An Adaptive trust-based e-assessment System for Learning

TeSLA

(Technical Annex. Sections 1-3)

Topic: ICT-2015-20 Technologies for better human learning and teaching [c) Innovation Action]

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1 Excellence

1.1 Objectives

The overall objective of the TeSLA project is to define and develop an e-assessment system, which ensures learners authentication and authorship in online and blended learning environments while avoiding the time and physical space limitations imposed by face-to-face examination.

The TeSLA project will support any e-assessment model (formative, summative and continuous) covering teaching and learning processes as well as ethical, legal and technological aspects. TeSLA will offer to educational institutions, accrediting agencies and to society, an unambiguous proof of learners academic progression, authorship and authentication during the whole learning process.

In order to provide an achievable and realistic solution to these challenges, the TeSLA project is submitted by a consortium composed of Higher Education institutions (including online and blended universities) in collaboration with technological companies (specialized in security, cryptography and online recognition techniques) as well as accrediting quality agencies.

To achieve the overall objective, the next specific objectives are proposed:

O1. Analyse and design the most appropriate learning activities for e-assessment taking into account both, academic requirements to ensure the learning process and the adaptation to a fully online and cross-curricular assessment.

O2. Improve the e-assessment process by introducing tools and resources in the learning activities that capture learners' data to ensure their authentication and authorship.

O3. Conduct several pilots of the TeSLA e-assessment system that guarantee the equality of opportunity and respect for diversity in real teaching and learning scenarios while ensuring the authentication and authorship of the learners during the e-assessment processes.

O4. Provide a core version of the TeSLA e-assessment system free of charge for educational institutions, in order to improve their e-assessment processes.

O5. Hold a set of training workshops, provide guidelines and elaborate learning resources for teachers to show how the TeSLA e-assessment system can be used for enhancing e-assessment processes.

O6. Implement a professional and commercial version of the TeSLA e-assessment system to be sold and distributed at international level.

1.2 Relationship to the work programme

The next table shows the alignment of specific objectives of the TeSLA project with the topics addressed by the Call ICT-20-2015 c).

TOPICS addressed by the Call: ICT-20-2015 c)	DESCRIPTION
"Support to large scale pilots (in real settings) that develop and integrate innovative digital educational tools, solutions and services for learning and teaching, and supporting engagement of teachers, learners and parents."	Specific Objectives: O2, O3, O5 The TeSLA e-assessment system will be extensively tested in different large scale pilots across Higher Education institutions in Europe (WP7). The system will evaluate different properties in an educational framework, authentication and authorship (WP8). The final pilot will be conducted with 10,000 learners from different partners of the consortium, including teachers and learners.
"Reducing the current restrictions of time and physical space in learning and teaching."	Specific Objectives: O1, O2, O4, O6 Virtual and blended scenarios allow reducing such restrictions but impose new challenges, the most relevant of which is learner e-assessment. The TeSLA system will provide a solution for e-assessment that can be used in any virtual or blended learning scenario, reducing face-to-face assessments (WP5, WP6, WP7).
"Foster greater connection between formal, non-formal and informal learning and remove obstacles for ubiquitous learning."	Specific Objectives: O1, O4, O6 With an increasing offer of online education, nowadays the main obstacle for ubiquitous learning is how learners can be evaluated in a reliable way, but without resigning to the ubiquitous properties of online education. The TeSLA system will provide a solution for e-assessment

	that will be able to be integrated in different online learning scenarios (WP3, WP4, WP9).
"The pilots should link all relevant stakeholders in educational technology."	Specific Objectives: O1, O5 The different pilots will involve not only learners and learning institutions but also security and educational companies, reseach centers and educational quality agencies (WP3, WP4, WP5, WP7, WP8, WP9).
"As part of piloting scenarios, a specific target group to address are children and adults with mental or physical disabilities who undergo general education, lifelong learning or vocational training. Activities for the latter could include work on skills recognition/validation through smart and business intelligence applications."	Specific Objectives: O3 Disabled learners are taken into account in the TeSLA e-assessment system (WP2, WP5, 6). The selection of learner population for the pilots (WP7) will take special care to include individuals from this group in order to test the correctness of the proposed solution for disabled learners.

1.3 Concept and approach

Nowadays, mobility of learners and professionals has increased and, for that reason, a growing percentage of learners are enrolled in fully online, or blended learning programmes. Educational institutions offer such undergraduate or postgraduate programmes through a virtual learning environment (VLE) where learners can follow the courses. In the EU, those programmes are under the European Higher Education Area (EHEA) regulations, which specify that in order to obtain an accredited degree by a university a set of cross curricula and specific competencies have to be acquired. For that reason, competency evaluation is a cornerstone of EHEA degrees.

Although competency evaluation has been largely addressed in traditional face-to-face learning scenarios, in VLEs, competency evaluation becomes a very difficult task, since in most situations there is no face-to-face contact between the learner and the teacher, and learner identity can be difficult to verify.

1.3.1 Overall concept underpinning the project and trans-disciplinary actions

This project tackles the issue of learner assessment in VLEs, known as e-assessment, by developing a global solution that builds a trust relationship between learners and their learning institutions (the concept of the project is sumarized in Figure 1). Such a trust-relationship should be constructed based on three different and trans-disciplinary angles: educational, privacy and technological.

1. From an educational point of view and with the EHEA framework, a set of cross curricula and specific competencies have to be acquired in order to obtain an accredited degree by universities. On the one hand, learners have to acquire a set of academic and competencies that have to be evaluated by teachers through different types of learning activities and examinations. In the activity statement, the tools and learning resources that learners can use for performing activities are included (the use of the Internet, databases resources, journals or other didactical material, is specified in activities). Learners can use and cite these information resources without commit plagiarism.

   A learning activity can be understood as a discrete method for assessing learners from an educational standpoint. The learning activities in distance or virtual environments can briefly be categorized as follows:

   - Personal deliverable submission: the learner carries out an activity individually and the result is a deliverable that ends up being assessed in the context of the course. The deliverable could contain any kind of data (i.e. it is not necessarily limited to plain text). Video editing, audio recordings or code development (e.g. with a programming language) also fall into this category.
   - Presentation: the learner carries out an exercise under direct teacher supervision. The interaction tends to be one-way (from the learner to the teacher). This type of activity includes all types of presentations, such as that of final projects.
   - Interview: similar to the above, but in this case, the interaction is bidirectional, as the teacher can ask questions, depending on the learner's responses.
   - Discussion: learners work individually or collectively to discuss an issue proposed by the course teacher.
   - Company internships: the learner works at a company on a temporary basis and his/her work is assessed by a supervisor appointed from within the company.

- Collaborative work: similar to the first case, but the work is not carried out individually. In this case, the deliverable submitted has been worked on by a group of learners, and assessment is carried out globally on all group members and not individually.

On the other hand, teachers include in each learning activity the assessment model and criteria, so learners are aware of how each activity will be evaluated. Furthermore, in each course, the syllabus indicates the assessment model (continuous assessment, formative assessment, summative assessment, etc) and the how infractions may affect the final mark. In face–to-face environments, teachers can usually detect when learners are not honest but this problem in virtual environments is not fully solved yet. However, each learning environment has its own characteristics and capabilities for assessment. Some virtual learning environments allow the performing and assessing of collaborative activities while others are based on automated test activities reducing interaction. These features can be considered when designing activities. The teachers' methodology and how they introduce tools in activities, determines the assessment process itself. If tools are well introduced in the teaching and learning process, the leaner's authorship and authentication can be reliable. Nevertheless, each institution should be able to select the most suitable assessment model for their courses being able to adapt their platforms to enhance the e-assessment processes. Online environments should not be a shortcoming for applying e-assessment in a secure and reliable way in educational processes. Distance learning environment capabilities, teacher expertise and the educational model, are key factors for transforming and enhancing e-assessment processes through technology.

In this project a set of e-assessment models and the key elements linked to the educational framework will be developed (competencies, learning activities, exams, tools and resources, etc). This educational framework will be analysed and considered when TeSLA describes the global requirements for an e-assessment framework. When referring to educational requirements, the project includes that special educational needs requires addressing (accessibility, functional requirements and specifications). Then the concept of education, from now, includes the disability target as a whole.

The TeSLA project proposes to introduce tools and resources for capturing learner data through activities or examinations. In this case, an activity that uses a multimedia format will allow us to capture images, voice and keystroke data to be analysed in a continuous way during the course. A final examination will be used for natural language analysis taking into account the previous delivered essays amongts others. The data will be obtained following the recommendations of experts and it will be analysed to ideantify learners' authorship and authentication.

2. When online environments, tools and resources are used for educational processes privacy and ethical issues arise. Currently the teaching and learning process takes place in mixed or fully virtual environments. The delivery of activities is done by learners and teachers received activities through the VLE. However when a final examination takes place, there are some ethical issues to be considered. The length of the examination, the social and cultural context and the uses of computer and the Internet need to be analysed. The traffic through the Net is moving personal and academic data that has to be protected following the legal recommendations at both, regional and European level. All the educational institutions have to protect data providing learners a level of trust between the institution itself and them. Building a bond of trust between learner and their educational institutions ultimately implies dealing with privacy and ethical issues. Such privacy and ethical considerations can be identified on both sides. From a learner point of view, an accepted agreement or letter of commitment has to be accepted. Regarding the educational institution, learner data will be held at the university and/or TeSLA server and it will be inaccessible through any kind of application. The server only sends learner data once the learner has been authenticated and all communications are encrypted. The institution has to guarantee privacy following legal restrictions. The project has to provide the statements to grasp the main issues raised by the project through, amongst others aspects, the analysis of the pertinent legislation as, for instance, the European Convention on Human Rights or the Charter of Fundamental Rights of the European Union and Directive 95/46 on the protection of individuals with regard to the processing of personal data and on the free movement of such data. On each issue, an ethical, social and legal analysis will be done in order to document the privacy requirements for an ethically acceptable balance between recognition and privacy.
3. Finally, the e-assessment scenario inevitably involves technological requirements that, in contrast to educational and private considerations, are more specific to the virtual nature of the e-assessment process. Notice that such technical requirements are needed to enforce some security properties, assuming that not all learners would behave as ethically as it would be desired. More precisely, two main requirements should be enforced: learner authentication and work authorship. For learner or user authentication, we define this term as how the learner is authenticated on the system when a learning activity is performed or submitted, and how the system protects the integrity of submitted activities. The authorship requirement consists of proving that the learner is the author of the learning activities.

   Different technologies can be used to achieve the TeSLA goals in building such trust between learners and educational institutions. Regarding learner authentication, digital signatures together with timestamps as well as

biometric systems (typing pattern recognition, face and voice recognition, etc.) can be deployed in order to securely authenticate learners of the system. On the other hand, regarding the work authorship, automated plagiarism detection tools and written natural language analysis can help to reach our goals, as well as the direct gathering of data in the workspace (monitor programs, etc.).

The technological solutions to be applied from other fields in learning activities or examinations are:

a) Biometrics. One of the project's requirements is to guarantee learner authenticity. It is in this regard that biometrics have great importance. Biometrics is the study of automated methods that allow the unique recognition of humans based on their behaviour or intrinsic physical characteristics. Biometric recognition is based on the use of mathematical and statistical techniques to identify or verify a person's identity. The biometric data most commonly used today are digital fingerprints, retina, iris, facial patterns, palm vein geometry, handwriting and voice, among others. Using some of these techniques calls for special devices, such as digital fingerprint readers or a high-definition camera for the iris. For this project, we have sought to use techniques that only require the most common devices found on learners' computers (webcam, keyboard and microphone). In this case it will work on:

Facial recognition: There are many methods for recognising the faces appearing in an image. Use is currently made of methods that analyse complex information, such as facial expressions, to carry out recognition that includes proof of life, which is difficult to trick and makes identity theft harder. Such methods usually require working with continuous sequences of good-quality images. The classic method, analyses isolated images and which works with images from traditional webcams. This method is not as secure, since they can be fooled by showing a photograph of the user, but they can be complemented with movement detection, making this type of attack more difficult. The facial recognition process consists of two stages: face detection and recognition.

Voice recognition: To be able to obtain the audio structure, a diarisation system has been used. This system uses state-of-the art audio description methods, and has been successfully applied in a range of audio analysis projects. The process consists of the following steps: description, speaker segmentation and cluster grouping.

Keystroke dynamics: It is a behavioural biometric technique that measures how a user writes using the keyboard. It is used mainly with writing on a computer keyboard, but can also be applied to ATMs or mobile telephones. To recognise a person, different information is used: one of the most common forms is time-based, measuring when a particular key is pressed and when it is released. It is possible to use other data, too, such as the pressure applied to a key and the relationship between a key and the finger used to press it. While time-based information can be measured using a small application, measurement of these latter types of information requires special devices.

b) Security mechanisms. A security mechanism is a method to deploy a security service provided by a layer of communicating systems. For instance, cryptography (mechanism) is a method to deploy privacy (service).

Digital signature: It is a mathematical scheme for demonstrating the authenticity of a digital message or document. A valid digital signature gives a recipient reason to believe that the message was created by a known sender, in such a way that the sender cannot deny having sent the message (authentication and non-repudiation) and that the message was not altered in transit (integrity).

Timestamp: It is a sequence of characters or encoded information identifying when an event is recorded by a computer. In many cases, the difference may be inconsequential: the time at which an event is recorded by a timestamp (e.g., entered into a log file) should be close to the time of the event. In a secure context, a timestamp is digitally signed, to ensure its authenticity and integrity.

c) Document analysis: it is a social research method which involves the analysis of written material like essays, descriptions, the outputs of learning activities, etc, using a qualitative analysis package. Content analysis is like a social survey that describes discourse and its intepretation. A document or an activity is something that we can read and which relates to some aspect of the social world.

Plagiarism tools: These tools are focused on to detect similarities among documents. The comparison is performed based on text matching without taking into account the semantic meaning of the text.

Forensic analysis: The forensic analysis tool comprises mechanisms and devices for determining the authorship verification and authorship attribution of written documents. This trusted assessment mechanism will be capable of confirming/refuting the authorship of reports, essays, homework and exercises or even detect sections of the document not written by the author.

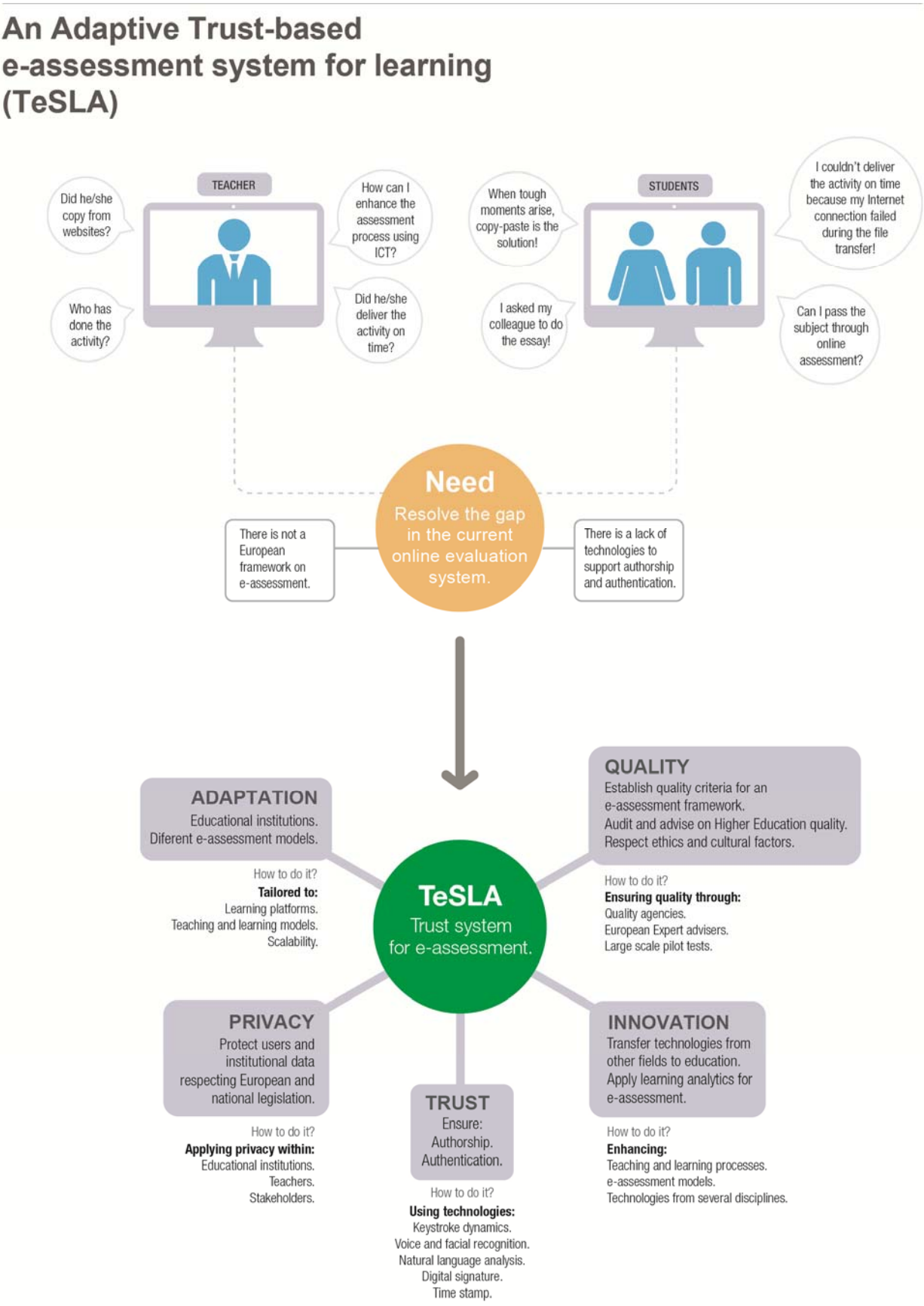

Figure 1: TeSLA Concept

All these technologies are developed and used in different sectors in an isolated manner. None of them are still integrated and customized for educational porpoises. The TeSLA project will integrate and customise them into any VLE for enhancing e-assessment processes. Authentication and authorship can be ensured in the e-assessment process if learning activities includes additional tools and resources that are able to capture and analyse the learner's data through activities across

courses. The integration of these technologies in an educational framework in an adaptive way will provide the teachers and educational institutions with a reliable system to prevent learners acting improperly during the assessment process.

The TeSLA framework will provide an e-assessment system that integrates the solutions developed for each one of the key issues of the project (authentication and authorship), correlating the educational model and e-assessment technologies, and taking into account ethical and legal issues. The main properties that the developed framework should provide are: non-invasiveness, modularity, adaptiveness, integrability, scalability and security. These properties are defined as follows:

- Non-invasiveness: The system should monitor the learning activity of the learner preserving their privacy by gathering only the required data for ensuring the e-assessment.
- Modularity: The technology developed in the project will be designed and implemented as independent modules. For each type of technology, there is a module: facial recognition, voice patterns, keystroke patterns, timestamp and a plagiarism tool module. This modularity is suggested since it later adaptable to different learning platforms.
- Adaptiveness: Each educational institution has its own characteristics regarding the teaching and learning process. Each one uses a particular teaching methodology for conducting evaluations and for designing and managing activities. The TeSLA system has to be completely adaptive and modular so that it fits each partner's methodology and learning activity. Each institution would be able to select both; which technology modules are suitable for them or the whole TeSLA system. The adaptiveness of the system will be guaranteed through its modules and the educational model behind it.
- Integrability: There are different learning platforms and environments to conduct teaching and learning processes. Although some institutions have their own platforms, some others institutions are sharing a common and customized platforms such as Moodle and Blackboard. The TeSLA system should be developed following the most suitable specifications and standards to be plugged to any learning platform. TeSLA system integration has to be guaranteed.
- Scalability: The system should be able to handle a growing amount of work in a capable manner. It should be enlarged to accommodate that growth when resources or users are added. When users are increasing in pilots, the system should be able to store and support all the learning activities and the data required from each technical module for e-assessment.
- Security: The developed framework should be secure in the computer sense of the term, so the chosen technical solutions should be able to provide a high degree of security. The system should be able to securely verify learners' authentication and the authorship of the works they provide as elements of assessment. Such property is especially relevant regarding the whole system's reliability since it prevents learners acting improperly during the assessment process which can degrade the system credibility and affect both the institution and honest learners.

The described properties will be applied in each modular technology developed for the e-assessment process. Technologies will be inserted into each learning activity and data will be gathered. The information collected during the pilots (questionnaires, biometric data, system data, activity statistics, etc.) will be analysed to define which can have an impact for future research. Selected data will be anonymised and made available in the *Open Research Data Programme.*

1.3.2 Outputs from international research and innovation activities linked with the project

As the e-assessment process is currently a key point in education, both teachers and educational institutions are using technologies and the Internet to improve VLEs and the teaching and learning processes themselves. Several international projects and experts are working on this topic to enhance it.

At international level, there are some projects that must be considered in this proposal since assessment is a burning issue in any type and level of education. For *Learning to learn together: A visual language for social orchestration of educational activities* project (Metafora), the design done to select the appropriate pedagogical strategies and new forms of assessment of individual and collaborative learning will be analyzed.

The partial results from *Innovative Technologies for an Engaging Classroom project* (iTEC), should be used for defining each learning scenario included in the TeSLA consortium. Their derived approaches about assessment to engage teachers, learners and stakeholders would also be studied. Their results about research on skills and competencies needed by teachers in the classroom of the future will be useful to engage TeSLA teachers in the planned teacher training actions.

As the TeSLA project focuses on enhancing e-assessment and subsequently learning activities and learner skills (located in any place at any time), the formative e-assessment model is really suitable for reducing most face-to-face examinations. In this sense the results and the expertise from *Next Generation Teaching, Education and Learning for Life project* (NEXT-TELL) on learner learning both in the classroom and at home will be an advantage for our work.

From the *Speakapps* European project, several learning resources and tools can be collected and used in a free way to develop a set of activities which include multimedia formats to collect learners information (images, voice, etc). These tools can be very useful for the biometric technology that has to be supported by the project.

There are also new projects and initiatives from regional countries. Regarding adaptive research, at Spanish level, one of the projects carried out was *Personalizing the Learning Process in Virtual Environments by means of Adaptive Formative Itineraries based on Reusable Learning Objects and Ontologies* (PERSONAL (ONTO)) project. It is focused, in the special case of VLEs, customization which allows the adaptation of contents, learning strategies, etc., to the competencies the learner has, so his/her learning needs can be satisfied in an optimal manner and with greater efficiency. In this project, from a multidisciplinary point of view, the design of a standard based virtual eLearning environment was considered, allowing the design of customizable learning itineraries, using reusable learning objects as the basis of the system, assuring interoperability with other learning platforms through the use of ontologies and semantic web technologies. As a result of this project, adaptive learning systems for learners and educational institutions were developed. Each learning path was developed taking into account each learning environment and learner performance. This can help us to define which technology module will be considered to implement in each university of the TeSLA consortium.

To analyse the data collected from each pilot, some learning analytics data should be applied. The project *Enhancing ICT Education through Formative Assessment, Learning Analytics &Gamification* (ICT-FLAG) is currently establishing a data mart about learning assessment. Its reports and deliverables will be analysed to take advantage of their results in TeSLA project.

The information collected during the pilots (questionnaires, biometric data, system data, activity statistics, etc.) will be analysed to define which can have an impact for future research. Selected data will be anonymised and made available in the *Open Research Data Programme.*

1.3.3 Positioning of the project

The TeSLA project is an innovation action that offers an interconnected high level system. Both, educational and technological solutions that will be used in the project, can be classified in the TRL8 and TRL9 levels in the Technology Readiness Levels. Moreover, the final framework plug-ins to connect those technologies to the learning platforms and secure technologies, are also standard technologies from other fields. The overall system should be classified in the TRL8 level, because despite the coordinator of the project already developed a similar platform prototype integrating most of the technologies with its own learning campus and tested it on small pilots, it is not a comercial product ready for use in the pilots. The overall TeSLA system needs to be tested to ensure all the commented properties at educational and technological level. As many users can test it, the reliability and scalability of the system will be ensured. Consequently, the mission of the project is to conduct large scale pilots, where a huge number of learners from different educational institutions use the TeSLA system in their e-assessment activities preserving the guarantees of user authentication and authorship assumed in the face-to-face assessment.

1.3.4 Overall approach and methodology: large scale pilots

The TeSLA project is based on a mixed approach. It follows the principles of an action research methodology combined with a design and creation approach. This is because the project is created in order to solve a problem in the teaching and learning environments but it also generates a product which deals with market needs which is tested by pilots in real learning scenarios.

The action research methodology has been used particularly by professionals who want to investigate and improve their own practices and it follows next principles [1]:

- Concentration on practical issues: It addresses the concerns and complex problems expressed by people living, working and acting in the real-world.
- An iterative cycle plan-act-reflect: The actors involved plan to do something in a real-world situation, they do it, and then reflect on what happened, and then begin another cycle plan-act-reflect. It is expressed in 5 stages: diagnosis, planning, intervention, evaluation and reflection.
- An emphasis on change: The actors involved are concerned with doing things that make a difference.
- Collaboration with practitioners: The actors are active participants.
- Multiple data generation methods: There are no restrictions on the types of data.
- Action outcomes plus research outcomes: Action research outcomes can relate to both action (practical achievements in the problematic situation) and research (learning about the processes of problem-solving and acting in a situation).

The action research is conceptualized in terms of a framework (F), a problem-solving methodology (M) and an area of application(A):

- F: a framework of ideas that acts as a theory basis for a particular action project
- M: a problem-solving methodology that actors create or adopt, which embodies F, enabling the theory base to be put in use.
- A: an area of application, that is, a real world problem situation where actors use M, aiming to help people in that situation bring about changes that they agree to be improved.

The other related approach behind this project is the design and creation approach. It focuses on developing new Information and Technology products (IT), also called artifacts, products or systems' development. Typically, design and creation is a problem-solving approach. It uses an iterative process involving five steps [2]:

- Awareness: It is the recognition of a problem where actors identify areas for further work looking at findings in other disciplines or from clients expressing the need for something.
- Suggestion: It involves a creative leap from curiosity about the problem offering very tentative ideas of how the problem might be addressed.
- Development: It is where the idea is implemented. How this is done depends on the kind of IT artifact being proposed.
- Evaluation examines the developed artifact and looks for an assessment of its worth and deviations from expectations.
- Conclusion: It is where the results of the design process are consolidated and the knowledge gained is identified.

These approaches will be followed in the development of TeSLA project. Firstly, the problem to solve (e-assessment) is detected and shared by teachers and educational institutions. Nevertheless, several WPs will analyse and study in deep the current state-of-the-art on both, educational and technical issues. The educational framework will be described in detail in order to identify the main problems to be addressed in our daily tasks as teachers in online environments.

Secondly, a solution will be provided. This solution is designed and developed to be tested in real leaning scenarios. In this stage, the TeSLA system will be ready to be integrated into learning platforms and activities.

Thirdly, the TeSLA system will be implemented and proved in different learning scenarios following the iterative cycle of plan-act-reflect. This cycle will be done through different pilots that will be conducted across the project (in the Figure 2, the large scale pilots processes are described in detail). The first cycle, will try to test communication protocols while the second one introduces technologies in the teaching and learning process in a isolated manner. The third cycle of pilots will be done to test scalability and the system as a whole. At the end of each cycle, an evaluation process will be done to correct deviations and introduce improvements. Here an internal evaluation about each pilot's results in terms of learning, e-assessment outcomes, quality, etc will also be done. Before beginning any pilot a risk plan will be designed in order to prevent and solve any deviation. At the end of these cycles, several reports will be elaborated to describe the results of the pilots (in terms of performance, scalability, security, educational processes, etc). Finally, the TeSLA system will be finished and ready for the society.

[1] Oates, B. J. (2005).Researching information systems and computing. Sage.

[2] Vaishnavi, V., & Kuechler, W. (2004). Design research in informatin systems.

1.3.5 Social, cultural and gender issues

In the context of the TeSLA project, gender issues as cultural and social factors must be taken into account. Given the partners involved in the consortium and their particularities, the TeSLA project will respect as a whole all the social and cultural factors derived from each country. In addition the project will also cover all the aspects related to learners with special needs (e.g. learners with mental or physical disabilities). The project team includes a great number of women (47%), who are present in almost all the partners, which means broadening the perspectives to meet the project's challenges and the work plan.

All these aspects are closely related to ethical issues, and need to be addressed in a transversal way along the whole project. From this point of view, both the technology and the educational model behind the e-assessment system will be adapted and developed under a responsible, respectful and ethical framework which ensures equality of opportunity and respect for diversity.

In a similar way, the selection process and criteria for participants in pilots will ensure an open, transparent selection and striving for balanced gender participation and taking special care of disabled learners. For the evaluation of the pilots' results, the recommended methods by the European Commission and by each partner too, will be followed to deal with gender, social and cultural factors.

Finally, if needed, the guidance of research experts on gender issues will be requested. In this sense, the UOC and through one of its research institutes, the Internet Interdisciplinary Institute (IN3) incorporates as one of the most internationally prominent programmes, the Gender and ICT Programme. The Gender and ICT Programme focuses on gender issues and challenges in science, technology and innovation, with particular emphasis on women's under-representation in all these fields.

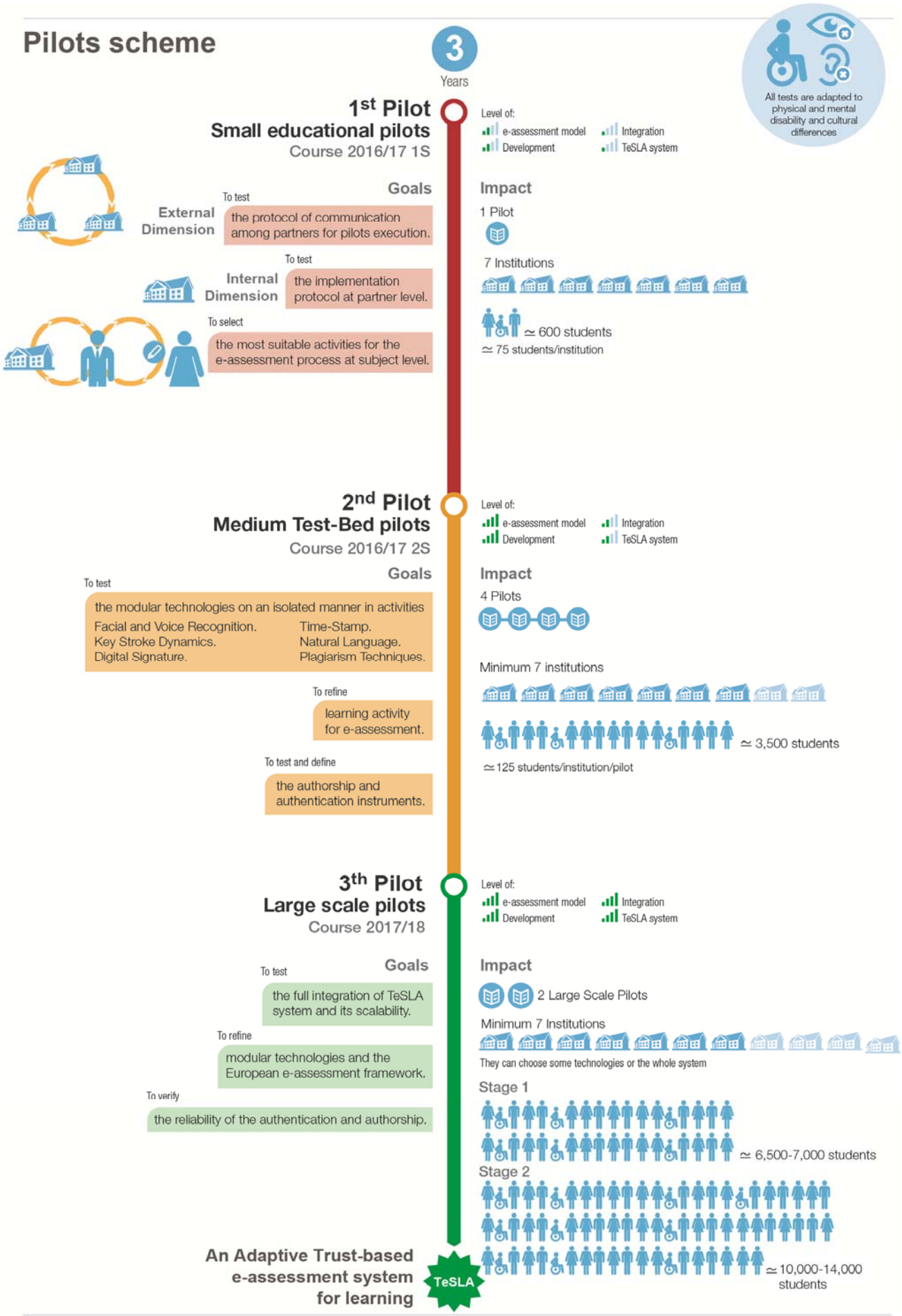

Figure 2: Pilots Scheme

1.4 Ambition

1.4.1 Advance and ground-breaking nature of the proposal

The ground-breaking nature of this project is based on integrating technologies from other fields in online and traditional learning environments. These technologies come from research areas such as security and privacy, biometry, ethics and semiotic disciplines. They can bring to education a trusted and reliable e-assessment system for educational institutions.

Nowadays, teachers and learners are using VLEs and the Internet entirely for learning, studying and interacting with colleagues in their daily tasks. The Internet has provided new opportunities for society and also technological devices that are connected are each time greater. This fact affects directly the educational area because learners are learning through the Net using it as the main resource of information. Learners can learn everywhere and at any time, but the main question is if they can be assessed by teachers through the Net but in a secure and reliable manner.

E-assessment can be defined as the process where information and communication technologies are used for the management of the end-to-end assessment process [1] [2]. In other words, e-assessment involves the use of any web-based method that allows systematic inferences and judgments to be made about the learners's skills, knowledge and capabilities [3]. E-assessment is an important aspect in online education, where learners' active participation and engagement through practice is needed along with a continuous formative assessment carried-out during the teaching and learning process [4]. The overall assessment process takes a significant amount of time and effort for both learners and teachers in the form of setting and responding to assessment tasks, marking or grading assessments.

Advances in technology offer interesting possibilities, if used appropriately, to build practice tools and can add value to any of the learning activities associated with assessment [5]. The appropriate e-assessment tools can be used to offer teachers the facilities to track learners' learning process and achievements throughout the duration of the course which in turn can be used to improve the course and the overall teaching process. Although these tools can be added in learning activities, none of them are designed to assure learner authentication and the authorship of these activities. This leads to a situation where maintaining the requirement of a face-to-face, on-site evaluation at the end of each subject in a degree becomes inefficient and simply not cost effective. However, as a certified educational institution, the university cannot just ignore the baggage in moving to a fully virtual assessment model, since it might heavily impact on the institution's credibility.

The verification of learner identity for e-assessment is based on two key elements: authentication and authorship. Although the control of these two factors is performed in a face-to-face setting, it might be argued that it can never be 100% reliable. Nevertheless, if we accept that this approach is a viable solution, current technology enables a direct translation to a virtual environment, for instance, via teleconferencing. Unfortunately, this approach completely lacks scalability, especially when we are talking about tens of thousands of learners. Some automatism is required.

If we are looking for a scalable approach from other disciplines that can be massively deployed by education such as biometric systems (typing pattern recognition, face and voice recognition, etc.) or direct control of personal workspace (keyboard and scriptorium blocks, monitor programs, etc.), then it could become a possibility. However, some of the current available systems for proctoring are usually highly invasive in order to be reliable, which leads to strong privacy problems. Learners may feel their personal space has been invaded, watched and questioned by default, undermining the trust between them and the institution. Therefore, a cost effective compromise must be reached.

In this project, a proposal based on the assumption that e-assessment cannot rely only on technological solutions, but in a system based on demonstrable e-assessment between the institution and its learners. Learner assessment can be continuously updated according to their interaction with the learning activities performed in the VLE, such as analysis of their exercises, peer feedback in cooperative activities or teacher trust information. Learning activities will include behind them invisible technologies for the learner. Evidence can be automatically collected and contrasted throughout all subjects in a course.

The literature describes different models and platforms for automatic e-assessment [6], [7] but not through continuous e-assessment. However, most of these platforms are focused only on the educational description without taking into account security measures and the whole technological part involved in authentication and authorship. The TeSLA project, defines security as how the learner is identified on the system when any learning activity is performed and/or submitted, how the authorship of the activities is verified, and how the system protects the integrity of continuous delivered activities.

Authentication on a virtual learning environment has been addressed using different levels of security. The simplest, and most commonly used method, is login authentication using a password. A more secure approach, still conceptually similar to using a password, would be using a digital certificate, such as the platform designed in [8]. Even though these approaches may be acceptable to access services, when authorship must also be considered, their usefulness is questionable. Authors in [9] propose using other authentication systems, based on biometric recognition. Biometric recognition can involves keystroke detection [10], [11], face recognition [12], voice recognition [13] or fingerprint detection [14]. Using this approach, the level of security increases significantly, since this information cannot be just handed away to a third party. Note that all these

techniques can reduce the possibilities of cheating but they are not applied in learning activities or the educational environment as far as for supporting the e-assessment process as a whole.

Authorship is another important objective, addressed as plagiarism detection in some works. There is a relevant discussion about which methods would be enough to refute the authorship of an activity [15], [16] but in the literature, it is still not fully solved.

1.4.2 Services partially available

There are some companies that focused its business on partial solutions for authentication and authorship. *Safe Exam Browser* (http://www.safeexambrowser.org) or *Secure Exam* (http://www.softwaresecure.com/) is an intrusive software that creates a safe work place in the learner's computer during the final examination period. The software blocks all the not allowed actions during the test (open a certain software, open a certain web connection, log the actions in the computer, look at learning resources permitted, etc). Although it seems a very safe system, the solution may have negative effects. The learners may get stressed during the test since they do not really know what is happening on their computer.

A less intrusive option to the previous software is the *Proctor-based assessment*. Several universities in the US (University of Penn State, Colorado or Washington) use the figure of the Proctor to assess learners living abroad especially in final exams. This person is selected by the learner (she/he is not a member of the staff of the university), she/he is verified by the university and she/he has the responsibility to monitor in person (face-to-face) a test or a final exam. It completely lacks scalability and security issues and authorship is questionable by performing only one exam with an unknown proctor (not the teacher).

Some companies have developed an online service to monitor learners using the same process. *Kryterion* (https://www.kryteriononline.com), *ProctorU* (http://www.proctoru.com), or *Pearson VUE* (http://home.pearsonvue.com) have found a lucrative business offering a similar service to universities to try to deal with the authorship and authentication of the learners but it lacks scalability and they are only based on the final examination. Continuous learning e-assessment through activities during the course cannot be performed. In addition, *Kryterion* also offers learner's authentication by means of biometric control (only facial recognition and writing patterns) that allows to detect the identity of the learner. Some MOOC platforms, like Coursera (https://www.coursera.com), already offers a simple and not correlated service of authentication based on only one biometric control to provide verified certificates for authenticated learners. These systems only allow once to verify that the learner that has made the final test is the enrolled learner.

Note that all these references try to partially solve some of the described security measures without covering the whole measures described in the previous sections, specially concerning those on behalf of a continuous assessment model. As can be seen, there is not a scalable, interoperable and secure system for e-assessment as a whole that can be connected and integrated into any fully virtual learning environment.

1.4.3 Potential innovation and ambitious of this proposal

The ambitious of this proposal is to take advantage of the benefits of all technologies in one system (TeSLA system), through its integration and its application for e-assessment processes in any educational institution. This will allow educational institutions to obtain evidence for e-assessing their learners during their learning process in an accredited and certified way.

Through the TeSLA system, all technologies will be applied in any learning activity and examination assuring the following aspects: a) authorship: it can provide evidence about the authorship of the activity during the continuous e-assessment; b) integrity: it can show that the deliverable received is what has been sent by the learner. This property avoids problems with submissions in which learners intentionally corrupt the deliverable in some way to gain more time and submit it again. It also shows that the deliverable has not been corrupted between its sending and receipt; c) non-repudiation: the mechanism can provide evidence so that the learner cannot deny that he/she has submitted an activity; d) authentication: it can provide evidence on the identity of the person who has submitted the deliverable.

The overall technologies described across the proposal, applied to any type of learning activity, provide the following properties although attention needs to be paid to some prerequisites:

	Security property to evaluate	Additional properties	Prerequisites
Biometric monitoring and recognition	authorship, authentication, non repudiation	automatic, scalable, fairly reliable,	There are minimum requirements in terms of devices (camera, microphone, etc.) to be able to carry out monitoring and identification.
Signing deliverables with digital certificate	authentication, integrity	automatic, scalable, very reliable	The learner needs a digital certificate accepted by the university or by accreditated agencies.
Receipt Timestamp	non-repudiation	automatic,	The university needs a timestamp system, either in-house or

		scalable, very reliable	supplied by a certified external undertaking.
Plagiarism	authorship	automatic, scalable	The system needs to be preconfigured with the information on the deliverables to be compared, since there may be parts common to all that are irrelevant (such as listings of the exercises). It is also important to indicate the level at which the comparison is to be made (inter/intra course, searching the Internet, etc.)
Forensic analysis of deliverables	authorship	automatic, scalable	The system needs to be trained by each learner using a body of deliverables from said learner to be able to perform the comparison and create a learner writing profile.

When implementing the TeSLA system as a product, we will ensure the following aspects:

- Data protection: Learner data is only held on the secure servers and is inaccessible through the application. The servers only send learner data once he or she has been authenticated and all communications are encrypted.
- Multilingual: The entire application will be developed using literal files, which allow it to show messages and fields in different languages without having to modify its code.
- Multiplatform: The tool will be developed to facilitate its use across all operating systems.
- Intermittent connection: We have assumed that learners may not have a totally reliable Internet connection and that they may not therefore always be connected with the server. The application stores the biometric and audit information and sends it when the connection is re-established.
- Multisession: With special regard to activities—although there may also be problems with learners' computers in exams—it must be possible for an activity to be carried out at different points in time. The application will allow learners to return to a previously initiated activity where they left off.
- Selective tools: Learning activities may vary so they do not call all for the same tools. It has been deemed fit to give teachers the ability to choose which tools will be suitable for each activity.
- Guaranteeing assessment: Given the importance of the assessment activities and the final examinations, the TeSLA system will be designed to be tested by the learners assuring that it is carried out even using alternative activities (risk management). Under no circumstances will the system allow the learner to carry out an activity or an exam out of the authorised dates and times. Similarly, mechanisms will be established to allow a test to be carried out less securely in the case of forecast failure of some software element, such as incompatibility with the connection. Information will also be stored to allow learners to recover the test or continue it without the use of the tool in the case of generalised failure.

The TeSLA system will be a created to be used within any virtual learning platform and it will be distributed, at least, in all the languages needed by the partners of the consortium. The system will be reliable, fully interoperable and scalable to be used by any educational institution interested in the product. TeSLA will distribute a free version across Higher Education institutions, regional schools or any educational institution interested. TeSLA will also develop a commercial version for profits and its own sustainability. Although this system is designed to enhance e-assessment in teaching and learning processes, it can be used for professional accreditations.TeSLA offers an innovative product for e-assessment based on secure technologies that ensure learner authentication and work authorship.

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2 Impact

2.1 Expected impacts

2.1.1 Expected Impact in relation to Work Programme

At a time when our societies are digital, European education and training systems are still unable to integrate ICT in their mainstream practices and reach their highest potential. Technology enhanced learning remains high on European agendas, embedded throughout Europe 2020, the EU growth strategy for 2010-2020 . There is currently an enormous gap between the embedded use of ICT in all facets of our lives and its use at schools and it is still out of reach for the majority of learners. In the meantime, the digital revolution has led to an exponential growth in educational courses and other resources available via the Internet, either free as Open Educational Resources (OER) or as paid-for resources. Knowledge is increasingly available for everyone, and very often for free. Digital technologies can reduce barriers to education and allow more flexible and creative ways of learning, reinforcing European leadership in adaptive technologies for the personalisation of learning experiences.

The TeSLA project will offer an innovative solution that will be able to overcome the current problems eLearning institutions are facing. The current solutions do not seem suitable to perform high stake external examinations credible. The increased spread of the distance learning methods also requires greater use of tests outside of central test centers. By offering the solution, the TeSLA project will reinforce European leadership in adaptive learning technologies presenting a safe and secure solution that will further enable the availability of eLearning to a wider audience. One of the biggest issues mentioned by teaching staff is the one of plagiarism and learners' identity. Most of the teachers do not trust on e-assessment and prefer the face-to-face to check their learners' knowledge and skills. This limits the application of online learning to a certain extent in the whole syllabus of the course. The results of the TeSLA project would resolve this problem and broaden the implementation of online education in the EU. On that note, the TeSLA so called technical partners will make sure to reach their individual desired impact thus reaching the overall desired impact at EU level. In addition, that would help to reduce the current restrictions of time and physical space in learning and teaching through the affirmation of a safe and secure e-assessment process that has so far proved as one of the key weak-spots of modern day eLearning. TeSLA will enable to conduct e-assessment activities more effectively and efficiently for a massive population of learners which will strengthen the competitiveness and growth of the EU eLearning institutions. This will improve the quality of the whole learning process of learners and contribute to the aims of the EHEA.

From the technical point of view, the TeSLA project will facilitate the emergence of innovative businesses and create a digital learning ecosystem in Europe by linking relevant ICT stakeholders. Partners within the consortium will be able to grow their business by acting as the principal technical suppliers of this innovative solution through offering it to a wide network of end users (mainly universities and educational centres). Innovative solutions are the basis of innovative business and as such the TeSLA project intends to foster a suitable climate for their growth through its technology partners. For example, currently LPLUS has a European market share of about 80% in the field of online exams in the aviation sector. Maintaining this position and broadening their share on the European University market is one of the impacts that will be achieved through the TeSLA project. This transfers over to new learners, courses and degrees covered by this partner. IDIAP will transfer into a real product

the voice recognition and face/voice anti-spoofing technologies developed over the years. This is expected to be massively used to authenticate learners in any kind of eLearning environment activity in the near future.

Western Europe is the world's second largest buying region for eLearning products and services after North America. This is set to change in the upcoming forecasted period. Asia is predicted to outspend Western Europe in eLearning terms by 2016. There seems to be universal agreement that the worldwide eLearning market will show fast and significant growth over the next three years. The worldwide market for Self-Pacede-Learning reached $35.6 billion in 2011. The five-year compound annual growth rate is estimated at around 7.6% so revenues should reach some $51.5 billion by 2016. Improving the security aspect of the e-assessment process will without any doubt increase the number of entities offering eLearning and the number of entities offering new and innovative solutions. This will in turn speed up the rate of adoption of technologies for the modernisation of education and training.

Taking into consideration that the end users of the TeSLA solution are mainly universities and educational institutions and most of the EU countries already have national eLearning strategies in place, it is more than likely that the project can increase the number of public-private partnerships addressing technological challenges for modernising and improving education and training. Guaranteeing a safe and secure e-assessment process at all levels of eLearning processes (formal, informal learning) is in line with this priority. Given the potential of eLearning in Higher Education, and its broad range of possible implications for institutions and learners, governments are expected to take a keen interest in it. According to a survey conducted by the European University Association a quarter of respondents stated that their countries have developed a national policy or strategy for eLearning, either specifically for Higher Education (16%), or for education in general (9%). In addition, 17% of respondents reported that the introduction of a nation-wide eLearning strategy is under discussion. Only one third said that there is no policy, or that they were not aware of one. This indicates that the trend of public involvement in the improvement of the eLearning process is highly present and desired.

Today, it is estimated that about 46% of college learners are taking at least one course online. However, by 2019, roughly half of all college classes will be eLearning-based. eLearning is also Eco-friendly. Recent studies conducted by Britain's Open University have found that eLearning consumes 90% less energy than traditional courses. The amount of CO2 emissions (per learner) is also reduced by up to 85%. TeSLA completes the full cycle of the eLearning process by improving its final milestone: the e-assessment. In the distance education system, learners are primarily examined via proctored face-to-face exams. Organising each exam requires displacement, additional staff and subsequently additional costs. This project will provide universities and other institutions to experience exams without any face-to-face constraints.

2.1.2 Strengthening Innovation Capacity, Competitiveness and Growth

Innovation and market potential for each partner is:

UOC: When TeSLA system will be ready, the UOC will collaborate to share and distribute the system with other educational institutions and schools for improving their e-assessment processes. The UOC is paying especial attention to the educational issues of the e-assessment process as well as pilots by testing the TeSLA system. As a fully online university, the system will be very useful to facilitate the detection of cheating and to verify the learner identity. TeSLA will also allow us to enhance the continuous e-assessment and rethink our face-to-face final examinations. At UOC we are still doing only face-to-face to examinations for assuring learners identity. The TeSLA system can be a solution for reducing or avoiding the final examinations. In the 2012-2013 academic course, the UOC had a total of 39,038 learners. This is the number of potential EU citizens that will use the TeSLA solution that will offer them a better quality education. The UOC have more or less 800 learners with disabilities. TeSLA system will facilitate to avoid their final face-to-face examination reducing their mobility in these cases. They will be assessed easily through the Net and from home offering them comfort and practicality.

ENQA: ENQA will take part in the quality assurance aspect of this project proposal. Along with AQU and EQANIE, ENQA aims to define the quality parameters that will be followed during the implementation phase of the project (pilots) in order to align with the aims of quality assurance agencies. ENQA aims to support the use of external and internal quality assurance for online higher education (based on the ESG). ENQA also wishes to further develop its work on QA of eLearning as this is one of the hot topics on the European agenda. One of ENQA's strategic aims is to provide services to its membership on relevant QA topics and QA of eLearning is one of them. The project tackles an important issue that is also relevant to ENQA membership.

UNAMUR: The primary goal of UNAMUR is to combine privacy, social acceptability and eLearning in order to give a maximum chance to people to enter the educational system. At the University of Namur, we try to disseminate education in parts of the world which are less accessible than other ones.

AQU: AQU Catalunya is the main instrument for the promotion and assurance of quality in the Catalan higher education system. This system includes the UOC and other blended programs offered by traditional universities. Nowadays, there is a lack of information related to quality parameters (indicators, etc.) for online education. TeSLA will be helpful on the definition of the accreditation process for the online degree programs and online institutions. AQU Catalunya is full member of ENQA and is included in EQAR, INQAAHE, REACU and ECA. The results of the project will be directly applied into the national e-

assessment processes and the institutional evaluation. The fact of being responsible for the process evaluation of the UOC is an exceptional scenario for applying the results of the project and obtain results that will be shared with the rest of the system.

LPLUS: We research and develop for several years on "exam at home". LPLUS expects to provide an integrated solution for trust-based e-assessment especially for continuous exams (which probably more and more will become a significant instrument for distance learning organisations). LPLUS has a European market share of about 80% in online exams in aviation sector. To keep this and to develop the European market of Universities is one of the main aim of LPLUS. We are convinced that our existing knowledge together with new developments will increase the quality of external e-assessment. We aim at providing interested education organisations with suitable solutions for their pedagogical control system. Therefore, we want to get more experience and a deeper understanding of the needs of the responsible educations institutes.

OUNL: OUNL is transforming its Bachelor and Master programmes to provide more structured study programmes close to the traditional less structured, open approach that offered maximum freedom of place, time and space. The new educational model aims at increasing the number of graduate degrees delivered. The model entails a shift towards alternative modes of e-assessment including formative e-assessment and incremental summative e-assessment to enhance efficiency of the learning process. OUNL has been a front runner in the Netherlands regarding computer based e-assessment. This project will help OUNL to explore alternative modes of e-assessment directed at further increasing efficiency of the learning process.

SU: ELearning is introduced in all pedagogical faculties and departments and over 1200 learners-future teachers are trained as online learner. As a result of which 156 courses were transformed in Moodle (http://moodle.e-center.uni-sofia.bg) from 1 Bachelor and 5 Master programmes at education faculties and specialties at Sofia University. Three of our courses developed six-month continued quality e-assessment within the Learning Agency Network. Courses received Epprobate quality certificate (international quality label for eLearning courseware). The University of Sofia is preparing to apply for institutional accreditation of the distance education this year. One of the biggest issues mentioned by the staff is plagiarism and learners' authentication. Most of the teachers don't rely on e-assessment and prefer the face-to-face check of the learners' knowledge and skills. That's why a participation in such a project is of a crucial importance for Sofia University. The results of TeSLA project would resolve this problem and broaden the implementation of online education in our University.

OU: TeSLA will allow us to raise awareness of the TeSLA approach and project results in respect to online proctoring at a distance and to sustain an institutional discussion regarding next generation tools and process. There are over 20,000 learners at the OU (UK) with a self-declared disability and many need special supervision/proctoring to take their examinations at home. This is a lengthy process as they also require rest periods during the examination so the technological solution proposed by TeSLA could assist with this supervision process and also save money. Moreover, recent enhancements to the university's learning design process requires module teams to define e-assessment strategies and to potentially find and develop new learning or e-assessment solutions to problems that have been identified. The university also continues to play a learning role in open online courses for which reliable e-assessment, certification or badging verification remains challenge.

PROT-OS: The collaboration in TeSLA will give us not only a unique tool to help institutions provide a complete online education experience but also a unique vision on what different European models and institutions are looking for in terms of an identity proven and non-invasive e-assessment framework. PROT-OS will gain a 360 degree understanding of advanced e-assessment needs in different markets and define a software framework that can respond to these varying requirements. PROT-OS an important player in the distance and online learning fields. We see more and more initiatives across Europe looking at full online services. We collaborate with more than 60 organisations. Authentication and authorship remain two of the major roadblocks to close the loop in the online and distance education lifecycle. Being able to collaborate on a model and software solution that aims to guarantee the authentication and authorship of a learner completing a fully e-assessment will be an incredible milestone and will fast track our ability to help institutions move traditional programs into the online space. Additionally, this type of innovation will help us close some of the gaps that traditional education is suffering from in terms of availability, flexibility and scalability.

IMT: IMT aims at getting involved in the supervisory board of the project and assist in the solution of problems not merely giving its experience and support but being part of the process that will lead to the innovative solutions adopted for the completion of the project. Mastering technical security issues will also permit IMT members to strengthen its current practice and reputation in the field of security management and so to broaden new dissemination opportunities. In addition TeSLA will give as an additional possibility positioning the institution among experts in this field and of being able to offer new academically oriented and technical-wise support services.

IMPERIAL: i-BUG will transfer the science and technology accumulated over the past 5 years on real-time deformable face tracking and face recognition into TeSLA. We strongly believe that TeSLA will lead to software licencing, as well. i-Bug is one of the world leaders in face analysis. The group is leading various EU and UK research projects in all aspects of face analysis. i-Bug group has developed state-of-the art technology in facial landmark localisation and tracking, as well as face recognition. The publicly available software in facial landmark localisation and tracking (http://ibug.doc.ic.ac.uk/resources, http://www.menpo.org) have been downloaded more than 10,000 times and are now used by various start-ups in the areas of

facial biometrics and facial behaviour analysis (iProov, MyWorks etc.). Furthermore, the facial landmark tracking technology developed by i-Bug has been licenced by a leading industrial player in the field (Seeing Machines).

TUS: TUS will implement several tasks for technology-enhancement of learning and adaptive e-assessment as well as in the area of security and privacy of information. We aim to improve the quality of learning and teaching at our university. Another result that we expect to obtain is the facilitation of the distant eLearning provided by our university. We aim to apply the innovative results of this project to satisfy the requirements of our engineering learners and the educational system as whole. The results will affect the lecturers at TUS allowing them to acquire new competences and skills in conducting exams and e-assessment of learners' knowledge. The expected result for the university consists in making it more compatible in the educational market in Bulgaria and in the Balkans through the innovation of the learning and teaching process.

AU: In our distance education system, learners are primarily assessed via proctored face-to-face exams conducted in 81 cities of Turkey as well as several cities abroad (Europe, Balkans, Azerbaijan, TRNC) consisting of multiple-choice questions. There is a mid-term and a final exam in each semester. For the organisation of each exam, about 350.000 staff are assigned all over the country and abroad which are conducted on two days with four sessions at the weekend. This project will provide Anadolu University to experience proctored exams without any face-to-face constraints. As well as that, Anadolu University has an intention of diversifying e-assessment methods and using more activity-based e-assessment tools. Currently there is no identification system used for the learners. Assessment requires a lot of assessors in face-to-face conducted exams for such a large population of learners. In this regard, the project will also contribute to achieve this intention. TeSLA will strengthen the competitiveness and growth of Anadolu University.

JYU: TeSLA will allow us i) to design European level framework for eLearning environments; ii) to design technologies which ensure user identification, authentication and authoring also for learners who have learning disabilities or mental/physical disabilities and iii) to create collaborative network between higher education institutes and technological companies. We are the leading Open University in Finland in online studies. We will provide our education by online and blended model in future too, but our authentication system needs more developing. It is matter of trust and quality for our activities. TeSLA is essential to have joint Open University programmes in Europe to promote aims of lifelong learning.

EQANIE: In the frame of its accreditation procedures for degree programmes in the field of informatics/computer sciences, EQANIE analyses how higher education institutions have designed examinations, projects and other e-assessment methods in order to be able to evaluate the extent to which learners can demonstrate achievement of the learning outcomes of individual modules and programme outcomes throughout the programme and at its conclusion. As the examination and e-assessment methods in use are constantly being further developed in line with the implementation of new forms of teaching and learning, it will be important for EQANIE to take into account the changing realities. Having in mind the prime goal of examination and e-assessment, namely to verify whether learners have achieved the intended learning outcomes at the desired level, EQANIE is thus interested in ensuring that any such developments are aligned to its quality expectations.

INAOE: INAOE's participation is motivated for the implementation of technology we have already developed for forensic analysis in a real and large scale system. So far our technology for authorship attribution and verification has been evaluated in benchmark data and validated in international evaluation campaigns (e.g., PAN, CLEF). Participating in the consortia will allow us to assess our developments in a real and large scale scenario. TeSLA will serve to prove our technology on forensic analysis meets the requirements of the European and worldwide market, helping us to commercialise our technology.

IDIAP: TeSLA will allow IDIAP to transfer into real product our voice recognition and face/voice anti-spoofing technologies. We expect this technology transfer to lead the commercial licensing (as for of SDK) and/or subsequent R&D projects. IDIAP is one of the leading research institute in Europe that both developed expertise in multi-modal biometrics (face, voice)

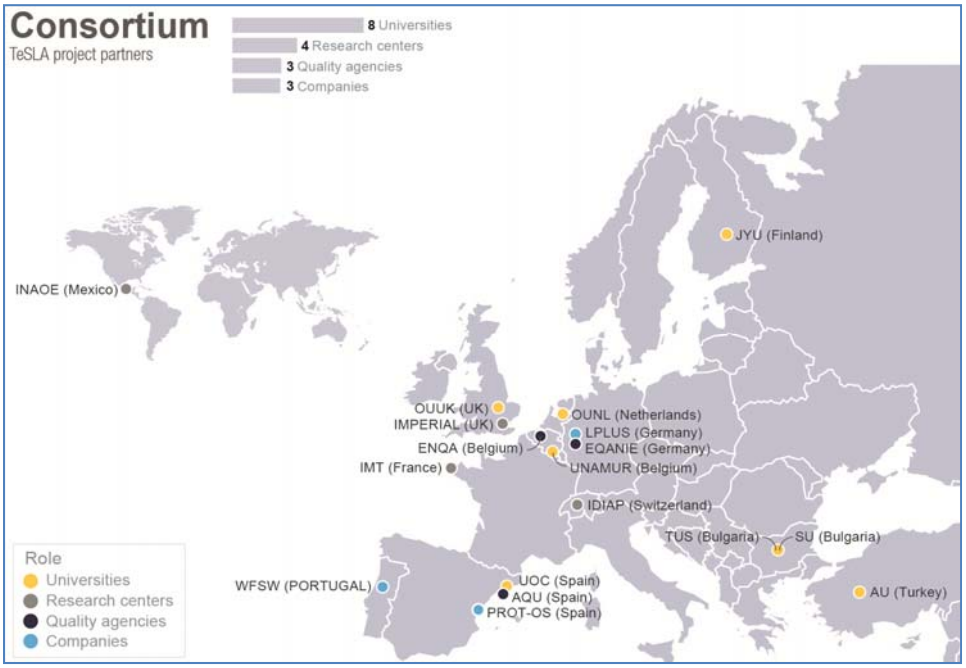

Figure 3: Consortium Map and Partners Role

and anti-spoofing. As a matter of fact, IDIAP was coordinating a major FP7 European project called TABULA RASA considered by the European Commission as a success story.

WATCHFUL: We have experience in Keystroke Dynamics as a biometric for authentication. As a software company focused on data/access protection, TeSLA will allow us to test and improve the Keystroke algorithm in a large group of users. We expect to positively contribute to something that could be massively used to authenticate learners in any kind of eLearning environment activity. We currently have an eBiometric solution in production, based on Keystroke Dynamics, and the accuracy of our product is, as it is for most of biometric techniques, based on False Rejection Rates and False Acceptance Rates. The number of test users in TeSLA is relevant to get more representative rates and to validate the technology at large scale.

2.1.3 Environmental and Social Impact and policies

TeSLA has a wide-range of potential impacts across the whole of formal and informal education:

- Equal opportunities: This project will increase opportunities for lifelong learning by distant online learning. The equal opportunities and idea of access for all are the most important social impacts.
- Improved learner experience and flexibility. The outputs will also support scientific advances for e-assessment. Besides, disabled person may have a better chance to participate on exams. The project is expected to provide more flexibility to those taking exams drastically reducing mobility for face-to-face examinations. This fact has a positive impact in the environment as well as in the economy of learners and institutions.
- Educational models: Having a framework on quality assurance for online programmes and a link to the implementation of particular tools to measure the process of teaching and learning in online higher education is strategic in the sense that we foresee a rapid transformation of educational models and therefore the external accountability will probably be changed too. The biggest long term impact is to enhance existing education models and to bring education closer to people that today cannot attend face-to-face programs. Furthermore, earn the trust of accreditation bodies and governments on e-assessments will help organisations grow their online programs and their reach within their countries. The work of the project will have a part to play in shaping the landscape of eLearning and in bringing automated support for e-assessment closer to being deployable in high stakes testing.

TeSLA tries to assure the authentication and the authorship with the goal of reducing the number of cheaters. The main indicators for this will be the statistical data gathered throughout the project so we can compare and evaluate the impact. Offering an adaptable and standardised solution is one of the key aspects that the TeSLA consortium will take into consideration in order to avoid obstacles that might potentially affect the desired impact. Potential obstacles covered by TeSLA are aspects regarding legal frameworks and balance between privacy and security. Security is a dynamic area which is moving faster every day and in every system or device. TeSLA will assure the authentication and the authorship with the goal of reducing the number of cheaters, and we expect to totally reduce this issue, combining data protection and social acceptability with control of falsification.

General Data Protection Regulation

General Data Protection Regulation (GDPR) is a proposal to reform the European Union's data protection framework in order to update and enhance the 1995 EU Data Protection Directive. GDPR includes a single set of rules and standardised mechanisms on data protection, valid across the EU, and will require businesses operating in more than one EU country to be subject to oversight from one supervisory authority rather than multiple authorities. Nevertheless, UK data protection lawyers have warned that the draft revision can introduce new bureaucratic burdens and contains several requirements which will be difficult to implement for many organisations. Furthermore, according to a study from Vanson Bourne for SecureData of 100 senior IT managers in large UK enterprises, 59% of respondents said the draft data protection rules would cost their business more than 3-4 years to comply to1. The regulation also regulates how businesses can use and share big data, mainly covering data security and privacy but also data scale, tracking, transparency or inaccuracy. This potentially implies an important impact for companies and users in order to reach a balance between protecting the consumer and ensuring they benefit from the advantages of companies using big data responsibly.

TeSLA acknowledges these challenges. The TeSLA system and pilots will include by design a clear set of user data privacy, security and information directives and features to cover the data protection framework early on. Besides, the consortium will thoroughly monitor the evolution of this regulation in the Data Management task of the project.

Open Data

TeSLA will ensure that all activity under the project complies to the above mentioned new data protection reform of the European Union's data protection framework in order to update and enhance the 1995 EU Data Protection Directive in terms of user data privacy, security and information directives and features. This frameworks also regulate how to the reuse public sector information (PSI) when it includes personal data. Thus, the management of the data generated and collected within the project and mainly within the pilots implementation and the mechanisms to preserve them will be linked to the strategy for exploitation and protection of the outcomes generated in the project and consistent with the open research principle of Horizon

2020. In order to comply with the regulation also in Open Data terms for personal data, the Data Management Plan of TeSLA will only share data that could be eventually published and will in advance establish mechanisms to comply with regulation with regards to data use and reuse, including anonymisation where needed.

2.1.4 Key Performance Indicators

KPI-1: Number of teachers involved in the design and evaluation process. TeSLA project will involve 350 teachers.

KPI-2: Number of learners using the e-assessment functionality in real learning and teaching activities. TeSLA project will involving 18.00 learners.

KPI-3: Number of Universities adopting TeSLA system in their learning environments. TeSLA project will involve 7 Universities. TeSLA aims at eventually involving 5 more Universities.

KPI-4: Satisfaction in the adoption of proposed system (improved or more efficient e-assessment experience by learner): In a survey to early adopters, TeSLA aims at obtaining a satisfaction level of at least 4 out of 5.

KPI-5: Number of clients from the industrial partners running TeSLA or some components of TeSLA. TeSLA aims at eventually reaching up to 10 new companies, mainly SMEs.

2.2 Measures to maximise impact

The success of TeSLA is strongly based on the dissemination, exploitation, liaisons and communication activities that are designed and implemented during the project. The project has arisen from a mix of educational and business needs identified by the academics and industry partners and the technologies and innovation capacity offered by the technology providers.

The project will have a real impact if we are able to take advantage of the demonstration actions envisaged around the large scale pilots proposed in order to validate the use cases of the e-assessment system and processes in real and relevant learning and teaching contexts, in order to foster the innovation capacity of the consortium members and the innovative offer for the targeted end users, minimising the commercial risks of the project results to prepare the access to the educational market.

In designing these measures, the partners has taken into consideration a variety of communication means and target groups.

The WP9, led by PROT-OS, is responsible for defining and executing the dissemination and exploitation activities and the communication plan, including the strategy for knowledge management and protection (with special attention to the new Unified Patent Court) and the Open Access and Data Management plan. The dissemination and exploitation activities proposed are a set of market-oriented actions that seek to promote the professional version of the e-assessment system having the greatest impact on key stakeholders outside the project partnership, and prepare the path for its future entry into the educational market. The communication activities proposed are a set of scientific and end user-oriented actions aiming at disseminating the results, making them available to all interested audiences, and informing about the knowledge gained through the project and the benefits of the e-assessment model and system, providing proofs how TeSLA adds value to the European society.

The measures proposed by TeSLA are based on the following principles that will help maximise the impact of the results:

- Complementary interests from industry and academic partners for the dissemination and exploitation of the project results, that will be supported by large scale pilots as vehicle for academic and industry partners to develop and validate the educational and business cases.
- Pilots based on driven experimentation and iterative customer-centric processes to ensure the technical validation of the project outcomes.
- Ongoing actions within the strategy for knowledge management and protection that will be implemented during and after the project to effectively exploit the project assets and give the innovations a competitive advantage.

2.2.1 Dissemination and exploitation of results

TeSLA will be exploited by both industry and academia partners based on the following approach:

- Common exploitation based on an open source strategy that will include a suite of existing tools and services provided by the partners and new tools developed ad-hoc for the use cases and pilots. It is important to remark that while these components work together to fulfil the aim of the TeSLA system, it will still be possible to exploit all these components individually because they are loosely coupled and concrete implementation is interchangeable. The main exploitation channel envisaged for the TeSLA system is open source release. Although the release of different blocks and components of the system under open source license does not guarantee broad and effective dissemination and exploitation, it is a significant enabler. This strategy allows third parties to make use of and experiment with the system prototype and enrich it, acquiring knowledge of and confidence in the TeSLA model and educational and business opportunities and exploitation in the mid-term.
- Individual exploitation by industry partners to improve their solutions for the educational sector and roll out to market.

All partners are interested in exploitation opportunities, although with different focus and individual routes to reach the market:

- For SMEs and industry, delivery of open source components must be accompanied by fostering an open source community, which can lead to take-up of components by trainers and customers who then buy support, consulting, professional training and integration services.
- For academic institutions, the "scientific market" is an attractive exploitation target. The success of universities involved leads to follow-up research projects, better teaching offerings and training content, personnel transfer, consulting services, etc. The Technology Transfer Offices of the universities identify and consolidate new technologies, learning and e-assessment models that can be coined into know-how sold in the form of technology consulting for early adopters or for end users, potential creation of spin-off, etc.

The exploitation strategy will include liaison activities to foster close collaboration with other educational initiatives, establish cooperation mechanisms, identify and reinforce synergies among different players, new opportunities and businesses, channel common efforts, enable the integration and widespread adoption of different technological solutions and, consequently, contribute to increase the number of potential adopters of the fully online and cross-curricular e-assessment system.

All academic partners will promote the results through its networks at national, European and international level. The project results will be applied in the Universities environment, and shared with our learners, teachers and collaborators, as a part of their e-assessment process. Targeted audiences are systems developers, teachers and learners of the different Universities. Project aims will be communicated at the earliest stages with relevant bodies determining the transition to the new educational model. This will optimise internal alignment and uptake by systems developers and teachers. Learners will be informed through regular channels and invited to give voice to their experiences taking part in evaluation of the technologies. The results will be published on paper-based and web-based journals and magazines, educational web sites, own web sites, social networks, workshops with learners and educators, PhD learners and researchers will be attracted, publication of scientific papers.

The table and guidelines below outline how we will achieve the desired impact:

Beneficiaries	Mechanisms	Benefits/Timescales
HEIs SRHE	Executive summaries of research outputs to all those responsible for Learning and Teaching Centres in HEIs in Europe	Developing an enhanced approach to e-learning across Europe, improving competitiveness of HEI sector
Government (e.g. Department for Children, Schools and Families) and NGOs	Report on future potential of the research for schools will be sent to those such as the DCSF Schools Directorate,	Encouraging decision makers to consider the future benefits of the research
Assessment Agencies and Organisations (e.g. ETS, Cambridge Assessment, SQA)	Presentations to key personnel and meetings with representatives from potentially interested companies	Feeding results into existing processes for assessment at School/Tertiary level
Professional Organisations (e.g. Higher Education Academy, JISC experts group	Seminars and demonstrations to closely related subject centres as well as to HEA's Assessment special interest group.	Raising awareness of the potential value of TeSLA and the core approach to enhance the student experience
Research-based Organisations (e.g. AERA, EARLI)	Contacts with relevant interest groups. Research results disseminated through presentations and research papers.	Distributing results and promoting take up and improvement of methods and technologies
University Lecturers	Articles in key publications (e.g. THES) and practice-based conferences/workshops. Guidelines for educators about TeSLA tools	Raising awareness of new approaches to assessment and recruiting for further research in cognate subjects
Technical Developers	Technical guidelines to extend the system with further tools and templates	Helping to inform and promote further technical development
Learning and Teaching support staff	Guidelines for non-technical users for how to create new learning testing environments based on TeSLA system	Raising awareness and knowledge within staff and help deliver e-assessment online and at a distance.
Undergraduates	Articles in student union publications	Increasing student understanding of automated assessment to improve the learning experience

Specific dissemination and exploitation actions for creating impact

UOC: The UOC will disseminate the project across the world and through its international contacts, and exploit the results reducing cheaters, reducing mobility of the learners by avoiding face-to-face examinations, enhancing our VLE with new features to guarantee learners' authentication and authorship, and improving the e-assessment framework (including learning activities and resources) for any virtual learning environment. As the UOC are providing education at different levels (formal, non-formal, etc), the system can be provided to other UOC business (for example: UOC-Business; UOC Campus for peace, etc). We will also promote the system in primary and secondary schools as they are educational institutions close to UOC. On the other hand, we will promote the project's results through conferences, journals and workshops. We will organise teachers training actions as well as several online communications.

ENQA: ENQA will disseminate the results through its communication channels; website, newsletter, as well as ENQA events.

UNAMUR: The University of Namur will disseminate the results through major conferences and its own ones as well as through books, papers and articles. Another way to disseminate is to use its educational canal (mainly masters, etc).

AQU: The Agency will disseminate the results through its web page. The agency will promote debates on how quality assurance can be developed under the use of new and more precise data on teaching and learning processes. The TeSLA system and the indicators will be considered in our quality assurance approach for online and blended higher education programs and as ENQA members we will exchange the outputs of our processes with other European Quality Agencies.

LPLUS: LPLUS is expecting to improve its range of services by offering state of the art assessment control system. According to the current market fields LPLUS is looking forward to disseminate the product to the main target groups as there are Universities, schools, companies and authorities.

OUNL: The technology developed in TeSLA will be piloted within the OUNL learning environment to disseminate and adopt it across the university. The system will be integrated to align with current facilities for computer based assessment to support teachers in developing and providing flexible high quality e-assessment solutions. Project webpages will present the results of project collaborations in various formats and will include information about field trials where possible. We will exploit the Open University's suite of eLearning collaboration tools (e.g., Meet-O-Matic, Elluminate, Sloodle) for increasing awareness, communication and project management. We will provide easy to read reports and project press releases which can be uploaded onto websites. The Open University's marketing department will also support public dissemination through press releases at key points in the project's development (i.e., initiation, technical development, field trials and evaluation findings).

PROT-OS (industry): PROTOS aims to reach Blackboard´s customer base in Europe to raise awareness and to provide access to pilots and related information. In a second phase we will follow the project´s exploitation strategy by attending specific events where education leaders and decision makers will gather. LMS eLearning market in Europe is close to 500M € and related services top 1000M €. The expectation is that TeSLA will create a brand new category within the related services industry and that within 3-5 years it can be at the core of its own multi-million euro niche. Our 60 direct clients in addition to Blackboard´s customer base (education decision makers like provosts, deans, heads of teaching and learning departments and CIOs) will ensure the widespread of the project. PROTOS expects in year 1 after project a total revenue of 250,000€ related to services, integration and consultancy linked to the deployment of TeSLA in production environments. The goal will be at least 5 projects for year 1 to achieve this revenue and a minimum of 25,000 learners impacted by the state of the art online assessment functionality. This will help us grow our consulting group purely related to learning technology in at least two head counts. Additionally, results and progress will be shared in different industry forums and events with higher education professionals responsible for innovation and distance learning.

IMT: IMT will contribute to the dissemination and exploitation activities by properly exploiting its results through patents, scientific articles in peer-reviewed international journals, international conferences and PhD defences. Our team has also a solid innovation track record: learners from the IMT group have won the school's young entrepreneur's challenge in 2010 and 2012 and have pursued in founding startups (MulteeGaming in 2010 and AJAXPLORER en 2012). Thus, IMT may pursue the development of a start-up based on the project's results. IMT will get the results to the end users of its federated grandes écoles (over 13000 learners and 4600 staff members) and participants of the Université Paris-Saclay mega university plan (over 60000 learners and more than 11000 academic members), from which IMT is one of the founder members.

IMPERIAL: i-Bug group will create publicly available software and reproducible research and produce scientific publications: i-Bug group is consistently publishing in top venues in computer vision, pattern recognition, machine learning etc. (such venues include very selective scientific conferences such CVPR, ICCV, ECCV, ICML, ECML, NIPS, which provide "green" open access), as well as top scientific journals (i.e., top IEEE Transactions). I-Bug group will execute the following commercial licenses: (a) SDK for real-time facial landmark tracking, and (b) SDF for face "frontalisation" and face recognition.

TUS: TUS will involve lecturers from the Faculty of applied mathematics and informatics as participants and from some other faculties of the university as users of the e-assessment system. We intend to familiarize the lecturers who have used the system in their exams with the results at the intermediate and the final level of the project. TUS will disseminate through the web site, publications in national journals and magazines, social networks and social groups of interests. Our target groups

include educators, bachelor, master and PhD learners from Faculty of Applied Mathematics and Informatics as well as the learners from other Faculties of TUS.

AU: 1.3 million active distance learners are having proctored face-to-face exams including multiple-choice questions at Anadolu University. At the end of this project, AU will be able to conduct proctored online exams without having learners in certain exam centers and use different types of assessment tools and questions. This will strengthen the learning process, satisfaction of learners and in turn increase employability of learners. Impact of the project will be measured by learner satisfaction.

JYU: JYU offers expertise in issues concerning learners with special needs. We will use the framework in our studies during and after this project. We are able to offer a large number of learners for piloting (500-3000). We are willing to publish our findings on international, national, and regional level with our project partners. JYU has over 15.000 learners using our technology for taking their studies and exams. We will provide a large number of learners for testing services. One part of our current quality system is questionnaires for learners. We will use these methods also for the purposes of measuring the impact of the project. We are also very active partner in national network of Open Universities (AF). Our education is provided by 54 collaborative educational institutes in different parts of Finland. They are also using our learning assessment systems.

EQANIE: Among EQANIE's members figure several national associations of deans of informatics/computer science from different European countries, national and European level associations of informatics professionals as well as subject-specific and general accreditation agencies for higher education. The spread of EQANIE's membership covers more than 30 European countries. Through its member communications such as regular newsletters, a designated website as well as annual meetings, EQANIE will seek input and feedback from different stakeholders in Higher Education with regards to planned developments in TeSLA and share newly gained experience and good practice.

IDIAP: IDIAP will embrace reproducible research as a mean to maximise dissemination and impact. IDIAP will pursue traditional routes in disseminating generated know-how and new technology through the standard scientific channels. We will target peer-reviewed publications in major international conferences, both foundation-focused and practice-oriented, and the most prestigious, open access ("green" open access) journals. The presentation of tutorials at major international events can also give an international dimension to dissemination and impact. We expect at least to execute 3 commercial license of the SDKs for voice recognition, face anti-spoofing and voice anti-spoofing. We will target the dissemination via other technical conferences and events, such as through Black Hat Briefings (http://www.blackhat.com) for instance. This approach has proved successful in attracting news reports by sources like CNN, BBC, NBC, Forbes, Wired and IEEE.

WATCHFUL: WFSW will leverage their own Marketing resources and tools to reach a selection of prospects, end-users and partners by the means of e-mail campaigns. Broader audience resources such as Press Releases and publications on corporate website and social media will also be used. WFSW will also participate in joint dissemination activities promoted by the consortium. Keystroke dynamics, as a biometric for authentication, will be used and enhanced for continuously detecting intrusions and continuously authenticating the learners on any eLearning environment. With False Rejection Rates below 2%, we will be able to massively increase the quality of the eLearning education system as well as making it secure and credible.

For dissemination purposes, a specific work package has been appointed. Specific attention will be given to extract relevant project results related to the TeSLA pilots in order to address decision makers at local, regional and national levels.

Beyond the contribution the project will have towards the expected impacts listed in the work programme, it is important that the project has the greatest impact on key stakeholders outside the project's partnership, to ensure that:

- Project outputs can be fully exploited and be most useful.
- The knowledge gained through the project, and more generally the information generated by the project, can be made available to all interested entities.
- Elements of excellence of the project can be reused and replicated in other projects.

Section 2.2 describes the measures for the dissemination and exploitation of the project results. In designing these measures, project partners have taken into consideration a variety of communication means and target groups.

In order to ensure the achievement of these objectives the project will implement a series of dedicated activities in the framework of WP9, focusing on project promotion, awareness raising and dissemination of project results. Specific acknowledgement of the EC funding source (H2020 + European Commission logos) will be made in all dissemination activities. The Dissemination Plan (D.9.2) will ensure that project promotion is optimised and that dissemination of information about the project and its results will reach a large and diverse audience and it will focus on the following key components:

- Establishing links and synergies with related projects and strengthen complementarity with EU funds mechanisms; in this direction we have identified the following projects:
  - FP7 Biometrics Evaluation and Testing (BEAT) https://www.beat-eu.org
  - European Association for Biometrics (EAB) http://www.eab.org

- Metalogue (http://www.metalogue.eu) The system will be able to monitor both its own and users' interactive performance, reason about the dialogue progress, guess the users' knowledge and intentions, and thereby adapt and regulate the dialogue behaviour over time. Uses natural language technologies.
- PREATY project: e-Assessment for learning http://www.preaty.org/en/introduction
- WATCHME Workplace-based e-Assessment Technology for Competency-based Higher Multi-professional Education http://www.project-watchme.eu

- Innovating in education and training is a key priority in several flagship initiatives of the Europe 2020 strategy, in particular in the Agenda for New Skills and Jobs, Youth on the Move, the Digital Agenda and Innovation Union. One of the main priorities under these Flagships initiatives is to support the Member States (MS) in integrating and taking-up ICT in their educational and training policies and practices. The Digital Agenda specifically called for MS to strengthen actions in this field.

For the follow up of the project demonstration activities towards a broader deployment, the partners will explore the integration of project results into the priority actions defined by the regions covered by the project and potential links with the priorities of other EU regions. Right from the beginning of the project, the partners will contact the managing authorities in charge of the National and relevant Regional programmes to inform them about the project, identify how the project results will fit into local priorities and the practical modalities for mobilising regional funds. Although the EU member states have to take charge of the management of the programmes and financing, this procedure based on the filter of a regional development strategy can guarantee the transformation of EU-policies into regional measures in a more reliable and traceable form. Results in relation to strategy and policies can be regularly monitored and measurable feedbacks used for programme optimisation.

2.2.2 Target groups

TeSLA focuses on three target groups:

- ELearning practitioners: Teachers, mentors, ICT advisers and other practitioners, are targeted by this communication strategy, especially the teachers involved in the successive pilot exercises.
- ICT vendors and suppliers: ICT vendors and suppliers are an essential group for mainstreaming innovation. TeSLA benefits from a direct involvement of ICT companies in the project itself.
- Education policy makers: Emphasis will be placed on the Ministries of Education from the partner countries and on understanding national mechanisms to channel innovative learning activities. Regional authorities, which are essential in implementing educational reforms, will be targeted later in the project. In addition, European stakeholders active in education (eLearning associations, industry, specialist press, the European Commission, the Open Education Initiative) will be continuously informed throughout the project.

2.2.3 Delivering the innovative solution to the market

As the end-users of TeSLA will be involved in the project from the very beginning it is clear that they will be the ones interested in exploiting it. The universities involved in the project will be the ones testing the solution throughout the project and evaluating the experiences of their learners along the way. This way the solution will be involved in their educational offer from the beginning and tailored to their needs. All feedback will be incorporated along the way thus leading to the final improved solution.

- The first step of exploitation will be performed by the participating universities. They will be the ones that will be able to offer the solution as part of their eLearning programs and make it a part of the overall eLearning experience on their premises. The idea is that the exploitation for the partners will be free of charge.
- The second step of exploitation will be offered to other entities that might be interested in testing the solution. Priority will be given to collaborating entities. The cost and compensation will be decided later on.
- The third and final step in the exploitation will be to offer the solution as a branded and marketed solution that can be sold to the rest of the interested entities.

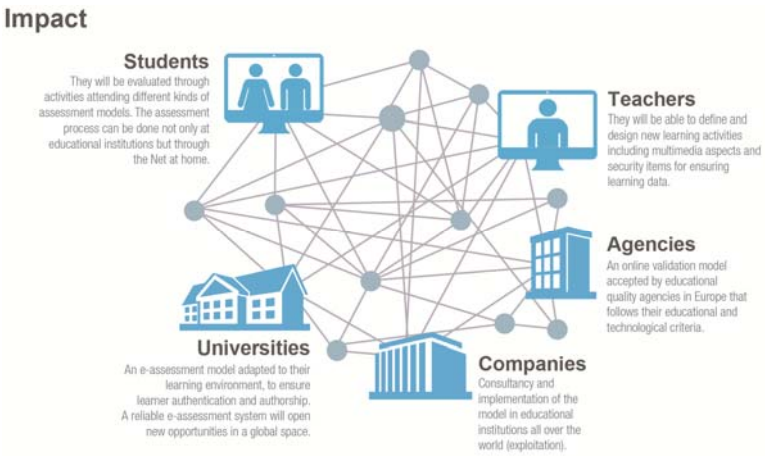

Figure 4: Impact

The ICT technology partners will be the ones that will be in charge of supplying the TeSLA solution. The core exploitation objective of TeSLA is to significantly improve educational technologies and solutions for the European educational industry. The industrial partners of TeSLA are very active actors with product and services covering a wide range of commercial activities and educational markets. However, the online assessment in the new learning and teaching processes demand next-generation solutions for ensuring the authentication and authorship of the learners. Meeting this demand, the TeSLA system will improve the ability of European ICT companies to run new educational solutions and businesses.

For this purpose, the project includes testing and demonstration activities with large scale pilots that will serve as a vehicle for ICT partners to validate the business use cases. The idea is to assess, evaluate and improve different business models through iterations of the pilots to check if they work and meet the business and educational perspectives of the Universities and the expectations of the learners and teachers.

Each ICT partner will elaborate a business plan during the project according to the continuous feedback received from the iterations and the customer-centric processes of the pilots in order to reach a pre-market stage. After the project, each partner will implement the business plan and perform the specific actions defined in order to scale-up what was tested, evaluated and validated in the pilots aiming to reach more clients and more educational market segments.

The exploitation plan of TeSLA will combine the following activities to reach the market with minimal commercial risk:

- Business development cycle
    - Market research, to analyse existing products and services and competitors.
    - Business modelling to effectively design the commercialisation of the project results (value proposition, competitive advantages, potential clients, product strategy, pricing, marketing).
    - Market access and commercialisation strategy to increase opportunities of increasing sales.
- Product/service development cycle
    - Development according to business and user requirements.
    - Integration of technologies for ensuring identity and authorship in the e-assessment processes.
    - Cross-domain large scale pilots to validate technical and economic viability including testing with end users.
    - Market replication and pre-commercial first application of the TeSLA e-assessment system free of charge for educational institutions and the final professional and commercial version.

The business cycle will be fed by the results/outcomes of the project cycle. The 3 pilots will allow validation of improvements and innovations in the industry partner solutions, based on feedback from the iterations feeds, and refinement of the educational and business model that will be implemented in the business plan after the project.

Data Management

TeSLA will follow the Data Management Guidelines for H2020 projects. A Data Management Plan (DMP) will be written as a deliverable linked to WP1, and will be continuously updated along the project course. The data management activities are closely linked to the strategy for knowledge management and protection of the project and will evolve from the initial plan depending on the progress of the developed innovations.

The data TeSLA captures will primarily relate to evaluation of large scale pilots and institutional assessment processes and practices, and it will refer to learner recognition and assessment results from tests and exams. Neither of these data will be exploited beyond those purposes defined in the project proposal (e.g. for evaluation, reporting and dissemination purposes). Learner sensitive data gathered by the participants will be kept on secure servers and pilot-related data (such as feedback, participation analytics) will not be linked to learner records beyond anything required for approved assessment purposes. Research and evaluation data will be kept according to partners policies for retaining of such information and subsequently destroyed. Data relating specifically to dissemination will be shared with the consortium and reported publically where relevant.

Some partners have a strong experience in the collection of benchmark databases and in the formulation of protocols for performance evaluation. These partners are already processors or controllers of databases and will work together to preserve these databases in compliance with the data protection regulations in Europe using the output of the FP7 BEAT project.

Most of the data generated will reside within TeSLA (IT based management and server based secure storages) and its data privacy and security framework. However, partners may leverage some high level statistics in terms of access, completion ratio, performance, and bugs/issues. Most of the high level data will be ownership of the institution that generated it and we will ask for permission in the event we decide to run aggregated statistics on usage and results.

A special mention deserves the i-Bug group of IMPERIAL, that has a long history in developing and maintaining large databases and benchmarks, as well as organising and executing challenges (http://ibug.doc.ic.ac.uk/resources). A portion of the data used to train the facial landmark tracking algorithms will be used to run the first competition in facial landmark tracking. In the same way, some partners such as WATCHFUL, will use the generated information (user profile data, the data generated by evaluations, authentications and detections) in order to use it in possible future work related with the Keystroke algorithm.

The consortium will participate in the Pilot on Open Research Data envisioned by the EC within Horizon 2020.

Strategy for Knowledge Management and Protection

TeSLA aims at bridging the gap between research and the market through a combination of existing technologies and tools supporting the e-assessment in the online learning activities exploring the assessment processes of the identity and authorship of the learners across different data sources and modalities in real educational contexts.

The consortium poses an overall strategy for knowledge management and protection (i) to effectively exploit the project results, (ii) to give industry and academic partners a competitive advantage, (iii) to avoid an increase of project costs due to infringement of third party rights for the use of patented technologies and (iv) to assure the testing and commercialisation plans.

The consortium is fully aware of the principles of Open Access that must prevail in H2020 projects, but the project foresees some innovations with potential industrial interest that could be eligible for some form of protection. The knowledge management strategy will therefore consider these two premises. The principles governing TeSLA will be compatible with the nature and mission of each participant always trying to maximise the educational, commercial and socio-economic impact of the project outcomes while fostering the open access dissemination of the research results. Both background and knowledge generated in the framework of the project have to be efficiently exchanged but also protected, if so decided. The consortium includes entities with departments with an extensive experience managing IPR issues and exploiting knowledge assets within their businesses and educational offering and also in the context of previous cooperative research projects.

A suite of existing technological tools & services is available for integration into the TeSLA system as detailed in section 1.3, while new tools may be developed in the project upon need. For every partner of the consortium, it is very important to have explicit rules on how to access background and foreground knowledge and how to ensure the protection of the innovations developed in the project. Therefore, the partners have started work towards a first version of the Consortium Agreement including IPR issues to support common and individual dissemination and exploitation strategies.

A specific Exploitation Agreement will be also developed taking into account the following preliminary commitments:

- Concerning exploitation of the project results, it is the understanding of the consortium that background IP will be made available to the participants in favourable conditions if they are necessary to perform the work in this project. The placement of background IP into the project will be detailed and listed in the annexes of the Consortium Agreement. Herein, every single partner is entitled to describe in depth their own background IP.
- Foreground IP is owned by the beneficiary generating such knowledge or result. Each entity will make available its foreground IP on a royalty-free basis to other partners to the extent that such information is necessary for the production of their own foreground knowledge within TeSLA If it is not possible to determine exactly the ownership of that foreground knowledge, in case of several entities participated in that specific development, joint ownership will be shared by pro-ratio effort invested by each partner.
- Background and foreground knowledge will be made available, on a royalty-free basis, to the other project partners for dissemination, research and academic purposes with respect to the intellectual property rights of the partner generating this knowledge.
- Background and foreground knowledge will be made available to the other project partners for exploitation purposes at favourable conditions, with respect to the usual commercial conditions applied by the granting partner.

The Project Management Board (PMB), after consulting with all partner representatives will develop the agreement on IPR issues to be included in the final version of the Consortium Agreement. It will regulate obligations and rights of the participants, and will be prepared and signed by the partners no later than the contractual project start date. The final Consortium Agreement will make explicit reference to important administrative points such as decision procedures within the project, risk management strategies, legal aspects regarding software to be used/produced in the project, trademarks, patents and rights of each partner in the exploitation of results.

The consortium IP management will include allocation of the ownership of IP which is generated in the project framework (foreground), identification of the IP which is previously possessed by the participants before starting the project (background) and which is necessary for project execution or exploitation purposes, access rights to foreground and background for these porpoises, conflict resolution procedures and the sharing of revenues. All these issues will be clarified by the participants at the highest level before the project starts within the Consortium Agreement. Moreover, for the definition of the agreement the following minimum principles will be taken into account and reflected: (i) All participants will set out clearly their aspirations and exploitation objectives for the project results; (ii) Ownership, assignment of ownership, joint ownership, access rights to background technology and knowledge, allocation of users rights; (iii) The availability and the protection of already available knowledge, content and software tools provided by the partners with their corresponding value on the market. Some of these components will be customised to become project compliant and will finish in the components of TeSLA integrated system; (iv) The value of the global solution and framework as dissemination vehicle and as support tool; (v) The resources (financial, human and tools) that each partner has made available to the project; (vi) The percentage of the investment performed by the

single partners in each specific WP will provide the basis for producing the results and the demonstrators for the pilots. The investment may include also the additional internal investment that each partner could perform for adding additional unplanned results to the project, and eventual third party investments; (vii) Eventual returns on investment and revenues that may arrive during the last year of the project after the set up of the first tools and services. These will be carefully divided in contribution to the whole project and/or fee for the exploitation of the previous knowledge and content.

All the partners are committed to maintain the software tools and documents delivered visible and accessible via the project web portal. The consortium will apply a fair balance between respect for appropriate confidential material and the right to publish research results. The defined process will enable prevention of prior disclosure of patentable material while not imposing the research groups undue delay on publication.

Dissemination: Gold and Green Open Access policies for scientific publications

TeSLA acknowledges the importance of Open Access (OA) policies towards accelerating and broadening the dissemination of the publicly-funded results of the project, as well as towards boosting the visibility of European research. Furthermore, open access could facilitate SMEs (which are among the main target audiences for the project's results) to access and use results that will be published around the open source project that will be established. To this end, the project will establish and promote measures for open access peer-review scientific publications. Such measures will be detailed in the consortium agreement and will bind partners in publishing 100% of the project's scientific publications as open access articles.

TeSLA researchers and partners will be given the freedom to choose between the two main open access publishing modalities: (A) «Gold» OA in either full or hybrid open access journals. As part of this option, the partners should be responsible for handling the publication fees, and (B) «Green» OA through self archiving journal articles in OA repositories. To this end, researchers will be offered the option of publishing in journals contained/registered in:

- Registry of Open Access Repositories (ROAR): http://roar.eprints.org
- Directory of Open Access Repository (OpenDOAR): http://www.opendoar.org
- Open Access Infrastructure for Research in Europe (OpenAIRE): http://www.openaire.eu

The project will take advantage of the fact that major publishers (e.g., IEEE/ACM) provide Hybrid Journals i.e. subscription journals that provide gold open access only for those individual articles for which their authors (or their author's institution) pay the open access publishing fee.

The following table shows a brief description of the measures to be implemented in the strategy for knowledge management and protection from the proposal preparation stage to the pilots validation phase:

Stage 1: Preliminary ideas and potential innovations at proposal preparation stage
▪ Partners have signed a Non-Disclosure Agreement to keep the information handled during the proposal preparation stage in secrecy, and to define the mandatory confidentiality measures applied before the submission of the proposal. ▪ TeSLA partners have screened and used patent databases to obtain an overview of the State of the Art, the competitors, to identify some additional innovative ideas and to avoid re-inventing and redeveloping. ▪ TeSLA partners have established a preliminary version of the Consortium Agreement with rules on IP and confidentiality that will be signed before the Grant Agreement starting date.
Stage 2: During the development of TeSLA
▪ Project partners will keep valuable information secret setting confidentiality obligations for researchers and employees, and reviewing scientific publications and technical communications within the consortium to avoid prior disclosure of potentially patentable material. ▪ Project partners will use IP searches and early freedom to operate searches (mainly in free-of-charge patent databases) to identify risks of infringement of third parties rights. ▪ Industry partners will fix internal rules for record keeping in order to collect valuable source of information to help a potential patent attorney, if needed. This is a first step to protect the intangible assets generated as there are several types of IPR and the partners may choose the most appropriate protection strategy (patent or keep in secrecy).
Stage 3. During the testing and demonstration activities within project large scale pilots
▪ The pilots will be performed with selected academic partners. In case the pilots finally involve any potential customer different from already represented in the consortium, confidentiality agreements and IP protection will be signed by parties involved in pilots. ▪ Additional and intense conducting freedom to operate searches in patent databases will be performed as competitors' rights may put our commercial perspectives out of business.
Stage 4: Commercialisation after TeSLA

- At pre-market stage, the industry partners may apply for IP protection in the form of a TradeMark if a brand name/logo for the new product/service is decided, or in the form of Copyright for the marketing material or content of the website.
- At pre-market stage, industry partners will analyse the different channels to commercialisation, if they can enter alone into the market or licensing agreements or if joint ventures are needed. In case of a patent, the partner will try to raise funds leveraging this IPR for the business growth.
- At market stage, the partners will reinforce IPR allocating the required budget for continuous monitoring to identify copies or infringements of third parties.

2.2.4 Dissemination materials and means

A dedicated website will be created at the beginning of the project and will contain general information on the project, project objectives, partner's profiles and the general framework within which the project is set both from a research perspective and a policy point of view as well as links to partners' websites. Moreover it will produce an extensive record of all publications and communications originated during the course of the project. The website will consist of a private area and a public one. The restricted area (only accessible by the project partners, the EC project scientific officer, and the project review panel team by entering their credentials) will contain documents and confidential information related to the project's internal activities and reporting (e.g. Grant Agreement, Consortium Agreement, Description of Work, Deliverables, meeting presentations and minutes). The public web pages will contain the project presentation, the description of the Consortium members, all project/related downloadable documents (press releases, news items, e-Newsletters, public deliverables, useful links, etc.). It will be possible for all website users to provide feedback on the project activities and publications. Visitors and community members will be allowed and encouraged to contribute to the dissemination of project results, thanks to the web site features allowing them to post contents and share contents through a variety of social networks. The website will be strictly linked to and from other tools and content developed by other international cooperation H2020 support projects. The project's website will be the contact point to the wider audience leading the interested party to information material, as well as contact details of the project partners. Website traffic will be regularly monitored in order to verify that it complies with the expected standards of visibility defined in the project Dissemination Plan. Given the importance of the website for the whole impact of the project, strict quality control procedures will be followed to ensure that the web presence of the project meets projects requirements.

Finally, interactions and direct links to other EU initiatives, previously-funded projects, technology platforms and networks will facilitate targeted information spread and will allow the consortium to widen the potential applications and the dissemination of the results. In addition a project logo will be developed to ensure consistency in visibility and the opportunities that social media offer will be explored, possibly resulting in one social media channel used for as a modern dissemination strategy aimed at broad public coverage.

Dissemination will be achieved through several dissemination supports developed by the project, including:

- Visual identity: a project Logo, a reference PowerPoint presentation, templates for deliverables and general documents will be designed in the very initial phase of the project;
- Professionally designed project materials, including a project fact-sheet, poster and brochure;
- Press releases, announcing the launch of the project and its key milestones;
- Project e-Newsletters and posts on social networks, contributing to raise awareness and pay attention toward project activities and high achievements;
- Articles, highlighting project achievements and excellence and written by each project partner for external publications (journals, newspapers, etc.). Where possible, opportunities to publicise the project outcomes in popular magazines, European and national eLearning magazines, sectorial publications, newspapers and/or other media channels will be explored in order to maximise the visibility of the project's results;
- Position papers are short reports based on project key deliverables and including feedback and inputs from participants to workshops, to be disseminated among policy-makers from the EU and EU MS/AC institutions.

2.2.4.1 Communication activities

In order to have a clear communication strategy, the principal materials produced at European level include:

- Project website: where all information, news, updates and promotional material are available. The site will principally function in English with some ad hoc multilingual content
- Promotional brochures: The first general brochure will be used at all events and workshops to be distributed to all target audiences. The brochure will be updated to follow the progress of the project each semester. A second brochure will target eLearning facilities specifically. It will be produced once scenarios are ready for public use/testing by teachers. A third brochure towards the end of the project will target policy makers and promote the project outputs.

- Newsletter: Every 6 months, in order to allow stakeholders that register through the web site to follow progress more easily as the project develops.
- Audiovisual material (demo video and short wide audience video) will also be produced for demonstration and dissemination purposes. Furthermore, all these materials will be uploaded in electronic format to the project website.
- Multi-lingual informational project factsheet will be also elaborated and updated.

2.2.4.2 Website and social networks

Apart from the website, the project's major events and results will be disseminated through the use of social media. The TeSLA will use social media tools to demonstrate innovative and up-to-date use of technology. The main TeSLA news items will be included in the following social media: Twitter; Facebook: community and sub-communities of education-related material and activities; LinkedIn: community for professional contacts that includes a great number of education-related clusters; YouTube for disseminating project videos; Slideshare for presentations

2.2.4.3 Dedicated events and presentations

The results of the TeSLA project will be presented at different national and international events (workshops, technical conferences, fairs and exhibitions) and in other potentially interesting events that are nationally and internationally organized by interested organisations. The university partners will also take advantage of internal events to present the project's results to the learner body that are currently not undertaking any eLearning courses. In addition, they will use their contacts with the policy making authorities to convey their experience with the solution and the benefits that have been achieved.

A series of presentations will be made in relevant events (such as trade fairs) in order to present the demonstrator and dissemination material. The purpose will be to show how the technology can be implemented across the European Union. This will also be an occasion for networking in view of the subsequent exploitation of the results once the project is concluded.

Some of those events include:

- The European Technology Platforms in the ICT for education area and events organised by them
- EC Conferences & Cluster Meetings: participation in conferences, EC concertation meetings per thematic area, events, exhibitions and other interesting EC initiatives will be considered to enhance project visibility and impact;
- Project events will contribute to disseminate knowledge and raise awareness of a targeted public, allowing to go into a detailed analysis of project objectives and activities and to establish personalised interactions;
- ENQA will organise an international workshop "Online teaching and learning in the light of the ESG". The target number is about 50 attendees and it is planned to take place in M6 under WP4 activities
- A list of target events will be agreed by project partners at an early stage and kept updated during the project's lifetime. Participation to external events includes presentations and the distribution of printed project collaterals. At this stage, the partners have identified some events that would be of benefit for the project dissemination:

Yearly (December) conference "Online Educa" in Berlin (very international)	Yearly (February) conference "Learntec" in Karlsruhe, Germany
BETT Show London http://www.bettshow.com	Educause http://www.educause.edu/annual-conference
Annual learning at Scale	Yearly International Conference on Biometrics (ICB)
Yearly Biometrics Conference in London (http://www.biometricsandidentity.com)	Yearly International Conference on Biometrics: Theory, Applications and Systems (BTAS)
Bi-yearly International Joint Conference on Biometrics (IJCB)	Yearly Conference on Computer Vision and Pattern Recognition
ICDE International Council for Open and Distance Education conference	European Association of Distance Teaching Universities conference - http://conference.eadtu.eu
Annual ENQA Quality Assurance Forums	Association for talent development https://www.td.org
EDEN conference http://www.eden-online.org/eden-events/upcoming-conference.html	European Conference on Technology Enhanced Learning http://www.ec-tel.eu/index.php?id=704
International Conference on Interactive Collaborative Learning http://www.icl-conference.org/icl2015	International conference on Knowledge Technologies and Data-driven Business http://i-know.tugraz.at
The 2016 e-assessment question will take place on 16th and 17th March 2016 http://www.e-assess.co.uk/index.html	Assessment Conference: Driving Accountability and Innovation

The following table summarizes the specific and measurable communication objectives:

Activity	Target group	Objectives
Website	General public, EC	Y1: 4,000; Y2: 8;000; Y3: 12,000 (total: 24,000 visits)
Blog	General public, professional audience	Average visits per article: 300 visits. Output: three articles per month
SEO	General public, professional audience	High visibility (Google Searchers page 1) for three keywords #e-assessment system, #learner identity authorship, #cross-curricular assessment
Twitter	Professional audience	Y1: 200; Y2: 400; Y3: 800 followers (total: 1,400). Followers should preferably be experts in the TeSLA domain. Output: 260 tweets per year (total: 300 Tweets)
Newsletter	General public, professional audience	Y1: 300; Y2: 500; Y3: 800 subscribers (total: 1,600 subscribers). Output: 2 Issues per Year (every 6 months after M6)
Flyer	Interested people during venues and conferences	3 (1 version per year)
Poster	Interested people during venues and conferences	3 (1 version per year)
Image, video	General public, professional audience	Visits: 2,500
Walkthrough	Professional audience (teachers, learners)	2 animated walkthroughs; Visits: 2.500 each
Training workshops	Professional audience (technical and non-technical users)	40 participants each
International event (M16)	Professional audience, education industry, decision makers, EC representatives	200
International Tesla Show event (M34)	Professional audience, education industry, decision makers, EC representatives	300
Scientific publications	General research community (open access)	Up to 40 conference papers, 10 journal papers

3 Implementation

3.1 Work plan — Work packages, deliverables and milestones

Large scale pilots involving many institutions from different countries, educational models and learning platforms requires continuous communication between the partners and a clear protocol. Moreover, the technological framework that will support this project requires involving many experts in different fields working together as one single team.

The project organization and the methodology have been defined in order to ensure coordination between all the partners, defining topic based WPs that will focus on the key points of the project, and some tasks devoted to the coordination between different WPs, with well defined deliverable contents. In addition, we have planned face-to-face meetings in the most critical points of the project, to ensure communication and coordination. The methodology is explained in the following, highlighting the phases of the project and the coordination aspects.

From a requirements point of view, the TeSLA project must take into account three sources of demands: a) educational and technical needs derived from the activities and learning platforms of each institution; b) accreditation issues and finally c) the ones coming from the authentication and authorship modules. Each of those main sources has its own WP, and the first task of each of these WPs is to identify the list of requirements taking into account all the involved institutions and experts:

1. From WP2, the educational model will define the type of activities that the system must support, which type of assessment models are involved and any additional functional and accessibility requirement to ensure the access to the system to any learner with any kind of disability.
2. From WP4, the quality and accreditation agencies will define the key aspects to ensure the quality of the learning process and specifically the ones related with assessment.
3. From WP5, the experts on the different biometric technologies, forensic analysis, plagiarism and digital certificates will provide the specifications on the data required for each module and the expected quality levels. In addition, they will provide the specifications on the generated information and the outputs of each module.

The results of this first phase of the project define the functional requirements that the TeSLA sustem must support and which type of information is managed by the system. In addition to those requirements, another key point of the project is to ensure data privacy and all the ethical aspects of the e-assessment process. Therefore, the inputs of this first phase will be analysed in the WP3, responsible for those topics, in order to define the protocols, guides and restrictions derived from European directives on data privacy and the additional restrictions applied in each of the countries where the pilots are conducted.

With the results of the first phase and the information provided by WP3, the integration process can start. This process, which is the second phase, is conducted in WP6, where all this information is used in order to design the TeSLA system. This is an important point for coordination of the technical teams involved in the project, because it will define how the system is accessed from learning platforms, the format and type of data used in the system and the interaction between the system and their internal modules, developed in WP5. This is the output of the second phase of the project, and will ensure the coordination between all the technical teams and the reliability of the final system.

The third phase deals with the temporal coordination. Before the final large scale pilots, many small pilots will be conducted in order to test different critical points of the project. Some of the points, such as the communication and evaluation protocols of the pilots will be tested in all the pilots, but other points have time constraints derived from the academic timing of institutions and countries involved in the pilots and from the TeSLA framework development. In this phase, focus is placed on the latter:

1. From WP2, a calendar of activities and assessment dates will be constructed with the information of all the educational institutions involved in the pilots.
2. Using the output of the TeSLA framework specification obtained in the previous phase, all the teams involved in the development of specific modules in WP5 will be able to perform and construct their planning.
3. With the planning of WP5 modules, the integration team of WP6 will create the final planning of the TeSLA system development. This planning will specify temporal milestones when each technology and activity will be supported by the system and the dates when it will be available at each educational institution.

The planning provided from WP2 and WP6, is the starting point of the pilots' definition. Using this information, WP7 will be able to define how many pilots will be conducted, the goal of each one and which institutions participate in each part of the pilot.

At this point of the project, WP2 is working on the activities and educational framework, while WP5 and WP6 are developing the TeSLA system and their integration into the learning environments. This fourth phase is a pilot-centered phase, and it is conceived as an iterative process, involving the following steps until the final large scale pilots:

1. WP7 defines a protocol for the pilot to be conducted, containing the dates, goals, techniques, assessment types, participants and the information to be gathered.
2. Each institution involved in the pilot performs the assigned activities and gathers all the information.
3. WP7 writes a report of the pilot, including the gathered results, incidences and any relevant information provided by the institutions.
4. WP8 evaluates the pilot using the report provided by WP7. The information recovered is analysed in terms of the quality of the process and results. This analysis also includes the performance of individual technological modules.
5. WP8 writes a report with the results of the pilot and provide a feedback to WP2, WP5, WP6 and WP7.
6. As a result of the feedback, the involved WPs may require to slightly modify their activities and it can affect their provided planing.
7. With the updates provided by WP2, WP5 and WP6, pilot planning is updated in WP7, improving also the protocols to deal with any detected deficiency. A final report with the pilot results and actions is created.
8. The final report is provided to WP4, where accreditation and quality agencies will act as an external auditory board.

At the end, the final phase is focused on the exploitation and dissemination of the project. At this point, the TeSLA system has been developed and tested in many educational institutions, so scalability has also been proved. Some extra effort will be necessary to put it on the market, such as creating distribution channels and all the documentation required for any company or educational institution to adapts their systems to take advantage of the TeSLA framework.

3.2 Gantt Chart

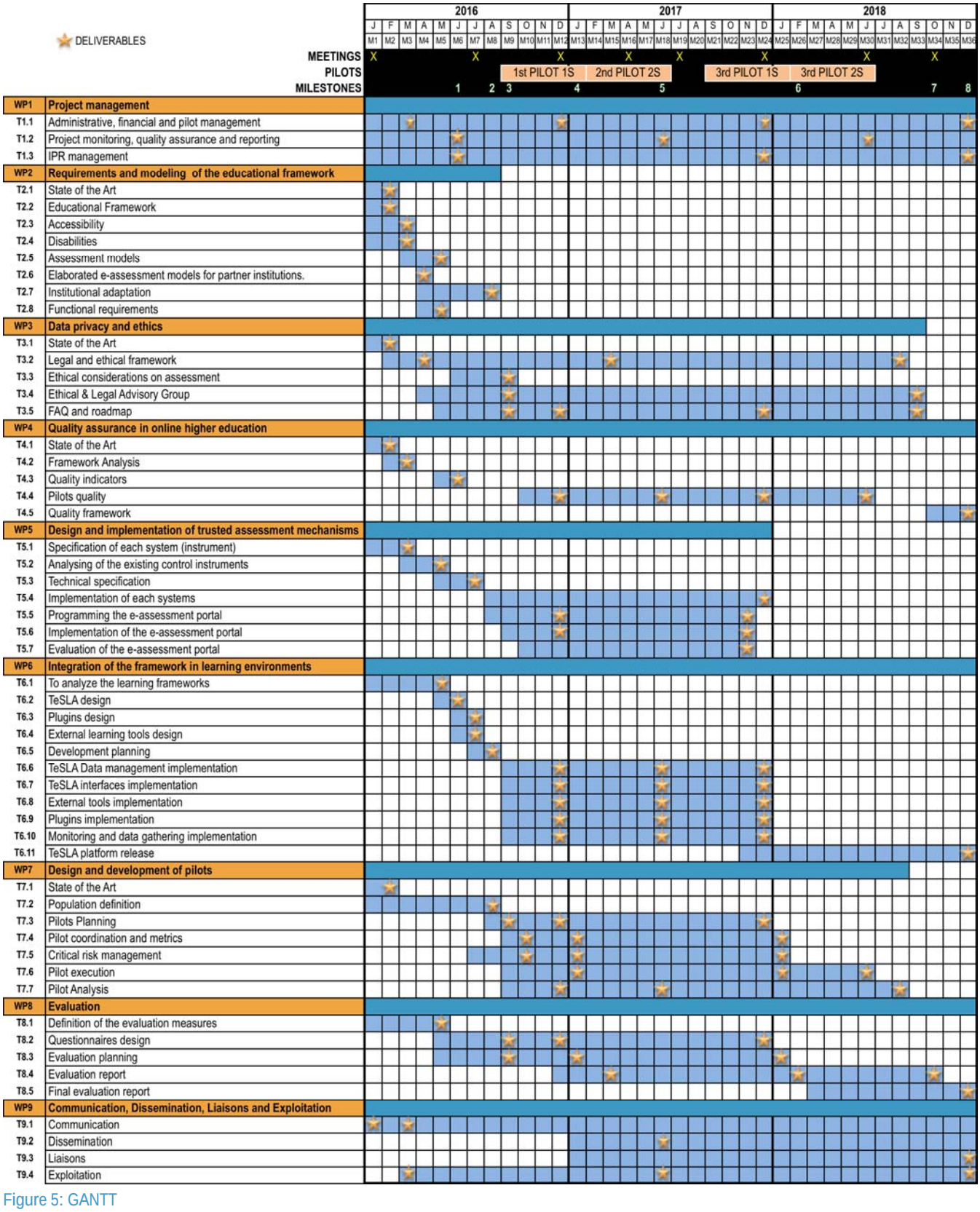

Figure 5: GANTT

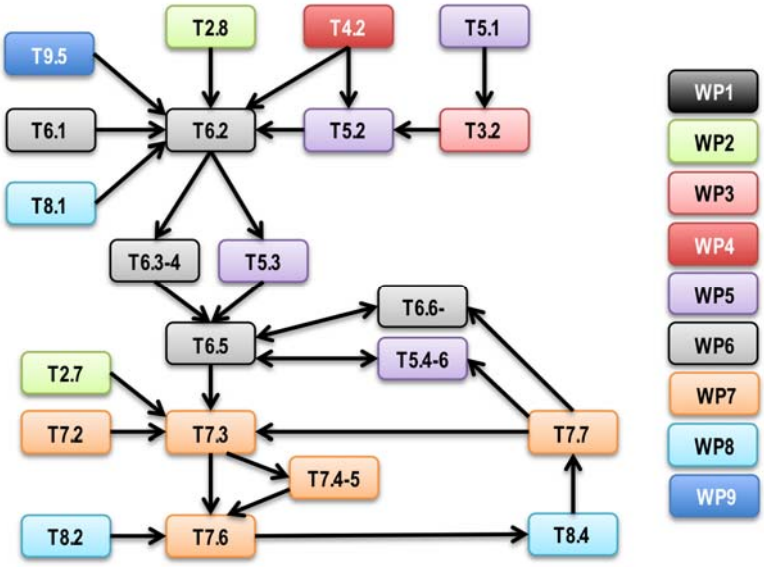

Figure 6: PERT

Table 3.1a: Work package DESCRIPTION

WP number	1	Start date or starting event:							M1
WP title	PROJECT MANAGEMENT								
Participant	P1	P2	P3	P4	P5	P6	P7	P8	P9
	UOC	ENQA	UNAMUR	AQU	LPLUS	OUNL	SU	OUUK	PROT
PMs	56	2	2	2	2	4	4	2	4
Participant	P10	P11	P12	P13	P14	P15	P16	P17	P18
	IMT	IMPERIAL	TUS	AU	JYU	EQANIE	INAOE	IDIAP	WFSF
PMs	2	2	2	2	2	2	2	2	2

Objectives

The aim of this WP is to perform overall project management, including financial management as well as quality, control and communication management of the whole project and their procedures. These activities cover the following objectives:

- Coordinate the consortium and WP leaders to ensure that all work plan activities meet the scope and objectives of the project.
- Provide an efficient preparation, coordination and review of technical and managerial documentation in order to assure the highest quality to project deliverables and public reports.
- Organise and manage project meetings.
- Motivate the cooperation of the partners and coordinating the decision-making processes.
- Provide risk management and implementing the relevant contingency plans when necessary.
- Control and monitorize resources consumption and costs statements.
- Produce and ensure both technical and financial interim and final reporting to the EC.
- Manage an efficient interaction with the European Commission and the Project Officer, handling administrative and legal matters, delivery of results and reports, and any possible amendment to the Grant Agreement.
- Promote gender equality, work and family life reconciliation and other ethical issues within the project.
- Control and monitorize the strategy for the knowledge management and protection of the outcomes and assets generated within the project in order to resolve any conflict arising and ensure an effective potential exploitation.

Description of work

This WP carries out all activities related to the overall legal, ethical, financial and administrative management activities of the project, ensuring contractual obligations towards the European Commission, a smooth progress of the coordination and support work, resolving any conflicts and providing reporting to the Project Officer.

The WP1 will ensure the achievement of the project objectives and milestones in accordance with the time-scheduled and budgetary constraints, by organising, re-structuring and controlling the inputs and efforts of the beneficiaries. The tasks of the WP1 will be continuous during the project lifetime and all the partners will be involved in, led by the UOC project coordinator. The members of the consortium belong to a common sector but also to different fields and type of organisations, therefore an efficient information flow will be required from the coordinator side.

This WP also provides and is responsible for the quality assurance of the project progress and results. An initial risk management plan has been implemented to identify potential problems during the proposal preparation phase, but will be fine-tune at the beginning of the project execution and action plans will be prepared to deal with them in case they arise.

T1.1 Administrative, financial and pilot management (M1-36, task leader UOC, contributes to D1.2, D1.3, D1.4)

The administrative and financial tasks include the communication with the European Commission and Project Officer, communication between partners, electronic collaborative tools, support to partners, information exchange, EC requirements assurance, meetings organisation, events organisation, financial flows control, resources follow-up, EC funds transparent distribution among beneficiaries, legal issues, potential amendments management and gender and ethical issues. This task also includes pilot management led by UOC which will be reported in the 6-monthly and annual reports.

T1.2 Project monitoring, quality assurance and reporting (M1-36, UOC, contributes to D1.2 to D1.7)

The monitoring task will include the following actions: day-by-day management, effective work and control of deadlines, work plan follow-up, deliverables and milestones follow-up, project advancement measurable indicators, problems to be solved, decision-making processes, motivation and cooperation, quality assurance, peer review workflow for deliverables, risk management and contingency plan.

Quality assurance and proper risk management are key objectives of task T1.2. The quality assurance plan will take into account as a starting point the metrics depicted in the table Critical Risks for Implementation. The indicators will be periodically revised and updated during the project. The risks and corrective actions will be periodically revised and updated during the project and the development of the pilots. The reporting task will include the official reporting required by the European Commission for FP7 projects: interim and annual reports preparation, templates, partners' inputs gathering, content integration, management reports elaboration, costs statements, Participant Portal management and C Forms signature process.

T1.3 IPR management (M1-36, UOC, contributes to D1.8 to D1.10)

The UOC and the Innovation Manager will be responsible for defining, implementing and monitoring the actions taken within the strategy for the knowledge management and protection from the beginning of the project to ensure the effective exploitation of TeSLA's innovations. This task aims at identifying the results and the best routes to be exploited and potentially protected (if needed) and will describe the mechanisms for (i) technology watch, patentability requirements, industrial interest; (ii) protection for early disclosure, confidentiality measures; (iii) proper IP right selection. This innovation management is very relevant for the success of the project and the Innovation Manager will play an important role in the management structure and decision-making processes of TeSLA. This task will also be in charge of organising and managing the background and the IPR-related aspects of the Consortium Agreement: economic conditions for the use of the background, treatment of joint ownership, specific agreements on shares, licensing, etc. This task will have a high interaction with WP9 activities.

This task will also define the policy for data management and will control that the beneficiaries meet their responsibilities regarding research data quality, archiving and sharing to ensure that the project contributes to the re-use of the research information and to widespread the knowledge generated. The initial version of the Data Management Plan will be available at M6 and will evolve from the initial plan depending on the progress of the innovations developed. A data management report detailing all actions taken in regard of data selection, curation and publishing will be delivered at the end of the project duration at M24. This task will ensure that the consortium is ready to participate in the Pilot on Open Research Data envisioned by the European Commission within Horizon 2020.

Deliverables

D1.1 Quality assurance and risk management plan. M3
D1.2 First Period Project Report. M12
D1.3 Second Period Project Report. M24
D1.4 Final Project Report. M36
D1.5 Periodic interim management report. M6
D1.6 Periodic interim management report. M18
D1.7 Periodic interim management report. M30
Periodic interim management reports (in accordance with the timeframe defined by the Project Officer). Initially six-monthly reports are expected by the project coordinator. M6, M12, M18, M24, M30, M36
D1.8 Data and IPR Management Plan. M6
D1.9 Data and IPR Management initial report. M24
D1.10 Data and IPR Management final report. M36

WP number	2	Start date or starting event:							M1
WP title	REQUIREMENTS AND MODELING OF THE EDUCATIONAL FRAMEWORK								
Participant	P1	P2	P3	P4	P5	P6	P7	P8	P9
	UOC	ENQA	UNAMUR	AQU	LPLUS	OUNL	SU	OUUK	PROT
PMs	16	0	0	1	1	6	6	6	0
Participant	P10	P11	P12	P13	P14	P15	P16	P17	P18
	IMT	IMPERIAL	TUS	AU	JYU	EQANIE	INAOE	IDIAP	WFSF
PMs	0	0	6	6	8	0	0	0	0

Objectives

The main goal of this WP is to define a general educational framework for an adaptive trust assessment system for teaching and learning in Higher Education. This goal includes the following ones:

- Analyse the European theory and existing experience of the partners institutions.
- Bring further clarity to the conceptualization of the field.
- Provide a foundation for the different models of adaptive trust e-assessment patterns for different educational contexts to support institutions, managers, teachers and learning designers in their e-assessment process.
- Provide a grounding for technical development of assessment tools and systems.

Description of work

To achieve the main goal of this WP, all the universities involved in the project (UOC, OUNL, SU, OUUK, TUS, AU, JYU) will provide their main concerns regarding assessment practices in their institutions. Each learning scenario has to be described taking into account the competencies to be achieved, the activities to be performed, the assessment criteria as well the expected learning outputs. A description of each virtual learning environment understood as a virtual classroom has to be also provided. The training experience about special educational needs will also be analysed and detailed to provide well-founded information in the e-assessment framework. This means that learner profiles are being collected for each institution to identify special requirements and facilitate learner performance in learning activities. Current trends and new challenges carried out by other institutions and research outputs at international level about e-assessment will be also collected.

Once this information is collected, a set of e-assessment models will be described and standardized to define the educational framework for an adaptive trust-based e-assessment system. Each educational institution involved in the project will select the most suitable models to be introduced into their teaching and learning processes. Then the adaptive approach consists in defining the most suitable e-assessment pattern and technology, for each learning scenario. An e-assessment proposal about what should be tested in the pilots will be provided. LPLUS will help in the definition of the functional requirements of the defined e-assessment framework and AQU will help in the analysis of the quality restrictions of each university in order to

take them into account in the final system.

The general educational framework will serve as the basis for developing e-assessment tools and resources to ensure authorship in any type of learning activities, final examinations or exercises. The technological requirements will be built through attending models, patterns and specifications provided by the educational framework. The educational framework has to provide a set of guidelines to enhance the e-assessment processes through learning activities in each scenario but also in the mandatory fields from an educational viewpoint have to be respected and supported by technology.

The tasks and the partners involved in each task are specified as follows:

T2.1 State of the Art (M1-M2, task leader SU, contributes to D2.1)

Definition of the main characteristics of European assessment scenarios based on evidences from the literature and the practice of the partners institutions.

T2.2 Educational framework (M1-M2, task leader UOC, contributes to D2.2)

Identification of the key elements and interconnections for the educational framework

T2.3 Accessibility (M1-M3, task leader JYU, contributes to D2.3)

Revision of the the models in respect to special accessibility issues

T2.4 Disabilities (M1-M3, task leader JYU, contributes to D2.4)

Analysis of the pedagogical models in respect to learners with disabilities

T2.5 Assessment models (M3-M5, task leader UOC, contributes to D2.5)

Define the assessment models based on the educational framework elaboration of a range of assessment models/patterns (including type of activities, learning outputs and competencies)

T2.6 Providing the elaborated e-assessment models/patterns to the partner institutions for evaluation, selection and adaptation to their needs : (M4-M4, task leader AU, contributes to D2.6)

Propose e-assessment models that institutions can select and adapt to support their teaching and learning needs

T2.7 Institutional adaptation (M4-M8, task leader OUUK, contributes to D2.7)

Selection, adaptation and contextualisation of the e-assessment patterns in each partner-institution and mapping the pilots (planning of which patterns of evaluation in which learning scenarios, subjects, groups of learners will be applied). Definition and selection of the suitable e-assessment models by each institution to transfer to WP 7, for planning pilots.

T2.8 Functional requirements (M4-M5, task leader TUS, contributes to D2.8)

Define functional requirements and specifications based on the developed models to support the technological definition of the system.

Deliverables

The deliverables are described as a report which contains the gathered information and its analysis and conclusions.

D2.1 Report with the state-of-the-art. M2

D2.2 Conceptual map with interconnections represented. M2

D2.3 Recommendations for User Experience definition (all types of end learners). M3

D2.4 Guidelines (or recommendations) of adaptive approaches for learners' experience (didactical guidelines). M3

D2.5 Report describing the teaching and learning process (including special educational needs). M5

D2.6 Report with a set of e-assessment models. M4

D2.7 Summarizing Table with e-assessment models for each partner. M8

D2.8 Report with detailed functional requirements from an educational point of view. M5

WP number	3	Start date or starting event:							M1
WP title	DATA PRIVACY AND ETHICS								
Participant	P1	P2	P3	P4	P5	P6	P7	P8	P9
	UOC	ENQA	UNAMUR	AQU	LPLUS	OUNL	SU	OUUK	PROT
PMs	1	0	30	0	2	1	1	1	0
Participant	P10	P11	P12	P13	P14	P15	P16	P17	P18

	IMT	IMPERIAL	TUS	AU	JYU	EQANIE	INAOE	IDIAP	WFSF
PMs	2	0	1	1	1	0	0	0	2

Objectives

The major challenge of this WP is to integrate the privacy dimension (based on legal social and ethical issues) in a project is to try to identify the learner as much as possible. As the recognition of the learner is a major challenge in this project, we will have to design a system which protects privacy without reducing the trustability and correctness of the recognition. The objectives are therefore:

- Analyse the concept of proportionality towards the identification of the data needed to be done by the WP5.
- Detect legal and ethical constraints with respect to the European privacy principles.
- Define and implement security mechanisms required for each data type.
- Preserve the ethical code at European level.

Description of work

The WP will explore the main ethical and legal issues raised by the project regarding its legal compliance and its social and ethical acceptability. Those issues will be identified by organizing a workshop with the designers (LPLUS, PROTOS and IMT) and universities (UOC, OUNL, SU, OUUK, TUS, AU and JYU) in order to understand the major technological choices at work to support the learners' identification and the trust of the system. Based on this understanding, a legal state-of-the-art will be conducted in order to point out the pertinent legislation as, for instance, the European Convention on Human Rights (e.g. art. 8 and 14), the Convention for Protection of Individuals with regard to Automatic Processing of Personal Data (108 of the Council of Europe), articles 7 and 8 of the EU Charter of Fundamental Rights, Directive 95/46 on the protection of individuals with regard to the processing of personal data and on the free movement of such data and, if the case arises, the new regulation on Privacy. The ethical analysis will explore the script of the project and will design a cartography of the different actors concerned in the project. This cartography will help to explore the balance of interests between the different actors regarding their social acceptability of the technological choices embarked in the script.

The results of the primary exploration will be used in order to analyze the used data and methods in WP5 from a proportionality side. That is, to identify if the data collected is proportional in the sense of the European privacy and ethical principles. In this sense, we will analyze, amongst others, the opportunity to use a Trusted Third Party (TTP) to allow the project to be compliant with the legal constraints. The framework will have to be analyzed from an ethical point of view. In this analysis, UNamur will participate as the data privacy and ethics expert with the leaders of technological WPs (LPLUS and PROTOS), and IMT as the security expert.

Indeed, social acceptability is a major issue to have a successful project or not. This analysis will be conducted on both learners and teachers and on universities and evaluators. To validate social acceptability, a sample of the 'public' concerned with the project will be drawn up with the help of the consortium in order to create a panel of 100 representatives. The criteria to be used to make this panel will take into account the roles (learners, academic assessors, education authority…) but also the national sensitivities for privacy protection as analyzed by our team in the PRACTIS project (http://www.practis.org/). This panel will be questioned through a online survey in order to collect their requirements regarding privacy protection to be supported by the project and their assessment on the technological and organizational specifications that could make the project socially acceptable. The analysis of this survey will identify the points of consensus but also the controversies expressed by the public in order to help the designers to improve the social acceptability of the technological specifications of the system. A web survey will be conducted in order to assess the area of social acceptability.

To ensure the compilance of the TeSLA project with the legal restrictions and its ethical aspects, a FAQ and roadmap will be performed for best practices, and an advisory group will be created as an independent consultant, with the responsibility of providing recommendations and audit the development of the project with respect to ethical and data privacy points of view.

T3.1 State of the Art (M1-M2, task leader UNamur, contributes to D3.1)

To explore the main ethical and legal issues raised by the project. First legal and ethical analysis will document the privacy and ethical requirements for a socially acceptable and economically supportable balance between recognition and privacy.

T3.2 Legal and Ethical aspects. Social acceptability. (M2-M32, task leader UNamur, contributes to D3.2)

Analysis of the ethical aspects of the project, the legal restrictions related to data privacy and issues to be considered for social acceptability. We will provide a first deliverable with the legal aspects and considerations about methods and data involved in WP5. This task will then focus its activity on the ethical and social acceptability, with a first deliverable in M15, and will continue all along the project to guarantee compliance with the legal and ethical requirements.

T3.3 Ethical considerations on assessment (M6-M9, task leader UNamur, contributes to D3.3)

The WP will question the project on some issues as the length of the exam/evaluation, the kind of picture which will create an alert. What will be an abnormal picture?

T3.4 Ethical & Legal Advisory Group (M4-M33, task leader UNamur, contributes to D3.4, D3.6)

The objective of this task is fourfold:

1. Elaborate an agreement between the consortium and the board that defines the mission statement of the board, that protects its independency and that organizes its agenda.
2. Prepare the documents and the materials to be submitted to the board to collect their assessments and recommendations.
3. Translate the recommendations to make them operational for all the partners associated to the project.
4. Document all this ethical process to make the ethical specification traceable and improve the accountability of the project.

T3.5 FAQ and roadmap (M5-M33, task leader UNamur, contributes to D3.5)

The objective of this task is threefold:

1. UNamur will operate all along the project and with ongoing consultancy (help desk) regarding the main and relevant privacy's questions encountered by the partners in their technological tasks.
2. A FAQ document will be written to summarise these questions and answers;
3. Based on these questions (and the answers given by UNamur), on the concepts and processes emerging from the previous WP2 tasks and on existing best practices, an ethical roadmap will be drawn up. This roadmap will formalize the ethical diary of the project in order to set up concepts, methods and best practices that should help other projects to manage the balance between recognition and privacy.

Deliverables

D3.1 State of the Art. M2
D3.2 Data privacy considerations for information managed in the TeSLA project. M4
D3.3 Legal and ethical framework. M15, M32
D3.4 Special issues on specific aspects of the exam/evaluation. M9
D3.5 FAQ and roadmap. Will be updated with pilot experiences. M9, M12, M24, M33
D3.6 Final report from the Advisory Group. M33

WP number	4	Start date or starting event:							M1
WP title	QUALITY ASSURANCE IN ONLINE HIGHER EDUCATION								
Participant	P1	P2	P3	P4	P5	P6	P7	P8	P9
	UOC	ENQA	UNAMUR	AQU	LPLUS	OUNL	SU	OUUK	PROT
PMs	0	24	0	36	0	0	0	0	0
Participant	P10	P11	P12	P13	P14	P15	P16	P17	P18
	IMT	IMPERIAL	TUS	AU	JYU	EQANIE	INAOE	IDIAP	WFSF
PMs	0	0	0	0	0	20	0	0	0

Objectives

The main goal of this WP is to assure and guarantee the quality of e-assessment processes in Higher Education. It includes:

- Define the quality aspects that must be followed during the project development to be aligned with the aims of the quality assurance agencies responsible for the Higher Education System.
- Establish the quality parameters of learner assessment in online Higher Education (considering ESG).
- Ensure the timely implementation of the baseline activities according to the agreed procedure.
- Guarantee that the proposed model of e-assessment fits the criteria defined by quality agencies to be accredited.

Description of work

The work will focus on how European Standards and Guidelines (ESG) could be adapted to online institutions and online or blended programmes. The analysis will take into account how internal and external quality assurance should be implemented for online Higher Education.

In relation with European standards and guidelines for internal quality assurance within Higher Education institutions, particular attention will be brought into standards 1.3 "Assessment of learners" (learners should be assessed using published criteria, regulations and procedures which are applied consistently) and 1.5 "Learning resources and learner support" (institutions should ensure that the resources available for the support of learner learning are adequate and appropriate for each programme offered). From the external quality assurance point of view, a deep analysis will be conducted in relation with standards 2.2 "Development of external quality assurance processes" and 2.4 "Processes fit for purpose".

A new version of ESG may be approved in 2015. The project will take into account all the points of this new version that are relevant for online Higher Education. For example, learner centered-learning or learner admission, progression, recognition and certification.

The partners involved in this WP are the three quality and certification agencies (AQU, ENQA and EQUNIE), and will take into account the ESG in order to validate the quality aspects of the pilots. This will provide results to improve quality criteria for e-assessment in teaching and learning processes (assessment methodology, assessment fairness, assessment consistency, etc.). ENQA has the global vision of the European standards and AQU has expertise in the acreditation and quality auditory of online Higher Education institutions. EQANIE will provide a more technological point of view of accreditation and quality standards.

T4.1 State of the art (M1-M2, task leader ENQA, contributes to D4.1)

Analyse the European Standards and Guidelines (ESG) taking into account the characteristics of online provision of educational offers by institutions and degree programmes.

T4.2 Framework Analysis (M2-M4, task leader EQANIE, contributes to D4.2)

Identification of the elements to be considered in the system, in terms of academic activities, competence evaluation, assessment models and the guarantees provided by technological systems.

T4.3 Quality indicators (M5-M6, task leader AQU, contributes to D4.3)

Propose a set of quality indicators that will be used to assess the performance and achievements in the pilots.

T4.4 Pilots quality (M10-M30, task leader AQU, contributes to D4.3)

Verify the quality aspects of the pilots and extract recommendations for improving next pilots (metaevaluation).

T4.5: Quality framework (M34-M36, task leader ENQA, contributes to D4.4)

Define a framework for quality assurance for e-assessment, considering all the information gathered during theTesla project.

Deliverables

D4.1 Report on the analysis of the ESG from the online teaching and learning perspective. M2
D4.2 Definition of the quality indicators to continue the development of the pilots. M4
D4.3 Metaevaluation report of the draft e-assessment framework in light of pilots. M12, M18, M24, M30
D4.4 Framework of e-assessment (at the end of the project) M36

WP number	5	Start date or starting event:							M1
WP title	DESIGN AND IMPLEMENTATION OF TRUSTED ASSESSMENT MECHANISMS								
Participant	P1	P2	P3	P4	P5	P6	P7	P8	P9
	UOC	ENQA	UNAMUR	AQU	LPLUS	OUNL	SU	OUUK	PROT
PMs	12	0	3	0	60	0	0	0	4
Participant	P10	P11	P12	P13	P14	P15	P16	P17	P18
	IMT	IMPERIAL	TUS	AU	JYU	EQANIE	INAOE	IDIAP	WFSF
PMs	25	16	0	0	0	0	16	60	12

Objectives

The main goal of this WP is to design and implement technologies behind the project to be integrated and used in pilots. It involves identifying and implementing all the technological requirements and tools to support the adaptive trust e-assessment model. The specific objectives are:

- Specify the biometric techniques (facial recognition, keystroke dynamics and voice recognition).
- Analyse and specify the forensic analysis (natural language analysis).
- Implement security techniques (digital signature, encryption, timestamp,…).
- Specify, design and implement the authorship and plagiarism evaluation.

Description of work

There are several systems (instruments) to support an adaptive trust assessment model. The consortium has to analyze the existing instruments and to check the transferability to a standardized model. In addition to the general ability, it needs to be investigated whether the instruments are suitable in the context of high stake loadings (up to 10,000 simultaneous assessments). Furthermore, it has to be explored how single or multiple instruments are suitable for the different test formats (continuous, formative, final and peer assessments) and finally, make available the appropriate instruments on a web-based e-assessment portal.

T5.1 Specification of each system (instrument) (M1-M3, task leader LPLUS, contributes to D5.1)

Define the requirements on the input data, storage and the outputs of each system. The description should include (if applicable), and other criteria may be stated:

- Input data description and possible formats to be used in each system.
- Data quality aspects such as sampling, resolution or type of documents.
- Minimum data block for evaluation, that is, the minimum valid length for a prediction (number of pages of a document, number of frames, seconds of sound, …)
- Estimation of the learnt models size in Mb/person.

T5.1.1 Specification of Forensic Analysis Tool (M1-M3, task leader INAOE)

The forensic analysis tool comprises mechanisms and devices for determining the verification and authorship attribution of written documents. In this task, the formal requirements on the format, type and lengths of the documents will be analysed, including any additional consideration in terms of information storage and the outputs of the system.

T5.1.2 Specification of Face Recognition Tool (M1-M3, task leader IMPERIAL)

The partners will define the requirements for best practice tools and methods for face recognition to become part of the TeSLA control instruments specifically for e-assessment. The quality information on the input images and time restrictions will be defined. In addition, the learnt models for this biometric technique will be detailed together with the output format.

T5.1.3 Specification of Voice Recognition Tool (M1-M3, task leader IDIAP)

The requirements of the voice recognition (or speaker recognition) tool will be defined in terms of accuracy (False Acceptance Rate vs False Rejection Rate), duration of utterances as well as speed for enrollment and test.

T5.1.4 Specification of Plagiarism Analysis Tool (M1-M3, task leader UOC)

Plagiarism detection consists of carrying out a comparison of learners' deliverables to find common elements. This comparison can be carried out between learners submitting an activity, between activities submitted in the context of the same course (in the same semester or other semesters) or even with the Internet content. The format of the documents to be analysed and the reference information will be defined. The outputs of the system will be described in order to be analysed in the final system.

T5.1.5 Specification of security techniques (M1-M3, task leader IMT)

Security techniques are those tools related to information security, such as the digital signature, encryption, timestamp or anti-spoofing, that will be used to secure the communications and for digital document validation, and to avoid authentication vulnerabilities in face and voice recognition.

T5.2: Analysing of the existing control instruments (M3-M5, task leader LPLUS, contributes to D5.2)

The information provided for all instruments is analysed and we will work out the concept for the technical requirements (informations, format, quality) to implement trusted assessment mechanisms. Balancing with the limitations coming from WP3 regarding privacy and ethics and from WP4 (quality) will also be done.

T5.3 Technical specification (M5-M7, task leader LPLUS, contributes to D5.3)

LPLUS: Based on the experience of the partners, the results of WP 3, the requirements of the educational model (WP 2) and the quality standards (WP 4) LPLUS will make a specification for an integrated web based portal (suite) containing the available instruments to ensure learner authentication and authorship. To ensure the correct integration of the developed systems with the final system, the leader of WP6 (PROTOS) will participate in the technical specification. To ensure that this will be done keeping in mind the concept of proportionality requested from a privacy point of view, UNamur will collaborate.

T5.4 Implementation of each systems (M8-M24, task leader LPLUS, contributes to D5.4 and D5.6)

To implement the instruments defined in T5.1 in accordance with the technical specifications provided by WP6. This task will be conducted in an incremental strategy, providing functionalities as soon as they are integrated. During the pilots, the results of each one of the modules will be analysed in terms of performance and scalability, introducing the required improvements to the system and instruments.

T5.4.1 Implementation of Forensic Analyse Tool (M8-M24, task leader INAOE)

Implementation of the trusted assessment mechanisms based on forensic analysis for confirming/refuting the authorship of documents written by the learners. These techniques comprise profile-based representations, standard supervised-learning methods, ad hoc authorship-analysis features and distributed representations. Such methodologies have been evaluated in benchmark data and in several evaluation campaigns. At the end, a technical report with a quantitative evaluation of the performance of the authorship analysis mechanisms will be provided.

T5.4.2 Implementation of Face Recognition Tool (M8-M24, task leader IMPERIAL)

IMPERIAL will implement a face recognition tool applying a pipeline that comprises of (a) facial landmark localization, (b) face normalization by using the acquired from step (a) detected landmarks (i.e., also called as face “frontalization”) and (c) feature extraction by training a Deep Convolutional Neural Network –DCNNs (based on the results acquired from steps (a) and (b)), using a large database of facial samples. This pipeline will be tailored to the needs of a continuous verification scenario. That is, facial landmarks will be tracked in videos. Then, using the acquired facial landmarks along with the rich information provided from the video frames, statistical normalization of the face will be implemented (i.e., a rich face “frontalization” exploiting the video frames). The existing facial databases will be exploited to train a DCNN which will be used for features extraction. Finally, it is worth noting that all the steps will be implemented in such as way that real-time high-performance face verification is achieved.

T5.4.3 Implementation of Voice Recognition (M8-M24, task leader IDIAP)

IDIAP will implement the latest state-of-art text-independent voice recognition techniques based on i-Vectors top-ranked during the last International evaluations organized by NIST.

T5.4.4 Implementation of Plagiarism Analysis Tool (M8-M24, task leader UOC)

The UOC will implement a plagiarism detection tool based on Natural Language Processing based on their current working system. The current system is integrated with this univertity campus and has been widely tested in many different subjects. Those methods will be implemented taking into account the TeSLA framework in order to be used by different institutions.

T5.4.5 Implementation of security techniques (M8-M24, task leader IMT)

IMT will coordinate and carry out with the implementation of the security mechanisms of the system. It will include the digital signature of learners’ deliverables in order to avoid non repudiation. The timestamp mechanisms, which provide the learners with a delivery receipt that guarantee the finishing date and content of their deliverables. Finally, IDIAP will implement the anti-spoofing techniques for voice and face recognition.

T5.5 Programming the e-assessment portal (M8-M23, task leader LPLUS, contributes to D5.5)

Based on the agreed specification LPLUS will design and manufacture a standard assessment tool (web application) for preparation, monitoring and validation of any kind of distance examination procedures.

T5.6: Implementation of the e-assessment portal (M9-M23, task leader LPLUS, contributes to D5.6)

Implement the e-assessment portal that will be used by the TeSLA system. This task is the bridge between the development team in WP5 with the integration team in WP6, and will assist in implementing the trust-assessment instruments required for successful integration.

T5.7: Evaluation of the e-assessment portal (M10-M23, task leader LPLUS, contributes to D5.7)

Analyse the data provided by the pilots’ execution and to extract improvements for all the instruments. Performance and system requirements will be monitored and analysed in order to ensure a correct scalability of the TeSLA system.

Deliverables

D 5.1 Complete descriptions and technical specification of all instruments. M3
D 5.2 Technical report with the data definition and usage for all the methods and instruments. M5
D 5.3 Instruments technical description and development scheduling. M7
D 5.4 Report of the complete and final technical specification. M24
D 5.5 Report of test protocols and complete technical documentation of the e-assessment portal. M12, M23
D 5.6 User and integration documentation. M12, M23
D 5.7 Final evaluation report. M23

WP number	6	Start date or starting event:							M1
WP title	INTEGRATION OF THE FRAMEWORK IN LEARNING ENVIRONMENTS								
Participant	P1	P2	P3	P4	P5	P6	P7	P8	P9
	UOC	ENQA	UNAMUR	AQU	LPLUS	OUNL	SU	OUUK	PROT
PMs	10	0	1	0	6	4	4	4	12
Participant	P10	P11	P12	P13	P14	P15	P16	P17	P18
	IMT	IMPERIAL	TUS	AU	JYU	EQANIE	INAOE	IDIAP	WFSF
PMs	15	0	4	4	10	0	0	0	60

Objectives

To integrate the technical and methodological topics worked on in WP5 into the learning environments of partners involved in the development of pilots. This objective takes into account the educational properties for learning and e-assessing defined in WP2, the pilots themselves (WP7), and the exploitation plan designed in WP9. The specific objectives are:

- Analyse critical features of each partner's learning environment (especially the ones involved in pilots), including the learner information system, to ensure the assessment system is transferable to multiple organizations.
- Analyse the most suitable learning and assessment tools in order to cover all the needs from all academic activities that will be applied in pilots.
- Define and implement flexible software modules in different learning environments to cover each stage of pilots till the end of the large scale pilots considering each previous learning analysis.
- Define a system according to the exploitation plan.

Description of work

One of the main concerns of the TeSLA project is to adapt the technology to the educational needs, and not the contrary. In this line, this WP is devoted to the final integration of all the technological modules in order to cover all the requirements coming from the educational needs analysed in this WP2, the requirements on data quality and flow defined in WP5 and the requirements extracted from the analysis of all partners' educational frameworks analyzed in this WP. The integration must take into account security aspects for the final system and the data privacy and ethical concerns provided by WP4. The final system will be built by assuring partially the integration across each pilot till the final one. The final goal of this WP is to define the software and hardware infrastructure that will allow all the partners to connect their learning environments to the TeSLA system in order to perform all the required types of learning activities with all the guarantees in terms of data privacy, security, authentication and authorship.

The first task of this WP will be to work with all the partners involved in the pilots in order to collect all the specifications in their learning environments, since some universities use their own platforms and other use standard platforms such as Moodle or Blackboard. This task will involve the technical staff of those universities (UOC, OUNL, SU, OUUK, TUS, AU and JYU), with the help of PROTOS, which is an expert in learning platforms development.

Using the information gathered on the first task, together with the adaptive e-assessment model developed in WP2, that has been informed by assessment practices across partner institutions and the data requirements provided by WP5, the second task of this WP is to define a public interface of the TeSLA system to be tested in pilots, taking into account:

- Functional requirements: WP2 delivers a conceptual model, based on assessment types, and related to authentication and authorship requirements. That means that all the types of activities required by the educational institutions are covered (e.g. write an essay, solve cases, answer questions orally, or by completing a multiple choice test, etc.) and taking into account the context (e.g. institution, policy, location, special needs...). The TeSLA framework must support all the identified use cases.
- Technical requirements: Each learning platform uses different authentication standards and provides public interfaces with different actions and data models. The public interface of the TeSLA system must ensure that all those platforms will be able to connect to all those systems and interchange the required data.
- Statistical information: Apart from being able to guarantee authentication and authorship in the e-assessment process, and to provide all the information required by WP8 for evaluation, the aim of the project is to improve the learning experience of the learners. One of nowadays' most growing interests in the educational field is the ability of get information about the learning process. In this sense, the public interface of the TeSLA system will provide the required methods to obtain as much information as it will be possible from all the activities done on the system, allowing the educational centres to use this system to perform learning analytics over the assessment process. In addition, other information will be gathered to verify /certify that all the internal modules are working as is expected.

Once the public interface is defined, the technical staff of each university that participates in the pilots can start working on creating the connectors or plug-ins that will allow their learning platforms to connect and take advantage of the trusted e-assessment mechanisms provided by the TeSLA system.

The public interface is the contract between the world and the TeSLA system, defining which functionalities are provided and how to use them. This is because many technologies are required in order to provide such functionalities, and much of the data will require to be stored in the system (biometric models, activities, …). It will also require defining internal interfaces and data formats to ensure that all the technological modules developed in WP5 can interoperate in order to provide the required functionalities. These issues will be tested by the iterative pilots. WFSF will collaborate with LPLUS in order to ensure connectivity; UNAMUR will ensure that data privacy and ethical restrictions are successfully achieved, and IMT will take care about the final system security aspects. The data flow and activity models will also be defined. As a result, the formal technical structure of the TeSLA system will be created and provided to WP5 in order to develop their modules according to the specifications of the final system. In the definition of those requirements, the following aspects will be considered:

- Security: Access to the system is restricted to allowed users in the approved ways, preserving the system's integrity and data protection.
- Interoperability: There exist some standards for some parts of the technologies involved in the TeSLA system. Use those standards reduce the integration risks and facilitate future exploitation of the project results. For instance, in the case of biometric part, there exists a standard call BioAPI that defines data flows and formats together with all the protocols to perform biometric actions. There are also standards on the digital signature of documents, which will allow the validation of those secure documents by third party software.
- Scalability: The system design requires being able to grow in functionalities and in number of users. This must be considered in design time, for instance using cloud services.
- Data privacy: The data coming from learning platforms, together with all the data gathered during the assessment process and all the internal information stored in order to provide the required functionalities (e.g. biometric models of the users), needs to be stored and protected in order to accomplish all the data privacy considerations, provided by WP3.

Once the design of the TeSLA system has been provided to WP5, the goal of this WP will be to implement the public and internal interfaces and the data storage system, in parallel with the development of the connectors between each partner learning platform and the TeSLA system. In addition, some external tools may be necessary in order to collect some type of information, such as plugins for web browsers or learning platforms to interact with the final users (e.g. capture keystroke patterns), or certain adaptations for disabled learners.

As an integration WP, the software development planning will be defined in this WP. The information will be obtained from the planning of the internal tasks (e.g. planning on the development of the plugins) and from the planning obtained from WP5 with respect to the development of the specific modules and the e-assessment portal. This planning will be provided to the WP7 in order to define the targets and timing of the pilots.

The tasks considered for this WP are as follows, considering that all the implementation tasks cover both the development and testing of all the software:

T6.1 Analyse learning frameworks (M1-M5, task leader WFSF, contributes to D6.1)

In this task, the different institutions participating in the pilots (UOC, OUNL, SU, OUUK, TUS, AU and JYU) will provide the main characteristics of their institutional learning systems in order to perform an analysis of requirements and restrictions of

the final TeSLA system.

T6.2 TeSLA design (M5-M6, task leader WFSF, contributes to D6.2)

In this task, the public and private interfaces will be defined. The data type and formats involved in the internal and external communication will be defined.

T6.3 Plugins design (M6-M7, task leader PROTOS, contributes to D6.3)

To define the plugins to connect each partner's learning platform to the TeSLA system, taking into account the conversion between the platform's internal data representation and the TeSLA standardized data formats.

T6.4 External learning tools design (M6-M7, task leader WFSF, contributes to D6.4)

Some information used by the TeSLA system will come directly from the learning platform, but other information such as the key patterns, images and audio will require the developing of small tools to acquire the data in the user devices and send it to the TeSLA system. In this task, we will define those tools in terms of functionality, structure and data formats.

T6.5 Development planning (M7-M8, task leader WFSF, contributes to D6.5)

Once all the involved systems have been defined, in this task, a development planning of the TeSLA system will be designed. This planning will consider the instruments for development planning provided from WP5 and the development of the system, external tools and plugins. The development of the system will be done using an incremental approach, adding functionalities as soon as they are available to be partially tested in pilots. This information will be used by WP7 in order to define the contents of the pilots taking into account the development status of TeSLA. Planning adaptation due to results of the pilots will be conducted in the implementation tasks related to the affected module of the system.

T6.6 TeSLA Data management implementation (M9-M24, task leader WFSF, contributes to D6.6)

Implementation of data structures and the data management system, including databases and backup systems and protocols.

T6.7 TeSLA interfaces implementation (M9-M24, task leader LPLUS, contributes to D6.7)

Implementation of public interfaces that will be used by the learning platforms and external tools, and the internal interfaces used by WP5 e-assessment portal. All the security issues related to ensure control access to the system's public interface from external applications would be implemented by IMT.

T6.8 External tools implementation (M9-M24, task leader WFSF, contributes to D6.8)

Implementation of the external tools to capture required information, such as video/audio, keystroke times, etc.

T6.9 Plugins implementation (M9-M24, task leader PROTOS, contributes to D6.9)

Implementation of the plugins between the TeSLA system and the learning platforms. In this task, the technical staff of each university will work with PROTOS in the design of the required plugins to connect its learning framework with the TeSLA system.

T6.10 Monitoring and data gathering implementation (M9-M24, task leader WFSF, contributes to D6.10)

Apart from the TeSLA system and the instruments required for a trusted e-assessment, we will store information about the use of the system and their modules across the pilots. This information will contain errors or warnings generated by the modules, performance statistics and auditory logs (i.e. incorrect data information, denied accesses or large response time for interface methods, incoherent biometric identification, etc.). This information will help to analyse the behaviour of the TeSLA system during the tests in order to detect errors or technical problems. Moreover, this information will allow to apply learning analytics approaches that can help to reinforce the learning model and the system security on each pilot till the end.

T6.11 TeSLA system release (M23-M36, task leader WFSF, contributes to D6.11)

In order to be able to successfully exploit the results of the project, a final distribution of the system will be prepared. The final release will contain the different versions of the TeSLA system that are considered in the exploitation plan, with the described functionalities (i.e. some free of charge versions with a subset of the instruments or time-limited full test versions). Each release will be accompanied with their technical and end-user documentation and the licence documentation.

Deliverables

The reports will contain the gathered information and their analysis, with all the technical information required in order to perform the derived tasks. Software deliverables will be incremental; adding to the previous deliverables the functionalities specified in the deliverable. Although the code will be introduced in the TeSLA system as soon as it is integrated and tested, we plan to perform three deliverables per implementation task, with the updated status of software and documentation.

D6.1 Report with the final analysis of partners learning environments. M5

D6.2 Technical document with the definition of the TeSLA system, including the data structures and public and private interfaces. M6
D6.3 Technical document with the definition of the TeSLA plugins for each partner's learning platform. M7
D6.4 Technical document with the definition of the external software tools. M7
D6.5 Planning for the TeSLA software development and risk plan. M8
D6.6 Software implementing the data types and storage system. M12, M18, M24
D6.7 Software implementing the public and private interfaces. M12, M18, M24
D6.8 Software implementing the external tools. M12, M18, M24
D6.9 Software implementing the plugins between learning platforms and the TeSLA framework. M12, M18, M24
D6.10 Software implementing the auditory and learning analytics data gathering. M12, M18, M24
D6.11 Final TeSLA system ready for distribution, with the technical description for third party developers and final users. M36

WP number	7	Start date or starting event:							M1
WP title	DESIGN AND DEVELOPMENT OF PILOTS								
Participant	P1	P2	P3	P4	P5	P6	P7	P8	P9
	UOC	ENQA	UNAMUR	AQU	LPLUS	OUNL	SU	OUUK	PROT
PMs	24	0	0	0	4	18	30	18	9
Participant	P10	P11	P12	P13	P14	P15	P16	P17	P18
	IMT	IMPERIAL	TUS	AU	JYU	EQANIE	INAOE	IDIAP	WFSF
PMs	0	0	18	18	18	0	0	0	4

Objectives

The main goal of this WP is to define and perform large scale pilots using the trust based assessment system for learning. This goal implies:

- Define the number and schedule of pilots, including: goals, subjects and population considering the state of the project; type of activities, final examination; the adaptive assessment model (according to learner behaviour); interaction and communication with academic staff and learners; teaching and learning guidelines.
- Define a pilot coordination protocol.
- Establish quality objective success metrics.
- Create an assessment protocol model for critical risks management.

Description of work

The consortium plans to develop pilots in a progressive, secure and scalable form taking into account the expected large-scale learners' impact in all the participant universities (UOC, OUNL, SU, OUUK, TUS, AU, and JYU). The first step is to design how pilots should be conducted: geographical distribution and gender issues, the scheduling according to each educational institution, which type of e-assessment model and technology will be applied in each learning scenario, the population involved in each pilot and how the teaching and learning will be performed. In this step, quality issues, data privacy, ethics and security guidelines from WP3 and WP4 must be considered (UNAMUR will participate to check privacy and ethical issues accomplishment). The quality agencies will not participate in the pilots execution, since they will act as external auditory involved in the posterior evaluation performed in WP8.

All the methodology employed will be based on an iterative and progressive process for enhancing the following pilots. An assessment protocol model for critical risks management will be developed for each pilot and improved for the next ones and it includes technical staff (LPLUS, PROTOS, and WFSF) for supporting pilots' technology. Pilots will be conducted in three phases to test the e-assessment models and technologies developed in previous WPs. The tasks are planned to maximise and guarantee all the elements involved in the learning process: learning activities, outcomes and competencies, learning resources and learning outcomes. The rationale behind the pilots is to increase the number of participants, the integration of technologies and the e-assessments models in each phase taking special care of disabled learners. Pilots will be conducted as follow:

1. Small Educational Pilots: In this first stage, we plan to involve about 600 learners from the different universities during the first year of the project. In this phase, the TeSLA system will be under development, therefore no technology will be tested, but we will test the coordination between all the partners and the defined protocols and data flows between involved WPs and actors (learners, teachers, auditory, ...). The assessment methodology will also be tested, using different evaluation type (continuous assessment, formative assessment, peer-assessment, etc.) and data collection for their posterior analysis and coordination protocols. A first critical risks guideline will previously be defined (on design step).
2. Medium Test-bed Pilots: This second phase will be conducted during the second year of the project, and the TeSLA system is expected that it will start providing functionalities at the start of this year and be fully functional for the last pilots in this phase. We plan to involve about 3,500 learners in this phase during 4 thematic pilots:
    a. Biometry: Some pilot cases will be defined in order to test the biometric instruments of the system (Face recognition, voice recognition, and keystroke dynamics).
    b. Security and integrity: Some pilot cases will be defined in order to test the issues related to security and integrity aspects of the system, such as the encrypted channels, the digital signature and timestamp of learners' deliverables.
    c. Document analysis: Some pilot cases will be defined in order to test the authorship of the deliverables with the forensic analysis and plagiarism instruments.
    d. Scalability: After the previous specific pilots where the different instruments of the TeSLA system have been tested and improved with the pilot results, pilot cases to test will be conducted with all the instruments with a growing number of learners to detect scalability issues.
3. Large Scale Pilots: This final phase of the pilots will be conducted during the third year of the project. The goal of this phase is three fold: 1) To test the TeSLA system's integration and scalability. 2) To test the refinement of the TeSLA modules and the European e-assessment Model performed with the feedback of previous pilot phases in a pre large-scale scenario. 3) To test the reliability of authentication and authorship mechanisms.

   Two rounds will be performed during this phase, the first one will involve about 6,500-7,000 learners and the second and final round will involve between 10,000 and 14,000 learners.

Each pilot stage will start with the definition of the coordination protocols and goals of each one of the involved cases. Each case will define the involved universities, subjects, teachers, learners' distribution, metrics and the dates.

After each pilot case, all the information of each institution and from the TeSLA system will be collected and summarized in a report. This report will be provided to WP8 for evaluation. After the evaluation, feedback and recommendations will be provided to all affected WPs in order to refine the instruments and protocols.

The tasks for pilot design and execution are defined as follows:

T7.1 State-of-the-art (M1-M2, task leader OUNL, contributes to D7.1)

All the universities involved in the pilots (UOC, OUNL, SU, OUUK, TUS, AU, and JYU) will analyse previous pilot experiences in their institutions and in the literature. This information will be used in order to incorporate interesting actions/experiences and to avoid previous errors.

T7.2 Population definition (M1-M8, task leader AU, contributes to D7.2)

All the universities involved in the pilots (UOC, OUNL, SU, OUUK, TUS, AU, and JYU) will define their contribution to the pilots in number of learners, evaluation time periods and skills. This information will be combined in order to define the pilot population, in numbers, distribution and availability (dates and quantity).

T7.3 Pilot Planning (M8-M24, task leader JYU, contributes to D7.3)

Using the information from the previous task and the TeSLA development planning, the planning of the pilot execution will be defined. It will include the dates of each pilot, its duration, the number of learners and goals, and the involved teachers of each institution (adaptive). For this task, all the universities involved in the pilots (UOC, OUNL, SU, OUUK, TUS, AU, and JYU) will work with the leaders of the technical WPs (LPLUS and WFSF). After the analysis of each pilot execution, the planning will be adapted to the new circumstances.

T7.4 Pilot coordination and metrics (M9-M25, task leader SU, contributes to D7.4)

Establish the pilot coordination protocol including the success metrics. Since those protocols will affect not only the coordination between project partners, but between the members of each institution (learners and teachers), all the universities will be involved in this task. The coordination protocol and metrics will change during the project due to the inclusion of new techniques in the pilots and the feedback from previous pilots.

T7.5 Critical risk management (M7-M25, task leader UOC, contributes to D7.5)

The pilots will be conducted by the universities in their subjects, therefore, real learners will be included as test users, and one of the main goals of the project is to ensure that all the learners will be able to be assessed and they are not disturbed from their learning process. In this sense, before each pilot, the possible risks for the methodologies and technology involved in the pilots will be analysed and alternatives will be provided to ensure that learners are not affected in case something does not work as expected. Some alternatives to planned pilots can depend on each institution; therefore, all the universities (UOC, OUNL, SU, OUUK, TUS, AU, and JYU) will participate in this task. Technological alternatives in case of instrument malfunction or failure will be defined by technological partners (LPLUS and WFSF). After the execution of each pilot case, the risk management will be revised and adapted.

T7.6 Pilot execution (M9-M30, task leader SU, contributes to D7.6)

All the universities participating in the pilots (UOC, OUNL, SU, OUUK, TUS, AU, and JYU) will conduct the pilots defined by the pilot planning and collect the expected information. Each institution will be responsible for providing all the required information to their staff (administrative and technological), their teachers and learners following the designed protocols and the formats specified by WP8. All the information will be provided by the project in the languages required for each institution. Technological partners (LPLUS and WFSF) will assist university technical staff to ensure that their learners can use the TeSLA system with the instruments that each pilot requires.

T7.7 Pilot analysis (M9-M32, task leader OUUK, contributes to D7.7)

After each pilot, the universities participating in the pilots (UOC, OUNL, SU, OUUK, TUS, AU, and JYU) will collect all the information of the pilot from their institution. Technical information collected by the TeSLA system will be collected by LPLUS and WFSF. All this information will be provided to the WP5 and WP6 for system improvement and performance analysis, and to WP8 for evaluation. Finally, with the recommendations provided by those WPs after feedback analysis, the pilots' protocols and the TeSLA system will be adapted to solve detected problems or to add additional information.

Deliverables

D7.1. Report with similar experiences in educational scenarios at international level. M2
D7.2. Report with population characteristics, geographical distribution and academic data and planned technologies. M8
D7.3. Diagram/map with each pilot scheduling and a global one with all pilots' information. It includes the teachers involved, the e-assessment model and technologies behind it to be tested. M9, M12, M24
D7.4. An effective and active communication protocol (between and across educational institutions). M10, M13, M25.
D7.5. Report with alternative plan/s for each pilot (and its influence on each WPs). M10, M13, M25
D7.6. Report about each pilots execution (from educational and technological point of views). M13, M25, M30
D7.7. Report with suggestions to be included in successive pilots and the involved WPs. M12, M18, M24

WP number	8	Start date or starting event:							M1
WP title	PILOTS EVALUATION								
Participant	P1	P2	P3	P4	P5	P6	P7	P8	P9
	UOC	ENQA	UNAMUR	AQU	LPLUS	OUNL	SU	OUUK	PROT
PMs	6	10	2	9	4	4	4	18	4
Participant	P10	P11	P12	P13	P14	P15	P16	P17	P18
	IMT	IMPERIAL	TUS	AU	JYU	EQANIE	INAOE	IDIAP	WFSF
PMs	4	4	4	4	4	9	1	1	4

Objectives

This WP will evaluate the outputs from the other WPs and consideration of evaluation will therefore be integrated into all WP activities from the outset. The evaluation will be iterative and agile, and use data from real learning environments. The specific objectives are:

- Develop a framework for the evaluation of pilot activities with particular consideration to five key stakeholder views: educators, agencies, learners, institutions and the project

- Plan for, and implement the co-ordinated pilot evaluations undertaken in the project.
- Validation and analysis of data for reporting and iterative development purposes

Description of work

This WP will be responsible of the evaluation of the pilots and to provide recommendations for the TeSLA system and the e-assessment model improvements. All the universities involved in the pilots (UOC, OUNL, SU, OUUK, TUS, AU, and JYU) will participate defining the indicators for evaluation, taking into account their institutional indicators. The technical partners (LPLUS, IMT, PROTOS and WFSF) will define the indicators for instruments' evaluation and performance monitoring. Finally, the quality agencies (ENQA, AQU, and EQANIE) will define their own indicators. All these indicators with the expected format will be provided to WP6 and WP7 in order to guarantee that all the information required for extracting such indicators is collected by the system or in the pilots' execution.

WP7 will provide a report containing the details of the pilot execution, issues found on the protocols or failures in the system and actions taken. In addition, all the indicators will be provided. Additionally, some questionnaires will be designed and provided to WP7 to be conducted before and after the pilots by their participants (teachers and learners). The results of those tests will also be included in the WP7 report. The aim of those questionnaires is to collect information about expectations, opinions and personal experiences on e-assessment and with the developed tools and instruments. All this information will be analysed by the universities and technical partners in order to provide a critical feedback about the pilots, educational model and the TeSLA system. UNAMUR will evaluate that the pilots respect the data privacy legality and ethical principles. A report with the feedback and improvement recommendations will be written and delivered to WP5, WP6 and WP7 to be taken into account for future pilots.

The quality agencies will not participate in this report, as they will act as auditors of the project quality. After each pilot, the report from WP7 with all the information and the report with the feedback and recommendations will be provided to the quality agencies in order to perform their evaluation on the whole pilot execution, from the definition of the system and pilots to the pilot's execution and posterior analysis. The conclusions of this auditory will be reported in WP4 deliverables.

T8.1 Definition of the evaluation measures (M1-M5, task leader OUUK, contributes to D8.1)

This task aims to gather stakeholder views in respect to what measures, indicators and key questions that the project will employ in its evaluation of the pilot studies and associated development activity. These will be used to develop an Evaluation Framework that not only sets the definition of type and format of data to be collected and structure for monitoring and reporting of evaluation data, but will serve to highlight what each stakeholder groups considers most important for determining the success and effectiveness of the assessment tools and their implementation. The framework will be used by partners and where required templates and/or protocols will be created based on the framework. This task will align with work undertaken on other WPs including the Educational Framework (WP2), Quality guidelines (WP4), and Dissemination activities (WP9).

T8.2 Questionnaires design (M5-M24, task leader UOC, contributes to D8.2)

Design of the questionnaires that will be used for surveys to teachers and learners before and after each pilot. Those questionnaires will be provided to WP7 before each pilot in order to be distributed to all the universities that participate in the pilots.

T8.3 Evaluation planning (M5-M25, task leader OUUK, contributes to D8.3)

Before each pilot, a planning for the evaluation process will be prepared in consultation with partners so as to ensure co-ordinated data capture and adequate time for reflection, analysis and feedback. This planning will define the actors that will participate from the different institutions, expected results, and timing for each pilot.

T8.4 Evaluation report (M12-M34, task leader OUUK, contributes to D8.4)

Prepare and write an Interim Evaluation Report on pilots undertaken in each year of the project. This task will consist of supporting partners in capturing and analysing their data, project-level capture of data (such as from non-pilot partners and other non-project stakeholders), overseeing preparation of partner reports, collation and meta-analysis of partner reports and write an internal development report (for use by WP5/6 in the iterative development of the project assessment technologies, for revisions to the Educational Framework in WP2, and the update of pilot planning, protocols and risk management in WP7).

T8.5 Final evaluation Report (M27-M36, task leader OUUK, contributes to D8.5)

Prepare and write a final Evaluation Report. This task will consist of supporting partners in reflecting data capture and capturing and analysing each year data, project-level capture of data (such as from non-pilot partners and other non-project stakeholders), overseeing preparation of partner reports, collation and meta-analysis of partner reports and writing of the final report.

Deliverables
D8.1 Report on the Evaluation Framework. M5
D8.2 Questionnaires. M9, M12, M24
D8.3 Evaluation Plan. M9, M13, M25
D8.4 Report on Pilot Evaluation. M15, M26, M34
D8.5 Final Evaluation Report. M36

WP number	9	Start date or starting event:							M1
WP title	COMMUNICATION, DISSEMINATION, LIAISONS AND EXPLOITATION								
Participant	P1	P2	P3	P4	P5	P6	P7	P8	P9
	UOC	ENQA	UNAMUR	AQU	LPLUS	OUNL	SU	OUUK	PROT
PMs	6	5	6	5	8	5	5	5	25
Participant	P10	P11	P12	P13	P14	P15	P16	P17	P18
	IMT	IMPERIAL	TUS	AU	JYU	EQANIE	INAOE	IDIAP	WFSF
PMs	6	5	5	5	5	5	8	8	8

Objectives
The main goal of this WP is to conduct and perform the dissemination and the exploitation of the project. It implies:

- Create a public web site and other communication tools and dissemination materials.
- Communicate general project activities and results to a wider public based on a thorough communication strategy via web, social media, press channels and print material.
- Disseminate the scientific and technical results of TeSLA via tutorials, targeted workshops and interaction with other EU projects and interested third parties.
- Manage project liaisons to attract third-party stakeholders.
- Observe the market and identify the potential use and commercial exploitation of technology and knowledge developed in the project.

Description of work
The commercial perspectives of this project promote a special effort on behalf of all consortium members to assess exploitation. What is more, given that the very first steps can influence the project's subsequent exploitation, a continual follow-up of the decisions that are made regarding the commercial exploitation possibilities is necessary. For this reason, TeSLA defines a specific profile for this function in the person of the Innovation Manager, whose job is to assess future alternatives of use and potential collaboration agreements with different institutions that will imply a greater commercial development of the system.

T9.1. Communication (M1-M36, task leader UOC, contributes from D9.1 to D9.4)

A comprehensive and target oriented communications of the project includes a thorough communication strategy based on a coherent corporate/project identity. This will be the basis of all communication activities and will enable a strong outer appearance. We will create a project website (tesla-project.eu) by M1, and maintain and update it continuously throughout the project. Additionally, we will be present and active in selected social networks such as Twitter, Facebook and Linkedin to build up and reach out to an interested community. Further internal and external communication means comprise of publishing press releases, developing brochures and posters, publishing a newsletter and develop audiovisual productions.

T9.2. Dissemination (M3-M36, task leader PROT, contributes from D9.1 to D9.4)

This task has the goal of disseminating the project results, and distribute information for public and potential third party companies and institutions interested in exploiting the results. Dissemination in scientific and industrial workshops will be carried out, at national and European levels. The task will deliver a Dissemination Plan on M3 that will describe the tools, activities and means of cooperation, which will ensure that the project results will be disseminated widely and effectively to the

different target groups. Some of the dissemination activities will be the scheduling, planning and preparation of two international workshops targeting key players of the European eLearning sector in M16 and M34. This second international workshop will be the International TeSLA Show. In addition, this task will lead the collaboration with other projects, institutions, and relevant national and European agents in the eLearning sector.

T9.3. Liaisons (M18-M36, task leader PROT, contributes from D9.1 to D9.4)

This task will ensure the appropriate external liaisons of the project with other (external) parties (notably other eLearning institutions, initiatives, projects, standardisation bodies, project clusters) with a view towards disseminating the project's results to wider audiences, attracting third-party stakeholders, as well as towards boosting the sustainability and wider use of the project approach to eLearning services. The methodology will include the creation of a list of the possible liaisons and the subsequent appointment of contact persons (from the TeSLA side), which will pursue and manage these liaisons.

T9.4. Exploitation (M5-M36, task leader PROT, contributes from D9.5 to D9.7)

This task provides an umbrella for individual as well as collective exploitation and use of knowledge from the project. TeSLA partners are strongly committed to exploit and continue the development of the project results. The exploitation report will take into account (an update of) technical and commercial developments in the relevant market sectors. The market watch activity will produce regular updates on industry trends (as part of the periodic reports). Academic partners will track and report on emerging research outside the project that may be relevant. Regular reports will contain market descriptions reflecting the individual business situation of use-case partners, competition analysis (SWOT), technical and business conditions of further successful exploitation, and an analysis of costs, price, revenues, market penetration, share and market profile. In addition to looking at commercial exploitation by the industrial partners, there will be exploitation by the eLearning institutions involved.

Deliverables

D9.1 TeSLA Website Online. M1
D9.2 Communication, Dissemination and Liaisons Plan. M3
D9.3 Communication, Dissemination and Liaisons Report, initial version. M18
D9.4 Communication, Dissemination and Liaisons Report, final version. M36
D9.5 Exploitation Plan. M3
D9.6 Exploitation Report, initial version. M18
D9.7 Exploitation Report, final version. M36

Table 3.1b: List of work packages

WP No	Work Package Title	Lead Participant No	Lead Participant Short Name	Person-Months	Start Month	End month
1	Project Management	P1	UOC	96	M1	M36
2	Requirements and modeling of the educational framework	P1	UOC	56	M1	M8
3	Data privacy and ethics	P3	UNamur	43	M1	M33
4	Quality assurance in online Higher Education	P4	AQU	80	M1	M36
5	Design and implementation of trusted assessment mechanisms	P5	LPLUS	208	M1	M24
6	Integration of the framework in learning environments	P6	WFSF	134	M1	M36
7	Design and development of pilots	P7	SU	161	M1	M32
8	Evaluation	P8	OUUK	96	M1	M36
9	Communication, Dissemination, Liaisons and Exploitation	P9	PROT	125	M1	M36
			Total months	999		

Table 3.1c: List of Deliverables[1]

Deliverable (num.)	Deliverable name	Work package num.	Participant short name	Type	Dissemination level	Delivery date
D1.1	Quality assurance and risk management plan	WP1	UOC	R	CO	M3
D1.2	First Period Project Report	WP1	UOC	R	CO	M12
D1.3	Second Period Project Report	WP1	UOC	R	CO	M24
D1.4	Final Project Report	WP1	UOC	R	CO	M36
D1.5	Periodic interim management report	WP1	UOC	R	CO	M6
D1.6	Periodic interim management report	WP1	UOC	R	CO	M18
D1.7	Periodic interim management report	WP1	UOC	R	CO	M30
D1.8	Data and IPR Management Plan	WP1	UOC	R	CO	M6
D1.9	Data and IPR Management initial report	WP1	UOC	R	CO	M24
D1.10	Data and IPR Management final report	WP1	UOC	R	CO	M36
D2.1	Report with the state of the art	WP2	OUNL	R	PU	M2
D2.2	Conceptual map with interconnections represented	WP2	OUUK	R	CO	M2
D2.3	Recommendations for User Experience definition (all types of end learners)	WP2	OUNL	R	CO	M3
D2.4	Guideline (or recommendations) of adaptive approaches for learners experience (didactical guideline)	WP2	SU	R	CO	M3
D2.5	Report describing the teaching and learning process (including educational special needs)	WP2	JYU	R	CO	M5
D2.6	Report with a set of e-assessment models	WP2	UOC	R	CO	M4
D2.7	Summarizing Table with e-assessment models for each partner	WP2	AU	R	CO	M8
D2.8	Report with detailed functional requirements from an educational point of view	WP2	TUS	R	CO	M5
D3.1	State of the Art	WP3	UNAMUR	R	PU	M2
D3.2	Data privacy considerations for information managed in the TeSLA project	WP3	UNAMUR	R	CO	M4
D3.3	Legal and ethical framework	WP3	UNAMUR	R	CO	M15 M32
D3.4	Special issues on specific aspect of the exam/evaluation	WP3	UNAMUR	R	CO	M9
D3.5	FAQ and roadmap	WP3	UNAMUR	R	CO	M9 M21 M24 M33

[1] If your action is taking part in the Pilot on Open Research Data, you must include a data management plan as a distinct deliverable within the first 6 months of the project. This deliverable will evolve during the lifetime of the project in order to present the status of the project's reflections on data management. A template for such a plan is available on the Participant Portal (Guide on Data Management).

Deliverable (num.)	Deliverable name	Work package num.	Participant short name	Type	Dissemination level	Delivery date
D3.6	Final Report from Advisory Group	WP3	UNAMUR	R	PU	M33
D4.1	Report on the analysis of the ESG from the online teaching and learning perspective.	WP4	ENQA	R	PU	M2
D4.2	Definition of the quality indicators to continue the development of the pilots.	WP4	AQU	R	PU	M4
D4.3	Metaevaluation report of the draft e-assessment framework in the light of the pilots	WP4	EQANIE	R	CO	M12 M18 M24 M30
D4.4	Framework of e-assessment	WP4	AQU	R	PU	M36
D5.1	Complete descriptions and technical specification of all instruments	WP5	LPLUS	R	CO	M3
D5.2	Technical report with the data definition and usage for all the methods and instruments	WP5	LPLUS	R	CO	M5
D5.3	Instruments technical description and development scheduling	WP5	LPLUS	R	PU	M7
D5.4	Report of the complete and final technical specification	WP5	LPLUS	R	PU	M24
D5.5	Report of test protocols and complete technical documentation of the e-assessment portal	WP5	LPLUS	R, SW Portal	PU	M12 M23
D5.6	User and integration documentation	WP5	LPLUS	R	PU	M12 M23
D5.7	Final evaluation report	WP5	LPLUS	R	PU	M23
D6.1	Report with the final analysis of partners' learning environments	WP6	PROTOS	R	CO	M5
D6.2	Technical document with the definition of the TeSLA framework, including the data structures and public and private interfaces	WP6	WFS	R	CO	M6
D6.3	Technical document with the definition of the TeSLA plugins for each partner's learning platform	WP6	PROTOS	R	CO	M7
D6.4	Technical document with the definition of the external software tools	WP6	WFS	R	CO	M7
D6.5	Planning for the TeSLA software development and risk plan	WP6	WFS	R	CO	M8
D6.6	Software implementing the data types and storage system	WP6	WFS	SW,R	CO	M12 M18 M24
D6.7	Software implementing the public and private interfaces	WP6	WFS	SW,R	CO	M12 M18 M24
D6.8	Software implementing the external tools	WP6	WFS	SW,R	CO	M12 M18 M24
D6.9	Software implementing the plugins between the learning platforms and the TeSLA framework	WP6	WFS	SW,R	CO	M12 M18 M24
D6.10	Software implementing the learning analytics data	WP6	WFS	R, SW	CO	M12 M18

Deliverable (num.)	Deliverable name	Work package num.	Participant short name	Type	Dissemination level	Delivery date
	gathering					M24
D6.11	Final TeSLA software ready for distribution, with the technical description for third party developers and final users	WP6	WFS	R, SW Portal	PU	M36
D7.1	Report with similar experiences in educational scenarios at international level	WP7	OUNL	R	PU	M2
D7.2	Report with population characteristics, geographical distribution and academic data and planned technologies	WP7	AU	R	CO	M8
D7.3	Diagram/map with each pilot's scheduling and a global one with all pilots' information. It includes the teachers involved, the e-assessment model and technologies behind it to be tested	WP7	JYU	R	CO	M9 M12 M24
D7.4	An effective and active communication protocol (between and across educational institutions)	WP7	SU	R	CO	M10 M13 M25
D7.5	Report with the alternative plan/s for each pilot (and its influence on each WPs)	WP7	UOC	R	CO	M10 M13 M25
D7.6	Report about each pilots execution (from educational and technological point of view)	WP7	SU	R	CO	M13 M25 M30
D7.7	Report with suggestions to be included in future pilots and the WPs involved	WP7	OUUK	R	CO	M12 M18 M32
D8.1	Report on the Evaluation Framework	WP8	OUUK	R	CO	M5
D8.2	Questionnaires	WP8	OUUK	R	CO	M9 M12 M24
D8.3	Evaluation Plan	WP8	OUUK	R	CO	M9 M13 M25
D8.4	Report on Pilot Evaluation	WP8	OUUK	R	CO	M15 M26 M34
D8.5	Final Evaluation Report	WP8	OUUK	R	PU	M36
D9.1	TeSLA Website Online	WP9	PROTOS	DEC	PU	M1
D9.2	Communication, Dissemination and Liaisons Plan	WP9	PROTOS	R	CO	M3
D9.3	Communication, Dissemination and Liaisons Report, initial version	WP9	PROTOS	R	CO	M18
D9.4	Communication, Dissemination and Liaisons Report, final version	WP9	PROTOS	R	CO	M36
D9.5	Exploitation Plan	WP9	PROTOS	R	CO	M3
D9.6	Exploitation Report, initial version	WP9	PROTOS	R	CO	M3
D9.7	Exploitation Report, final version	WP9	PROTOS	R	CO	M36

3.3 Management structure and procedures

The consortium has been built in order to meet the educational and technological purposes and reach the objectives outlined in the large scale pilots. It is a well-balanced consortium covering the entire value chain of the educational process and all the roles needed for the implementation of the demonstration and validation activities of the different pilots: renowned Higher Education (traditional, distance and online universities), research institutions in Europe and Mexico (specialized in biometry, security, cryptography and facial and voice recognition) in collaboration with technological companies and relevant accrediting agencies as well as the different target groups addressed: learners and teachers.

The organisational and project management structure and procedures reflect the complexity and peculiarities of the consortium and are based on a classic research project methodology but stressing the relevance of the large scale pilots as a vehicle for educational and industrial partners to develop and validate teaching and learning use cases and minimise educational and technological risks. A specific WP dedicated exclusively to coordination tasks and effective innovation management has been foreseen in order to efficiently manage the project innovations and to ensure fair and proper decision-making mechanisms.

Innovation management, closely linked to the strategy for knowledge management and protection, and the technical and financial viability of the large scale pilots will be led by the Innovation Manager and the Pilot Manager; both representatives of the organizations driving this Innovation Action and leaders of WP7 and WP9. There will be another specific and key role for covering the overall educational aspects; the Educational Manager, that will be played by Dr José Janssen, from the Welten Institute of the Open Universiteit Nederland. The UOC has the right expertise to coordinate and manage the Innovation Action (with significant previous experience in both FP7 and CIP projects), making the overall management as efficient and effective as possible. Furthermore, all partners participating in the project have previously collaborated in other research projects and activities and other business and educational initiatives. Then, such pre-existing collaboration and mutual knowledge will ease and ensure successful project management.

The organisational structure for the Innovation Action and Large Scale Pilots management and its interdependencies are shown and described below:

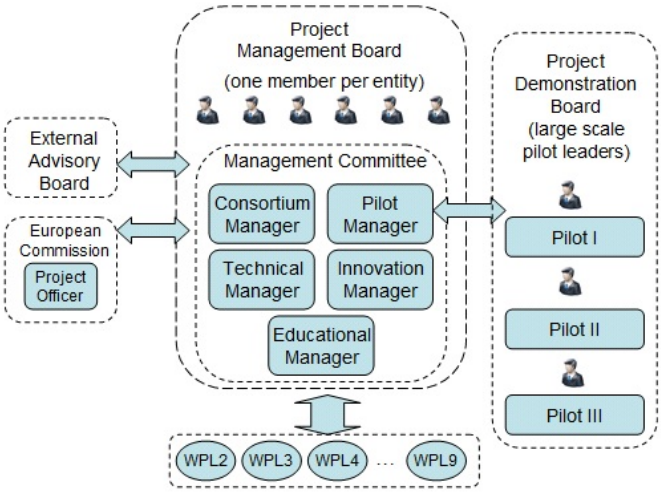

Figure 7: Management Structure

The project will be supervised by the Project Management Board (PMB) composed of one representative of each entity, which will be the highest decision-making and arbitration authority of the innovation action. The pilots will be supervised by a Project Demonstration Board (PDM) composed by the Pilot Leaders (PL) formed by the seven HEI involved in pilots, which will be a lower decision-making body at demonstrator level. The consortium will also have an external Advisory Board to monitor the project progress and provide recommendations and institutional support.

The project will be administered in its day-to-day activities by a Management Committee (MC), composed of five managers – Consortium Manager (CM), Technical Manager (TM), Pilot Manager (PM), Innovation Manager (IM) and Educational Manager (EM). The project is organised as a set of closely related packages of work and the WP Leaders (WPL) are responsible for technical coordination of each individual WP. The tasks and responsibilities of each Manager and Board are described in detail in the following paragraphs.

Consortium Manager: The UOC has appointed Dr. Anna Guerrero as Consortium Manager (CM), in order to run the project on a daily basis, due to her experience in coordinating an internal e-assessment pilot at the UOC level and her educational and strategic vision as Head of the Educational Model Unit at the eLearn Center (UOC pilot enrolled 600 learners of 17 subjects from 7 faculties, and 35 faculty members were involved as well). In her role as CM, she will be supported by Israel Conejero as the eLearn Center senior project manager, and the UOC project office that currently manages more than 30 EU and national projects.

The CM has the overall responsibility for the organisation, planning and controlling the innovation action. The CM represents the sole contact person for the project with the European Commission and will ensure the punctual delivery of reports and deliverables to the Project Officer. The CM will be responsible for the efficient administration of the project, calling, organising and chairing the MC meetings and proposing the agenda.

The CM will also collect, monitor and integrate financial and administrative data from the partners at 6-month intervals, and will be responsible for the preparation of the technical and financial data for submission to the EC. The CM will be in charge of the following tasks:

1. Ensure efficient management of tasks within the consortium, leading and reporting to the PMB.

2. Monitorize project progress according to the work plan, time schedule and resources-budget established in the Grant Agreement, with special attention to the development of large scale pilots and innovation management.
3. Act as the interface to the European Commission and the PO during negotiation, if needed, and the active phases of the project.
4. Ensure preparation and timely submission of deliverables, reports and cost statements. The Administrative Board (AM) is chaired by the CM.
5. Establish and monitor efficient communication flows within the consortium and the pilots.
6. Provide support to the PMB on meeting organisation and production and distribution of meeting minutes.
7. Resolve any potential conflict, following the corrective mechanisms to rectify them.
8. Ensure any necessary important deviations from the Grant Agreement (GA) and work plan are presented and approved by the PMB; he/she should have the decision power to approve of any minor deviations and should subsequently inform the PMB.
9. Inform the Commission of any necessary deviations from GA and work plan.

Technical Manager: The consortium looks at the separation of concerns and roles between administrative/management and technical activities as a significant benefit to ensure the optimal results of the project. The Technical Manager (TM) has the overall technical responsibility for the technological aspects of the project and provides support to the CM as far as technical management is concerned. The TM must at all times be fully informed of the current status of the project. He/She is responsible for the long-term strategy, the choice of technique and technologies, the results and quality. The TM is provided with a progress report every six months by each WPL. The TM will submit to the Management Committee a report at each MC meeting, describing the status of the technical work, including work progress, resources consumed, current goals, future work and other relevant information.

The UOC will be responsible for the technical management of the project and has appointed Dr. Josep Prieto, Dean of Computer Science, Multimedia and Telecommunication Studies due to his experience in educational technology, his research activities on a great number of national and international projects and the significant impact of his articles and work. He will be responsible for the following tasks:

1. Provide support to the PMB on technical progress and potential risks.
2. Coordinate technical decisions between WPs, organising regular meetings with WPL. The Technical Board (TB) is chaired by the TM.
3. Coordinate technical innovation.

Pilot Manager: The validation of the technical and financial viability and the focus on demonstration activities of this innovation action promote a special effort to assess the work performed within the different large scale pilots. What is more, it can influence the project's subsequent exploitation and sustainability, then a continual follow-up of the driven experimentation and decisions that are made by the relevant stakeholders is mandatory. For this reason, the project defines a specific profile for this function in the person of the Pilot Manager (PM), who will work in close collaboration with the Innovation Manager, and be in constant contact with the CM and the TM to define and execute the work plan. Sofia University has appointed Dr./Ms.Roumiana Peytcheva-Forsyth as PM due to his overall educational and technological vision and experience in monitoring and evaluating test beds and field trials focused on minimising risks and his knowledge of innovative digital educational tools and solutions development cycles.

Innovation Manager: The perspectives of this project promote a special effort on behalf of all consortium participants to assess exploitation and dissemination in order to accomplish with the expected impact of the European e-assessment framework. For this reason, the project defines a specific profile for this function in the person of the Innovation Manager (IM), and whose job is to assess future alternatives of use and commercialisation routes of the project results, covering the protection and exploitation of the foreground, and also potential collaboration agreements with different educational institutions and agencies that will imply a greater development and adoption of the system and gain the respect of the target groups. At the same time, the IM will draw up a proper dissemination plan, engaging beneficiaries to check the exploitation options of the system developed by the project. The IM will be in constant contact with the Consortium and Technical Managers to define and execute the dissemination and exploitation plan. The Innovation Manager will be responsible for selecting the most relevant events for the presentation of the project's results and include them in the Dissemination Plan schedule. He will also be responsible for defining, within this dissemination plan, contacts with magazines and journals specialised in innovative educational tools to contribute to the project's promotion. The CEO Pablo Langa from PROT-OS has been appointed as Innovation Manager due to his experience in open innovation practices and educational business models, and will be responsible for the tasks detailed above.

Educational Manager: The organization, planning, execution and evaluation of the educational actions derived from the project makes it crucial to define a supervisor of all aspects concerning the assessment. The Educational Manager (EM) has the overall educational responsibility for the supervision of the teaching and learning processes and their adaptation to a fully online

and cross-curricular assessement. The EM is also responsible for the management and execution of the formative and training actions addressed to faculty members and instructional designers regarding the deployment of the e-assessment system. The EM must at all times be fully informed of the current status of the project. She has to assess about the choice of techniques to be applied, from an educational point of view. The EM is provided with a progress report every six months by each WPL. The TM will submit to the Management Committee a report at each MC meeting, describing the status of the educational and pedagogical work, including work progress, resources consumed, current goals, future work and other relevant information. She will work in close collaboration with the PM. The OUNL will be responsible for the educational management of the project. Specifically the consortium has appointed Dr. José Janssen, due to her experience in developing and implanting initial in-service programmes for career practicioners. She will be responsible for the following tasks:

1. Define the educational framework for the adaptive e-assessment system.
2. Provide the educational grounding for the technical development of the e-assessment system.
3. Define the quality framework of the e-assessment system to ensure compliance with Quality Assurance Agencies.
4. Organize and execute training workshops addressed to teachers, instructional designers and stakeholders.
5. Manage and supervise the development of guidelines and learning resources required along the project and in the deployement of the e-assessment system.

Project Management Board: The PMB, which is the principal decision making body, will be formed by management staff of all participants of the consortium and will be chaired by the CM. Additionally, TM, PM and IM will be part of the PMB. The PMB is in charge of the overall project progress; it will assist the CM in administrative issues and will be responsible for policies, overall control, and communications with the Commission. It will produce the Consortium Agreement of the project in which IPR, confidentiality and exploitation issues, conflict resolution, decision-making procedures, agreements mechanisms, voting rights, foreground and background material, etc, will be set up. The PMB will meet twice a year. In addition, regular teleconferences will be held. The experts of each beneficiary will supervise the progress of work within each organisation and will be duly empowered to make all necessary decisions on behalf of that participant. It is the responsibility of the members of the PMB:

1. To establish the position of their organisation for all issues to be decided by the PMB.
2. To attend PMB meetings and teleconferences if appropriate, and represent their organisations.
3. To act as a contact person for any administrative, legal and financial issues.

Project Demonstration Board: The PDB, which is the principal decision making body for the large scale pilots, will be formed by faculty and technical staff of all the pilot leaders with real expertise in test-bed and field trials of innovative solutions for learning and teaching, open innovation, and a great knowledge of the educational markets, and will be chaired by the Pilot Manager. The PDB is in charge of the overall pilot progress considering its educational and market dimension. It will provide support to the PM in controlling iterations, scaling-up the demonstrators, evaluating the validation activities and the end user acceptance, and communications among parties and stakeholders. The PDB will meet regularly in order to perform these duties. In addition, Skype meetings will be held as required. The members of the PDM are in charge of:

1. Sharing the experience gained during the development and validation of the large scale pilot.
2. Providing support to all the parties involved in their pilot, with special attention to the end user (teachers and learners) and to educational and exploitation prospects.
3. Attending PDB meetings and teleconferences if appropriate, and represent their pilots.

Administrative Board: Each beneficiary provides a member for this board. It is chaired by the Consortium Manager and the project office from the UOC and could have meetings every 6 months or teleconferences whenever necessary. The results of this Board can be held and distributed via e-mail or other communication means. The member of the AB has to:

1. Collect and verify the administrative information from the beneficiaries.
2. Revise the production of Cost Statement.
3. Verify the expenditures of administrative and financial resources.
4. Request and collect administrative and technical information and reports from their institutions.
5. Obtain audit certificates from the beneficiary when required.

Technical Board: Each beneficiary provides a member with a technological profile for this Board, usually the same person leading the WPs. Also, the IM will be part of the Technical Board (TB), to assess the educational value of the results of the project. The TB is chaired by the TM and could have meetings every 6 months, or teleconferences whenever necessary. The TB has to:

1. Define jointly work methodologies, procedures and resources.
2. Monitor the results and validate the quality of the deliverables.
3. Collect the suggestions of the peer reviewers and evaluators.

4. Evaluate exploitation and societal value of the project as well as its acceptance by the potential end users and target groups.

Work Package Leader: The project breakdown is structured into well-defined work packages (WPs) and tasks. As is indicated in the WP description section, each beneficiary is the leader of a specific WP according to their experience and know-how. WP leaders (WPL) will represent the WP's interest and provide liaison with other WPs. The WPL's responsibilities are:

1. Control the progress of the scheduled work within the work-package in terms of technical and demonstration achievement, planned deliverables and expenses and to report to the MC.
2. Collect the information needed to prepare the periodic progress reports.
3. Manage topic ground meetings and to report to the MC on all matters related to the topic and WP progress.
4. Organise regular WP meetings: guaranteeing smooth intra-WP cooperation, and flagging serious problems to the PMB.
5. Assist the CM in producing annual reports and preparing for the technical reviews.

Pilot Leader: The responsibilities of the pilot leaders deserve a special mention because they will play a very relevant role within the innovation action. They will be in charge of monitoring and controlling all the activities performed within their relevant large scale pilots and educational application domains. The driven experimentation activities are structured into 3 well-defined pilots, which will be led by the Pilot Leader (PL). The PL's responsibilities are the following:

1. Monitorize the work and validate the results within their large scale pilot.
2. Control the progress of the scheduled work plan and the evolution of the iterative development process.
3. Control and ensure the integrated e-assessment system built is a really scalable and sustainable solution covering the needs of a variety of educational markets.
4. Monitorize user acceptance and provide feedback to the technical and financial viability validation of the different use cases.

External Advisory Board: The Advisory Board (AB) will be composed of recognised academic and industry representatives that have been selected on the basis of their relevant expertise and contacts that will further help the project to achieve maximum excellence and impact. The AB members will be given access, under a confidentiality agreement, to all the project material, which they will use to study and analyse the status and progress of the project and large scale demonstrators. The industry experts specifically will be requested to give feedback and advice to the consortium on defining a solid marketing uptake strategy, based on their knowledge of the innovative educational solutions sector. The AB is scheduled to meet with the consortium twice over its 36 months duration in a one-day event in which they will be provided with a detailed overview of project results and are expected to give feedback on any aspects of interest and/or concern. AB members are not consortium participants and shall not hold any of the rights and obligations of the Grant Agreement. Some external advisers already identified are the following:

Confirmed Advisors:

- Dr. Jordi Herrera Joancomartí, *Universitat Autónoma de Barcelona* (jordi.herrera@uab.cat)
  Role: expert in security (http://www.deic.uab.cat/~jherrera/publications.html)
- Dr. Harvey Mellar, *Institute of Education University of London* (h.mellar@ioe.ac.uk)
  Role: expert in eLearning and assessment (https://www.ioe.ac.uk/staff/CCMA/LKLB_34.html)
- Dr. Sergio Escalera Guerrero, *Universitat de Barcelona* (sergio@maia.ub.es)
  Role: expert in biometrics/facial (www.maia.ub.es/~sergio/)
- Juan Ramón Alegret Crespí, Strategic Acount Executive, *Blackboard* (Juan.Alegret@blackboard.com)
  Role: market/innovation/exploitation/ comercialitation (https://es.linkedin.com/in/juanralegret)
- Gard Titlestad, General Secretary of the International Council for Open and Distance Education (titlestad@icde.org)
  Role: Open/Distance Education Inernational dissemination (http://www.icde.org/filestore/About/GardTitlestadCV.pdf)
- Alejandro Moledo, *European Disability Forum* (alejandro.moledo@edf-feph.org)
  Role: New Technologies and Innovation in Disability context (https://be.linkedin.com/pub/alejandro-moledo-del-río)

Potential Advisers:

- AEGEE (Association des États Généraux des Étudiants de l'Europe), it is known as the European Learners' Forum in English. It is the largest trans-national, interdisciplinary learner organisation in Europe. currently having around 13,000 members, more than 200 local groups in university cities across Europe, including Russia, Turkey and the Caucasus, with a European Board and Head Office in Brussels.

- The European Learners' Union (ESU) is the umbrella organisation of 47 national unions of learners from 39 countries and through these members represents over 11 million learners. The aim of ESU is to represent and promote the educational, social, economic and cultural interests of learners at a European level towards all relevant bodies and in particular those of the European Union, Council of Europe and UNESCO. ESU is representing the voice of the learners in Europe by being a consultative member to the EHEA.
- The European Association of Distance Teaching Universities (EADTU) is Europe's leading institutional association in online, open and flexible Higher Education, and is at the heart of the modernisation agenda of European universities. Growing from its eleven founding members in ten European nations, EADTU now has a membership of fifteen institutions and fourteen national associations across 25 nations. Its membership covers over 200 universities and around 3 million learners.

  The European Association of Teachers (AEDE), has a network of more than 25,000 teachers, heads, inspectors and officials, from nursery to university level. AEDE welcomes teachers and schools throughout Europe who wish to work together to build the European society of the future.

3.3.1 Conflict management and decision making mechanisms

Project participants have a substantial track record on collaboration and European project expertise, and consequently the expected day-to-day methods to reach agreement will be informal, based mainly on telematic contacts followed by written confirmation. Key technical and project management issues will need to be agreed and documented in written form. Potential conflicts should be identified and brought to the immediate attention of the CM by the appropriate PL, AM and/or WPL. Any other project beneficiary may contact the CM directly, who will then attempt to resolve issues by discussion or by calling an ad-hoc meeting and/or audio conference. The voting mechanism will be based on the following principles:

- Every beneficiary represented in the PMB has one vote.
- Decisions are taken with majority of votes (in case of draws, Innovation Manager's vote will count as a casting vote).
- Case of serious disputes: In case of serious disputes, conflict resolution procedures will be initiated whereby the CM will advise the PMB that it will have to meet in emergency session to discuss the conflict and find a solution.

The consortium will aim at resolving any conflict as soon as possible and in a friendly manner. Then within 21 days of notification by the CM of the requirement for an emergency procedure, the PMB has to meet in a plenary session. The quorum threshold for this meeting is 90%. The meeting will attempt to achieve full consensus on the resolution of the issue but in any case, a majority vote will be taken to determine what resolution will be implemented; if necessary the CM will use a casting vote. In circumstances of persistent and serious conflict that may put the continuation of the project at risk, the PMB will consider its options such as involving the EC Project Officer, seeking external advice followed by a review of the situation and advice in an emergency session for a collective decision in order to implement a final remedy of the issues involved.

Any dispute, controversy or claim arising under the Consortium Agreement including its formation, validity, binding effect, interpretation, performance, breach or termination, as well as non-contractual claims, shall be submitted to mediation in accordance with the WIPO Mediation Rules. The place of mediation shall be Brussels and the language to be used in the mediation shall be English.

Information flows and procedures: e-Mailing will be the main means of communication among participants. A project management system for repositories of draft reports and deliverables will be established at the very beginning of the project. This will be the main vehicle for communication and discussion outside of the regular consortium meetings and teleconferences. Different levels of access will be granted for different kinds of documentation. The communication platform will keep all the partners fully informed about the project status, the planning of the large scale pilots and all other issues of importance to the partners in order to achieve maximum transparency and to increase the cooperation degree within the pilots.

The consortium also wants the project to be visible as much as possible in order to raise public awareness. This will be done by installing a publicly accessible website on which project aims and goals will be presented. The project website will be developed within 4 weeks from the start of the project. This will have an open access interface as well as news boards for consortium members. Further dissemination and communication activities are outlined in the relevant WP9 description.

The CM with the support of the project manager and the UOC project office will ensure consistency across the WPs so that all project deliverables will be of an equally high quality; the CM will also be responsible for T1.2 within WP1 and the production of the Quality Management Plan (M3) to be implemented by all participants throughout the project. The Quality Management Plan will set out the QA procedures, software development procedures, documentation, data handling and communication rules to be used during all the project's lifetime as a joint responsibility of the participants.

Meetings schedule: The schedule of meetings for TeSLA considers the following principles: (i) a rigorous and cost-effective use of resources provided by the European Commission, (ii) the project duration (36 months), (iii) the number of reporting periods (3), (iv) an average cost of €2,000 per person for travel, and (v) the venue of the plenary meetings at the premises of the entities represented in the consortium. As a general rule, the coordination of the research and innovation activities will be

done mainly through emailing and teleconferences as the consortium is committed to reduce travel expenses as much as possible, although face-to-face meetings will be also crucial for the success of the project. Plenary meetings scheduled for the PMB (twice a year) and technical meetings (twice a year) will be organised to maintain a common understanding of the scope and exploitation objectives of the project. Meetings will be held in coordination with other meetings and events envisaged during the project lifespan as much as possible to safeguard efficiency. For instance, two of the plenary meetings will be held in conjunction with the review meeting of the first and second reporting periods (M12 and M24) and the preparation of pilots (M7, M12, M19, M24).

The members of the Advisory Board will be invited to participate in the AB meeting to be organised in conjunction with every second plenary meeting of the year (M12, M24). The envisioned meeting schedule can be summarised as follows (see the timeline as well):

Type of meeting	Kind	Participants	Estimated month
Kick-off meeting	Transnational	All consortium partners	M1
1st pilot preparation	Transnational	PMB, PB	M7
1st reporting period, 2nd pilot preparation, AB meeting	Transnational	PMB, PB, AB	M12
Mid-term meeting and International event	Transnational	All consortium partners	M16
2nd reporting period, 3rd pilot (1S) preparation, AB meeting	Transnational	PMB, PB, AB	M24
Pilots evaluation	Transnational	PMB, PB	M30
Final meeting, International TeSLA Show event	Transnational	All consortium partners	M34
Technical meeting	Teleconference	TM, WP leaders and team members of the consortium partners involved in the WP progress as required	Monthly, or on demand, along the project life-cycle
EC liaisons meeting or events	National level or teleconference	All consortium partners	One per term, along the project life-cycle (from M13 to M36), or on demand

Table 3.2a: List of Milestones

Milestone number	Milestone name	Related work package(s)	Estimated date	Means of verification
M1	TeSLA requirements defined	WP2, WP3, WP4, WP5, WP6, WP8, WP9	M6	Deliver D6.2, which combines the requirements from all related WPs and defines the final system design.
M2	TeSLA development planning	WP5, WP6	M8	Deliver D6.5, which contains the final development planning.
M3	Ready for pilots.	WP2, WP6, WP7	M9	The deliver D7.3 will contain the planning for the pilots, taking into account all the requirements to start.
M4	1st year pilots executed and analysed	WP7, WP8	M13	The 1st deliver D8.4 will contain the details or the execution and the results analysis for 1st year pilots.
M5	TeSLA system developed	WP5, WP6	M18	The 2nd deliver of D6.6, D6.7, D6.8, D6.9, and D6.10 will contain all software system.
M6	2nd year pilots executed and analysed	WP5, WP6, WP7, WP8	M26	The 2nd deliver D8.4 will contain the details or the execution and the results analysis for 2nd year pilots.
M7	3rd year pilots	WP5, WP6, WP7,	M34	The 3rd deliver D8.4 will contain the details or the

	executed and analysed	WP8		execution and the results analysis for 3rd year pilots.
M8	TeSLA framework evaluated and released	WP5, WP6, WP8,WP9	M36	The deliver D6.11 will contain the TeSLA system's final release. The deliver D8.5 contains the final evaluation report for the pilots and the system.

Table 3.2b: List of critical risks and mitigating actions

The work plan, the content and structure of activities, the allocation of resources, the e-assessment framework development and the large scale pilots' timeframe are aspects that have been fully agreed and provide a sound basis for a smooth performance of project activities. Nevertheless, a set of factors could be seen as potential threats for achieving the main expected outcomes. The following table drafts those risks preliminarily identified and describes measures to reduce any consequences. The list of risks and relevant contingency plans will be updated each 6 months and are included into the management periodic reports.

Description of risk	WP(s) involved	Proposed risk-mitigation measures
Changes in the project team, one person leaving the project (risk level: medium)	WP1	The project management foresees ongoing communication with participants and their teams in order to identify this type of situations. Partners have been chosen for their background and knowledge, and are able to provide different experts to the project. Participants are aware of this possibility and have to identify and communicate these situations as early as possible. Participants will consider substitutes with equivalent (or higher) qualifications and expertise. The consortium will inform the substitutes about their role and responsibilities.
Changes in the project consortium, one partner leaving the project (risk level: low)	WP1	Partners have been selected because of commitment with the project. This could delay or even make impossible reaching some of the project objectives (e.g. critical milestones as pilots and demonstration activities implementation on time). Effective management procedures are applied to timely intercept problems, remove or reallocate partners and, if needed, replace them with new partners with suited skills and profiles. The Consortium Agreement will realise the policies behind this. The Consortium will invite other entities that showed interest in the project in the proposal preparation phase.
Poor performance of partners (risk level: low)	WP1	The project management already foresees ongoing communications and control mechanisms to avoid this situation. In general, the distribution of the EC contribution to intermediaries will require the submission of deliverables on time and in appropriate quality. The corrective action is activated when a delay of more than a week without justification is incurred by one participant. A warning and a new internal deadline is communicated. In case of recurrence, the PMB will discuss the measures to be undertaken. The Consortium Agreement shows the mechanisms to identify a defaulting partner.
Delay in the project work plan and timeframe (risk level: low).	WP1	Delays in a WP could affect activities under other(s) WP(s) and the pilots implementation, but the consortium has already taken this aspect into account in order to minimise the risk. Proceed with activities, taking advantage of a decoupled work plan flow, execution of tasks in parallel, review and revise resource allocations to enable catch-up, reschedule activities.
Compliance with the new General Data Protection Regulation of the EC (risk level: low)	WP1	The e-assessment system and pilots will include by design a clear set of user data privacy, security and information directives and features in order to cover the data protection framework early on. Besides, in the Data Management Plan of WP1, the Consortium will thoroughly monitor the evolution of this regulation in the Data Management task of the project.
Lack of engagement in development of framework by Partners in Year 1 (risk level: low)	WP2-7	All project partners have some (albeit often very small) amount of time allocated to this WP thereby ensuring all partners have time to contribute to the framework

Inconsistent data collected that is not comparable across pilot case studies (risk level: low)	WP6-8	The framework will set expectations and protocols for the gathering of data and reporting. WP8 will be active during pilots in ensuring partners are collecting appropriate data
Partners do not complete their pilot evaluations on time (risk level: low-medium)	WP7-8	WP8 has allocated time for the WP led to oversee and coordinate the writing of pilot case studies and ensure these remain on track
Lack of evaluation of activities undertake in WP4-5 (risk level: low)	WP4-5, WP8	WP8 will work with these WPs from the outset to ensure monitoring, data capture and evaluation takes place on this activity.
Low participation in project events (risk level: low)	WP9	The multidisciplinary partners, their direct network of contacts, their capacity of mass dissemination, and the quality of the liaisons and engagement strategy make this risk unlikely. The contingency plan is activated in case that an event has 25% less registered participants than the targeted number. The person responsible for the event organisation notifies the PMB of the situation and contacts new potential interested participants. Additional interested actors are identified by the other partners and Advisory Board members. The consortium investigates reasons for the low involvement and agrees on corrective actions to improve the approach for the second round of events. The PMB can re-allocate additional budget for covering the corrective actions.
Low publicity of the project activities and outcomes (risk level: low)	WP9	The customised and coherent communication and engagement strategy, supported by multidisciplinary partners and their high quality network of contacts, make this risk unlikely.
Property rights over developed modules do not allow to test all the desired instruments. (risk level: low)	WP5, WP6, WP9	Establishing the appropriate rules, structures and processes during the preparation of the consortium and grant agreements between partners.
Propietary learning systems dificult the integration of the TeSLA framework. (risk level: medium)	WP6	The institutions with a propietary learning platform, that is not based on the starndard ones have more person months in the integration part.

3.4 Consortium as a whole

The consortium brings together a cluster of 18 European and South American partners from 12 different countries (Spain, Belgium, Germany, Netherlands, Bulgaria, UK, France, Turkey, Finland, Switzerland, Portugal and Mexico), including industry, universities, research centers, accrediting agencies and private non-profit organizations ensuring a well-balance composition. These entities are relevant stakeholders and very active across a wide range of educational activities and markets.

The research centres bring to the project the latest advances on each technology described (biometrics, security, privacy, forensics analysis). The educational industry provides its experience in the market sector and all the educational institutions contribute with their teaching and learning expertise as traditional, blended and online universities.

The challenge is afforded through conducting large scale pilots in real online teaching and learning scenarios thanks to the involvement of 7 Universities of the consortium (Universitat Oberta de Catalunya, Open Universiteit Nederland, Sofiiski Universitet Sveti Kliment Ohridski, The Open University UK, Technical University of Sofia, Anadolu University, Jyvaskylan Yliopisto) that are capable of providing a great amount of learners, which will ensure the reliability of work authorship and user authentication during the real learning and e-assessment processes. Specific pilots for disabled learners will also be conducted thanks to the participation of the University of Jyväskylä and Universitat Oberta de Catalunya.

These partners will ensure reaching new strategies to take advantage of the new e-assessment framework in the educational process improvement (adaptive learning, e-assessment models, the suitable e-assessment learning activities for special educational needs), and promote and commercialise the quality and prestigious of e-assessment through TeSLA system at international. Consequently the trust between institutions and society is assured.

Small Educational Pilots	Medium Test-Bed Pilots (4 Thematic Pilots)	Large Scale Pilots		Total Impact
Course 2016/2017 1st semester	*Course 2016/2017 2nd semester*	*Course 2017/2018 1st semester*	*Course 2017/2018 2nd semester*	
75 learners x 7 HEI	125 learners x 7 HEI	1,000 learners x 7 HEI (minimum)	2,000 learners x 7 HEI (minimum)	
600 learners	3,500 learners	6,500 – 7,000 learners	10,000 – 14,000 learners	20,000 – 25,100 learners

To have more details regarding the scale pilots development see figure 2: Pilots Scheme

The project will be coordinated by the UOC, a leading entity in open and online Higher Education, with a track record of successful participation and project management from the 6th and 7th Framework Programmes. The selected group of partners is capable of conducting the activities of the project due to the excellent expertise and background of each entity in the particular role that each entity must play. Most of them have already cooperated in the past as business or research partners with some entities of the Consortium (i.e. UOC has collaborated and currently collaborates with OUNL, OUUK, SU, ENQA, AQU, AU, JYU and it is member of common networks has EADTU). This is a distinct advantage, both in managing the project and in strengthening long-lasting cooperation between the participants beyond the innovation action. Project participants have a great respect and opinion of each other, recognising competency, value and capability.

The Consortium is fully convinced that the project will significantly contribute to bringing control measures ensuring learner identity and authorship to the digital educational sector, by identifying strategic aspects to be reinforced in the future of the Higher Education and beyond, rocking the education market, and by mobilising the innovator ICT ecosystem, quality agencies and learners and teachers of Europe in order to obtain trust and social recognition. The project also intends to provide high-level competency guidance and dialogue to assist the educational community, and EU stakeholders and policymakers in the educational sector and its innovation.

The TeSLA Consortium brings the expertise in the specific domain proposed, the educational industry, the deep knowledge both technical and managerial of the European programmes, the management experience required to lead a large Consortium with large scale pilots, and the tractor muscle to achieve a definitive impact in the educational sector in Europe and all over the world. It is composed by:

	WP	UOC	ENQA	UNAMUR	AQU	LPLUS	OUNL	SU	OUUK	PROTOS	IMT	IMPERIAL	TUS	AU	JYV	EQANIE	INAOE	IDIAP	WFSF
Usability and accessibility	WP2	***	**	**	**	**	**	**	**		*	*	**	**	***	**	*	*	**
Educational Models	WP2	*	**	*	**	**	**	**	***		*	*	*	*	**	**	***	**	*
Security	WP6	*	**	*	**	**	*	*	*	**	***	*	*			*	*	**	***
Data privacy and Ethical	WP3		*	***	*	**	*	*	*	**	*	*	*	*	*	*	*	**	***
Facial recognition	WP5	**		***		**				*		***	**				*	***	
Voice recognition	WP5	*		***		*				*		*	*					***	
Multilingual NLP / Natural language Analysis	WP5	***								*							***		
Plagiarism	WP5	***								*	*						**		
Keystroke dynamics	WP5																	*	***
Forensic Analysis	WP5	*															***		
HE quality standards	WP4		***	*	***		**	*	***				*		*	***			
Educational sciences	WP2		***	**	***		***	**	**		*		***	*	*	***			**
e-assessment	WP2	***	**	*	***	***	***	*								**			
Learning Analytics	WP2	*		*		**	*	*	***		*	*	*						**
Distance/Virtual Learning	WP2	***	*		***		***			**						***			
Cloud architecture	WP6	*		*		**	*	*				***			**		**		**
Open source technologies and platforms	WP6	*		*		*	*	*			***		**			**	*	***	***
Software Engineering and Development	WP5 WP6	**				***				***	***	***	**			*	**	***	***
Software Quality Control	WP5 WP6	*				***				***	**	**	*			**	*	**	***
Evaluation methodologies	WP8	**	***	**	***		***	***	**			**		***		***			
Business development	WP9					***				***									***
Education adaptation for special needs	WP2	**	*	*	*	**	*	*		*			*	*	***	*			**

3.4.1 Other Countries

The project TeSLA contains one partner from Switzerland, which is considered at the moment as a industrialized third country in H2020, hence not requesting any EU funding.

This means that for the 2015 calls for proposals, the participation of Swiss entities will be in accordance with Horizon 2020 provisions governing the participation of third country entities. More particularly, as stated in the official EU document[2]:

1. Swiss entities may participate in Horizon 2020 actions as entities from any industrialised third country not associated to Horizon 2020. This means that Swiss participants are not be automatically eligible for funding and will not count towards the minimum number of participants required for a project (eligibility criteria).
2. Swiss entities may become project coordinators under Horizon 2020, since the place of establishment is irrelevant for a consortium's choice of a coordinator. However, the Swiss partner would not be automatically eligible for EU funding.

[2] http://ec.europa.eu/research/participants/data/ref/h2020/other/hi/h2020-hi-swiss-part_en.pdf

3. The legal basis for direct funding of Swiss project partners by the Swiss authorities (as was the case before 2004) is mentioned in the Swiss Federal Decree of 10 September 2013 on funding of Swiss participation in European framework programmes in the area of research and innovation for 2014-2020 by the Swiss Parliament.

The project TeSLA contains one partner from Mexico as well, which is considered a Non-EU country that is NOT automatically eligible for funding. Applicants like Mexico from other non-EU countries may be granted funding if:

1. Funding is provided for in a bilateral scientific/technological agreement or similar arrangement between the EU and the country where the applicant is based.
2. The call for proposals clearly states that applicants based in such countries are eligible for funding.
3. Their participation is deemed essential for carrying out the action by the Commission

Since there is none of these cases, the partner INAOE will be considered as Not elegible for funding but elegible as a partner anyway. More detail on the participation of Mexico in H2020 projects can be found in the following applicable regulations of the EU Programme: http://ec.europa.eu/research/participants/data/ref/h2020/grants_manual/hi/3cpart/h2020-hi-3cpart_en.pdf

3.5 Resources to be committed

The total budget is 7,283,092.50€ and the requested EC contribution is 5,916,028.50€. which meets the expectations of the call for large Innovation Actions. The project total cost represents an excellent value for money given the type of activities envisaged and the expected impact. We would like to remark the presence of two entities (IDIAP and INAOE) belonging to countries such as Switzerland and Mexico that will be directly funded by their National Authorities, so that their budget is not considered in the EC contribution calculation.

The tables in the following pages illustrate in detail the cost structure of the action taking into account all cost categories, including also travel expenses, other specific project direct costs, and subcontracting costs. The distribution of the consortium budget per type of cost is the following:

- Direct personnel costs are the most important categories of costs: 66.98% of the overall budget.
- Other direct costs include all expenses related to meetings (both internal consortium and review meetings), training workshops, and the Advisory Group expenses for travelling. Attention has been paid to keep the incidence of trips on the budget as low as possible (8.93%) fostering Skype meetings instead of face-to-face meetings, by foreseeing the organisation of different types of events and workshops in such a way that they do not entail multiple trips. The main goal is to reduce costs and optimise the use of resources.
- Subcontracting costs (0.74%, a total of 54K€) include those expenses related to the cloud services such as servers and data backup, which it has to be outsourced to a third party out of the consortium.
- The method of calculating the indirect costs (19.85%) has been 25% of direct costs excluding subcontracting.

Personnel costs:

The participants will provide the necessary high quality and most suitable personnel to carry out the tasks arranged to reach the outlined objectives. The overall number of person months deployed throughout the 36 months duration of the project is 999 pm. This figure includes 96 pm for the project management aimed at ensuring the smooth running of the project.

The allocation of resources is mainly focused on WP6, WP7 and WP8 representing around 39.14% of the project overall effort, which clearly shows the relevance of performing large scale pilots. All partners were allocated with person months within WPs according to their roles and involvement in the project.

Other direct costs:

Trips

Travel expenses are expected to support Consortium meetings, review meetings, liaison meetings, the events organised (International ETG workshop, and the International TeSLA Show) and covering the trips of the members of the Advisory Board (see meetings schedule in the section 3.2.1 above):

- Between 28K€ and 32K€ has been allocated to participants as a minimum budget for travelling during 3 years (2K€/travel/person or 1K€/travel/person considering some meetings are in the same country): (i) kick-off meeting (ii), PMB and PB meetings; (iii) the two international events organized. It has been considered 2 pax for every partner except for the co-ordinator with 3 pax.
- 4.6K€ has been allocated to the UOC for the EC meetings at Brussels.
- 18K€ has been allocated to the UOC as an additional budget to cover Advisory Board members' travel expenses.
- 6K€ has been allocated to all partners (except for the quality Agencies ENQA, AQU and EQANIE) as additional budget to cover the attendance to scientific, dissemination and exhibition events for dissemination and exploitation.

The consortium is committed to use electronic means of communication to reduce trips as much as possible.

Goods and services

- 5.5K€: External audit (certificate on Financial Statements) for entities with an EC contribution > 325k€ (not considering indirect costs)
- 3K€ for the innovation and exploitation for a patentability and utility model study for the TeSLA result. It has been allocated to PROT-OS as leader of the exploitation WP.
- 6K€ for the TeSLA project corporate graphic design, website design and implementation.
- 3K€ has been allocated to all partners (except for the quality Agencies ENQA, AQU and EQANIE) to cover the conferences/dissemination and exhibition events fees.
- 10K€ for dissemination material: leaflets, brochures, posters, infographies, multimedia. It is allocated to PROT-OS as leaders of the management and exploitation WPs respectively) to centralize the production and optimize the cost.
- 1.8€ for web services and certificates (multi-domain name registry, security multi-domain), social media statistics services, online surveys and other specific software licenses required for the project, centralized in UOC.
- 24K€ for Amazon Web Servers in the cloud. This expense has been allocated to the UOC as TeSLA co-ordinator of the project in order to centralize the service.
- 12K€ for venues and organization of the foreseen 8 meetings to host partners (1.5K€/meeting).
- 7K€ allocated to ENQA for preparing the International workshop "Online teaching and learning in the light of the ESG" It includes 2.5K for venue and materials and 4.5K€ for catering and refreshement (50 pax)
- 4.5K€ allocated to UOC for preparing the final event "International TeSLA Show" It includes 1.5K for venue and materials and 3K€ for catering and refreshement (100 pax)

Subcontracting costs:

- 9K€ for professional short video production of dissemination and how-to pieces aimed to spread the TeSLA evolution, benefits, functions and experiences informed the stakeholders (mainly HEI, teachers and learners). Allocated to PROT-OS as leader of the dissemination and exploitation WP to take advantage of lower Spanish market prices.
- 45K€ for translation of interfaces, pilot protocols and key deliverables to English, Spanish, Catalan, French, German, Bulgarian, Dutch, Turkish, Finish languages (foreseen an average of 5K/language). This expense is in OUUK, PROT-OS, UOC, Unamur, LPLUS, TUS, OUNL, AU and JYU respectively (corresponding to its language)

Equipment

The budget contemplates a total amount of 75K€ for proprietary servers (5€K for each of the 15 partners except for the 3 quality agencies ENQA, AQU and EQANIE). The justification for this, and for the cloud servers, is the following:

University platforms use to be located in secured private networks to avoid unauthorized access to the systems and information. The structure and complexity of private networks will depend on the size and typology of institution, but its security is fundamental. To ensure that during the pilots we do not put in risk the institution systems, we will install an instance of the institutional learning platform and the developed plug-in for the institution in a server inside each institutional network, with access to the required information from the institution servers and to the TeSLA cloud infrastructure, that will be shared among all the institutions in the project. The use of cloud infrastructure will allow to easily scale-up the system for the large-scale pilots, renting additional resources. We will use Amazon Web Services, that guarantees that the machines are physical located in Europe (Germany or Ireland). Therefore, for the pilots we will need one server per each institution participating in the pilots. In addition, since the development and integration works in the WP5 and WP6 continues during the pilots, we will need extra servers for the developer teams, where the TeSLA system and instruments will be tested before to push them to the cloud infrastructure. Both, the virtual machines in the cloud service provider and the physical servers must be powerful enough to support large amount of simultaneous connections and the data processing capabilities to process the data of all the connected learners for continuous biometric authentication. Regarding the cloud infrastructure mentioned above, it will be maintained through the potential benefits obtained by the comercialization of the TeSLA syste after the end of the project.

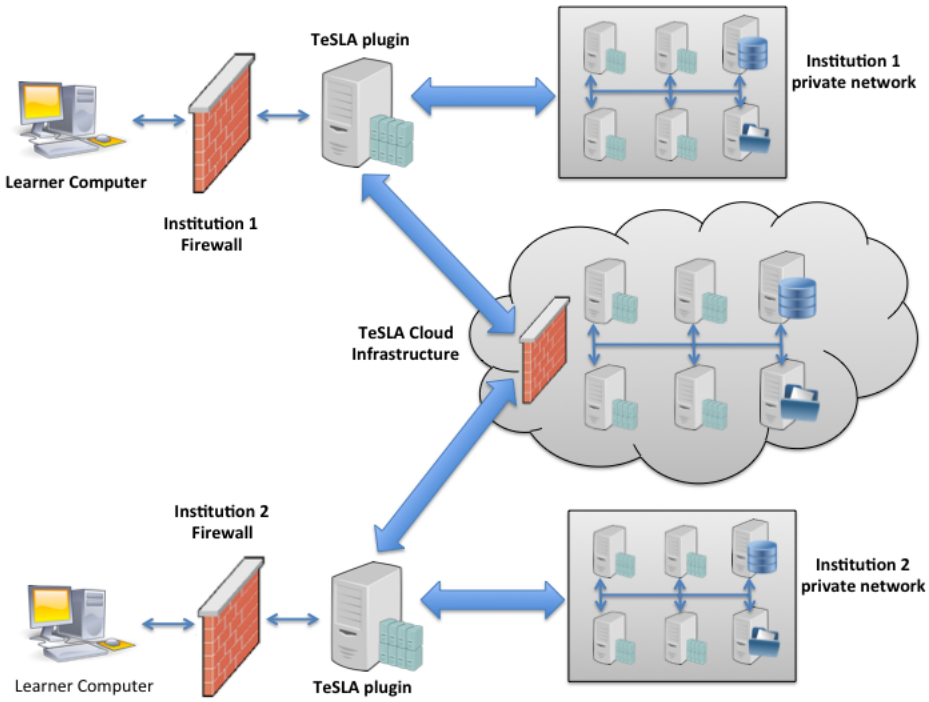

Figure 8: Propietary and Cloud Infrastructure

Table 3.4a: Summary of staff effort

Participant		WP1	WP2	WP3	WP4	WP5	WP6	WP7	WP8	WP9	Total PMs
1	UOC	56	16	1		12	10	24	6	6	131
2	ENQA	2			24				10	5	41
3	UNamur	2		30		3	1		2	6	44
4	AQU	2	1		36				9	5	53
5	LPLUS	2	1	2		60	6	4	4	8	87
6	OUNL	4	6	1			4	18	4	5	40
7	SU	4	6	1			4	30	4	5	54
8	OUUK	2	6	1			4	18	18	5	54
9	PROT-OS	4				4	12	9	4	25	58
10	IMT	2		2		25	15		4	6	54
11	IMPERIAL	2				16			4	5	27
12	TUS	2	6	1			4	18	4	5	40
13	AU	2	6	1			4	18	4	5	40
14	JYU	2	8	1			10	18	4	5	50
15	EQANIE	2			20				9	5	36
16	INAOE	2				16			1	8	27
17	IDIAP	2				60			1	8	71
18	WFSF	2		2		12	60	4	4	8	92
	Total	96	56	43	80	208	134	161	96	125	999

XX Persons/Month of the WP leader

Table 3.4b: 'Other direct cost' items (travel, equipment, other goods and services, large research infrastructure)

Please complete the table below for each participant if the sum of the costs for' travel', 'equipment', and 'goods and services' exceeds 15% of the personnel costs for that participant (according to the budget table in section 3 of the proposal administrative forms).

P1 - UOC	Cost (€)	Justification
Travel	64,600.00 €	Attendance to 6 consortium meetings (2K€/person/meeting) x3 pax (total of 36K€) Attendance to 6 conferences/dissemination events (1K€/pax) (total of 6K€) Attendance to 2 EC meetings (1.15K€/pax) x 2 pax (total of 4.6K€) Advisory board members travels (18K€)
Equipment	5,000.00 €	Computer Server (all partners except for the quality agencies)
Other goods and services	53,300.00 €	Audit and legal advice >325K€ of contribution (total of 5.5K€) Attendace to conferences/dissemination, exhibition events feed (total of 3K€) Venue and organization of 2 consortium meetings (1.5K€/meeting) (total of 3K€) Venue and organization "International TeSLA Show" event (100 pax) (total 4.5K€) Attendace to conferences/dissemination, exhibition events fees (total of 3K€) Project corporate image, web design and development (6K€) Multidomain digital security certificates (1.8K€) Web services/licenses i.e. Survey monkey, Mentimeter, Mail Chimp (2.5K€) Cloud servers services WSA centralized for all the Consortium as WP1 leader (24K€)
Total	122,900.00 €	

P3 - ENQA	Cost (€)	Justification
Travel	32,000.00 €	Attendance to 8 consortium meetings (2K€/person/meeting) x2 pax (total of 32K)
Other goods and services	12,500.00 €	Audit and legal advice >325K€ of contribution (total of 5.5K€) Venue and organization of the International Workshop "Online teaching and learning in the light of the ESG" (50 pax) (total of 7K€)
Total	44,500.00 €	

P3 - Unamur	Cost (€)	Justification
Travel	38,000.00 €	Attendance to 8 consortium meetings (2K€/person/meeting) x2 pax (total of 32K€) Attendance to 6 conferences/dissemination events (1K€/pax) (total of 6K€)
Equipment	5,000.00 €	Computer Server (all partners except for the quality agencies)
Other goods and services	8,500.00 €	Audit and legal advice >325K€ of contribution (total of 5.5K€) Attendace to conferences/dissemination, exhibition events fees (total of 3K€)
Total	51,500.00 €	

P6 – OUNL	Cost (€)	Justification
Travel	34.000.00 €	Attendance to 7 consortium meetings (2K€/person/meeting) x2 pax (total of 28K€) Attendance to 6 conferences/dissemination events (1K€/pax) (total of 6K€)
Equipment	5,000.00 €	Computer Server (all partners except for the quality agencies)
Other goods	10,000.00 €	Audit and legal advice >325K€ of contribution (total of 5.5K€)

and services		Venue and organization of 1 consortium meeting (1.5K€/meeting) (total of 1.5K€) Attendace to conferences/dissemination, exhibition events feed (total of 3K€)
Total	49,000.00 €	

P7 - SU	Cost (€)	Justification
Travel	34,000.00 €	Attendance to 7 consortium meetings (2K€/person/meeting) x2 pax (total of 28K€) Attendance to 6 conferences/dissemination events (1K€/pax) (total of 6K€)
Equipment	5,000.00 €	Computer Server (all partners except for the quality agencies)
Other goods and services	10,000.00 €	Audit and legal advice >325K€ of contribution (total of 5.5K€) Venue and organization of 1 consortium meeting (1.5K€/meeting) (total of 1.5K€) Attendace to conferences/dissemination, exhibition events feed (total of 3K€)
Total	49,000.00 €	

P8 - OUUK	Cost (€)	Justification
Travel	34,000.00 €	Attendance to 7 consortium meetings (2K€/person/meeting) x2 pax (total of 28K€) Attendance to 6 conferences/dissemination events (1K€/pax) (total of 6K€)
Equipment	5,000.00 €	Computer Server (all partners except for the quality agencies)
Other goods and services	10,000.00 €	Audit and legal advice >325K€ of contribution (total of 5.5K€) Venue and organization of 1 consortium meeting (1.5K€/meeting) (total of 1.5K€) Attendace to conferences/dissemination, exhibition events feed (total of 3K€)
Total	49,000.00 €	

P9 – PROT-OS	Cost (€)	Justification
Travel	34,000.00 €	Attendance to 8 consortium meetings (2K€/person/meeting) x2 pax (total of 28K€, considered two meetings are in the same country) Attendance to 6 conferences/dissemination events (1K€/pax) (total of 6K€)
Equipment	5,000,00 €	Computer Server (all partners except for the quality agencies)
Other goods and services	16,000.00 €	Study of patentability and utility model (3K€) Production of dissemination materials centralized for all the consortium (10K€) Attendace to conferences/dissemination, exhibition events feed (total of 3K€)
Total	55,000.00 €	

P10 – IMT	Cost (€)	Justification
Travel	38,000.00 €	Attendance to 8 consortium meetings (2K€/person/meeting) x2 pax (total of 32K€) Attendance to 6 conferences/dissemination events (1K€/pax) (total of 6K€)
Equipment	5,000.00 €	Computer Server (all partners except for the quality agencies)
Other goods and services	8,500.00 €	Audit and legal advice >325K€ of contribution (total of 5.5K€) Attendace to conferences/dissemination, exhibition events feed (total of 3K€)
Total	51,500.00 €	

P11 – IMPERIAL	Cost (€)	Justification
Travel	36,000.00 €	Attendance to 8 consortium meetings (2K€/person/meeting) x2 pax (total of 30K€, considered one meeting is in the same country) Attendance to 6 conferences/dissemination events (1K€/pax) (total of 6K€)
Equipment	5,000.00 €	Computer Server (all partners except for the quality agencies)
Other goods and services	3,000.00 €	Attendace to conferences/dissemination, exhibition events feed (total of 3K€)
Total	44,000.00 €	

P12 – TUS	Cost (€)	Justification
Travel	34,000.00 €	Attendance to 7 consortium meetings (2K€/person/meeting) x2 pax (total of 28K€, considered one meeting is in the same country) Attendance to 6 conferences/dissemination events (1K€/pax) (total of 6K€)
Equipment	5,000.00 €	Computer Server (all partners except for the quality agencies)
Other goods and services	3,000.00 €	Attendace to conferences/dissemination, exhibition events feed (total of 3K€)
Total	42,000.00 €	

P13 – AU	Cost (€)	Justification
Travel	34.000,00 €	Attendance to 7 consortium meetings (2K€/person/meeting) x2 pax (total of 28K€) Attendance to 6 conferences/dissemination events (1K€/pax) (total of 6K€)
Equipment	5,000.00 €	Computer Server (all partners except for the quality agencies)
Other goods and services	4,500.00 €	Venue and organization of 1 consortium meeting (1.5K€/meeting) (total of 1.5K€) Attendace to conferences/dissemination, exhibition events feed (total of 3K€)
Total	43,500.00 €	

P14 – JYU	Cost (€)	Justification
Travel	34,000.00 €	Attendance to 7 consortium meetings (2K€/person/meeting) x2 pax (total of 28K€) Attendance to 6 conferences/dissemination events (1K€/pax) (total of 6K€)
Equipment	5,000.00 €	Computer Server (all partners except for the quality agencies)
Other goods and services	10,000.00 €	Audit and legal advice >325K€ of contribution (total of 5.5K€) Venue and organization of 1 consortium meeting (1.5K€/meeting) (total of 1.5K€)
Total	49,000.00 €	

P15 – EQANIE	Cost (€)	Justification
Travel	32,000.00 €	Attendance to 8 consortium meetings (2K€/person/meeting) x2 pax (total of 32K€)

Total	32,000.00 €	

P16 – INAOE	Cost (€)	Justification
Travel	38,000.00 €	Attendance to 8 consortium meetings (2K€/person/meeting) x2 pax (total of 32K€) Attendance to 6 conferences/dissemination events (1K€/pax) (total of 6K€)
Equipment	5,000.00 €	Computer Server (all partners except for the quality agencies)
Other goods and services	3,000.00 €	Attendace to conferences/dissemination, exhibition events feed (total of 3K€)
Total	46,000.00 €	