Executive Agency, Education, Audiovisual and Culture

Lifelong Learning Programme

Online Vocational Training Course on Laparoscopy´s ergonomics for surgeons and laparoscopic instruments´ designers (LapForm)

Final Report Public Part

Project information

Project acronym:		LapForm
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Executive Summary

This report details the results, outcomes and developments for the Leonardo da Vinci project *Online Vocational Training course on laparoscopy´s ergonomics for surgeons and laparoscopic instrument´s designers (LapForm)*.

LapForm Project aimed to create, implement and set the basis for a European exploitation of a new online VET course in laparoscopy ergonomics applied to product development (instruments and equipment) addressed to designers of laparoscopic instruments, and posture and workplace-related ergonomics for laparoscopic surgeons. For this purpose, a consortium comprised of 6 members (IBV, CCMIJU, KOMAG, SUT, BGU-MURNAU and SECLA) with a wide expertise on laparoscopy, ergonomics and virtual modelling and simulation, was created. In addition to their complementary technical capabilities, it is worth to note their experience working together in previous projects at National and European level, in R+D and transfer of formative contents.

The methodology that the project has followed is, in first setting, an educational framework and, afterwards, implementing and validating an online course. These main lines have been constantly accompanied by enhancement activities that helped in managing and in disseminating the project results.

More information about the course can be followed by visiting the project´s website: http://lapform.eu/index.php/en/

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1. Project Objectives

The main objective of the project has been to develop the contents and to implement two online courses: one in laparoscopy ergonomics applied to **product development** (instruments and equipment) addressed to designers of laparoscopic instruments, and the second in **posture and workplace-related ergonomics** for laparoscopic surgeons.

To reach this purpose, other individual objectives where stated:

- ✓ First of all, gathering the training requirements of the targeted groups;
- ✓ Secondly, the definition of the Vocational Education Training curriculum and the qualification recognition system for the course according to the specific improvements in skills and competences detected.
- ✓ Consequently, according to the learning objectives and to the structure defined by the VET curriculum, the consortium developed the course materials, which is another of the objectives.
- ✓ The next objective was the implementation of the multi-language e-learning tool and contents and,
- ✓ Finally, the consortium conducted a pilot course and validation of the e-learning tool and contents with real end users, which was the latest of the individual objectives to be implemented.

The targeted groups have been involved from the beginning of the project in many of the activities, gathering their needs throughout questionnaires, communicating their concerns directly to the consortium in conducted workshops and receiving information on the progress of the results of the project by dissemination activities.

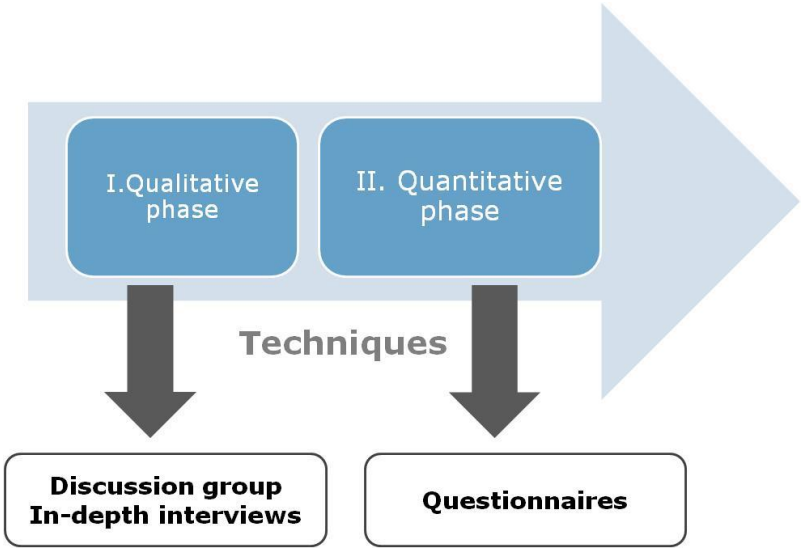
2. Project Approach

The LapForm Project activities, target and outcomes have been directly addressed to improve a high quality new product in Lifelong Learning, with a highly innovative dimension in contents and systems. Different approaches have been used to ensure the highest quality content, proper functioning and sustainability of the project during the planned work and after-completion.

Detection of needs

An **integrative approach** was planned to tackle the detection of needs for generating the contents of the course. Potential end-users of the course as well as expert in on-line training were contacted to gather their opinion and expectancies about the future course.

We followed a two-step methodology, as shown in the figure below, to obtain relevant information regarding users' needs, gaps, expectancies and preferences. This methodology intends to identity and defines the knowledge areas of the course based in a first qualitative analysis and in a second quantitative analysis.



Initially, a group of experts in Minimally Invasive Surgery defined a list of initial topics for the courses based on their experience.

Qualitative analysis

We gathered qualitative information from potential users of the course by means of focus groups and interviews. A focus group is a group conversation in a permissive and non-directive atmosphere designed to obtain information about a topic. A small group of persons, generally between six and eight, participate guided by an expert moderator in a relaxed and comfortable atmosphere. The purpose is to know what participants think, how they feel or what they know about the specific issue. This qualitative technique is particularly appropriate when the study tries to describe the people´s perception about a situation, program, event, or like in this case, a course.

Several individual interviews were developed to complete the information obtained from the focus group. An in-depth interview is a qualitative research technique that allows person-to-person discussion. It can lead to increased insight into people's thoughts, feelings, and behaviour on important issues. This type of interview is often unstructured and therefore permits the interviewer to encourage an informant (respondent) to talk at length about the topic of interest. The in-depth interview uses a flexible interview approach. It aims to ask

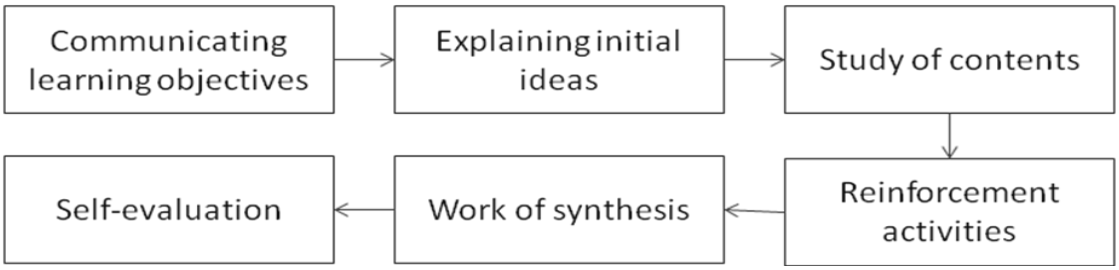
questions to explain the reasons underlying a problem or practice in a target group. This technique is used to gather ideas, to gather information, and to develop materials.

Quantitative analysis

The survey technique is one of the techniques used in social research to gather information from a representative sample of the population on both objective aspects (sociodemographic data, facts, habits, behaviour, personal characteristics, etc.) and subjective aspects (opinions, attitudes, values, etc.). Results obtained from the focus group and the interviews were used to generate a questionnaire including closed questions and all aspects of interest previously detected. Results coming from the descriptive analysis of the questionnaires were used to take decisions about the design of the course.

Generation of the contents and implementation into the e-learning platform

To generate the contents of the course, the first step was the definition of the formative modules; they are the different thematic areas of the course. Each module involves the learning sequence showed in the figure below.



We defined different modules according to the needs detected and the most relevant aspects to be considered for laparoscopy ergonomics applied to product development (instruments and equipment), and posture and workplace-related ergonomics. The courses have been generated with the aim of facilitating the comprehension and understanding of the information by the future participants. For doing this, different resources have been used:

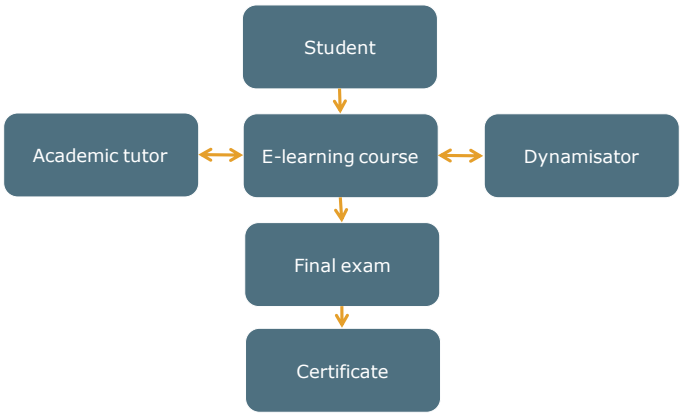
- Visual itemization
- Extension of concepts
- Bibliographic citations
- Examples
- Highlighted ideas

Experts in different areas participated in the generation of the contents. Each module of the course includes different sessions, each working session involves around 2-3 hours of study to be completed.

Contents of the course were translated into four different languages to reach a wide market within Europe: English, Spanish, German and Polish. All these contents were uploaded into the e-learning platform, generating eight different courses. Besides, roles for the exploitation of the course were defined:

- Academic tutor: an expert in the contents who helps students in understanding the contents, solving doubts, clarifying concepts and correcting activities and evaluations.
- Facilitator: a person that monitors the students, managing their enrolment, following the accomplishment of the schedule, encouraging them to participate in the forums, to develop the activities, keeping a constant contact with students during the development of the course.

The process of development of the course was defined according to the figure below. After performing the e-learning course, the student has to pass a final exam in order to obtain the Certificate of Completion of the course.



Validation and improvement

The validation of the course was planned as a real case with professionals in the field of Minimally Invasive Surgery (MIS). The validation developed had different objectives:

- To get direct feedback from the sectors the course is addressed about the contents included into the course.
- To detect aspects to be improved, regarding technical contents, graphical design, aesthetic appealing and level of comprehension.
- To get Feedback module by module as well as whole assessment to differentiate the improvements to be made.
- To simulate a real call of the course to check the information channels, protocols established and roles defined for the future exploitation of the course.
- To implement the improvements defined to get a final validated course.

76 European professionals in the field of MIS participated in the validation of the LapForm course and provided feedback. They were representative of the two sectors included into the course: designers of laparoscopic instruments and laparoscopic surgeons. They received a Certificate, indicating the completion of the course.

The results allowed defining different actions addressed to improve the course. The course obtained good assessment in all countries participating in the validation. Recommendations provided were implemented during the project and contents were improved following these recommendations.

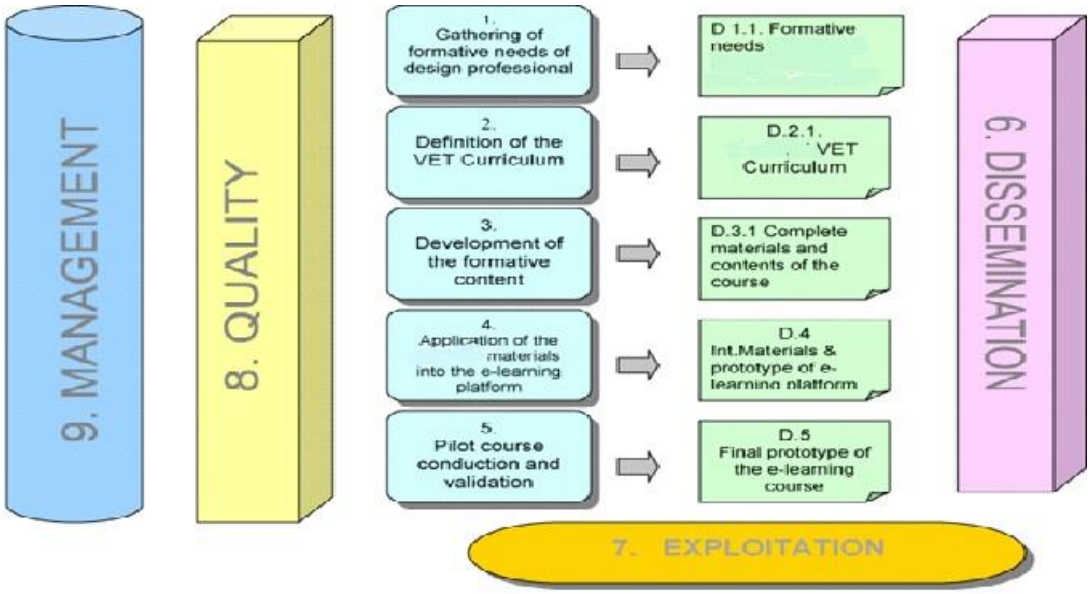
Enhancement activities

The project's strengths were also characterized by the pursuit of excellence in operations carried out in the project. That was provided by a system for **evaluating the quality of work**, accompanied by quality questionnaires which consortium members filled periodically.

For proper **dissemination** and sustainability of the results upon completion of the project there were produced detailed dissemination and exploitation strategies. The dissemination activities include the projects logo and the website, as well as leaflets for direct dissemination in sector events as well as newsletter to inform the interested stakeholders and workshops. These tools were used by the project members among events where they were in contact with the interested stakeholders. The exploitation strategy has been discussed during the whole project and has been agreed between the members of the consortium to assure the sustainability of project results.

3. Project Outcomes & Results

During the life of the project, the consortium has been following rigorously the time table and schedule prefixed in the application form of the project. Work Packages and corresponding Deliverables were distributed as follows:



This is the description of the work packages developed during the project and the corresponding outcomes and results:

WP1. Gathering of the formative needs of design professionals

The main objective of the work done during the first six months was the detection of formative needs related from the target users of the LapForm course, including into this category European professionals.

The responsible for this WP was the Spanish partner IBV. Eleven professionals participated in focus groups and in-depth interviews to define and characterize their training needs. One hundred and twenty four professionals from European countries provided information through on-line surveys.

Results:

Results obtained from the development of this work package are included into deliverable *D1.1 Formative needs in children ergonomics for product designers*. Main obtained results are:

- Current available knowledge
- Formative needs
- Aspects of interest and demanded sources of information
- Level of interest in the proposed thematic contents
- Conditions and requirements for the on-line course

WP2. Definition of the VET curriculum

The objective of this work package was defining the VET curriculum of the LapForm course considering the results obtained in the previous work-package, the available knowledge and sources of information and the learning and educational model to be used and implemented for the course.

The Spanish partner CCMIJU was the leader of this Work Package. After gathering the information, an analysis of the data was done in order to create a VET curriculum that meets the end user's needs, covering the demanded skills and competencies.

Results:

Results obtained from the development of this work package are included into deliverable *D2.1 VET curriculum*. This document includes:

(1) A definition of the content and structure of the course, that is the curriculum of the LapForm course

(2) A specification of the core parameters in the learning services to be developed, also called the 'training model' or 'competence development model'

WP3. Development of the training materials

Considering the results obtained in the two first Work Packages, WP3 developed the materials of the course that meet the formative needs of the European design professionals in the children's' products field.

This Work Package was leaded by CCMIJU in cooperation with IBV, as both are the responsible for the two first workpackages. The contents of the course were generated by CCMIJU, KOMAG, SUT and IBV, including theoretical and practical information. The structure of the course and the associated learning model was supervised by BGU-MURNAU to accomplish the designer competencies resulting from the development of work package 2.

Results:

Results obtained from the development of this work package are included into deliverable *D3.1 Complete materials and contents of the course*. The course is structured in the following way:

LAPAROSCOPIC INTRUMENTS DESIGNERS COURSE

MODULE I – INTRODUCTION TO THE ERGONOMICS

- *Session 1: Ergonomics: concept, fields of application and problems related with the lack of ergonomics.*

MODULE II – FUNDAMENTALS OF THE ERGONOMIC DESIGN

- *Session 1: Anthropometry: introduction, interpretation and use of Anthropometric Data.*
- *Session 2: Anthropometry applied to the ergonomic design.*
- *Session 3: The design considering body dimensions: height, reaches, clearance and spaces of work.*
- *Session 4: The design considering body postures, movements and physical efforts.*

MODULE III – ERGONOMIC DESIGN REQUIREMENTS FOR THE DESIGN OF LAPAROSCOPIC INSTRUMENTS

- *Session 1: The necessity to apply ergonomics to the laparoscopic instruments.*
- *Session 2: Ergonomic aspects to consider related with the use of the laparoscopic instruments.*
- *Session 3: Ergonomic criteria to consider in the design of instruments.*

MODULE IV – TOOLS FOR THE INTEGRATION OF ERGONOMICS IN THE DESIGN OF LAPAROSCOPIC INSTRUMENTS

- *Session 1: Ergonomics and products development, and innovation.*
- *Session 2: User needs detection.*
- *Session 3: Simulation of the use by means of CAD tools (human modelling software).*
- *Session 4: Evaluation methods for the validation of prototypes: observational methods and instrumental techniques (goniometry, EMG…).*

LAPAROSCOPIC SURGEONS COURSE

MODULE I – INTRODUCTION TO THE ERGONOMICS

- *Session 1: Ergonomics: concept, fields of application in surgery and problems related with the lack of ergonomics.*
- *Session 2: Ergonomics studies and technologies in laparoscopic surgery.*

MODULE II – USE OF LAPAROSCOPIC INSTRUMENTS

- *Session 1: Laparoscopic surgical instruments.*
- *Session 2: Instrument handling and ergonomic solutions*
- *Session 3: New surgical approaches and specific instruments design*

MODULE III – OPERATING ROOM POSITION AND SETTING OF EQUIPMENT

- *Session 1: Environmental conditions*
- *Session 2: Innovative solutions and accessories*

MODULE IV – OTHER ERGONOMICS ASPECTS

- *Session 1: Cognitive ergonomics*
- *Session 2: Workflow and surgical team*

MODULE V – GENERAL ERGONOMICS RECOMMENDATIONS

- *Session 1: General aspects and upper-body recommendations*

WP4. Multilanguage e-learning platform

The objective was to transform the materials developed in WP3 into a working prototype of the e-learning course in the 4 languages defined (English, German, Spanish and Polish).

The different tasks performed where the configuration of the e-learning platform, the translation to the national languages and to upload of the contents to the e-learning platform and creation of the LapForm course

WP5. Pilot course conduction and validation

The main objective of conducting a pilot course was to test and analyse the performance achieved with the new e-learning course and propose improvements to maximize its adequacy to satisfy the needs detected.

The performance of the work package was divided in three phases, the course preparation, the course development and the result analysis.

Each of the members of the consortium informed about the pilot course by their means, as well as using the normal communication system of the project. We obtained an important response from the stakeholders, which high interest in the contents of the course.

The project members where all involved and served as interlocutors with the participants of the course, solving technical and content issues that might arise.

The participants of the course had to fill in questionnaires which gave us feedback about different aspects of the course which were later compiled and revised, to improve the final version of the course. The participants received a certificate of participation.

Results:

Results obtained from the validation of the course are included into deliverable *D5.1 Pilot test report*. This document includes:

- Opinion and assessment of the course by potential users
- Detection of aspect to be improved, regarding technical contents, graphical design, aesthetic appealing and level of comprehension
- Test of the information channels, protocols established and roles defined for the future exploitation of the course

WP6. Dissemination of the LapForm course

The objective of the Dissemination Plan was to identify and organize the activities to be performed in order to promote the commercial exploitation of the project's results and the widest dissemination of knowledge from the project.

SECLA is the leader of the activities which main purpose is to raise awareness of the project in order to make LapForm a successful and sustainable project. This is being carried out from the beginning of the project by using various communication materials, such as a web site, newsletters and leaflets but also by face to face information at conferences, workshops and events. The information will also meet the general public through media coverage.

All members of the consortium are contributing to the dissemination by participating and giving presentations at conferences, publishing papers and similar activities.

Several activities have been done preceded by a Dissemination Plan:

- A LapForm logo was created and it is being included in the all communications with the Leonardo official logo.
- Creation of the public website with a private access for partners to the internal platform.
- Creation of leaflets of the project to disseminate.
- Creation of newsletter in order to communicate to interested stakeholders.
- Dissemination and communication activities during fairs, exhibitions and workshops.

WP7. Exploitation Activities

Exploitation activities help to sustain the project results once it is concluded. Its current importance is the need to ensure the correct implementation of the project results efficiently in the market so it reaches the targeted audience.

CCMIJU is leading this Work Package, which began with a stakeholder register to be used in the dissemination activities and the pilot implementation. The consortium signed an agreement on how to develop the exploitation strategy and to deal with the IPR of the results.

WP8. Quality plan

The objective was to provide a sound framework to assure the quality and adequacy to objectives set of the project outcomes through both internal and external evaluations as a continuous process along the entire project.

The responsible of this Work Package was IBV, and the tasks done were based on internal and external evaluations to assure the correct development of the project.

One of the tasks is the conduction a periodic internal evaluations with questionnaires to the partners in order to determine their feelings about the progress of the project. The other one is an external peer review done to assure the excellence in the completion of the deliverables.

WP9. Project management

The objective of this workpackage was to assure an adequate deployment of project activities and the achievement of objectives set within the timescale and resources planned.

The responsible of this work package is IBV, and with the collaboration of all partners involved in the project, has produced deliverables that contribute to the correct functioning of the project; the steering committee regular meetings, the financial reporting and the Mid Report.

4. Partnerships

The partnership counts with all the required expertise to implement this project. The consortium has partners with a great pedagogical experience in development and evaluation of methodologies for training and there are partners with a large experience in Occupational Safety in the laparoscopic surgery sector and, directly, involved in vocation training in that industry. Their roles in the project are directly related with their expertise.

Partners involved in the project proved to have strong relationships with some Universities, in the business world at their regions, as well as with Local and Regional Authorities. This contact network developed by each partner will be very important for the dissemination and exploitation of the results.

Each partner will set up a project team for supporting the activities assigned to them. It should correspond to a flexible, effective and efficient structure, which will ensure close communication.

All partners have the necessary skills, knowledge, expertise and experience in the field of transnational cooperation. Some of them are very experienced in coordinating/participating in European projects.

The partners involved in this project are presented below:

Instituto de Biomecánica de Valencia - SPAIN

IBV is a Technological Centre whose aim is the promotion and practice of scientific research, technological development, technical assessment and training in Biomechanics. Engineers, medical doctors, physical therapists, biologists, informatics, and experts in training, design and social work compose its interdisciplinary staff, with large experience in European, national and regional projects.

IBV, in addition to project management, will focus its work on detecting formative needs of laparoscopic surgeons and laparoscopic instruments designers, as well as on the development of formative materials for designers, due to its expertise in ergonomic design and product development.

Minimally Invasive Surgery Centre Jesús Usón - SPAIN

The Jesús Usón Minimally Invasive Surgery Centre, CCMIJU, is a multidisciplinary institution dedicated to excellence in research and training in minimally invasive surgical. Thanks to the available facilities and equipment, it is possible to develop less invasive surgical treatments by applying combined techniques and multidisciplinary equipment for treatment approach, thus benefiting the patient and providing higher precision to the surgeon. Similarly, the Centre is committed to technological development and innovation in health care, and for its advancement, it works closely with companies from all over the world.

Due to its proximity to laparoscopic surgeons and its expertise in professional training, CCMIJU will lead the development of formative materials, focusing on laparoscopic surgeons. In addition, CCMIJU will lead dissemination activities together with SECLA.

Instytut Techniki Gorniczej KOMAG - POLAND

KOMAG is a state-owned research and development organization, subordinated to and supervised by the Ministry of Economy, employing 125 scientific research and technical specialists (total 225 employees), offering new, competitive technical solutions in the branch of mechanical systems. An interdisciplinary knowledge of KOMAG specialists, their high scientific, research and technical qualifications create a significant potential, enabling to develop the best-advanced technologies.

Its efforts will be addressed to support the consortium in the development of formative contents, in matters specially related to workplace ergonomics through the conception of virtual prototyping.

Silesian University of Technology. Faculty of Organization and Management - POLAND

The Faculty of Organization and Management is an entity of the Silesian University of Technology (1935 employed researchers), one of the largest higher education institutions in Poland having long scientific and didactic traditions. It is one of the leading scientific entities located in the region of Upper Silesia. Their activities are focused on enhancing work conditions and ergonomics in health care.

SUT will cooperate in supporting the consortium and developing material, in matters specially related to multimedia, interactive information and training materials. Spatial models for presentation of surgery. Analyses of surgeon's postures during surgery based on input data from motion capture.

Institute of Biomechanics, Trauma Center Murnau and Paracelsus Private Medical University Salzburg - GERMANY

The Institute of Biomechanics Murnau is a research institute for orthopaedic disorders. Key activities are biomechanical research, product development, clinical research, training and education, and gait analysis. The research institute is associated to the Trauma Center Murnau, which is known for their expertise in trauma surgery. The primary research focus is mechanical testing and numerical evaluation of the interaction between implants and biological tissues in order to improve osteosynthesis techniques.

BGU-MURNAU will collaborate in all work packages, being its main role is the assessment of the course, from the beginning to the validation of the pilot course, because previous experience in the field as well as for representing both profiles of the LapForm target groups.

Sociedad Española de Cirugía Laparoscópica y Robótica - SPAIN

The Spanish Society of Laparoscopic Surgery and Robotic (in Spanish SECLA –Sociedad Española de Cirugía Laparoscópica y Robótica-) was founded in 2000. Its main purpose was to bring together in one organism the different surgical specialties that have in common the use of endoscopic approach as surgical instrument. These specialties include General Surgery, Gastroenterology, Gynecology, Obstetrics, Urology, Pediatric Surgery, Thoracic Surgery, Vascular Surgery, Neurosurgery, and Traumatology, among others.

SECLA will have presence in the definition of VET curriculum and recruitment of trainees for the international pilot course. However, their main role will be to participate in the Dissemination Committee. They will be responsible of WP6 (Dissemination manager), together with CCMIJU, because the professionals they represent, and the European networks for dissemination, as well as participation in workshops.

5. Plans for the Future

LapForm Consortium will continue to provide online access to high quality proven materials and resources to support current and future training programmes around Europe.

Once the project has finished, the next step is the dissemination and exploitation of the final results. To do this, a specific dissemination and exploitation plan has been elaborated, including an Exploitation Agreement signed by all partners.

- The exploitation models identified for LapForm can be divided into two categories. First, we distinguish a "**non-commercial exploitation**". This model provides indirect benefits to the partners as it is seen as an opportunity to develop activities that are linked with the main topics of LapForm (workplace ergonomics, participatory ergonomics, personal abilities and skills, etc.) and especially to marketing purposes in order to promote the commercial version.
- Secondly, we distinguish "**commercial exploitation**". Our commercial proposal offers paid services for stakeholders which are interested in the contents of LapForm. To do this we have developed a modular structure in each course version, in order that the potential clients can choose between the full course and a "tailor-made" training process that combines several modules of the standard course and also additional services (e.g.: in person training, ergonomics assessments, additional modules, etc.) as may be required by the potential customers.

The fundamental aspects models of exploitation included in this document are the following:

Type	Model	Description
Non-commercial	1. LapForm Diffusion	Basic information and structure of the courses.
Commercial	2. Standard courses	Complete LapForm online courses (4 versions: English, Spanish, Polish and German
	3. Customized courses	LapForm courses adapted to the need of the customer and with additional features.

6. Contribution to EU policies

LapForm promoted and gave awareness in the importance of cultural and specially, linguistic diversity within Europe, since the project and the training contents have been developed and validated in 4 different languages in order to achieve the maximum impact among target groups. LapForm courses have been implemented on a tele-pedagogic platform which accessibility is rated "AA" by the W3C (specialised organisation in certifying websites' accessibility, www.w3.org). Moreover, the training program and materials have been developed under accessibility criteria for motor, speech and auditory impaired persons. This way, LapForm project encourages the integration and equal opportunities.

Addressing Education and Training 2020 Work Programme, a skilled workforce is an essential asset to develop a competitive, sustainable and innovative economy in line with Europe 2020 goals. LapForm project complies perfectly with different European policies. It follows in fact the Lisbon Strategy/Bologna Process according to the following points:

- Improving competitiveness of SME's: Prague Communiqué (2001): "Lifelong learning is an essential element of the European Higher Education Area. In the future Europe, built upon a knowledge-based society and economy, lifelong learning strategies are necessary to face the challenges of competitiveness and the use of new technologies and to improve social cohesion, equal opportunities and the quality of life".

http://www.bologna-berlin2003.de/pdf/Prague_communiquTheta.pdf

This has been one of the objectives of the project. A better knowledge of how designing more accurate products, the companies can better reach their customers and give benefits increasing the final sales.

- Promoting diversity of language in an Open Learning Environment: All the training materials are available in different languages, and all the dissemination and communication materials have been translated into the language of each partner's country. Also, the web course is addressed to people of different range of age and experience and the result will be an instrument easily achievable practically and economically, and affordable for all SMEs, employers and students.

- Improving digital competencies and learning systems: Bergen Communiqué (2005) states "time is needed to optimise the impact of structural change on curricula and thus to ensure the introduction of the innovative teaching and learning processes that Europe needs."

http://www.bologna-bergen2005.no/Docs/00 Main_doc/050520_Bergen_Communique.pdf

The tool generated by the project is a modern digital based course, accessible by all with a constant tutorial support in each country.

- Inter-institutional cooperation: Bologna Declaration (1999) "Promotion of the necessary European dimensions in higher education, particularly with regards to curricular development, inter-institutional co-operation, mobility schemes and integrated programmes of study, training and research"

http://ec.europa.eu/education/policies/educ/bologna/bologna.pdf

LapForm project would not be possible without the integration, in a balanced way, of companies associations of the sector, training higher Institutions with curricula in the sector and technical developers and consultants. All the members of the consortium, coming from various European countries (Spain, Germany and Poland) give also to the project an interesting transnational point of view of the industry and the sector.