' section is also visible with icons for quantity and diversity. A sidebar on the left contains navigation options: OVERVIEW, EDUCATOR TASKS, RESOURCES, RATING, and RETURN TO REPOSITORY. The footer includes 'FAQs Privacy Policy' and 'Co-funded by the Erasmus+ Programme of the European Union'.

Figure 7. Screenshot of the EICAA Digital Platform depicting the structure of a learning module belonging to competence Creativity (see text, Step 3, n.10).

5. Discussion

The EICAA Digital Platform offers an innovative instrument to facilitate blended entrepreneurship education for higher education teachers as well as those seeking to foster entrepreneurial learning in the corporate sector. By following and carrying out the pathways of EntreComp, it is based on a wide and domain neutral conceptualisation of entrepreneurship. This broad conceptual understanding is also embraced by its two substituent components—the EICAA Competence Monitor and the EICAA Competence Development Kit. Consequently, they have been designed to be applicable to a wide range of disciplines and are beyond the scope of preparing learners to start-up businesses or similar purposes.

The EICAA Digital Platform relies on the identification of the entrepreneurship and intrapreneurship competences collected under the EICAA Competence Framework. The Competence Framework keeps the same structure as EntreComp [21], the reference framework designed by the Joint Research Centre (European Commission), while reducing its complexity to four progression levels, and adding three key competences, namely Design, Digital, and Process management. While the reduction makes the framework more accessible and manageable, the new additions update the framework to the newer trends on entrepreneurship. Particularly, we place a greater emphasis on the current practitioners and teaching practices—a scientific approach to entrepreneurship and agile development—while keeping the neutrality with respect to any particular entrepreneurship method. EICAA Competence Framework has also been benchmarked with other extant competence frameworks [33–35,43,44], and we ensured that all competences relevant for successful entrepreneurship identified in these frameworks are represented in the EICAA Competence Framework.

The EICAA Competence Framework sets the basis for the definition of a rubric system and, in turn, for the Competence Monitor, a survey for self-assessment of entrepreneurial and intrapreneurship competences. The survey is answered by the individual student/employee and aggregated to the group level and presented to the educator/trainer. Thus, it allows the educator to diagnose the current development of entrepreneurship competences of their group of learners and apply tailored interventions. Adapting teaching interventions to the results of entrepreneurship competence assessment was also reported in a previous case study, although it was restricted to entrepreneurship personality traits and fewer skill dimensions [31]. The EICAA diagnosis tool also allows for enhanced functionalities, such as comparisons of pre–post interventions and/or among different groups.

Furthermore, if we compare it with other cited platforms, we note that EICAA has been set up to enable large-scale applications by allowing the self-assessment of entire organisations (e.g., entire student body of a university), providing a dashboard that delivers an aggregate analysis of all assessment data, and by suggesting suitable education activities to improve entrepreneurial competences.

A potential limitation of the EICAA Competence Framework is its broad approach to entrepreneurship, which consequently results in a broad and general definition of some competences. As an example, one could argue that competence “Ethical and sustainable thinking”—and its translation into the survey items—remains too broad and applicable to any area of life or work. A similar reasoning can be applied to other competences, such as “Motivation and perseverance” (see the Appendix for the detailed list of the survey’s statements). The reason behind this approach is to evaluate the competence of the student or learner rather than the entrepreneurial behaviour itself. This, in turn, relies on the conceptualisation of competence as the ability to use knowledge and skills as well as personal, social, and/or methodological abilities in work or study situations and in professional and personal development, as defined by European Qualification Framework (EQF) [41]. Because of this conceptual approach, the EICAA Competence Framework contains competences and competence definitions that are relevant not only to entrepreneurship but also to other areas of life and work. Nonetheless, this might promote a greater acceptance of the Digital Platform in programs and faculties beyond business schools, such as in the humanities. It is also worth noting that the Competence Development Kit is designed with hands-on activities based on the methodological approach of “teaching through entrepreneurship”. Thus, despite adhering to a broad conceptual understanding of entrepreneurship in the Competence Framework and in the Competence Monitor, the Competence Development Kit provides opportunities for learners to develop the entrepreneurship competences through experiential learning in real or simulated entrepreneurship scenarios.

The EICAA Competence Development Kit offers a set of stackable learning modules that the educator can use by following the recommendations for the target group or by freely selecting among the set of available modules. Compared with Massive Open Online Courses (MOOCs), the Competence Development Kit provides resources for teachers, educators, and trainers and gives greater flexibility for selection and adaptation to the teaching objectives.

Notwithstanding this, the real benefits that the EICAA Digital Platform may offer can only be evaluated once a series of use cases has been established in different contexts. This is particularly true for applications that are not of large scale and outside the context of higher education. In fact, using the EICAA Digital Platform only for a low number of self-assessments jeopardizes the statistical value of the metrics delivered by the dashboard of the EICAA Competence Monitor as well as of the course/training interventions suggested by it.

To add, the EICAA Digital Platform has been developed as an open educational resource. Its use is cost-free upon prior user registration. It is published under the European Union Public Licence (EURL 1.2). However, the consortium was not willing to licence the platform entirely as open source, as this would allow the commercialisation of its code by externals. Rather, EICAA makes use of the “commons clause” which serves as a legal wrapper text to EURL and turns the EICAA Digital Platform into a source-available solution. The prevention of commercialisation of open-source code appears to be an unsolved issue given that there seems to be no ideal licencing model yet strong enough to prevent such a scenario.

Furthermore, the EICAA Digital Platform is GDPR-compliant, which, however, appears to be challenging when trying to collect data of students and/or employees and when the technical infrastructure is not provided by the very organisation running the self-assessment. Apart from the self-assessment of entrepreneurial competences, the EICAA Competence Monitor also asks self-assessment participants a very basic set of demographic questions (e.g., age, gender, and country where university/organisation is located). While large-scale applications are the preferred scenario, use cases that collect only a few self-assessments and, in principle, bear the potential to infringe on the data privacy of

self-assessment participants, cannot be entirely ruled out. Defining a threshold for data volume that prevents such (unlikely) abuse appears to be challenging. Thus, the trade-off relation between guaranteeing data privacy and allowing for a meaningful data analysis is hard to balance when trying to establish a digital instrument such as the EICAA Digital Platform. As a result, innovative digital tools that collect participant data with a good and non-commercial intention behind it are legally challenging to establish. It will need to be reflected whether the current legislation is still sufficiently incentivising the establishment of such digital innovations that are developed as open educational resource.

6. Conclusions

This article presents the EICAA Digital Platform which is aimed at helping educators and trainers develop the entrepreneurial and intrapreneurial competences of their students/employees. It has three main components: the Competence Framework, which sets a taxonomy and a rubric of entre/intrapreneurial competences, the Competence Monitor, a self-assessment survey for learners, and the Competence Development Kit, a set of learning modules for every competence. Within the framework, the user (educator or trainer) can assess the entrepreneurial competences of their group of students/employees, analyse their developmental needs, and apply tailored trainings.

The EICAA Competence Framework and the Competence Monitor have been validated with several samples of students in the five partner universities of the consortium, and it is ready for a massive pilot round of university and business application cases during the winter term 2022/23. This pilot will prove the adequacy of the Competence Monitor and the benefits of the Competence Development Kit in helping educators further develop the entrepreneurship competences of their target group. The pilot will collect feedback from users, which will be synthesized in a public report and will serve to improve the tool and as a case study to inspire other entrepreneurship education programs. Ultimately, the success of this beta round will also serve as an indicator of whether the platform has the potential to substantially grow its user base as well as to keep users using it over time. Following the beta pilot round, the platform will be ready for the open launch and available to any educator or trainer upon free registration.

Beyond all the above-mentioned functionalities, the platform will allow the educators to collect their own data for research purposes. Thus, educators will be able to assess the impact of their own interventions. The EICAA community behind it may also become a valuable point of reference for national and European policy makers, as it offers new data on entrepreneurial competences or learners within and across organisations. As such, the EICAA Digital Platform may also be understood as a proof-of-concept for whether a wider understanding of entrepreneurship is still practical enough to be translated into a clear-cut measurement tool that leads to relevant data about entrepreneurial competences.

The EICAA Digital Platform can become a reference source of entrepreneurship teaching modules that can be enriched with the experiences of the users. Thus, ensuring ways of collecting feedback and suggestions from users will help further improve the platform. Beyond this, future developments of the platform could consider an open collaborative tool where educators and trainers become content creators by including their own teaching designs and resources.

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Appendix A

Table A1 presents the list of items and their match with the competences and threads. The participant needs to answer on a five-point Likert scale where 1 is no proficiency (none) and 5 is the highest proficiency (expert).

Table A1. EICAA Competence Framework and EICAA Competence Monitor (survey items).

Competence Area	Competence	Survey Item
Ideas and opportunities	Spotting opportunities	1. Scanning the environment to obtain relevant information.
		2. Identifying challenges by questioning mainstream ideas.
		3. Creating opportunities by actively using my knowledge.
		4. Discovering opportunities by interacting with others (such as peers, colleagues, mentors, etc.)
	Creativity	5. Challenging the status quo, i.e., questioning the current solutions and ways of operating and providing alternative points of view.
		6. Promoting and leading disruptive changes.
		7. Solving problems creatively.
		8. Generating ideas and developing them.
		9. Developing and implementing innovations (product, technology, process, marketing, etc.)
	Vision	10. Developing an inspiring vision for an entrepreneurial idea.
		11. Thinking strategically in alignment with my long-term vision.
		12. Guiding action by building and implementing an action plan or a to-do list.
	Valuing ideas	13. Developing strategies to assess the value of new ideas.
		14. Identifying which stakeholder prefers which value type of a new idea (economic, influence, harmony, etc.)
		15. Protecting and sharing intellectual property by using appropriate strategies (such as patents, copyrights, trademarks, agreements, etc.)
	Ethical and sustainable thinking	16. Adopting and promoting ethical behavior when turning an idea into action.
		17. Thinking about the sustainable impact of my actions before executing them.
		18. Monitoring and assessing the impact of what I do.
		19. Ensuring accountability for my actions.
	Design	20. Developing a user-oriented offering.
		21. Identifying the needs of relevant target groups
		22. Anticipating future needs.
		23. Identifying basic functions of a prototype
		24. Testing a prototype.
		25. Co-creating products, services, or solutions with others.

Table A1. Cont.

Competence Area	Competence	Survey Item
Resources	Self-awareness and self-efficacy	26. Following my aspirations by translating them into achievable goals.
		27. Identifying my strengths and weaknesses regularly.
		28. Implementing a project, even in difficult circumstances.
		29. Shaping my future by developing necessary skills.
	Motivation and perseverance	30. Maintaining my focus on long-term tasks.
		31. Staying motivated and passionate when realising an entrepreneurial idea.
		32. Persevering in the pursuit of my goals, despite difficulties.
		33. Showing resilience (staying emotionally well) in the face of adversities.
	Mobilising resources	34. Making the most of limited resources (such as money, people, time, etc.)
		35. Acquiring the resources needed to make an entrepreneurial idea successful.
		36. Building a network that supports me and my ideas.
	Financial and economic literacy	37. Understanding economic and financial concepts (such as supply and demand, cash flow, and profit and loss).
		38. Proactively designing a budget plan
		39. Securing funding by raising money from diverse sources.
		40. Understanding and complying with the basic mechanisms of taxation.
41. Developing the key processes and actions required to implement an entrepreneurial idea, such as marketing operations, sales, HR, and legal aspects.		
Mobilizing others	42. Seeking inspiration from role models.	
	43. Inspiring others by maintaining momentum even in adverse circumstances.	
	44. Persuading others to engage them with an entrepreneurial idea.	
	45. Developing ethical negotiation strategies	
	46. Communicating my message clearly and effectively.	
Digital management	47. Developing effective media (social and other) strategies to mobilise others.	
	48. Knowing when and how to use general digital tools (MS Office, virtual communication, etc.) best suited for my purpose.	
	49. Employing complex digital tools (CRM, web analytics, etc.) to grow an entrepreneurial idea.	
	50. Reporting data in meaningful and clear ways like graphs and charts.	
		51. Ensuring own and others' safety against cybersecurity risks through protective measures (e.g., anti-phishing guidelines, malware protection, etc.)

Table A1. Cont.

Competence Area	Competence	Survey Item
	Taking the initiative	52. Taking responsibility while performing tasks.
		53. Working independently when required.
		54. Initiating action on new ideas and opportunities.
	Planning and management	55. Defining clear and achievable goals.
		56. Planning and organizing carefully to make an entrepreneurial idea successful.
		57. Defining priorities for tasks, even in uncertain circumstances.
		58. Developing a sustainable plan of action for an entrepreneurial idea.
	Process management	59. Monitoring progress by using appropriate metrics.
		60. Redirecting my plans when necessary.
		61. Being flexible and adaptive to changes.
		62. Anticipating team changes and being able to respond to them.
		63. Working agilely by planning short-term and achievable goals and adapting my plans according to my results.
Into action	Coping with uncertainty, ambiguity, and risk	64. Coping with uncertainty, ambiguity, and risk.
		65. Calculating the risk versus the benefit of an entrepreneurial idea.
		66. Developing risk management strategies for an entrepreneurial idea.
		67. Testing and refining the key assumptions underlying an entrepreneurial idea.
	Working with others	68. Promoting the diversity in my team by being open to different profiles and points of view.
		69. Developing and displaying emotional intelligence.
70. Listening actively to my users and other relevant stakeholders.		
71. Building a team with balanced and complementary skills.		
72. Working with others structurally and harmoniously.		
73. Developing emotionally positive relationships with project partners (including mentors, investors, etc.)		
Learning through experience	74. Expanding my network proactively.	
	75. Reflecting on and learning from failures and achievements.	
	76. Actively engaging with opportunities to grow on my strengths and reduce my weaknesses.	
	77. Learning from my or others' prior experiences.	

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