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# Social network tools and procedures for developing entrepreneurial skills in PhD programmes

## D6.1 (WP6): Key performance indicators (KPIs)

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## EXECUTIVE SUMMARY

The project “Social network tools and procedures for developing entrepreneurial skills in PhD programmes” (prodPhD) aims to implement innovative social network-based methodologies for teaching and learning entrepreneurship in PhD programmes. The multidisciplinary teaching and learning methodologies to be developed will enable entrepreneurship education to be introduced into any PhD programme, providing students with the knowledge, skills, and motivation to engage in entrepreneurial activities. However, the use of the output of the project will depend on the nature and profile of the research or scientific field. In this context, key performance indicators (KPIs) form the base on which the quality and scope of the methodologies developed in the project will be quantified and benchmarked.

The project’s final product will be an online tool that higher education students can use to learn entrepreneurship from a social network perspective. Performance measurement is one of the first steps of any project and involves the choice and use of indicators to measure the effectiveness and success of the project’s methods and results. All the KPIs have been selected according to criteria of relevance, measurability, reliability, and adequacy, and they cover the process, dissemination methods, and overall quality of the project. In this document, each KPI is defined together with the units and instruments for measuring it. In the case of qualitative KPIs, five-level Likert scales are defined to improve indicator measurability and reliability.

The KPIs for prodPhD are divided into three main dimensions, depending on the stage of the project they evaluate. The three main dimensions are performance and development (which are highly related to the project’s process), dissemination and impact (which are more closely correlated with the project’s output), and overall project quality. Different sources (i.e., European projects and papers) have been drawn upon to define a set of 51 KPIs classified into six categories, according to the project phase they aim to evaluate. An Excel tool has been developed that collects all the KPIs analysed in the production of this document. This tool is shared in the Scipedia repository.



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## 1. INTRODUCTION

This deliverable aims to develop a methodological framework for assessing the performance of the prodPhD project, from the first phases of the project to the final results implementing social network-based methodologies for teaching and learning entrepreneurship in PhD programmes.

The methodology is built upon a selection of KPIs that capture the project's performance at its various steps. A variation of Input-Process-Output performance models was applied to define the KPIs. It is assumed that the traditional input measures have already been measured during project evaluation. Thus, input is eliminated from the performance evaluation methodology. However, a new quality category is included to evaluate the relationships among the project's members and the satisfaction levels of participants, stakeholders, and team members. The KPIs are clustered into three macro-categories (development/performance, dissemination/impact, and quality assessment). The sections below describe the model in more detail.

The initial set of KPIs was mostly maintained. However, this deliverable introduces some changes and improvements. In essence, the changes can be classified into three types. First, some KPIs were re-classified into other dimensions. Secondly, some qualitative indicators were adapted to quantitative standards. Also, some KPIs were re-structured (e.g., divided into two or three new KPIs) to improve their measurability and reliability. Finally, intermediate categories were designed within the main performance dimensions (i.e., development/performance, dissemination/impact, and quality assessment) to reflect the project's stages and work packages. A complete list of the changes is presented in Appendix 1.

The sections of this document are structured as follows. First, a short state-of-the-art description is presented. In section two, the KPI definition, evaluation, and classification methodologies are defined. The classification section includes a definition of the categories and the 51 KPIs that will be used to evaluate this project. Lastly, the final list of KPIs is presented in a table for better visualization of the structure and the indicators.

### 1.1. State of the art in performance assessment

This section includes a review of existing performance evaluation methodologies. The review initially covers performance evaluation in general and then moves on to project performance evaluation and education and training performance evaluation. Not all the methodologies outlined here are directly applicable to the prodPhD project, but they are needed to arrive at a set of general considerations on how to apply performance assessment to this specific project. They also constitute a starting point for developing specific methodologies that are directly applicable to prodPhD.

Performance evaluation is a common practice in industries and organizations, and the use of KPIs is widespread in Public-Private Partnerships (PPPs). Literature on PPP evaluation is rich and offers some models that can be easily adapted to public projects. Although early performance evaluation models only focus on the three traditional factors of cost, time, and quality, more recent work also includes customer satisfaction, team satisfaction, and health and safety criteria [1], factors that are also similar to those developed by the KPI Working Group (2000).



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Other authors add even more elements having to do with relationship-based approaches [2], customer satisfaction [3], and overall stakeholder satisfaction [4]. Some scholars have also included the notion of the team's satisfaction and the team's ability to manage project risks and solve conflicts that arise in the course of the project [5].

A clear methodology must be defined to choose suitable key performance indicators. After reviewing several performance indicator methods, [6] concludes that the IPO (Input-Process-Output) and IPOO (Input-Process-Output-Outcome) methods are the best suited for public sector projects. The input component is defined as the resources required for a project or service (money, human capital, etc.). The process is how the service is delivered or the project is carried out. Outputs and outcomes are both results of the project, but whereas outputs are immediate results, outcomes are long-term changes propitiated by the project. Outcomes are therefore less tangible effects that might arise later and are more difficult to measure [7]. Although some outcomes are specified in the Grant Agreement, they will only become noticeable in the long term and therefore will be impossible to measure during the project. However, they should be specified here. The desired outcome is for the project to have a positive impact on the employment and innovation potential of PhD candidates and PhD graduates. The project also aims to have a positive impact on collaboration between academia and stakeholders and on researchers' interdisciplinary and international mobility. Lastly, it would be desirable for the project to impact the entrepreneurial training capacity of European higher education institutions, particularly the participating organizations.

The IPO scheme has also been adapted for university-industry collaborative projects [8] and for use in the specific field of academic entrepreneurship [9]. The authors propose a cyclical process-centred model with five steps: design and implementation of entrepreneurial capital initiatives, opportunity recognition, early step technology development, product and service development, and profit and harvesting. ProdPhD adapts and complements this process-centred approach, using a linear perspective of the process phase with the major involvement of stakeholders. It also emphasizes the project's output, developing a set of KPIs that measure the direct results, phase by phase. Finally, in a nod to relationship-based approaches, prodPhD's performance measurement system includes an exhaustive set of indicators on stakeholder satisfaction, participant assessment and satisfaction, and team satisfaction and conflict-solving ability.

## 2. METHODOLOGY

### 2.1. Definition of key performance indicators

The methodology for assessing the prodPhD project's performance is based on the definition of a set of KPIs. Each KPI is associated with one of the stages of the performance measurement system shown above and is designed to measure specific aspects of some step of the project. All KPIs have been designed considering the principles of relevance, measurability, reliability, and adequacy, as stated in the Grant Agreement.



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- Relevance: Not all indicators are suitable for supporting and measuring the goals of any project. Including relevance as one of the main KPI features ensures that the data measured are essential for understanding the project's target [10], [11].
- Measurability: Goals should be measurable, clear, and concrete. Measurements may be qualitative or quantitative, but they must be quantifiable to enable comparisons and decisions about the project's performance [12]–[14].
- Reliability: Indicators should be free of measurement errors, consistent and independent of external factors. Consistency is considered in terms of time (the performance result should be the same regardless of when it is measured) and in terms of subjective individual evaluation (the result should not depend on who makes the evaluation) [10], [15].
- Adequacy: Indicators should measure the intended phase, stage, or initiative of the project. Adequacy relies on solid selection criteria for choosing each indicator [10], [15].

In addition to these four principles, interpretability was considered when designing the KPIs. Interpretability ensures that the indicators are detailed and specific. They are defined clearly and concisely so they can be easily understandable. Also, the units of measurement have to be specified in the case of quantitative indicators, and the measurement process has to be defined in the case of qualitative KPIs. Interpretability ensures that indicators are understood similarly by everyone [16].

## 2.2. KPI evaluation

The set of KPIs designed for prodPhD includes both qualitative and quantitative indicators, which refer to a variety of aspects related to the process, the project's results, and the relationships among the project's members.

### 2.2.1. Quantitative KPIs

All quantitative KPIs have an associated target that is the minimum number of units required to consider the performance evaluation successful. Units may be people, workshops, website visits, etc., depending on the indicator and the project phase. Section 2.3 and section 3 review all indicators in further detail.

### 2.2.2. Qualitative KPIs

Qualitative KPIs are usually trickier, as measuring them may be a more subjective affair. To avoid uncertainty, a Likert scale is used to measure qualitative KPIs. Likert scales are usually used to determine the frequency, importance, satisfaction, or agreement of participants with a given statement, action, or product. ProdPhD uses qualitative indicators to measure stakeholder satisfaction in the various phases of the project, the quality of the results, and stakeholders' assessment and feedback.



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The Likert scales for each indicator and the meanings of the values are described in the next section. Each scale is specific to a particular KPI. Other H2020 projects such as RETOPEA<sup>1</sup> and S-PACRCS<sup>2</sup> have used this same system for qualitative KPIs.

### 2.3. Classification

KPI classification is the product yielded naturally at the end of the phases of the prodPhD project. The figure below is taken from the Grant Agreement and defines the four main phases of the project. The KPIs are divided into three main dimensions (development and performance, dissemination, and overall quality) that are almost identical to the methodological approach defined in the GA. To complete the stages of Figure I, the KPIs also include measurements oriented toward evaluating the quality of the final product and the dissemination and impact of the project.

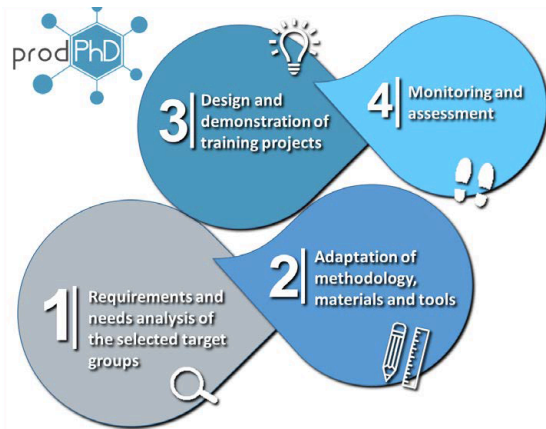


Figure 1 – Outline of the methodological approach of the prodPhD project (source: GA)

Figure 2 shows a general overview of prodPhD's performance measurement system. The project is defined here as the activities that will be carried out in the two years from January 2021 to December 2022. The approach does not include the input, because all input-related aspects (human and material resources, initial ideas, methodological design, etc.) have already been considered and evaluated in the proposal phase. Also, as the project is only two years long, it cannot evaluate outcomes as defined above, and result evaluation will focus only on immediate results (outputs). Lastly, the system includes an overall quality and satisfaction perspective and incorporates stakeholders at all stages of the evaluation process.

1 GA: 770309

2 GA: 785134



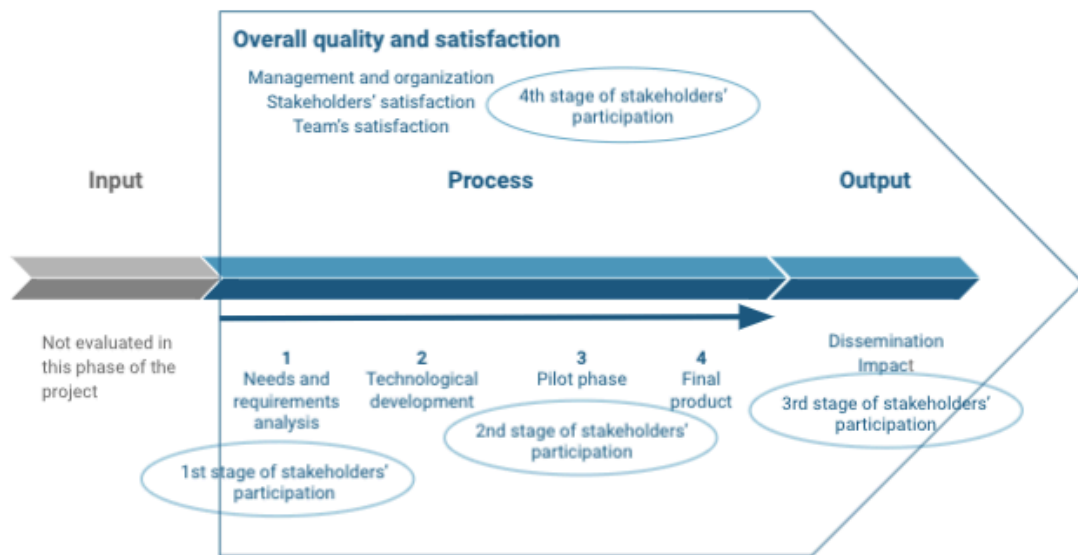


Figure 2 – ProdPhD evaluation model.

### 2.3.1. Process: development and performance

The methodology used here is a process-centred approach, as the process' phases comprise the majority of the project's tasks and work packages. The process is defined as all the steps that go from the diagnosis of the problem to identification of the findings. For this performance analysis, four steps are identified. The first one might be defined as the diagnosis, as it formulates the needs and requirements analysis that guides the next stages of the project (WP2). The second phase is related to the planning of the action, in this case, the design of the module and the platform (WP3 and WP4), which are evaluated in the third stage of the process: the demonstration actions (WP5). Finally, the feedback from the stakeholders involved in the demonstration actions is used to design the final product. The performance analysis is structured using these stages. Therefore, the performance indicators are categorized in the same manner.

#### 2.3.1.1. Needs and requirements analysis

The needs and requirements analysis aims to clearly define the actual entrepreneurship training needs of PhD programmes and to identify the requirements training activities must meet for easy integration into current PhD programme curricula. This KPI category is highly correlated with WP2, which uncovers the skills that should be addressed by the training modules and the best practices for developing transversal entrepreneurial abilities.

Set of KPIs:

P.NR.1: Adequacy/relevance of reference materials collected: Bibliographical materials are the primary source of the project's development and constitute the basis of the design of all the steps of prodPhD. The bibliographic references are being collected in a public database that will be published in Scipedia and updated when new literature is published or as required by the project's needs. The database is organized into categories according to subject matter (e.g.,



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entrepreneurship training, survey design, stakeholder analysis, etc.). The relevance and adequacy of the materials will be measured using a Likert scale defined as follows:

Scale value	Definition of scale value
Very high	<p>The materials collected in the database are both adequate and relevant to the specific needs of the project. Relevance is measured in terms of connection with the subject matter. Adequacy is defined as sufficiency for the project's purpose.</p> <p>The list includes references to all the phases that need a state-of-the-art review, and the materials are referenced in the project's deliverables. The list continues to be updated with new materials until the project comes to a close.</p>
High	<p>The materials collected in the database are both adequate and relevant to the specific needs of the project. Some secondary stages of the project are not covered in the bibliographic collection or the bibliography is not fully updated by the end of the project.</p>
Medium	<p>The materials are adequate and relevant to the project, but there are significant phases of the project that they do not cover. The final bibliography is not fully updated.</p>
Low	<p>Some of the materials are adequate and/or relevant to the project, but, although all the materials collected are both adequate and relevant, there are significant phases of the project that they do not cover.</p>
Very low or none	<p>The bibliographic materials are neither relevant nor adequate for the project's objectives.</p>

P.NR.2: Number of organizations collaborating or enlisted on the Expert Advisory Board: The Expert Advisory Board will monitor the project's progress and provide the consortium with feedback and suggestions. Members of the EAB will be stakeholders such as entrepreneurs, European associations, higher education institutions, and other organizations. It is important to have a large number of organizations from different backgrounds so the feedback comprehends different and complementary perspectives that will help the consortium get a final product that is both interesting and useful for the majority of the potential users. The minimum number of EAB members is set at 25 to ensure representation from several European countries and organizations within the countries.

P.NR.3: Sharing of answers to the survey on entrepreneurial teaching at the PhD level: The needs and requirements analysis is a central part of the project, as it allows the partners to find out what PhD students think about, know about, and expect from entrepreneurship training. The KPI was set at 30% of the answers to the student survey. Although higher numbers are more beneficial and increase the amount of information available, it is important to take into account the limitations of mail surveys. Scholars [17] have studied the response rate of mail and email surveys from 1971 to 2017. Their analysis shows a noticeable decrease (from 71% to



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41%) in the number of responses and predicts that the tendency for the coming years will follow the same path (21% in 2030). The time factor of this phase of prodPhD makes it impossible to allow a longer answer time with multiple follow-up emails, which might increase the response rate. Therefore, the KPI took a conservative but reasonable approach, setting the minimum response rate at 30%.

P.NR.4: Number of universities reached in the call for students (survey): The sampling process endeavoured to recruit European PhD students from various countries and disciplines. The design was planned to take advantage of prodPhD's partners' networks and connections. The four consortium members have extensive, diverse connections that were considered in the survey distribution process. Non-probabilistic accidental sampling was used as the primary methodology for survey distribution [18]. However, two minimum quotas were defined to include a more representative sample of European PhD students: a minimum number of universities and a minimum number of PhD programmes included in the call. The KPI aimed at more than 30 universities so that different countries, education systems, and organizations could be represented in the sample.

P.NR.5: Number of PhD programmes reached in the call for students (survey): A variety of PhD programmes is important for the project's objectives, as prodPhD aims to include students from all disciplines in entrepreneurship training. Thus, the minimum quota of PhD programmes was set at 50.

P.NR.6: Number of PhD students reached in the call for students (survey): Considering the issues raised in P.DI.3 and assuming that the response rate would be around 30%, it was important to ensure that the number of students reached by the survey was large enough to give the project team a reasonable representation of European PhD students. It was also important to establish a feasible number taking into account the partners' networks and connections. The KPI was therefore set at 300 PhD students.

P.NR.7: Gender balance of the survey respondents (measured as percentage of women): Following the European Parliament resolution on promoting youth entrepreneurship through education and training, prodPhD intends to stimulate the involvement of women students in entrepreneurship activities. Thus, it aims to reach between 40 and 60% of women.

P.NR.8: Number of people interviewed/attending focus groups on entrepreneurial teaching at the PhD level: Interviews and focus groups are important qualitative means of complementing the survey results. The number of participants in a qualitative study varies depending on the study's intention, the population that is being researched (homogeneity vs heterogeneity), and other factors such as the project's duration and resources [19]. Although the special characteristics of the study have to be considered, some authors have proposed between three and 10 interviewees for studies based on interpretative phenomenological analysis as a rule of thumb [20]. ProdPhD uses interviews and focus groups to complement the information obtained in the survey. Although the population is not completely homogeneous, its members share important characteristics, such as their level of education, current situation (PhD candidates), and some cultural characteristics (given by the fact they are all studying their PhDs at European universities). Due to these two factors, we anticipate the saturation level will be reached soon, and the KPI was designed accordingly (more than seven interviews).



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### 2.3.1.2. Technological development

The methodology will leverage existing frameworks and models that can be adapted to the online world as well as step-by-step methodologies that will guide students through the learning process. These frameworks, models, and methodologies have been successfully used in in-class courses as well as blended education. As the project progresses, the need to combine synchronous and asynchronous tools as well as offline educational material that can be taught directly at the institutions will be evaluated. The methodology will also leverage CIMNE's business incubator branch and IPAG's innovative WWVI online incubator and their start-up ecosystem to illustrate and support the methodology design and demonstration actions as needed.

Set of KPIs:

P.TD.1: Number of training modules developed: The project aims to develop different training materials for PhD students based on online entrepreneurship courses already designed by IPAG. However, the courses will be adapted to the project's necessities according to the analysis in WP2. Thus, prodPhD aims to design 8 new modules.

P.TD.2: Number of new features proposed (software tools, beta version): The prodPhD Online Training Environment will integrate different software tools to allow PhD students to develop "learning by doing" projects. The platform's utilities will include working groups and discussion fora, internal messaging, a document library, online collaborative edition tools, personal and community profiles, and a project site. The platform will include a feedback mechanism for users, and it will be reviewed by the partners and EAB members and updated or improved accordingly. The KPI sets the number of new features initially at five, but this is by no means an upper limit, as the platform's, modules' and features' development will be cyclical and in permanent evolution.

### 2.3.1.3. Pilot phase

This stage of the project will feature a set of demonstration actions whose main content will be the development of training-by-doing projects with the material from WP3. The projects will be carried out by different teams of selected PhD students from the collaborating universities. The PhD students will be selected through a number of calls organized with the collaborating institutions. Teams will be selected based on the interests and background of the students who respond to the calls with a stated interest in participating in the training exercises. Feedback from the participants (trainers and trainees) will be crucial for improving the final tool. Thus, this set of KPIs concerns the aims of the demonstration actions, in terms of the number and kind of participants and their assessment and feedback.

Set of KPIs:

P.PP.1: Level of engagement and types of stakeholders involved in the pilot action: ProdPhD aims to reach different stakeholders from several European countries. The project attempts to include entrepreneurs, European associations, higher education institutions, research centres, companies, and other organizations. Cooperation between higher education institutions and the business world will help balance out the presence of academics in the entrepreneurship



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training field and favour integral training paths. As an H2020 project, it also aims to include institutions/organizations from a large number of European countries.

This KPI will be measured in terms of the types of organizations involved in the pilot actions and the countries they come from.

Scale value	Definition of scale value
Very high	The pilot actions have (at least) representation from entrepreneurs, European associations, higher education institutions, research centres, and companies from more than 20 European countries.
High	The pilot actions have representation from at least four of the groups stated in the previous level from more than 15 European countries.
Medium	The pilot actions have representation from at least three of the groups stated in "Very high" from more than 10 European countries.
Low	The pilot actions have representation from fewer than three of the groups stated in "Very high" from more than five countries.
Very low or none	The pilot actions have representation from only one of the groups stated in "Very high" from fewer than five European countries.

P.PP.2: Level of engagement and types of stakeholders involved in the implementation of the project outputs: Following P.PP.1, the inclusion of different stakeholders from diverse countries is also important for the implementation of the project's outputs.

Scale value	Definition of scale value
Very high	The pilot actions have (at least) representation from entrepreneurs, European associations, higher education institutions, research centres, and companies from more than 20 European countries.
High	The pilot actions have representation from at least four of the groups stated in the previous level from more than 15 European countries.
Medium	The pilot actions have representation from at least three of the groups stated in "Very high" from more than 10 European countries.
Low	The pilot actions have representation from fewer than three of the groups stated in "Very high" from more than five countries.
Very low or none	The pilot actions have representation from only one of the groups stated in "Very high" from fewer than five European countries.

P.PP.3: Number of institutions involved in the call for the selection of interested PhD students (demonstration actions): Because higher education institutions and students are the project's main stakeholders, it is important to count on them for the demonstration actions. They will provide the main feedback on the modules and software, and their involvement and opinion



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are crucial for the project's final result. Thus, prodPhD aims to involve a minimum of 30 higher education institutions in the demonstration actions.

P.PP.4: Number of students reached in the call for the selection of interested PhD students (demonstration actions): Within the higher education community, students will be the main stakeholders of the tools developed by prodPhD. Although faculty and other academic staff are an essential part of the project, students will be the direct beneficiaries of the modules. This is the reason why prodPhD wants to involve students in all phases of the project. They will be the users but also the designers of the tools. Thus, they are the fundamental group consulted for the needs and requirements analysis and during the pilot and demonstration actions. Considering the anticipated survey response rate discussed above, one concern is to reach a large number of students for the pilot actions so as to secure a reasonable representation of the group. Therefore, the project aims to reach 100 students in the first call. The following KPIs show the natural decrease from the students reached in the call, to those who answer, to those who finally become involved in the actions.

P.PP.5: Number of answers from PhD students reached in the call for the selection of interested students (demonstration actions): The project aims to have a 50% response rate for the demonstration actions, that is, 50 answers. The partners will use their networks to ensure that the institutions are responsive and to deliver the message to their students.

P.PP.6: Number of PhD students involved in the demonstration actions: The final number of students prodPhD aims to involve in the actions is 30. This number is chosen as a balance between a reasonable minimum of participants and in-depth feedback on the modules and tools, assuming participants have a genuine interest in the matter.

P.PP.7: Gender balance of the students involved in the demonstration actions: Similar to P.NR.7, prodPhD aims to include a 40-60% of women in the demonstration actions.

P.PP.8: Number of webinars during the project timeframe (students): Different training webinar sessions will specifically address the participants (trainers and PhD students) from the organizations involved in the pilot activities. Two webinars are expected to be sufficient to fulfil the needs of the participants, who will then continue learning during the demonstration actions.

P.PP.9: Number of training modules considered adequate by the trainees: The project will develop various training modules based on the needs and requirements analysis. The modules will be used by the faculty and students to teach/learn entrepreneurial skills using the project's methodological framework. During the pilot phase, trainees and trainers (students and faculty) will have the opportunity to try modules and give their feedback through a short survey that will include specific and general questions. One of the more general questions will concern the adequacy of the training modules. Ideally, 80% of the modules will be considered adequate by both trainees and trainers. However, if any module is considered inadequate, survey participants will have the opportunity to give more specific feedback on the reasons why, and the module will be improved following their suggestions.

P.PP.10: Number of training modules considered adequate by the trainers: Similarly to what happens in P.PP.8, trainers will be asked about the adequacy of the modules. Ideally, 80% of



the modules will be considered adequate, but trainers will have the opportunity to provide more in-depth feedback for those they consider inadequate.

P.PP.11: Weaknesses identified through the PhD students involved in the pilot actions: The PhD students and other stakeholders involved in the demonstration actions will have the opportunity to provide feedback about the platform, materials, and methodologies used to create the modules. They will also have the opportunity to indicate the specific weaknesses and strengths they find. Weaknesses and strengths will be evaluated in the same manner, this is, by ranges, and the level of each one will be calculated as follows:

Scale value	Definition of scale value
Very high	More than 20 weaknesses reported by users.
High	Between 15 and 20 weaknesses reported by users.
Medium	Between 10 and 15 weaknesses reported by users.
Low	Between five and 10 weaknesses reported by users.
Very low or none	Fewer than five weaknesses reported by users.

P.PP.12: Strengths identified through the PhD students involved in the pilot actions: Strengths will be calculated in the same manner as weaknesses, but the scale will be reversed. That is, the project aims at a very low degree of weakness and a very high strength level. The table below shows the description of the five levels.

Scale value	Definition of scale value
Very high	More than 20 strengths reported by users.
High	Between 15 and 20 strengths reported by users.
Medium	Between 10 and 15 strengths reported by users.
Low	Between five and 10 strengths reported by users.
Very low or none	Fewer than five strengths reported by users.

P.PP.13: Assessment of the PhD students' report: The PhD students involved in the project will have the opportunity to give feedback about the methodology, materials, and software tools. This feedback is highly related to the evaluated strengths and weaknesses and will be assessed as follows:

Scale value	Definition of scale value
Very high	More than 90% of the students report positive feedback.
High	More than 75% of the students report positive feedback.



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Medium	More than 50% of the students report positive feedback.
Low	More than 25% of the students report positive feedback.
Very low or none	Less than 25% of the students report positive feedback.

### 2.3.1.4. Final product

The final stage of the phase evaluates the launch of the new technological developments [9]. In the case of prodPhD, the social network and collaborative tools will be customized from existing Scipedia.com technology and will include a social network solution for the creation of virtual communities, a document and data management system that allows communities to create, share, and manage the results of their research, and an online publishing system.

Set of KPIs:

P.FP.1: Adjustments to the methodological framework after consultation with stakeholders and target groups (workshop): The pilot phase is a crucial step of prodPhD, as it is the place where the modules and software tools are tested. It also allows the participants to leave their feedback regarding the methodological framework, the content of the modules, and the software tools. As engagement with stakeholders is an important part of prodPhD, it is equally important to incorporate stakeholder feedback into the project. The table below describes how adjustments made to the project's methodological framework after consultation with the stakeholders are evaluated.

Scale value	Definition of scale value
Very high	The feedback received after consultation with the stakeholders and target groups contributed substantially to the improvement of the platform. That is, all the weaknesses reported were resolved and other comments were taken into account for improving the modules and software.
High	Most of the weaknesses (more than 75%) and comments were taken into account for improving the modules and software.
Medium	Around half of the weaknesses (between 25% and 75%) and other comments were taken into account for improving the modules and software.
Low	Only a few weaknesses were resolved (less than 25%) and other comments were taken into account for improving the modules and software.
Very low or none	User feedback was not used to improve the modules or the platform, and the reported weaknesses were not resolved.

P.FP.2: Number of reported malfunctions solved (software tools, beta version): The PhD students and other stakeholders will have the opportunity to report any malfunction they might





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find. The objective of the project is to solve all the reported bugs and leave the platform ready for higher education institutions to use.

P.FP.3: Number of new features implemented in the final release: The prodPhD Online Training Environment will be built on Scipedia.com. Scipedia already has some functionalities that will be used for the development of the prodPhD platform. However, the technology will be customized to offer new utilities, such as social networking sites, a data management system, and other services to facilitate collaborative work. A total of five new features will be implemented to fulfil the project requirements.

P.FP.4: Number of new features pending implementation in the final release: The software environment developed for prodPhD will include a user feedback mechanism that will allow users to leave their opinions and views on the platform's operation and suggest improvements. The feedback received during platform preparation and review meetings will be used to improve the platform and implement the final version of the software. The target number for the new features to be implemented is five. However, if more than five features are proposed, all the new features and their updates (depending on the feedback and suggestions) will be considered for implementation before the end of the project.

### 2.3.2. Output: dissemination/impact

One of the main goals of this plan is to disseminate the results of the prodPhD project to inform the European stakeholders and society in general of the project's expected positive outcomes. Communication activities will be carried out throughout the project, starting at the outset and continuing throughout the entire course of activities, based on SMART communication objectives. The SMART framework recommends specific, measurable, achievable, realistic, time-bounded objectives [12]. The communication and dissemination plan is designed considering these principles, and its impact and results are challenging, as they include different but complementary dissemination channels (i.e., website, social media, workshops, and academic publications), all of which are nonetheless feasible.

Set of KPIs:

O.1: Number of scientific publications (peer-reviewed) submitted during the project: The number of scientific publications in relevant journals, where potential stakeholders can become familiar with the project, is a relevant indicator of the scientific dissemination of prodPhD. Apart from the fact that scientific publications are a well-suited indicator of dissemination, they are also a well-fitted proxy for impact, as they can lead to larger use by industry, scientists, partners, and the wider public. Scientific publications have been used in other projects as a proxy for dissemination [21], [22]. Peer-reviewed articles have been widely argued to be effective for the dissemination of knowledge and its impact [23], [24]. ProdPhD aims to publish four articles in the project's two-year period.

O.2: Number of workshops organized: One way to familiarize the target groups with the project is to present the project's various features in workshops. Workshops will serve as a means to disseminate the outputs of the project and a way for the target groups to exploit the project's outcomes [25]. The target for this KPI is to hold at least three workshops. The first one will serve



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as a means to create exposure for the project and will be held during the first year, whereas the second and third will be held at the end of the second year.

O.3: Number of people attending the meetings, training, and local activities: The number of attendees is an important measurement of the project's performance [25]. Furthermore, figures about the activities will help the project in terms of measuring growth and identifying possible ways to improve. Two hundred attendees, counting all the activities (i.e., meetings, training, and local activities), is assumed to be a reasonable number, taking account of the project partners' network.

O.4: Number of people, organizations, and stakeholders reached through research, dissemination, and training activities: The number of people, organizations, and stakeholders reached is an important indicator for the dissemination activities. This KPI measures the potential external target audience. Furthermore, this KPI aims to include different stakeholders, an important goal for the project, as a wider range of stakeholders may mean a wider reach and therefore result in better dissemination and impact for the projects' outputs. Considering the consortiums' network base, the target set for this KPI is 40.

O.5: Number of comments, shares, and retweets/reposts in social media: The cumulative number of shares, retweets, and reposts can influence several things, including website traffic, the number of downloads after activities, sign-ups, etc. As the number of retweets, reposts, and reshares goes up, numbers elsewhere in the project are expected to increase as well. Similar KPIs have been adopted in other projects; see for example [22] for the tweet activities per month. The target for this KPI is a total of 250 comments, shares, retweets, and reposts on social media platforms.

O.6: Number of unique visitors to the project website: Unique visitors are an important indicator for understanding a webpage or website's reach [26]. Knowing a website's unique visitors over a set period allows us to understand the value that the site can provide. It is essential to understand unique visitors and similar metrics to be able to provide inferences about the impact of the project's outputs. As the unique is a subsegment of the total visitors to the website (see next KPI), 100 unique visitors is set as the target at the end of the second year of the project. This number of unique visitors is broadly based on the experience of the project's partners in previous projects.

O.7: Number of total sessions/visits to the project website: The numbers of visits to the project's website is an important proxy for website traffic and can be used to measure project impact [26]. Therefore, based on the explanation given in KPI O.6, at least 300 sessions are expected by the end of the second year of the project. As previously mentioned, the rationale for the estimate of visitor numbers is the consortium members' previous experience.

O.8: Number of countries from which participants/readers come: The number of participant home countries will be used as a metric for the outreach of the project outputs. Also, it will provide future directions for the project's global dissemination and communication strategies. The target for this KPI is 20 countries, which takes into consideration the reach of the network base of the project's partners.



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O.9: Average time spent on site/page: The average time spent on the website is considered a proxy for user experience, website effectiveness, and actual use of project outputs by the target population [27]. In the industry, the average time spent on a website is said to be around two to three minutes; for educational websites and scientific dissemination, however, the average may be different [28]. As prodPhD is an educational website that contains materials like videos and teaching courses, the target for the average time spent on the website is longer than two to three minutes. An average time of five minutes is set as the target for this KPI.

O.10: Number of visits and downloads of public documents from the website and open access repositories: Outbound links will be used to track tags that are subsequently used to track the download of PDF files, videos, and other types of file downloads. This metric has been used previously to measure the effectiveness of library websites [27]. The number of documents downloaded from the project website is set at 100 documents by the end of the second year of the project. The rationale for 100 downloads is related to the number of total sessions on the website, which is set at 300 sessions. One third (i.e., 33.33%) of the total sessions are expected to involve downloading or visiting at least one document, making a total of 100 documents downloaded.

### 2.3.3. Overall quality and satisfaction: quality assessment

The overall quality dimension has three main categories and involves all the stages of the project. As stated above, prodPhD performance evaluation does not only focus on traditional indicators but adds relationship-based and satisfaction approaches [2], [3], [29].

#### 2.3.3.1. Management/organization

Management and organizational KPIs are especially important to measure the relationship among project members and their ability to collaborate and avoid or resolve conflicts. This kind of indicator is now present in the evaluation of many university-industry collaborative projects and other public sector projects [8], [30]. ProdPhd includes the following KPIs related to the team's organization, its ability to solve internal conflicts, and the relationship between the partners and the Expert Advisory Board. The category also includes KPIs related to the overall quality of the project, such as the number of KPIs successfully met and the overall quality of the project. All of them are further described below.

Set of KPIs:

QA.M.1: Number of timely answers from partners in consultation processes: In customer service, timely consultations are highly related with quality assessment [31], [32]. Following the same logic, the number of timely answers from partners is considered a quality assessment indicator due to its importance for the project's efficiency and progress. It also indicates the existence of good relationships among the members of the consortium. Within the consortium, communications run smoothly, which makes it unlikely for answers to take longer than one week. Therefore, the target is five timely answers by the end of the project. Timely answers are those answers that arrive within one workweek.

QA.M.2: Number of KPIs proposed (qualitative, quantitative, long- and short-term): To cope with the quality and performance requirements, a constant KPI prognosis is performed to monitor, improve, and/or add new KPIs [33]. Therefore, improvements to existing KPIs and



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suggestions of relevant KPIs to include are of utmost importance to enhance the project's quality. As a rule of thumb, a total of at least twenty KPIs has been set, including improvements of existing KPIs and inclusion of new KPIs. The motivation for this rule of thumb is that it is hard to locate the bottlenecks in existing KPIs to suggest improvements and/or include new KPIs [34]. However, this number will most likely have to be adjusted during the project lifetime and may vary depending on the number of EAB assessments as well.

QA.M.3: Number of KPIs enhanced after revision by the Expert Advisory Board (workshop): The project includes a diverse EAB that will review the KPIs. Periodical meetings with the EAB are of utmost importance due to the formal advice offered during these meetings. It is highly expected that the EAB will provide comments and suggestions to improve the KPIs. Considering the importance of good KPIs, as highlighted in QA.M.2, the initial list of KPIs will be revised and improved with the approval of the EAB. At least 20 KPIs are expected to be added or improved after the EAB's revision.

QA.M.4: Share of KPIs successfully met: The quality and performance of the project will inevitably be influenced by many factors [29]. Ideally, the expectation is to meet all the KPIs; however, that scenario might be too ambitious. Also, it is acknowledged that, no matter how precisely or poorly a KPI is defined, some likelihood of a KPI failure always exists [35]. Therefore, prodPhD aims to meet 80% of the KPIs.

QA.M.5: Number of EAB consultations: In nearly all projects, several new avenues need to be explored, focusing on new forms of developments and innovations that can enhance the project's quality and performance [36]. Motivated by the European Commission's recommendation, prodPhD considers EAB consultations to be of vital importance. While consultations are measured in numbers, the actual content of consultations is qualitative. Therefore, the number of consultations ends when it reaches a saturation point [37]. Initially, 15 consultations are considered enough to reach a saturation point. However, if the consortium members cannot reach a consensus, additional consultations will be performed to collect additional feedback.

QA.M.6: Number of meetings with the EAB: Throughout the project's lifetime the input of the EAB will be of vital importance to the progress of the project. In total there will be more than six PMB meetings. As the EAB has no governance authority or statutory responsibilities, fewer meetings will be required [38]. Therefore, three meetings are considered to be enough to meet the project's requirements.

QA.M.7: Number of internal conflicts (consortium): Monitoring relationships in a strategic partnering process can be challenging, particularly when agreement needs to be found in conflicting scenarios [39]. Evidently, due to the diversity, complexity of communication, and nature of the prodPhD project, conflicts may arise at any point during the project's lifetime. Apart from these complexities, the values of the different partners may also result in conflicting views and therefore cause conflicts. For instance, [35] identifies four types of value from which conflicts may arise: individual value, team value, stakeholder value, and organizational value. However, due to the nature of relations within the consortium, the size of the consortium, and pre-assigned tasks and duties, no critical conflicts are expected to arise. Therefore, the number of internal conflicts is set at zero.



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QA.M.8: Number of internal conflicts solved (consortium): All internal conflicts will be solved as they arise. The project partners have all assumed their tasks and duties, leaving no room for conflicts. However, this might be too ambitious, and therefore the possibility of conflicts has still been considered. Nonetheless, all conflicts will be solved as soon as they arise thanks to the good, fluent relationships among the partners.

QA.M.9: Transparency: Transparency is crucial for project accountability and governance. Despite the importance of transparency, a means of measuring this quality remains elusive in the academic literature [40]. The concept of transparency encompasses many dimensions and relates broadly to the full flow of information. Furthermore, the concept of transparency asks the question of what content is available and to whom [41]. In prodPhD, the most important dimension is the collection and dissemination of data within the consortium. The consortium has an intranet space where documents, data, and other information can be uploaded so they become available to all partners. Therefore, the perceived transparency assessment will indicate the extent of internal transparency. [40] offers an index for measuring data dissemination with many desirable properties. In prodPhD, perceived transparency is measured based on a five-point scale. The table below presents how perceived transparency will be assessed.

Scale value	Definition of scale value
Very high	The perceived transparency is very high when all partners have equal access via the dedicated intranet platform to all the documents and data that have been collected and drafted by the partners. Furthermore, this data has been communicated explicitly to all the project partners.
High	The perceived transparency is high when all documents and data are made available by the project partners.
Medium	The perceived transparency is medium when documents and data have been drafted and collected but have not been uploaded to the intranet platform.
Low	The transparency is low when the documents and data handed over to partners are incomplete and lack essential parts.
Very low or none	The transparency is very low when data and documents are not uploaded to the intranet platform at all.

QA.M.10: Quality of the project's outputs: The quality of the projects' outputs will be measured by KPIs examining the scope of dissemination and impact. [35] proposes to measure quality in terms of value, as value affords a better measurement of the degree to which a project satisfies its objectives. Some attributes of value are satisfaction, perceived usefulness, and impact. Therefore, in prodPhD, the metrics of stakeholder satisfaction and dissemination/impact will be taken as proxies for measuring the quality of the project's outputs. The table below describes the Likert scale for measuring overall project quality.

Scale value	Definition of scale value
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Very high	Project output quality is very high when substantial value is observed. The observed value is substantial when all the impact KPIs are exceeded and the stakeholder satisfaction KPIs show high satisfaction scores.
High	Output quality is high when stakeholder satisfaction is high and impact/dissemination KPIs are met.
Medium	Output quality is considered medium when stakeholder satisfaction receives “medium” scores and the impact KPIs are met only slightly.
Low	Output quality is low when stakeholder satisfaction KPIs are low and the impact/dissemination KPIs are not met.
Very low or none	Output quality is very low when the stakeholders are completely unsatisfied and the impact KPIs are unmet.

### 2.3.3.2. Stakeholder satisfaction

Stakeholder satisfaction is a key indicator of a project’s quality. New project evaluation approaches highlight the importance of stakeholders’ participation and satisfaction [42], [43]. In particular regard to higher education institutions, [44] emphasizes measures relative to the level of student interest and actions to stimulate entrepreneurial talent and skills. The following KPIs measure the satisfaction of the project’s main beneficiaries, the PhD students involved in the activities and the users of the software developed in the project. This set of indicators also includes the assessment and feedback of the EAB, since the board is made up of major stakeholders like universities and other public and private organizations that will benefit from the project’s developments.

Set of KPIs:

QA.SS.1: Satisfaction of the PhD students involved in the demonstration activities: The satisfaction of a project’s participants has been identified as an important factor of project success [45]. User satisfaction has been measured before in large-scale projects. For instance, the Create-IoT project measured user satisfaction with pilot activities on a five-point scale [46]. Other authors suggest measuring satisfaction in terms of ratings – i.e., poor, fair, good, very good, and excellent [47]. Rating systems may confuse participants, however, because words may have different meanings for each participant. Indeed, lexical-anchored scales may pose validity issues in measuring satisfaction [48]. Therefore, the use of emoji-anchored scales to measure satisfaction is suggested [48] over numerical- and lexical-anchored scales. Motivated by this discussion, prodPhD opted to include an emoji-based scale to measure the satisfaction of the participants in the pilot and demonstration actions.

The literature has developed several specific categories for rating student satisfaction with learning and teaching systems [49], [50]. Taking into account what all of them have in common but trying to keep it simple and quick for the participants, the project will measure student satisfaction in four dimensions: teaching and learning activities, content and relevance of the modules, quality of the platform, and quality of support service. The teaching-and-learning and content-and-relevance dimensions will be assessed in this KPI. The third and fourth dimensions (quality of the platform and support system) will be assessed in the next KPI.

As discussed above, a five-level emoji-anchored scale will be used to measure how well PhD students and other participants in demonstration activities are satisfied regarding two dimensions: the teaching and learning activities, and content and relevance. PhD students will be asked at the end of the activities to rate their satisfaction with the activities, and the image shown below will be displayed. Participants will choose an emoji to indicate their satisfaction level.



QA.SS.2: Satisfaction of PhD Students with the platform: As discussed above, PhD students participating in the pilot actions will be provided with a survey-like question to indicate their satisfaction regarding the quality of the platform and the support system. Here too the survey question will be based on a five-point ordinal emoji-anchored scale.

QA.SS.3: Feedback after consultation with stakeholders and target groups (workshop): Feedback is one of the pillars of learning and provides room for improvements [51]–[53]. Moreover, feedback generated during the workshops about the application of such a novel way of teaching entrepreneurship to PhD students is expected to close the gap between the current performance and the desired goals of the platform [54]. Therefore, this KPI aims to assess the effectiveness of the feedback received during the workshops with stakeholders and target groups (i.e., PhD students and faculty). In line with previous assessments of feedback in social networks [54], a five-point scale is created to assess feedback effectiveness. The table below presents the scale values and their definitions.

Scale value	Definition of scale value
Very high	The feedback received after consultation with the stakeholders and target groups is substantial – improvements in what has already been developed as well as the inclusion of overlooked aspects.
High	The feedback received after consultation with the stakeholders and target groups is decent – i.e., only improvements to what has been already developed.
Medium	The feedback received after consultation with the stakeholders and target groups is average – minor improvements are suggested.
Low	The feedback received after consultation with the stakeholders and target groups is low – no suggestions for improvement contribute to the quality of the project’s outcomes.
Very low or none	The feedback received after consultation with the stakeholders and target groups had no contribution to bridging the gap between the current and desired performance of the platform and the current and desired content of the courses.





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QA.SS.4: Assessment and feedback from the Expert Advisory Board (EAB): The assessment of the feedback from the EAB will be measured following the same criteria as in the previous KPI, with a five-point scale. The table below provides the scale values and their definitions.

Scale value	Definition of scale value
Very high	The feedback received after consultation with the EAB is substantial – improvements in what has been already developed as well as the inclusion of overlooked aspects.
High	The feedback received after consultation with the EAB is decent – i.e., only improvements to what has been already developed.
Medium	The feedback received after consultation with the EAB is average – minor improvements are suggested.
Low	The feedback received after consultation with the EAB is low – no suggestions for improvement contribute to the quality of the project's outcomes.
Very low or none	The feedback received after consultation with the EAB had no contribution to bridging the gap between the current and desired performance of the platform and the current and desired content of the courses.

### 2.3.3.3. Team satisfaction

Team satisfaction is also a key indicator of a project's quality. The assessment of satisfaction as an indicator of the quality of work has been explored and studied quite recently [55], [56].

Set of KPIs:

QA.TS.1: Satisfaction of the working team involved in the development activities: The development activities associated with this KPI correspond to WK 5, task 5.1. In this KPI the goal is to assess the team's satisfaction with the specific content of the activities developed in task 5.1. To this end, a statement based on a five-point scale will be used to measure the satisfaction of the partners involved in this task. The statement will be formulated about the team's overall satisfaction with the content of the development activities.

QA.TS.2: Satisfaction of the working team involved in the demonstration activities: In task 5.3., a one-day meeting will be organized to foster the implementation of the demonstration actions. The execution of the demonstration actions will include the development of network analysis, aimed at optimizing the potential of the software networking solution for entrepreneurship training. For this purpose, different interventions will be designed to help build towards the objectives set out by the participants in their respective tracks to obtain their network training goals. Therefore, this KPI aims at assessing the satisfaction of the team concerning the overall quality of the demonstration activities. To that end, a statement will be formulated concerning the team's satisfaction measured based on a five-point scale of agreement levels.





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### 3. FULL LIST OF KEY PERFORMANCE INDICATORS

Code	Scope	Category	Key Performance Indicator	Type	Target
P.NR.1	Development/performance	Needs and requirements analysis	Adequacy/relevance of reference materials collected	Qualitative	-
P.NR.2	Development/performance	Needs and requirements analysis	Number of organizations collaborating or enlisted on the Expert Advisory Board	Quantitative	>25
P.NR.3	Development/performance	Needs and requirements analysis	Sharing of answers to the survey on entrepreneurial teaching at the PhD level	Quantitative	>20%
P.NR.4	Development/performance	Needs and requirements analysis	Number of universities reached in the call for students (survey)	Quantitative	>30
P.NR.5	Development/performance	Needs and requirements analysis	Number of PhD programmes reached in the call for students (survey)	Quantitative	>50
P.NR.6	Development/performance	Needs and requirements analysis	Number of PhD students reached in the call for students	Quantitative	>300
P.NR.7	Development/performance	Needs and requirements analysis	Gender balance of the survey respondents	Quantitative	40 - 60%
P.NR.8	Development/performance	Needs and requirements analysis	Number of people interviewed/attending focus groups on entrepreneurial teaching at the PhD level	Quantitative	>7
P.TD.1	Development/performance	Technological development	Number of training modules developed	Quantitative	8
P.TD.2	Development/performance	Technological development	Number of new features proposed (software tools, beta version)	Quantitative	>5
P.PP.1	Development/performance	Pilot phase	Level of engagement and types of stakeholders involved in the pilot action	Qualitative	-



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P.PP.2	Development/performance	Pilot phase	Level of engagement and types of stakeholders involved in the implementation of the project outputs	Qualitative	-
P.PP.3	Development/performance	Pilot phase	Number of institutions involved in the call for the selection of interested PhD students	Quantitative	>30
P.PP.4	Development/performance	Pilot phase	Number of students reached in the call for the selection of interested PhD students	Quantitative	>100
P.PP.5	Development/performance	Pilot phase	Number of answers from PhD students reached in the call for the selection of interested students	Quantitative	>50
P.PP.6	Development/performance	Pilot phase	Number of PhD students involved in the demonstration actions	Quantitative	>30
P.PP.7	Development/performance	Pilot phase	Gender balance of the students involved in the demonstration actions	Quantitative	40-60%
P.PP.7	Development/performance	Pilot phase	Number of webinars during the project timeframe (students)	Quantitative	>2
P.PP.8	Development/performance	Pilot phase	Number of training modules considered adequate by the trainees	Quantitative	80%
P.PP.9	Development/performance	Pilot phase	Number of training modules considered adequate by the trainers	Quantitative	80%
P.PP.10	Development/performance	Pilot phase	Weaknesses identified through the PhD students involved in the pilot actions	Qualitative	-
P.PP.11	Development/performance	Pilot phase	Strengths identified through the PhD students involved in the pilot actions	Qualitative	-
P.PP.12	Development/performance	Pilot phase	Assessment of the PhD students' report	Qualitative	-



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P.FP.1	Development/performance	Final product	Adjustments to the methodological framework after consultation with stakeholders and target groups (workshop)	Qualitative	-
P.FP.2	Development/performance	Final product	Number of reported malfunctions solved (software tools, beta version)	Quantitative	All
P.FP.3	Development/performance	Final product	Number of new features implemented in the final release	Quantitative	>5
P.FP.4	Development/performance	Final product	Number of new features pending implementation in the final release	Quantitative	0
O.1	Dissemination/impact	Dissemination	Number of scientific publications (peer-reviewed) submitted during the project	Quantitative	>4
O.2	Dissemination/impact	Dissemination	Number of workshops organized (general)	Quantitative	≥2
O.3	Dissemination/impact	Dissemination	Number of people attending the meetings, training, local activities	Quantitative	>200
O.4	Dissemination/impact	Dissemination	Number of people, organizations, and stakeholders reached through dissemination, research, and training activities	Quantitative	>40
O.5	Dissemination/impact	Dissemination	Number of comments, shares, and retweets/reposts in social media	Quantitative	>250
O.6	Dissemination/impact	Dissemination	Number of unique visitors to the project website	Quantitative	>200
O.7	Dissemination/impact	Dissemination	Number of total sessions/visits to the project's website	Quantitative	>300
O.8	Dissemination/impact	Dissemination	Number of countries from which participants/readers come	Quantitative	>20



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O.9	Dissemination/impact	Dissemination	Average time spent on site/page	Quantitative	5 min
O.10	Dissemination/impact	Dissemination	Number of visits and downloads of public documents from the website and open access repositories	Quantitative	100
QA.M.1	Quality assessment	Management/organization	Number of timely answers from partners in consultation processes	Quantitative	>5
QA.M.2	Quality assessment	Management/organization	Number of KPIs proposed (qualitative, quantitative, long- and short-term)	Quantitative	>20
QA.M.3	Quality assessment	Management/organization	Number of KPIs enhanced after revision by the Expert Advisory Board (workshop)	Quantitative	>20
QA.M.4	Quality assessment	Management/organization	Share of KPIs successfully met	Quantitative	> 80%
QA.M.5	Quality assessment	Management/organization	Number of EAB consultations	Quantitative	>15
QA.M.6	Quality assessment	Management/organization	Number of meetings with the EAB	Quantitative	>3
QA.M.7	Quality assessment	Management/organization	Number of internal conflicts (consortium)	Quantitative	0
QA.M.8	Quality assessment	Management/organization	Number of internal conflicts solved (consortium)	Quantitative	All
QA.M.9	Quality assessment	Management/organization	Transparency	Qualitative	-
QA.M.10	Quality assessment	Management/organization	Quality of the project's outputs	Qualitative	-
QA.SS.1	Quality assessment	Stakeholder satisfaction	Satisfaction of the PhD students involved in the demonstration activities	Qualitative	-
QA.SS.2	Quality assessment	Stakeholder satisfaction	Satisfaction of PhD students with the platform	Qualitative	-
QA.SS.3	Quality assessment	Stakeholder satisfaction	Feedback after consultation with stakeholders and target groups (workshop)	Qualitative	-
QA.SS.4	Quality assessment	Stakeholder satisfaction	Assessment and feedback from the Expert Advisory Board (EAB)	Qualitative	-



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QA.TS.1	Quality assessment	Team satisfaction	Satisfaction of the working team involved in the development activities	Qualitative	-
QA.TS.2	Quality assessment	Team satisfaction	Satisfaction of the working team involved in the demonstration activities	Qualitative	-



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## APPENDIX 1: REGISTER OF CHANGES IN THE INITIAL LIST OF KPIS

Appendix 1 registers all the changes and improvements that have been made to the initial list of KPIS so they can be consulted and approved by the partners and the EAB. Apart from these changes, the KPIS' short definitions have been improved for a readier understanding of the indicators without having to consult their description.

### 1. Modifications of scope

The scope of the KPIS has been modified to three main categories, to make them simpler to understand and to link them with the phases of the project and the (I)PO model. The following changes have been made:

- All KPIS previously defined as “development”, “performance” or “development/performance” have been categorized as “development/performance”.
- The KPI defined as “development/impact” (number of PhD students reached in the call for students) has been moved to the “development/performance” category in view of its importance in the needs and requirements analysis.
- The dimension called “awareness” has been removed, because the only KPI in this category has been removed from the list. The reasons for eliminating this KPI are discussed below.

### 2. Modifications of KPIS

#### 2.1 Development/performance

##### Needs and requirements analysis

Three KPIS have been reclassified from “dissemination” to “development/performance” and classified in the “needs and requirements analysis” phase due to their importance for the design of the modules and platform in the first phase of the project. They are also essential for defining the first steps and the conceptual framework.

- P.NR.4: Number of universities reached in the call for students (survey)
- P.NR.5: Number of PhD programmes reached in the call for students (survey)
- P.NR.6: Number of PhD students reached in the call for students

##### Technological developments

“P.TD.1: Number of adapted training modules (projects)” has been defined as quantitative after revision, and the description has been changed to the more readily understandable “Number of training modules developed”.

##### Pilot phase

Two new KPIS have been added to improve the evaluation of the modules:

- P.PP.8: Number of training modules considered adequate by the trainees
- P.PP.9: Number of training modules considered adequate by the trainers

The KPIS previously named “Number of webinars/workshops to be organized” has been changed to “Number of webinars during the project timeframe (students)” (P.PP.7), and the



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objective has been reduced to two. Webinars here refer to the sessions that will be held with the PhD students so they become used to the platform. The definition update responds to the existence of another KPI, “Number of workshops organized (general)” (O.2), to avoid confusion.

“Number of weaknesses/strengths identified through the PhD students involved in the pilot actions” has been divided into two KPIs in order to differentiate between weaknesses and strengths, thus enabling both to be analysed better, especially in the case of the weaknesses, whose analysis is fundamental for improving the modules. The two KPIs are defined as follows:

- P.PP.10 Weaknesses identified through the PhD students involved in the pilot actions and
- P.PP.11: Strengths identified through the PhD students involved in the pilot actions

### Final product

“Number of new features implemented/pending implementation in the final release” has been divided into two new KPIs, as it is important to differentiate between the features actually implemented and the features pending implementation at the end of the project. The objectives for both types of features are actually different, as the project aims to implement the new features. The final KPIs are defined as follows:

- P.FP.3: Number of new features implemented in the final release (objective: 5)
- P.FP.4: Number of new features pending implementation in the final release (objective: 0)

## 2.2 Output: dissemination/impact

“O.5: Number of comments, shares, and retweets/reposts in social media” has been reduced from 350 to 250 so it fits better with the scope of the project in terms of length and number of partners.

“Number of unique visitors to the project website, total sessions/visits, average time on site/page” (objective: 50,000) has been divided into three new indicators, as the units of measurement are completely different for unique visitors, total sessions, and average time on site. The three new KPIs are defined as follows:

- O.6: Number of unique visitors to the project website: 200
- O.7: Number of total sessions/visits to the project's website: 300
- O.9: Average time spent on site/page: 5 min

In line with O.10, the “Number of visits and downloads of public documents from the website and open access repositories” has been reduced from 500 to 100 to fit better within the scope of the project in terms of length and number of partners.

## 2.3 Quality assessment

### Management/organization

The “Share of KPIs successfully met” (QA.M.4) has been reduced from 90% to 80%. Ideally, the expectation is to meet all the KPIs, but that might be unreasonable due to unavoidable risks



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and unexpected events. Also, there is always some likelihood of a KPI failure. Thus, 80% seems a more reasonable number than 90%.

## 2.4 Removed KPIs

“Project expectations of partners, trainers, trainees (survey, interviews)” has been removed, as the satisfaction and feedback of PhD students, team members, and other stakeholders are sufficiently measured in other indicators, such as QA.SS.1, QA.SS.2, QA.SS.3, QA.SS.4, QA.TS.1, and QA.TS.2.