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Peer Learning Scenarios on Footwear Computer Aided Design

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1. Executive Summary

The INGA 3D project aims to transfer and extend innovative software solutions and 3D technologies for computer-aided footwear design. This will be achieved through four complementary activities:

- by transferring the innovation from Spain to other countries, namely Romania, Portugal, and UK;
- by developing skills and competencies in 3D footwear computer-aided design in VET professionals (teachers, trainers and tutors) so that they can teach ICT based technical courses that support creativity and innovation among their own VET students/trainees;
- by developing new training content and supportive e-learning tools based on units of learning outcomes and competencies. This will ensure effective assessment, evaluation and validation;
- by setting up an Online Learning Platform.

The project brings together universities, research and training centres, adult education providers and IT companies. The consortium has partners with great pedagogical experience in development and evaluation of methodologies for education and technical vocational training. Also, there are partners with experience in vocational training, and research and development for the footwear industry.

The project products will introduce innovative solutions for e- learning in order to test and to validate new teaching methodologies and approaches suitable for vocational training in footwear computer-aided design. The online platform will integrate various flexible learning scenarios and supportive tools for learning. The new training content and its supportive guide will be designed, developed, tested and evaluated in line with the best practices identified by partners in their institutions, countries and elsewhere in Europe. It will contribute to developing skills and competencies of VET professionals in order to face with the future challenges.

This publication is the deliverable of the WP3 - Peer learning scenarios on Footwear Computer Aided Design. The main goal of this WP was to handle the full analysis of the mix of skills and competencies to be acquired by VET professionals in order to perform teaching/training activities in footwear CAD by matching up to the existing best practice in teaching/training courses in each participating country and in Europe. Apart from the first contact with the target group, this WP allowed to:

- Collect the views of the VET professionals on the usage of software solutions for 3D Footwear CAD in teaching, and to measure their expectations related to introducing new ICT based training tools in their everyday activities in class;
- Determine opportunities related to introducing/enlarging in VET institutions the new CAD courses that will foster innovation and creativity among the next generation of students/trainees;

- Analyze the user profile and learning needs of VET professionals in order to support their personal career development by acquiring skills and competencies for teaching/training activities on 3D Footwear CAD;
- Set up the functionalities of INGA- Online Learning Platform for 3D Footwear Computer Aided Design, where VET professionals will share their experiences and practices, will find topics and resources for class activities with their students/ pupils/trainees.

The integrated report was prepared in several stages:

- Defining the report structure, methodology and guidelines;
- Organizing data collection through desk and field research;
- Collecting data and formulating the national reports;
- Analysing the national reports and establishing the further steps of the INGA 3D project development;
- Cross referring and integration of the findings from national reports into the final report.

Partners prepared contact databases with national bodies/authorities, universities, VET schools and centres, professional organisations/associations, other relevant educational institutions, and enterprises and performed an analysis of the current situation in

their countries and in the neighbouring regions. The findings of national teams were presented as reports describing the status in partner countries. These reports gathered the experts' opinions acquired through questionnaires and semi structured interviews. The cross referred report allowed for expanding its conclusions to training needs of VET professionals in order to support their personal career development by acquiring skills and competencies for teaching/training activities on 3D Footwear CAD.

The INGA 3D training content, its supportive guide as well as the online learning platform will be designed, developed, tested and evaluated in line with the best practices identified by partners in their institutions, countries and elsewhere in Europe. Following the experts' opinion, the new training course on 3D Footwear Computer Aided Design is found to be beneficial for VET schools, colleges and training centres in partner countries as well for footwear companies.

2. Analysis of existing best practices in teaching/training courses on footwear computer aided design

This research aimed to be national and it contains mainly data based on the experience of the partner's organisations. In addition, the research was extended by taking into consideration international experience from countries outside the consortium that was identified as being valuable for INGA 3D project. The methodology is based on **desk research**. The partners searched for information and they collected data using existing resources at organizational, national, EU, worldwide levels, such as: Web resources; Articles (or other publications); Textbooks; Documents from the Government and relevant National Authorities, universities and research organizations, VET schools and training centre, other industrial sources. The partners will cover their national sources.

The identification of projects and initiatives focused on Computer Aided Design gathered data on: project/initiative name, objectives, funding organisation, contact, leader/director/manager main responsible person, web site, other relevant information. Three distinctive directions were considered:

- Projects and initiatives from footwear sectors that could be used as example of good practice for developing e-learning or/and CAD training content, research projects for footwear CAD.
- Projects and initiatives from other sectors (textile, clothing, automotive industry, furniture, etc.) that could be used as example of good practice for developing e-learning or/and CAD training content.
- Examples of videos/tutorials for teaching CAD systems

The best practice in using Icad3D+ software for footwear industry revealed the structure of the training courses provided by partners INESCOP and RED 21. The existing learning contents for footwear CAD was gathered and analysed in two categories:

- Training courses on Footwear CAD among national/European learning providers
- Teaching subjects on Footwear CAD, which are part of the curriculum of full study or training program among national/European learning providers

For each training course or teaching subject, the information gathered for further development of the INGA project, was:

- Name of the training course / teaching subject
- Learning provider (school, training centre, university etc.)

- Level of the training course/ Qualification
- ECST credits (for higher education/tertiary level) (if any reference is available)
- Duration (hours/ weeks/years)
- Accessing requirements (if any)
- Detailed learning content (curriculum), including the number of hours per subject/module

2.1 Spain

According to the analysis made in Spain about development and use of 3D tools for footwear industry, it can be concluded that:

- According to data of the partnership contract, specific 3D Icad software, currently there are 220 installations, as well as 248 installations with 2D software in Spanish companies. Some of these companies may have both systems.
- Although the existence of other tools from other suppliers of specific software for the Spanish footwear market is known, the number of these installations is unknown.

The analysis carried out in Spain on the development and use of 3D tools for footwear industry, reveals that:

- Generally the training programs are product design-oriented; the existing ones are very basic, showing only the idea of how the shoe would be. There are still small businesses, which still use the traditional way of pattern making.
- Teachers tend to be professionals and freelance shoe designers with experience in footwear production; sometimes they have their own brand or work for reputable companies. They have good knowledge of artisan work, some from different specializations (product, jewellery, fashion accessories, leather goods). They may have technical knowledge and use 2D programs but are not trained in 3D software.
- Big brands are already working with 3D and 2D tools (Zara / Magrit / Pikolinos / Callaghan / Santiago Pons Quintana). Normally, there are two professional profiles: the person who designs and captures the idea and the other that runs it, so it is necessary to develop the skills of each profile to streamline communication and improve every phase of the process. Both professionals should have knowledge of materials, aesthetic and production processes of footwear.

2.2 Portugal

The main organization offering certified VET courses in the footwear industry is **CFPIC - Professional Training Centre for the Footwear Industry**. Also **CTCP –**

Portuguese Footwear Technology Centre offers specialized short duration training courses mainly oriented to staff and workers of the footwear industry (including footwear, leather goods, and components, among others). These are Certified Module Training. These courses are address to adults (< 18 years old) with qualifications of level II (> ninth grade) and level III (> twelfth grade). In the field of Technology of Processes and Products and related to CAD/CAM, the Certified Modules available are the same presented above as Teaching Subjects included in the curriculum of training programs proposed by CFPIC, as follows:

- 2D CAD - technical documentation / datasheets (25h)
- CAD 2D - extraction, grading and export of patterns for automatic cutting (50h)
- CAD 2D – personalization of desktop and digitalization of Base Plan (50h)
- Computer-Aided Design CAD 3D - Footwear models (50h)
- Pattern cutting of different shoe models - 2D CAD (50h)
- MindCAD is the most used software, but there are others like Teso, Caligula, Crespim that are also commonly used by Portuguese companies. It was not possible to access the contents of the existing Footwear CAD training programmes targeting VET professionals. This happens because the training is directly performed by the CAD software development companies and there are no manuals available.

2.3 UK

In relation to footwear design in the UK, de Montford University in Leicester and University of the Arts and Design in London provide training in CAD. In addition, there are two manufacturers of CAD/ CAM who provide training (Delcam and Shoemaster).

In relation to specialist orthopaedic footwear manufacture there are currently 18 companies who supply the National Health Service, private health organisations and individuals. Some of these are general "orthotic' companies and some are focussed purely on footwear. Some provide their 'goods' to Orthotic Services within the Health Service whilst some provide the service element also. These companies manufacture either off the shelf 'stock' footwear or complex bespoke or both. The training of technicians in these companies tends to be in-house with 2 companies linking with Further education establishments for National Vocational Qualifications (though led in-house not by the awarding institution). Some of the in-house training is led by orthotists (Orthotists are trained at one of the two Universities (university of Salford and the University of Strathclyde) that provide a BSC (hons) course in Prosthetics and Orthotics. There is one company (Algeos) who supplies the specialist footwear trade with materials and equipment and they provide training (one day events) in CAD/CAM.

INGA3D project rises up several challenges:

1. Does a lack of reply = lack of interest? Or misunderstanding of what CAD offers = we have a sales task initially

2. To whom is CAD useful, how is it useful to them, what are ST, MT, LT added value to them, what does CAD not do...

3. Very varied scope, size and nature of Footwear businesses in the UK (1 person to few 100's), some very craft based, highly bespoke, direct to HCP, direct to consumers. Strong cross over with retail/health care services

4. Very polarized views – some strong opposition to CAD, some recognise its value but need to better understand investment, or have other parts of their business prepared

5. Education and Training – it is needed, current solutions are small scale and localised actions within individual companies

6. Need to transfer skills base is widely recognised but NO national footwear hub (e.g. College of Technicians), and CAD not seen as part of the solution (does it make a solution easier to access/deliver?)

7. Issue re place of Training in HE or FE – but prefer to offer continuum of education via HE.

2.4 Romania

A survey conducted by the Romanian Institute for Evaluation and Strategy (IRES) revealed that the Romanian education system focuses too much on providing

information and too little on developing skills and competencies and it emphasizes the necessity of re-valorising vocational education and training by re-establishment of VET schools, especially for the economical sectors that bring important contributions to the national economical growth (Source: http://www.asociatia-profesorilor.ro/invatamantul-profesional-din-romania-un-nou-inceput.html). In Romania the reality of the last 2-3 years has demonstrated that the actual rate of passing the national Baccalaureate exam by high school graduates is low. Also, not all graduates from secondary schools follow up a tertiary level study program. On the other hand, employers require prospective employees with obvious professional competencies, not just having a theoretical knowledge base and generic skills. Working with CAD systems for producing designs and patterns is a competence highly demanded by Romanian footwear producers. The VET schools that have classes for Footwear Designers/Footwear Technicians/ Workers for footwear and leather industry cannot provide graduates having CAD skills and competencies to the level required by employers. And the main cause is the lack of competencies in teaching Footwear CAD among VET professionals.

One major issues of the footwear industry at the moment is that **the overall level of skills acquired by graduates needs rising**. Therefore, it is necessary to RE-DESIGN the educational programs as an integrated SYSTEM, from the secondary level to the tertiary level by:

- Performing in-depth and critical analysis of the national curricula and adapting it to the requests of the national labour market for footwear CAD technicians;

- Developing footwear CAD skills and competences by introducing dedicated software in VET schools. Even if the hereby-analyzed study curricula is addressed to level 5 (EQF), the learners acquire only basic knowledge in CAD skills as the main software used in schools is AUTOCAD. A designer working with CAD systems in a footwear company should have new skills and competences in using various software solutions;

- Re-designing the curricula based on units of competences and equivalent transferable credits according to ECVET system;

In Romania there are no public educational providers for short training courses in Footwear CAD. The software developers active in Romania, such as Delcam (UK) and Mind (Portugal) offer initial training courses to footwear companies that purchase their software solutions. These courses are certified by the company itself, but they are not certified by a national authority/body or education provider. Moreover, this initial training does not meet the pedagogical needs and the technical requirements of the VET system. However, three training providers are registered on the National Registry of Providers of Adult Training (*http://www.anc.edu.ro/index.php?page=rnffpa*) for *CAD Technician* (COR 3122.3.5), and other three providers for Technician in leather industry (COR 3161.3.5 or COR 3119.1.1). By reviewing the available curricula of the training programs for *Technician in leather industry*, for example, it can be noticed that the CAD topics/ subjects are relatively small represented.

In Romania, the National Occupational Standard- COR does not include any qualification for Footwear Computer Aided Designer. Post secondary pre-university

formal education **has two study programs for NQF level 3 of qualification (EQF level 5): Technician for footwear/leather industry (COR code 3161.3.5.) and Designer – leather products pattern maker (COR code 3161.3.2.)**. The study curriculum covers 2 years; it contains 30% general subjects and 70% specific technological subjects. On the other hand, 50% of the teaching of technical subjects is theoretical and 50% is practical. Some units (subjects) are common for both qualifications, and some units are different. VET high schools, which are running these study programs for footwear sector have ICT/CAD based content in their curriculum, but it is designed for covering the basic ICT/CAD literacy skill set. Working with CAD/CAM technologies belongs to the second ICT skill set, which is represented by the occupationally specific ICT literacy skills. From this perspective, the VET national curricula are very poorly covered. Corresponding to Footwear CAD topics, several observations could be made:

- The number of hours for the topic of Information Communication Technology (ICT) is higher in case of Technician qualification and lower in case of Designer qualification. Also, the number of hours for this module is the same with the number of hours for the CAD module. In our opinion, the number of hours should be significantly different as this topic should allow for developing skills at higher level by using dedicated CAD/CAM software for footwear.

- The topic of Computer Aided Design is placed in the second year, 120 hours for technicians and 60 hours for designers. Analysing the everyday activities/tasks undertaken by the employees having these jobs in footwear (or leather goods)

companies, the given number of teaching hours should be higher in the case of designers and smaller in the case of technicians.

- The national curriculum includes only the teaching hours conducted in class. Hours for individual study (projects, homework etc.) are not taken into consideration.
- As the ECVET system is under development in Romania, there are no ECVET points allocated to each module/unit.

The undergraduate and postgraduate study programs for tertiary education in the area of footwear design and technology are provided by 'Gheorghe Asachi' Technical University of Iasi. The curricula of these programs include subjects on footwear CAD, starting from basic skills gained from working with AUTOCAD to more advanced approaches that are given by using dedicated footwear CAD software (Delcam Crispin and MIND).

Romania is facing the issue of not having trainers/teachers/tutors for footwear CAD. For several years, the footwear sector (regardless if it is fashion, mass production or orthopaedic/customized footwear production) doesn't attract the young generation to become trainers or teachers. This situation is not common for our sector only, but in general for engineering and other manufacturing sectors as well. On the other hand, the lack of these professionals means that there will be a lack of qualified employees in design and product development departments.

In Romania, the teaching resources available in the area of footwear CAD (books, guides and tools for teachers, tutorials etc.) are lacking. Most of these existing

resources (on the Internet, published textbooks) are mainly in English. Linguistic barriers on technical terms stop many teachers/trainers/tutors to introduce these novelties in their lectures or training content. Furthermore, assessing the web sites of the main European or worldwide training/education providers (schools, universities, research or training centres) for footwear industry, it is clear that there are relatively few online training programmes. Also, there is a lack of tangible outcomes on footwear CAD ready to be transformed into a training tool that incorporates high quality pedagogic approach and methodology.

3. Analysis and description of the user profile in terms of skills and competencies to be acquired by VET professionals in order to perform teaching/training activities in footwear computer aided design

INGA 3D project defined the user profile in terms of skills and competencies to be acquired by VET professionals in order to perform teaching/training activities in Footwear CAD by adopting following methodology:

- Literature review on peer learning and peer teaching concepts
- Desk research on the Skills and Competences acquired by learners as they are described by the available training courses and study programs related to Footwear CAD among national, European and world-wide learning providers. For each training course or teaching subject, the necessary information for further development of the INGA project was:
    - Training course/ teaching subject
    - Learning provider (school, training centre, university etc.)

- Acquired skills and competences
- CAD Tools (what software tool is used for teaching, if info is available)
- Teacher/Trainer's profile (short description of the skills/competences/ qualification of the persons who are teaching CAD related subjects)

- Field research consisting in Questionnaires followed by Interviews based on semi-structured questionnaires applied to VET professionals (teachers, tutors, trainers), as well as to other experts, stakeholders or local/national authorities involved in footwear industry.
- Competence mapping and designing the matrices of skills to be acquired by VET professionals in order to perform teaching/training activities in Footwear CAD.

3.1 Peer learning and peer teaching strategies

The dynamics of economic, social and information changes that occur in the XXI century requires for rethinking the entire education policy. In this context, traditional human communication was replaced by virtual communication, with all its advantages and disadvantages. It is known that people from increasingly younger age communicate, negotiate, and socializes online easier than face to face. In this environment, knowledge spreads more rapidly and the feedback is a click away. Existing online communication systems have created a new kind of teenager; this fact requires a deep rethinking of the entire educational system based on

collaborative learning - peer learning. Peer learning involves combined teaching/ assessment strategies, application of group management strategies and diversification of evaluation techniques targeted on students required skills and competencies (figure bellow). While lecture attendance is one of the most passive forms of learning, participation and dialogue among students/learners constitutes one of the most active forms. Furthermore, peer teaching can enhance student competitiveness in the classroom, thus increasing cooperation and participation.

Due to its specificity, the technical education system can easily adopt a new educational strategy based on pear learning and face-to-face learning principles. In practice, “Blended Learning” is more suitable for higher technical education. Blended learning involves a combined approach in which classic face-to-face teaching tools (professor-student) are supplemented with the possibility of accessing e-learning platforms and various peer learning strategies (Ruiz et all, 2006). The main goal is to improve teaching and learning by rapid exchange of experiences and ideas through work groups, or following the direct feedback from the discussions between the work groups.

‘Peer education’ also requires ‘peer teaching’ and ‘peer learning’. Both have their own implementation strategies and models that can be customised depending on the existing situation (targeted group, field of activity, education system).

“Peer learning” encompasses several teaching and learning practices. “Peer tutoring,” “peer instruction,” “cooperative or collaborative learning” (group work), and “peer editing” are some of the terms referenced in discussions concerning pedagogy. Some

practices, such as peer tutoring, fall into the category of peer learning but most occur in contexts other than the classroom. Online peer learning can occur through discussion boards, blogs, and wikis rather than face-to-face.

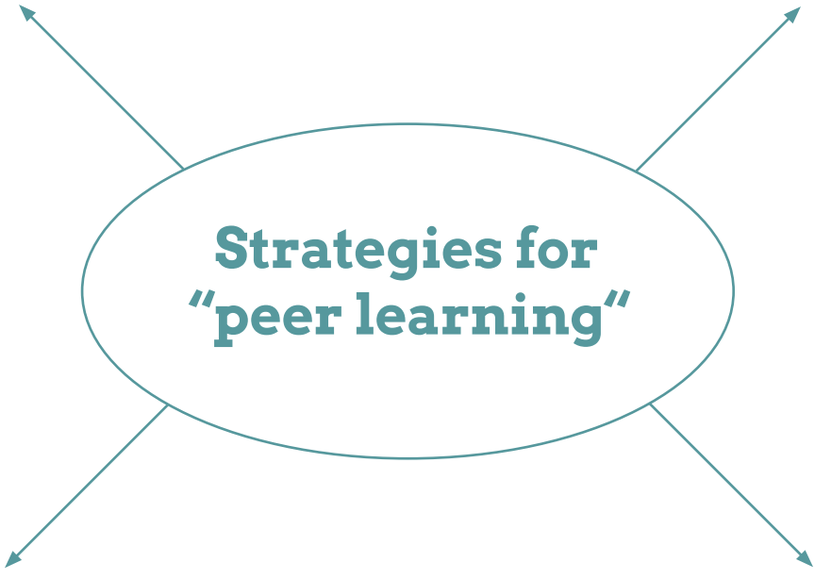
"Peer learning" is a form of cooperative learning that enhances the value of student-student interaction and results in various advantageous learning outcomes. "Peer learning", construed as a "two-way reciprocal learning activity" (Boud et al., 2001), refers to networks of learning relationships, among students and significant others. Also, it could be defined as a method by which one student instructs another student on topics on which the first is an expert and the second is a novice.

A necessary feature of "peer learning" is its reciprocity. Peers can and do learn from each other. Teachers/trainers/tutors also learn with and from learners, through such processes as "learning through teaching". Being challenged, they become aware of new literature and resources, joint investigation and through exposure to new information. In some fields of science the prime research output is from the work with students and the research performance of academics is fundamentally dependent on that of students. There is a symbiotic and co-productive relationship that can be construed on one level as one between peers, although this assertion must be tempered with due attention to the differential relations of power, authority and expertise (Boud & Lee, 2005).

To facilitate successful "peer learning", teachers may choose from an array of strategies (http://www.cdtl.nus.edu.sg/success/sl37.htm). The methods applied to peer education vary considerably. Some forms of peer education apply very similar methods to formal

Buzz Groups: a large group of students is subdivided into smaller groups of 4–5 students to consider the issues surrounding a problem. After about 20 minutes of discussion, one member of each sub-group presents the findings of the sub-group to the whole group.

Affinity Groups: Groups of 4–5 students are each assigned particular tasks to work on outside of formal contact time. At the next formal meeting with the teacher, the sub-group, or a group representative, presents the sub-group's findings to the whole tutorial group.



Solution and Critic Groups: One sub-group is assigned a discussion topic for a tutorial and the other groups constitute 'critics' who observe, offer comments and evaluate the sub-group's presentation.

'Teach-Write-Discuss': At the end of a unit of instruction, students have to answer short questions and justify their answers. After working on the questions individually, students compare their answers with each other's. A whole-class discussion subsequently examines the array of answers that still seem justifiable and the reasons for their validity.

Source: Christudason A , Peer Learning , available at http://www.cdtl.nus.edu.sg/success/sl37.htm

tutoring, such as whole class teaching in schools or group discussion in youth centres. Other methods include very informal tutoring in unstructured settings, one-to-one discussions and counselling.

Critique sessions, role-play, debates, case studies and integrated projects are other exciting and effective teaching strategies that stir students' enthusiasm and encourage peer learning. Students thus have different opportunities to experience in a reasonably "safe" and unconstrained context (while perhaps being evaluated by another group and/or teacher), reactions to complex and "real" problems they may face later in their careers.

In higher education, for example, peer group learning (Collier, 1983), collaborative learning (Bruffee, 1999), cooperative learning (Mills & Cottell, 1998) and peer tutoring (Falchikov, 2001) all cover the idea that in undergraduate education there is considerable educational advantage in students working with each other, often apart from teachers, to teach and to learn from each other (Boud & Lee, 2005).

The methods adopted depend to some extent on the intended outcomes of the project, whether it be passing on information, behaviour change, skills development or community development. Methods also seem to be selected because they fit well with the context or culture of the target group. Some projects include a variety of methods, whilst others keep to one method (Turner & Shepherd, 1999).

The major advantage of "peer education" system is to develop transversal skills: team working, communication, solving problems. "Peer learning" involves **formal,**

structured and also informal practices, events and relationships that make up a complex pedagogical environment. **"Peer learning" is optimized when it is incorporated as an integral component of a curriculum**, paying special attention to (*http://www.cdtl.nus.edu.sg/success/sl13.htm*):

- **Creating a conductive learning environment**. Students must build mutual respect, trust and confidence, so that they "feel free to express opinions, test ideas, and ask for, or offer help when it is needed" (Smith, 1983). Peer learning can be further enhanced if the "environment of mutual help... continues over time and beyond the classroom" (Boud, 2001). Thus, students are individually and collectively accountable for optimising their own learning and achievements.
- **Learning in small collaborative groups**. Many of the key elements for effective "peer learning" are often incorporated in the design of small collaborative learning groups, and "research shows that students who engage in collaborative learning and group study perform better academically, persist longer, feel better about the educational experience, and have enhanced self-esteem" (Landis, 2000). Furthermore, "the peer support... is powerful psychological ballast to critical thinking efforts" (Brookfield, 1987).

"Peer teaching" is a complex process by which students learn from students that are more experienced and knowledgeable about specific topics (Tennessee Teaching and Learning Centre, *http://tenntlc.utk.edu/files/2010/12/HowToPeerTeachingFinal1.pdf*). According with the hereby-referred source, five models that can be implemented in a variety of class sizes and subjects may be considered:

- **Discussion Groups** – Teaching assistants lead seminar-style sessions for other students. This model is most beneficial in very large classes, as it provides a link between the many students in the class and the professor. Graduate teaching assistants are typically used in this case.

- **The Proctor Model** – Students serve as a liaison between professor and other students (by communicating the work progress and problems in understanding material), as well as an experienced guide to the students/learners with whom they are working.

- **Student Learning Groups** – Students work in self-guided groups in order to foster peer learning. Students in learning groups have been found not only assist those at different levels of ability, but also to hold peers accountable for readings and other assignments.

- **Media-Activated Learning Groups** – Very similar to traditional student learning groups, MALGs place students into groups, but work through the learning process with materials provided by the instructor, including audio-visual aids, presentations, and other media tools to provide structure to the process.

- **Student Counselling Model** – Here, peers serve first as a counsellor or sponsor to incoming freshmen; they help with orienting the student to campus life and helping with day-to-day issues. Later, the student-counsellors assist the younger students with curriculum, tips on note taking, lab work, etc.

Opportunities offered by information technology (e.g. computer programs/databases, Internet facilities) have led to the expansion of online learning. Thus, the "peer learning" which started as an initiative of students/learners to cope with an unsupportive teaching regime, has became increasingly systematized as a pedagogical methodology. It helps teachers/trainers to be learner-centred in classes at a time when this could not be achieved by conventional teaching and training practices. For "peer learning" to be effective, the teacher must ensure that the entire group experiences 'positive interdependence', face-to-face interaction, group processing, and individual and group accountability.

Although "peer learning" strategies are valuable tools for educators to utilise, it is obvious that simply placing learners in groups and telling them to 'work together' is not going to automatically yield results. The teacher/trainer must consciously orchestrate the learning exercise and choose the appropriate vehicle for it.

3.2 Analysis of the user profile based on Questionnaires

Questionnaires were circulated among target groups and stakeholders, including VET professionals (trainers/tutors/teachers), experts, other specialists and practitioners in footwear sector. Also, the partners identified other experts that can have a relevant contribution to the research. During kickoff meeting in Elda/Spain, the partners have proposed to include in the target groups the professionals whose training needs are referring to CAD of customized/orthopaedic footwear and components and

professionals dealing with fashionable footwear. The questionnaire briefly introduced the INGA 3D project and had two parts:

- First part provides data on general expectations of the target group regarding the learning process and use of ICT
- Second part refers to expectations regarding technical aspects of Footwear Computer Aided Design process, such as 3D last design, 3D footwear design, 2D pattern making, grading etc.

3.2.1 Distribution of respondents by countries

Spain. The filled questionnaires were received from 50 specialists from VET schools, enterprises, R&D centre/training institutions and universities and 2 freelance designers/teachers.

Portugal. The questionnaires have been delivered to the main training organizations in the footwear industry (identified in this report). It was possible to collect answers from VET professionals – trainers – working at the Professional Training Centre for the Footwear Industry (CFPIC) and at the Felgueiras Professional School. The results below show a great interest in the type of training promoted by INGA3D project. About 87% of all the answers collected is ‘5’ (the highest value available) which means that the respondents perceive with high expectation all the general and technical aspects related with the training course in Footwear CAD.

UK. The questionnaires were distributed to 17 specialist (orthopaedic) footwear manufacturers, 30 high street specialist suppliers/manufacturers and the 3 higher/ further education universities/colleges that deliver footwear design elements in their fashion courses. They were also sent to Satra, the British Footwear Association and BAPO. Four questionnaires were returned (following email prompts) from three involved in training footwear technicians in specialist (orthopaedic) companies and one high street specialist manufacturer. As detailed in the previous report on the Desk research there are no specific training establishments for the training of VET professionals/trainers, with these four companies training 'inhouse'. From their responses and also from other communications with SkillSet UK (an organization that supports apprenticeship schemes) there is interest in the possibility of utilizing the type of training promoted by INGA3D project. Most of the responses were high (above 3) indicating in these companies that there is recognition of the value of a training course in CAD in the technical aspects in particular.

Romania. The questionnaires have been delivered to persons from footwear companies who are involved in in-situ training of own apprentices, and to teachers from VET schools. 38 entities from the lists 2.3 and 2.4 have been contacted by email. 21 questionnaires have been filled, providing a response rate of 55%. However, the sample is balanced, including respondents from vocational schools and footwear companies.

3.2.2 Results. Discussion and Analysis

The questionnaires were distributed in all partner countries: Romania, Spain, Portugal and UK. The analysis is made for each country and grouped for all four, and figures 5.1-5.5 reflect the results.

3.2.2.1 PART I. GENERAL ASPECTS ON THE TRAINING/TEACHING PROCESS

3.2.2.1.1 To use Information Technology (IT) in my workplace, free time and for communication purposes

This part of the report focuses on general aspects of the training/teaching process. Over 85% of the respondents reported very high level of interest regarding ICT, nearly 52% in Romania, 43% in Portugal, 42% in Spain, 50% in UK and 45% as an average for the four countries, stating ‘to a large extent’.

3.2.2.1.2 To use computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet

3.2.2.1.3 *To pursue and persist in learning, to organize my own learning, including through effective management of time and information, both individually and in groups. Lifelong learning approach*

Whilst 84% of respondents reported the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet, the opinions are consistently with their interest to pursue and persist in learning, to organize their own learning, including through effective management of time and information, both individually and in groups.

3.2.2.1.4 *To acknowledge my personal learning needs*

Nearly 86% of the respondents reported their interest in acknowledging their personal learning needs, thus showing interest in the program. However, the results are different: 52% in Romania, 28% in Spain, and 71% in Portugal and UK reported the opinion ‘to a large extent’.

3.2.2.1.5 *To overcome obstacles, to achieve success in the learning process*

Regarding the determination to overcome obstacles for success in learning 81% are interested in some or in large extent on this topic. The distribution shows about 15% ‘Neutral’ that may prove a limited self confidence in successfully graduate the course, given the nature of the teaching and its content.

3.2.2.1.6 *To turn my ideas into action. I7. To develop my creative thinking*

Nearly 88% of the respondents in all four countries expressed confidence in turning own ideas into action the opinion 'to a large extent' reaching 52% in Romania, 47% in Spain, 86% in Portugal and 49% in UK. In Portugal's case, it seems that this topic presents a great interest among people, because all the answers were 'to some extent' and 'to a large extent'. Similar percentages were also reported regarding the use of creative thinking where as a mean for all four countries, 49% of the respondents reported 'to a large extent', while in case of Portugal, all the respondents, 100%, think that issue is a must.

3.2.2.1.7 *To use innovative solutions*

3.2.2.1.8 *To identify available opportunities for personal, and/or professional activities*

Whilst over 90% of the respondents reported willingness in using innovative solutions, 57% reported it 'to a large extent' and in case of Romania and Portugal, these options were higher, 71%, respectively 100%. This variable appears to have a similar distribution with opportunities identification, 92%. Similar distribution of responses should be expected if we consider that there is a strong link between the perception of innovative solutions and opportunity identification.

3.2.2.1.9 To demonstrate communication skills and capacity to work within a team (designers, sales, management, clients etc.)

92% of the respondents understand that improving their communication skills and capacity to work within a team (designers, sales, management, clients etc.) through ICT is an important aspect in each sector, especially in footwear.

3.2.2.2 PART II - TECHNICAL DIMENSIONS ON FOOTWEAR CAD.

This part of the report focuses on technical aspects of the footwear design process.

3.2.2.2.1 To gain relevant theoretical knowledge on principles and techniques for footwear CAD

In all four countries, 72% of the respondents manifest a high interest for relevant theoretical knowledge on principles and techniques for footwear CAD. In Romania's case, 90% reported it 'to a large extent', in case of Spain – 60%, in Portugal's case – 86% and in UK's case – 75%.

3.2.2.2.2 To understand the main differences and advantages of 2D and 3D footwear CAD systems

This item exhibits respondents' perceptions regarding the understanding of the main differences and advantages of 2D and 3D footwear CAD systems, highlighted by 77% 'to a large extent' responses.

3.2.2.2.3 To import/export various file formats for CAD/CAM systems

3.2.2.2.4 To import lasts in 3D environment

The answers collected show the interest in skills on importing/exporting various file formats for CAD/CAM systems. Whilst 65% of the respondents had chosen ‘to a large extent’, 4% maintained a neutral perspective and 2% were not interested on this topic. Whilst still expressing interest, to import lasts in 3D environment has nearly 73% responding ‘to a large extent’, 23% “to some extent”, 3% ‘neutral’ and only 1% to ‘small extent’. Such values may be attributed to the importance of introducing a last in a 3D environment, in order to design a proper footwear product.

3.2.2.2.5 To prepare and to present in an attractive format new footwear design concepts (collections, models) using 3D CAD software

This item has a great importance for the course as it received nearly 96% of responses ‘to large extent’ and ‘to a very large extent’.

3.2.2.2.6 To interpret, to manipulate and to modify designs using CAD software in accordance with the required design specifications

An even greater interest (nearly 98%) was expressed by respondents in interpreting, manipulating and to modifying designs using CAD software in accordance with the

required design specifications, where “to a very large extent” reached about 79% of responses.

3.2.2.2.7 To simultaneously use the 3D and 2D CAD tools for developing footwear’s uppers and linings. To view/transfer and to control the 3D lines with 2D patterns using CAD software

There is also a strong interest in using the 3D and 2D CAD tools for developing footwear’s uppers and linings, highlighted by 77% ‘to a large extent’ responses.

3.2.2.2.8 To produce footwear virtual prototypes by creating panels, adding texture, stitches and decorative elements

Respondents’ interest in footwear CAD is consistent across the survey, fact proven by reported interest on this topic which received nearly 72% responses ‘to a large extent’.

3.2.2.2.9 To obtain, modify and adjust 2D upper’s patterns with CAD software

The results for this item also suggest a great interest, 76% of the respondents being interested ‘to a very large extent’.

3.2.2.2.10 To lay out the patterns and to estimate specific material consumptions with CAD software

This topic receives a positive perception of nearly 92% “to some extent” and ‘to a large extent’.

3.2.2.2.11 To obtain the footwear sizing series through grading (grading the patterns) with CAD software

Whilst still expressing interest, ‘To obtain the footwear sizing series through grading (grading the patterns) with CAD software’ has 7% responses ‘neutral’ and l% ‘to small extent’.

3.2.2.2.12 To obtain realistic images, panels, boards and technical drawings in order to prepare the collection of models with CAD software

Nearly 97% of the respondents reported their interest in obtaining realistic images, panels, boards and technical drawings in order to prepare the collection of models with CAD software. However, the results are different, 81% in Romania, 63% in Spain, 86% in Portugal and 25% in UK reported their interest ‘to a large extent’.

3.2.2.2.13 To check the final appearance when designing products using CAD systems

However, the respondents would like to check the final appearance when designing products using CAD systems, as nearly 84% of them reported 'to a very large extent'.

3.2.2.2.14 To maintain accurate records, documents, sketches, samples, drawings sheets, working progress files (data banks, etc.) for each step of the design process

This topic has a great importance for the course as it received nearly 92% of responses to some and large extent.

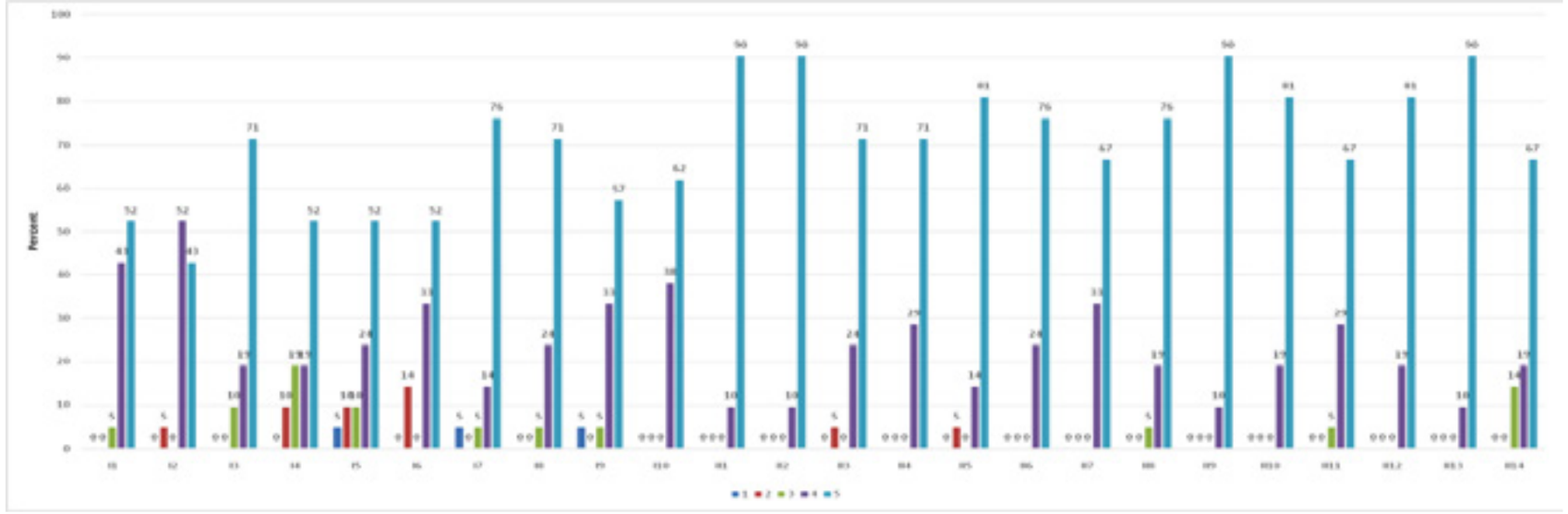
3.2.3 Conclusions

Respondents' interest towards CAD/CAM is consistent across the survey, fact proven by the reported data. Further interest for the technical aspects of the course is expressed by gaining relevant theoretical knowledge on principles and techniques for footwear CAD, nearly 90% of respondent having chosen 'to a large extent'.

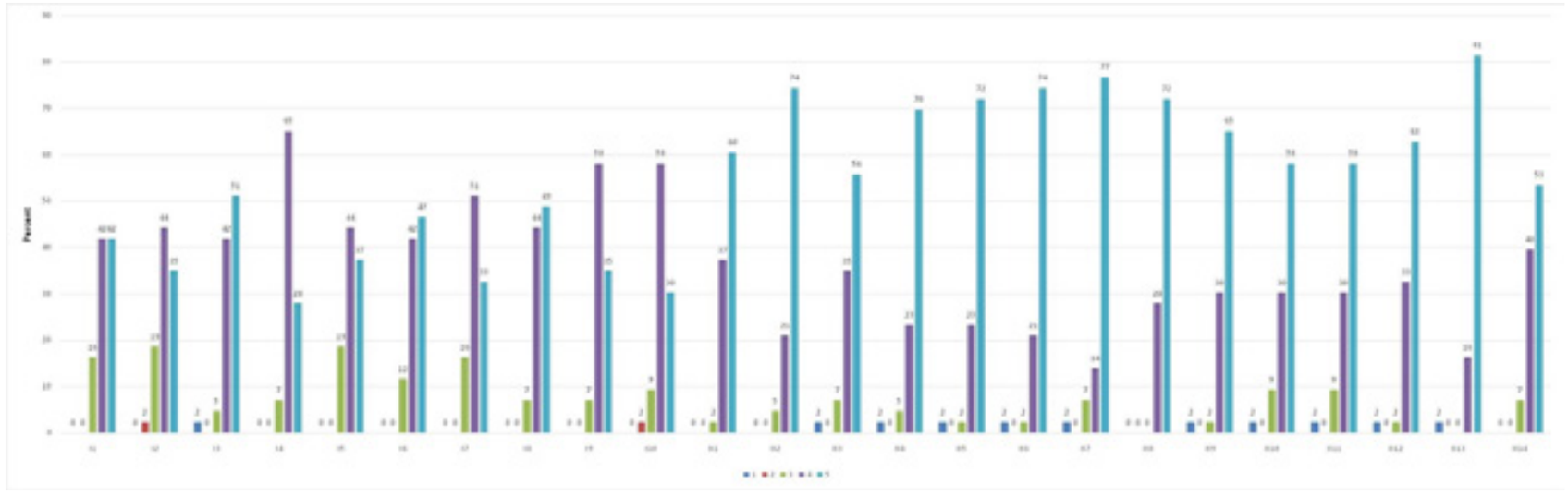
'To understand the main differences and advantages of 2D and 3D footwear CAD systems' is also an important topic that the respondents would like to improve on. Also, 'To produce footwear virtual prototypes by creating panels, adding texture, stitches and decorative elements' and 'To draw accurate sketches, panels, boards and technical drawings in order to prepare the collection of models with CAD software' are aspects to be considered when developing the courses, with 90% interest from the participants.

Lower values were obtain by the general aspects, like for example ‘To acknowledge my personal learning needs’, ‘To overcome obstacles, to achieve success in the learning process’, ‘To turn my ideas into action’, which demonstrates the fact that these persons already have this knowledge.

The respondents perceive with high expectations all the general and technical aspects related to the training course in Footwear CAD.



Centralized results for Romania



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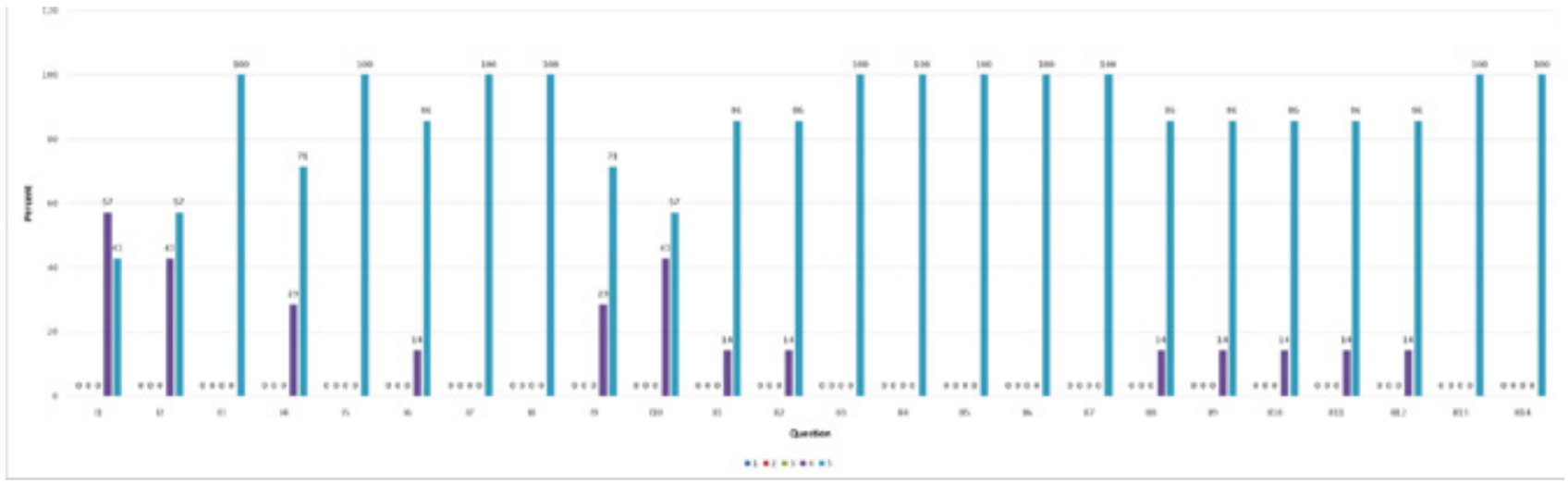
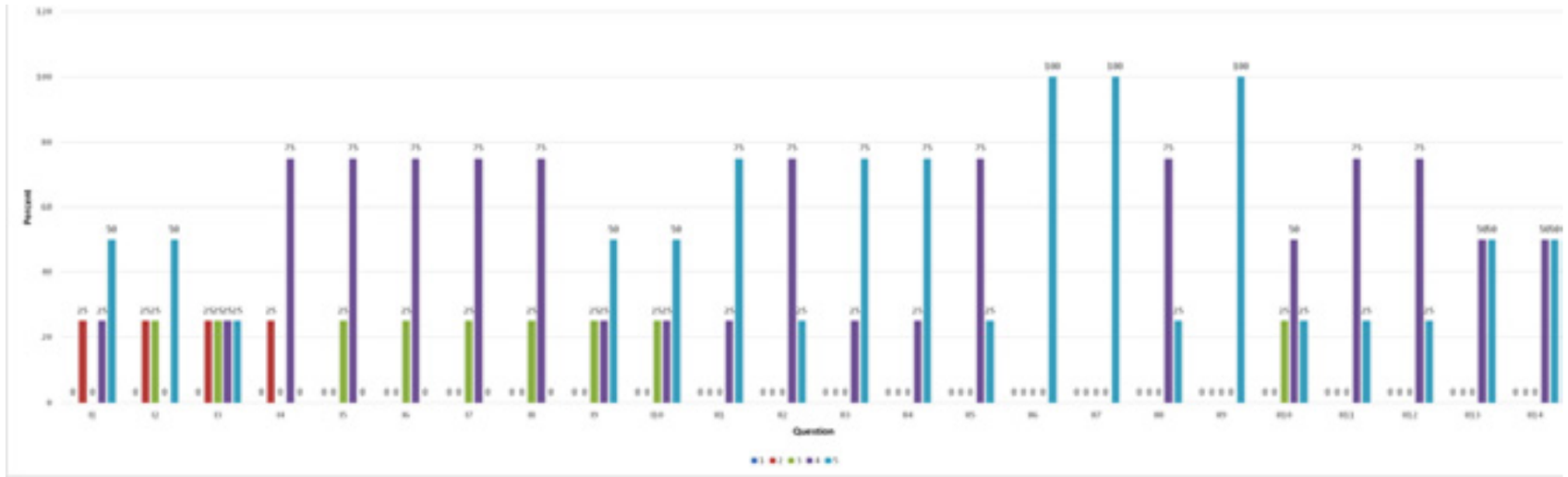
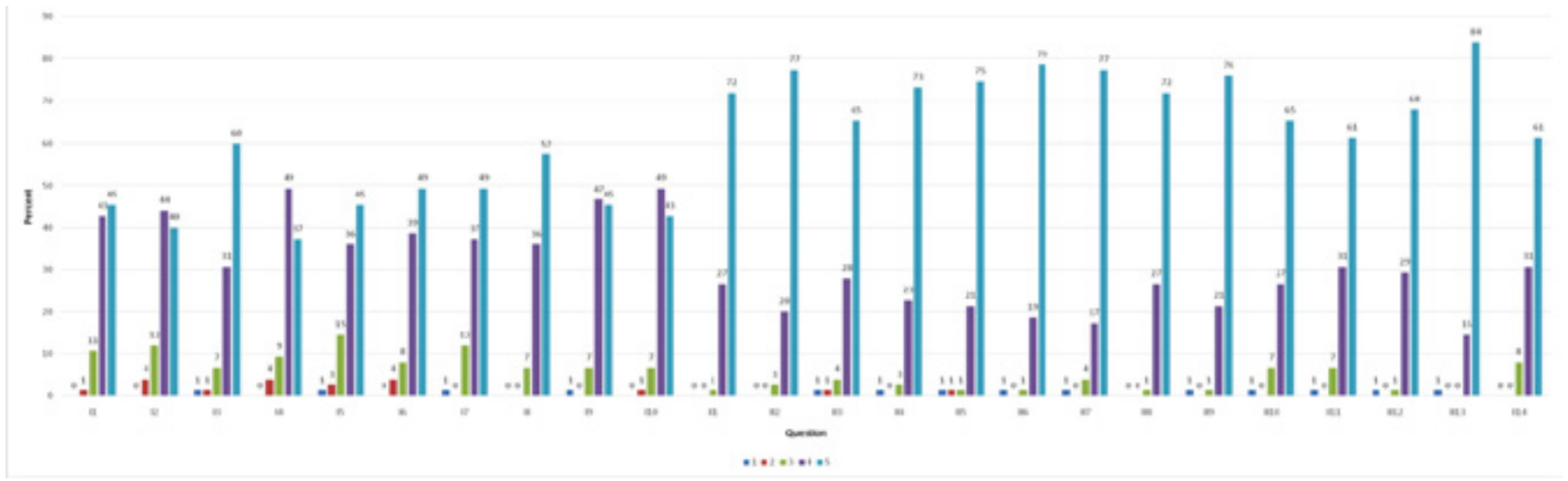


Centralized results for Portugal



Centralized results for UK



Centralized results for all four countries

3.3 Analysis of the user profile based on semi-structured interview

The goal of the applied semi-structured interview is to have the interviewees answering a set of predetermined questions but leaving space for other questions that might arise during the interview, either from the interviewer or from the interviewee.

3.4 Spain

3.4.1 Participants

Seven experts were interviewed in Spain, having the following professional background: two Footwear design teachers /tutor, one Freelance footwear designer and teacher, one Creative Director/Founder, one Product and Quality Manager, one Area Responsible, one Technician, two Designers, and one IT Technician.

3.4.2 Analysis of answers

3.4.2.1 WE ARE TARGETING VET PROFESSIONALS (TEACHERS, TRAINERS, TUTORS) FROM VET SCHOOLS, TRAINING CENTRES OR TRAINING DEPARTMENTS. WHAT LEVEL OF EDUCATION SHOULD THEY HAVE?

All the interviewees stated that these professionals have to have the appropriate knowledge for this field. A few suggested professionals with high education level with experience in working in footwear companies, teaching skills, high standard of knowledge in 3D design software or supplementary courses on CAD tools (Photoshop, Rhinos, etc.). The interviewee gave two examples: INESCOPs Diploma in Footwear Design or Advanced Vocational Training on Footwear.

3.4.2.2 DO YOU KNOW ANY COURSES OF FORMAL EDUCATION FOR THESE TARGET GROUPS?

Half of the interviewees stated that they do not know any courses of formal education for these target groups. There are not many courses available in the footwear sector, but some of interviewees mentioned the following courses: SIPECO for training professionals offered by INESCOP, courses organised by CEFIRE (Centre for Training, Innovation and Educational Resources) within the Secondary School Sixto Marco, general footwear courses organised by SERVEF (Public Employment Service of the Valencian Region), ESME-Camilo Jose Cela for accessories, and in Elda one can find courses related to modelling.

3.4.2.3 ARE THERE ANY TRAINING/EDUCATION PROVIDERS THAT HAVE RELEVANT TRAINING PACKAGES FOR THE TARGETED VET TEACHING/TRAINING STAFF IN THEIR PORTFOLIO?

The answers of 2/3 of interviewees highlighted the absence of training/education providers that have relevant training packages for the targeted VET teaching/ training staff in their portfolio. The training/education providers suggested by three interviewees are: INESCOP, CEFIRE (Centre for Training, Innovation and Educational Resources), general footwear courses organised by SERVEF (Public Employment Service of the Valencian Region), and RED21 provides consulting and training for any industry in the area of footwear.

3.4.2.4 DO YOU KNOW ANY EXISTING LEARNING CONTENT IN YOUR LANGUAGE IN 3D FOOTWEAR COMPUTER-AIDED DESIGN?

Only one of the interviewees stated that some years ago INESCOP, jointly with other partners, created a learning content about 2D and 3D (early stages) CAD for footwear, in the framework of the Leonardo Project SHOES-INNOVA. The rest of the interviewees do not know about any existing learning content in their native language for 3D footwear computer-aided design.

3.4.2.5 DID YOU DISCOVER ANY GAP BETWEEN THE SKILLS/COMPETENCIES OF THE TARGET GROUPS AND THE SKILLS/COMPETENCES REQUIRED FOR TEACHING/ TRAINING ICT BASED TECHNICAL COURSES FOR FOOTWEAR INDUSTRY?

The answers are divided, a few of interviewees suggested gaps between the skills/ competencies of the target groups and the skills/competences required for teaching/ training ICT based technical courses for footwear industry, trainers still teaching only traditional processes. The gaps are also due to the lack of specific courses regarding 3D footwear design. Other persons interviewed suggested that there is currently no gap, because professionals are used to work in 2D and know already the technical components, they have a 3D vision, basic knowledge in graphic design, previous knowledge in design software and ICT terminology, basic knowledge of CADShoe parts and materials, knowledge about foot anatomy (orthopaedics), knowledge about how artisan shoes are made.

3.4.2.6 COULD YOU PROVIDE SEVERAL EXAMPLES OF SKILLS AND COMPETENCIES IN 3D FOOTWEAR COMPUTER-AIDED DESIGN THAT TEACHERS/TUTORS/TRAINERS SHOULD HAVE IN ORDER TO SUPPORT CREATIVITY AND INNOVATION AMONG THEIR OWN VET STUDENTS/TRAINEES?

One third of interviewed persons could not provide examples of skills and competencies in 3D footwear computer-aided design, which teachers/tutors/trainers should have in order to support creativity and innovation among their own VET students/trainees. The other interviewees suggested that teachers should: have

suitable knowledge of the 3 stages covered by the CAD process: design, pattern engineering and grading, last digitisation, 3D printing, software operation; have knowledge about footwear design techniques, how the it is build and merge to a form; a great have experience in 3D footwear design and ability to create any model and footwear component in 3D; encourage students to develop their ideas; track students assignments and projects; show students innovative case studies. A proposal for the course contains a section about footwear design and manufacturing where the students can learn about the different materials they can use, the parts of the shoe and if it is possible it should include a visit to a factory so they can learn the process. Also, an important highlighted issue is that the trainer must teach the tool without interfering with the creative process. An interviewee talked about his own experience in preparing the training contents. He adapts the training to the profile and level of knowledge of the students. He gives guidance on the use of the software in an efficient and speedy way. Speed is the key, as demanded by the industry. He asses the learning process, the effort and the end-of-course project (continuous evaluation). He establishes a list of evaluation criteria (creation of lines, nodes).

3.5 Portugal

3.5.1 Participants

In Portugal interviewees were Training Centres directors, training department coordinators and trainers from the main footwear training related institutions.

3.5.2 Analysis of answers

3.5.2.1 WE ARE TARGETING VET PROFESSIONALS (TEACHERS, TRAINERS, TUTORS) FROM VET SCHOOLS, TRAINING CENTRES OR TRAINING DEPARTMENTS. WHAT LEVEL OF EDUCATION SHOULD THEY HAVE?

Two of the interviewees stated that level 4 should be the minimum required (complete secondary professional school). However, according to the third interviewee, Bachelor degree should be the minimum required. All agreed that is actually important that the VET professional has a close link with the footwear entrepreneurial world, i.e. strong professional experience.

3.5.2.2 DO YOU KNOW ANY COURSES OF FORMAL EDUCATION FOR THESE TARGET GROUPS?

It seems that there is a clear gap at this level. There are not many courses available in the footwear sector for updating knowledge and/or specialization targeting VET professionals. At higher education there are courses both at industrial design and arts level and at engineering level (for what concerns production/automation). CTCP offers a few technical courses, as well as UFCDs (Certified Training Units of Short Duration), and intra-enterprise training. Most of the courses offered to the companies are tailored (60 to 120 hours) with specific objectives and addressing trainees with previous knowledge.

3.5.2.3 ARE THERE ANY TRAINING/EDUCATION PROVIDERS THAT HAVE RELEVANT TRAINING PACKAGES FOR THE TARGETED VET TEACHING/TRAINING STAFF IN THEIR PORTFOLIO?

CTCP is the main actor in this context. CFPIC and Felgueiras Professional School can eventually offer some evening (after-work) courses. These are the references at national level specifically for the footwear sector. At regional level, ESAD offers higher education courses, as well as Árvore and Modatex that often have specific courses for the industry professionals. Minho University and CITEVE – regional references for what concerns training and technological innovation – are more focused on the textile sector.

3.5.2.4 DO YOU KNOW ANY EXISTING LEARNING CONTENT IN YOUR LANGUAGE IN 3D FOOTWEAR COMPUTER-AIDED DESIGN?

Concerning CAD, the software generally used is MindCAD 2D / 3D. The training materials are in national language as the software company is Portuguese. MindCAD does not have open manuals or courses. For what concerns Footwear CAD, each software company promotes its products and provides the training. MindCAD is the most used software, but there are others like Teso, Caligula, Crespim that are also commonly used by Portuguese companies.

3.5.2.5 DID YOU DISCOVER ANY GAP BETWEEN THE SKILLS/COMPETENCIES OF THE TARGET GROUPS AND THE SKILLS/COMPETENCES REQUIRED FOR TEACHING/ TRAINING ICT BASED TECHNICAL COURSES FOR FOOTWEAR INDUSTRY?

One of the interviewees argues that ideally, the CAD trainer should have both technical knowledge in shoe production (hand-made) and knowledge of the software system. Referring to the trainers that come from the software companies the first competence is missing most of the times. On another hand, considering the footwear companies and the VET training, it was stated that unfortunately the entrepreneurial world is more open and wide, while the training context is usually more closed and sometimes a bit lagging behind.

It was also referred that this gap is always present, including in other sectors. And that this happens because in specific sectors, like footwear, the level of knowledge update for the professionals is quite demanding. When the VET professional has an effective connection with both the industry and the software company, these gaps are generally reduced. So it will depend at a great extent on the trainer.

3.5.2.6 COULD YOU PROVIDE SEVERAL EXAMPLES OF SKILLS AND COMPETENCIES IN 3D FOOTWEAR COMPUTER-AIDED DESIGN THAT TEACHERS/TUTORS/TRAINERS SHOULD HAVE IN ORDER TO SUPPORT CREATIVITY AND INNOVATION AMONG THEIR OWN VET STUDENTS/TRAINEES?

‘Trainers are usually more focused in the technical aspects rather than the creative and innovative features. In part this happens because this is considered to be the

responsibility of the company or the trainee. Moreover these competencies can be considered as an extra skill more development-oriented.'

It may happen sometimes that the CAD 3D software functionalities are not fully secure. It is an open process of updates and improvements in the software. The trainees (mainly from companies) raise practical issues that force sometimes the trainer to go back and bring updates to the product.'

'Once again the answer varies according to each trainer. For what concerns product design it is essential to be close to the tendencies and to the artistic shed and have creativity related skills. If there is a handicap at this level, even if the trainer masters the technology/software, it will always miss the inspiration for the student/trainee. VET professionals have to maintain and cultivate their professional interest. The software tutorials address creativity issues, but it will always depend on the trainer and his/her ability to transfer this to the trainees."

3.6 UK

3.6.1 Participants

Senior staff from 4 major footwear manufacturers, providers and R&D actors where interviewed to extract data relevant to the project tasks. Three were at Director level, fourth at Product development level.

3.6.2 Analysis of answers

3.6.2.1 WE ARE TARGETING VET PROFESSIONALS (TEACHERS, TRAINERS, TUTORS) FROM VET SCHOOLS, TRAINING CENTRES OR TRAINING DEPARTMENTS. WHAT LEVEL OF EDUCATION SHOULD THEY HAVE?

All the interviewees said that whether the VET professional is within the company or an educational provider, the main criteria should be that they have professional experience. If the VET professionals were outside of a company then they should have strong links with companies in order to ensure that the training met the changing needs of the industry. NB There are no specific training centres or courses in the UK (other than those short courses provided on demand by organisations with a much wider portfolio of activities not related to footwear such as SATRA) the responses were also very much focused on the need for a training course to supplement their 'in-house' training. They also suggested that the lack of VET professionals was one of the main reasons for the problem of replacing the technicians who were traditionally trained (and due for retirement) with those who are trained in CAD (and CAM). This provides an opportunity in the UK to develop a longer term strategy for training VET professionals.

3.6.2.2 DO YOU KNOW ANY COURSES OF FORMAL EDUCATION FOR THESE TARGET GROUPS?

It is clear that in the UK there is an absence of specific courses available for the footwear sector for initial training or updating skills and knowledge. At higher education there are courses in design as part of a wider design programme of study. There is a further education college that provides some of the skills in relation to footwear manufacture as the focus rather than design (Leicester College). Reed Medical have worked with Skill Set UK in order to support the training of their technicians as apprentices. The University of Salford is the only training establishment in England to train Orthotists – currently CAD CAM design of foot ortheses has been introduced. There is potential here for future developments in training the VET professionals/ trainers. There is currently no national footwear hub.

3.6.2.3 ARE THERE ANY TRAINING/EDUCATION PROVIDERS THAT HAVE RELEVANT TRAINING PACKAGES FOR THE TARGETED VET TEACHING/TRAINING STAFF IN THEIR PORTFOLIO?

As above.

3.6.2.4 DO YOU KNOW ANY EXISTING LEARNING CONTENT IN YOUR LANGUAGE IN 3D FOOTWEAR COMPUTER-AIDED DESIGN?

Shoemaster will provide bespoke training and ongoing support. (This seems to be the preferred option with the companies that responded.)

3.6.2.5 DID YOU DISCOVER ANY GAP BETWEEN THE SKILLS/COMPETENCIES OF THE TARGET GROUPS AND THE SKILLS/COMPETENCES REQUIRED FOR TEACHING/ TRAINING ICT BASED TECHNICAL COURSES FOR FOOTWEAR INDUSTRY?

There appears to be some degree of resistance to changing working practices, lack of understanding CAD with many companies remaining very craft based and traditional in relation to design and manufacture. Two of the companies contacted the UOS directly by telephone and were extremely concerned that the traditional skills would be lost by embracing technology. During the interviews the representatives from the four companies described others not recognizing the benefits of CAD to their companies in relation to investment in the equipment and training. From their footwear designs it is clear that these 'others' are lacking in achieving contemporary and creative designs. So, there is a huge gap between those companies that use CAD and those that don't. The lack of courses, trained teachers/tutors results in a lack of change in practice.

3.6.2.6 COULD YOU PROVIDE SEVERAL EXAMPLES OF SKILLS AND COMPETENCIES IN 3D FOOTWEAR COMPUTER-AIDED DESIGN THAT TEACHERS/TUTORS/TRAINERS

SHOULD HAVE IN ORDER TO SUPPORT CREATIVITY AND INNOVATION AMONG THEIR OWN VET STUDENTS/TRAINEES?

At the moment the training at Leicester College is more on the manufacturing side with design being embedded in the higher education courses (both focused more on the high street fashion end) and none for the specialist (orthopaedic) footwear. Design and innovation appears to happen with in companies that have a vision. Design tends to be with specific people within a company and then once the designs are translated into the footwear manufacturing process the technicians then identify the practical issues which then result in a change in the design. So there is not really the opportunity for the technician trainee to develop their design skills.

3.7 Romania

3.7.1 Participants

The invited interviewees were professionals who are involved in both activities: footwear design and 'in situ' training of the company's staff, in order to find the labour market oriented opinion suitable to the needs of transferring the new CAD footwear designer occupational profile in schools. These experts were: one manager of the Product Development Department and one manager of the Human Resources department of two large enterprises.

3.7.2 Analysis of answers

3.7.2.1 WE ARE TARGETING VET PROFESSIONALS (TEACHERS, TRAINERS, TUTORS) FROM VET SCHOOLS, TRAINING CENTRES OR TRAINING DEPARTMENTS. WHAT LEVEL OF EDUCATION SHOULD THEY HAVE?

The two interviewees suggested that every teacher, trainer and tutor should have a university degree. These professionals should have skills and competences in the field of design, technology, production processes, product development and ITC. To be a good VET professional (teacher, trainer and tutor) requires a good understanding of all aspects regarding footwear production, starting from the design stage and up to the final product, and also good knowledge of the links between each stage. Apart from teaching a person how to develop footwear products, it is very important to teach how to make functional footwear products. A good footwear developer must take into consideration the materials to be used, manufacturing technologies, product functionalities and so on. Therefore a good VET professional should have passion and strong theoretical and practical skills and competences in the field of footwear design and technology. Also, very important for a teacher, trainer or tutor is for him/her to have psycho-pedagogical training during faculty or after graduation (for example during master degree). It is mandatory for such a person to be able to explain to the students and understand their needs and to identify their capabilities. Not everybody can be a teacher, trainer or tutor; he/she has to have patience, self-improvement capacity, reliability and prestige.

3.7.2.2 DO YOU KNOW ANY COURSES OF FORMAL EDUCATION FOR THESE TARGET GROUPS?

Both interviewees stated that there is this kind of education at the Gheorghe Asachi Technical University of Iasi, Faculty of Textile, Leather and Industrial Management. In one interviewee's opinion, this is the only institution in Romania that can train this kind of professionals. Unfortunately, nowadays the students are not very interested in attending courses on this subject. They do not want to pursue this kind of VET teacher, trainer or tutor career. In the last years, less and less students graduate these courses. The courses are optional and usually they do not prefer to attend them. In his opinion, the students do not really have all the information regarding their possibilities of employment after graduation and suggested a better communication with the students starting with their first year in the faculty.

3.7.2.3 ARE THERE ANY TRAINING/EDUCATION PROVIDERS THAT HAVE RELEVANT TRAINING PACKAGES FOR THE TARGETED VET TEACHING/TRAINING STAFF IN THEIR PORTFOLIO?

One of the interviewees is not aware of any training companies or education providers that have such specialized courses in Romania. Accordingly to the other interviewee, the only provider in Romania that has relevant training packages for the targeted VET teaching/training staff is Gheorghe Asachi Technical University of Iasi, but she doesn't know if their training packages are suitable/good enough for the VET teachers,

trainers, tutors. For now, the legislation is not yet prepared for the functioning of the ECTVET system.

3.7.2.4 DO YOU KNOW ANY EXISTING LEARNING CONTENT IN YOUR LANGUAGE IN 3D FOOTWEAR COMPUTER-AIDED DESIGN?

The two interviewees said that at the Faculty of Textile, Leather and Industrial Management in Iasi the students learn about 3D footwear computer-aided design, but they don't know if this knowledge is enough and if it regards the softwares that are now on the market for footwear design, like Shoemaster, Teseo, Crispin, RomansCAD, MindCAD, Lectra. One suggested that VET professors should get acquainted with as many programmes as possible in order to be able to teach students. The graduating students must be able to self-educate themselves if the company where they work has or decides to buy 3D footwear software other than the ones they learned about in school. They have to know the basics of 3D software design and being trained on more types of software at the University is an advantage the more software when working as VET professionals. One interviewee stated that he tried several times to search for such learning material and even tried "Google search", but was could find nothing.

3.7.2.5 DID YOU DISCOVER ANY GAP BETWEEN THE SKILLS/COMPETENCIES OF THE TARGET GROUPS AND THE SKILLS/COMPETENCES REQUIRED FOR TEACHING/ TRAINING ICT BASED TECHNICAL COURSES FOR FOOTWEAR INDUSTRY?

Performing as VET teacher, more than other teachers, he/she has to be excellent practitioner in order to teach the students. They have to know not only to work with computers but also to know footwear design. Taking into consideration that ICT based courses are a new approach in any domain and the fact that many persons above the age of 35 were not skilled during their studies in the field of computers, this may represent a problem. As now most people have at least basic computer knowledge and if they have strong theoretical and practical competences in the field of footwear design and technology, the person interviewed thinks that, with proper training and tools, there will be no problem for them to teach/train ITC based technical courses for footwear industry.

3.7.2.6 COULD YOU PROVIDE SEVERAL EXAMPLES OF SKILLS AND COMPETENCIES IN 3D FOOTWEAR COMPUTER-AIDED DESIGN THAT TEACHERS/TUTORS/TRAINERS SHOULD HAVE IN ORDER TO SUPPORT CREATIVITY AND INNOVATION AMONG THEIR OWN VET STUDENTS/TRAINEES?

One of the interviewees referred to specific skills and competences that he thinks are required for these VET professionals: experimenting with elements of product design: line, shape, form and colour; setting up design specifications within a new concept of footwear; defining and analyzing the new product concept; develop a collection line

for footwear, based on required design specifications; produce construction grids (design standard /master pattern) in reference to foot anatomy, last construction/ characteristics and footwear style; design 3D/2D models; obtain accurate mean forms by flattening the surfaces of the last; design various footwear models and transform the 3D construction and model lines into 2D patterns; produce working patterns of uppers and linings.

The other interviewee argues that teachers/tutors/trainers should have competences in design (composition, form, colour, lines), foot anatomy and biomechanics of the materials used for footwear products (textiles, leather), footwear structure and functions, lasts for footwear, footwear technology (cutting, sewing, lasting), pattern making (allowances, grading, patterns for uppers, for lining and so on) and they should be able to provide examples from practice. He also thinks that the future in education will combine the classical form of teaching with ICT based teaching because the future generations are born using computers and for them it is natural to assimilate and use any information using computers. He states that in Europe, in general and in Romania, in particular, the lack of skilled workers in the footwear industry is starting to be a problem because many of the schools were closed, the employees are getting old and there are very little possibilities to attract young generations to this industry and to train them. For company to be competitive on the market it needs highly skilled employees (production workers, product designers and developers, production managers and so on) and the first step for skilled workers in the footwear industry is to have top-level teachers/tutors/trainers.

4. Conclusions

INGA 3D partners investigated the state of Footwear CAD study/training programs in order to draw awareness from the VET professionals, experts and stakeholders from footwear industry and to find solutions and examples of good practices. Computer is no longer a curiosity, becoming an everyday working tool, similar to a pencil or pen. The young generation of students/learners/trainees has other expectations from the learning/training programs. They want to work with computers in all their courses, not only for acquiring basic digital competencies. Therefore, in all partner institutions, the training/study curricula for qualifications dealing with footwear design and product development should be designed to incorporate exactly what footwear producers are asking in terms of professional skills necessary for using the latest developed software programs based on 3D technologies.

The main conclusions, based on the feedback of VET professionals and representatives of the main training organizations and footwear companies in all partner countries, suggest that:

- There is a clear gap between the existing offer of formal education for knowledge updating and/or specialization targeting footwear VET professionals.
- In terms of vocational training systems and practices applied in different countries, a discrepancy among the levels of training provided by various VET schools,

universities and training centres was observed, as well as a large range of curricula and contents for Footwear CAD.

- Concerning CAD software training materials there are no open manuals or courses. Indeed Each CAD software company promotes its products and provides the training. The software developers offer initial training courses, which are certified by the company itself. Also, these courses could be or could be not certified by a national authority/body or education provider. Often, this initial training does not meet the pedagogical needs and curricula requirements of the VET/university system.

- Gaps between the skills/competencies of the VET professionals and the skills/ competences required for teaching/training ICT based technical courses for footwear industry may occur. As similar to other specific sectors, the level of knowledge update required from the professionals is quite demanding and therefore VET professionals need to have an effective connection both with the industry and with the CAD software company, so that this gap can be reduced. The new training course on 3D Footwear Computer Aided Design is found to be necessary for universities, VET schools, colleges and training centres in partner countries.

- Trainers are usually more focused in the technical aspects rather than in the creative and innovative features. It is necessary to provide them with skills/ competencies in order to support creativity and innovation among their own VET students/trainees.

- There is a great interest in the type of training promoted by the INGA3D project. This is supported by the results of the questionnaires where the respondents perceived with high expectation all the general and technical aspects related with the training course in Footwear CAD.

The desk research and the feedback of experts participating in questionnaires and semi structured interviews sessions gave the possibility of summarizing ideas for further developments of the INGA curriculum and training contents in the field of Footwear CAD.

4.1 To up-skill teaching staff from secondary/tertiary education for applying new Footwear CAD technologies in their classes

Similar to other domains of engineering (for example, automotive industry, mechanical industry, textile industry, etc.), the software for applications in footwear industry is very complex. The process of learning is becoming very difficult if the teacher/trainer does not understand this complexity and if he/she is not able to transform this complexity into learning procedures and tools based on pedagogical and methodological approaches oriented toward the learner's needs for learning. On the other hand, the teacher should be able to make the difference and the transfer between various modules; therefore he/she should have in-depth knowledge of all facilities of such dedicated software.

The Icad3+ software solution selected for being transferred and developed within the INGA3D project by adding a new training content suitable for targeted groups gives an immediate feedback both to teacher and student/trainee, mainly because the possibilities offered by the 3D technology to visualise the footwear prototypes in a virtual space. Based on the transferred 3D technology and software solution, the knowledge and the skills for developing footwear virtual prototypes will be effectively transmitted by VET professionals to learners (students or/and trainees). The main benefits of INGA project for the education sector are:

- To add new technology to the traditional education in footwear in order to create a link between education and industry
- To introduce new teaching/training CAD tools in schools/universities
- To offer training methodologies and contents that meet the expectations of new generation of students/learners

INGA 3D project will contribute to developing skills and competencies of VET teachers, trainers, tutors, in order to face the future challenges raised by the necessity of adding to the actual curricula in VET institutions ICT skill sets that will enable their graduates to work with highly specialized footwear CAD technologies. The INGA 3D project should integrate in an organized and illustrative way all the steps required for acquiring quickly, easily and in a technologically advanced manner the knowledge/ skills/competences necessary for performing activities in footwear computer-aided design, virtual prototyping, accurate visualization of three-dimensional models, and

pattern making. The entire process of developing new training content and peer learning scenarios should stimulate creativity and innovation among end users- VET students and trainees from vocational schools and training centres, employees from SMEs.

4.2 To train staff from footwear companies for performing training/tutoring activities in Footwear CAD technologies toward their own employees – train the tutors/trainers

There are various approaches on in–situ training within the footwear companies. Thus, we have identified the following situations:

- enterprises that provide apprenticeships by coaching or shadowing,
- enterprises that have their own training department,
- enterprises that provide shared training (collaborative training in partnership with research /universities/schools).

Mainly, the footwear companies are small and medium sized; therefore training/ human resources departments cannot be organized. Apart from the footwear companies that have a human resources department, the INGA 3D project will also include in its target group the SMEs that are interested in training their own staff to become trainers/tutors for apprentices by coaching or shadowing. Thus, apart from

teachers from VET schools, representatives of SMEs will be selected/invited for piloting sessions.

4.3 To produce training/teaching content for creating knowledge, skills and competences, that are necessary to cope with the European/global trends of the footwear industry on creativity, innovation and new CAD technologies

All partner countries reported that there is lack of teaching resources (books, guides and tools for teachers, tutorials etc.) available in the area of footwear CAD. When these resources are available (on Internet, published textbooks), they are mainly in English. Linguistic barriers on technical terms stop many teachers/trainers/tutors from introducing these novelties in their lectures or training content. Furthermore, assessing the web sites of the main European or worldwide training/education providers (schools, universities, research or training centres) for footwear industry, it is clear that there are relatively few online training programmes. Also, there is a lack of tangible outcomes of footwear CAD ready to be transformed into training tool that incorporates high quality pedagogic approach and methodology.

4.4 To experiment various learning scenarios in order to maximize the number of potential users by designing the INGA 3D training program and content in a modular manner.

A distinctive feature of the INGA 3D education and training comprises a mix of health and fashion concepts, enabling students to work using CAD in both domains. Therefore, the INGA 3D project will deal with following issues:

- Address key groups that dominate health and consumer sectors now and in the future (obese older people, diabetes)
- Consider the feet according to their age group rather than traditional 'fashion' or "medical" pathways that are separate. So, when you CAD training for sole design and should do some fashion soles, through to some medical soles, and so on for uppers. Thus, students are taught a wide range of examples and working applications (good for their employability).
- Students want to leave the course more employable than before – to the fashion sector they can bring new ideas related to health and thus help a company consider good design across the life course (cradle to grave type idea). For the health sector they bring a stronger design and fashion perspective which will make the footwear more acceptable – so students can span multiple brands in their careers (for retail and in health care), or stay with brands in one sector and help them stretch into the

adjacent areas (e.g retail brand that wants to explore potential for 'healthy' retail footwear).

- Create a data base of case studies across the life course of footwear users – e.g. older foot, female/male activity shoes, children to enable combination to health and fashion elements to create challenges for students.

Following challenges may occur during INGA 3D's structure and content development process:

- have some sort of separation between 'fashion' and 'health' footwear or try to combine these at least to some degree throughout all modules?
- decide which are "core modules/skills" that are common to both fashion and health, and which are specific to each fashion and health pathway.

4.5 To contribute at increasing the attractiveness of the VET study/training programs in the field of footwear design and technology

When the VET graduates are employed in CAD departments of footwear companies, the rate of their satisfaction is important, as is the level of salary. It could be important issues in stimulating the young generation to follow a VET study program. Changing the educational strategy to using the most advanced technologies could increase the

attractiveness of the VET system. A VET study program that incorporates the latest results from research could motivate the learner for better skills, for better jobs and for better salaries.

4.6 To encourage and to motivate VET teachers, trainers and tutors in stimulating innovative thinking and creativity among their students/trainees

The hereby report reveals the necessity of co-ordinating the national curricula of VET schools in order to introduce the recent developments on Footwear CAD technologies
The INGA 3D training tools should demonstrate good practices for stimulating innovative thinking and creativity in VET institutions. Both the VET professionals and their students/pupils/trainees are perceiving the process of making patterns for footwear by manual methods or by using generic computer software (for example, AUTOCAD that is very good for mechanical engineering but it is difficult to apply for footwear products) as being very difficult and time consuming, even boring.
The impact of the INGA 3D project on vocational training in both institutional and industrial environments will be significant and beneficial. It will demonstrate the usefulness of the proposed 3D technologies and it will encourage VET teachers, trainers and tutors to participate to curriculum development for future VET students/trainees.

4.7 To motivate university graduates for choosing a career as teacher in VET schools

All partner countries are facing the issue of not having trainers/teachers/tutors for footwear CAD. For several years, the footwear sector (regardless if it is fashion, mass production or orthopaedic/customized footwear production) doesn't attract the young generation to become trainers or teachers. This situation is not common for our sector only, but in general for engineering and other manufacturing sectors as well. On the other hand, the lack of these professionals means that there will be a lack of qualified employees in design and product development departments. In the implementation stage (piloting), undergraduate students from partner institutions will be trained together with VET professionals.

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6. Annex 1

6.1 Questionnaire

6.1.1 PART A: Brief Description of the INGA 3D project

The **INGA 3D** project is funded by **European Union within the Lifelong Learning - Transfer of Innovation Program**. INGA 3D project aims to transfer and extend innovative software solutions and 3D technologies for computer-aided footwear design, namely ICad3D+, produced by Spain.

The project brings together universities, research and training centres, adult education providers and IT companies. The project products will introduce innovative solutions both for e- learning and face-to-face learning in order to test and to validate new teaching methodologies and approaches suitable for vocational training in footwear computer-aided design. The online platform will integrate various flexible learning scenarios and supportive tools for learning. The new training content and its supportive guide will be designed, developed, tested and evaluated in line with the best practices identified by partners in their institutions, countries and elsewhere in Europe. It will contribute to developing skills and competencies of VET professionals in order to face with the future challenges.

Therefore, could you please provide us with input by filling in the following questionnaire, which will enable us to design and develop a course that will respond better to your specific needs for training?

The questionnaire has two parts:

- First, please, provide us data on your general expectations regarding the learning process, use of IT and increase of self-confidence in your experience and strengths, to put your ideas into practice.
- Second part refers to expectations regarding technical aspects of Footwear Computer Aided Design process, such as 3D footwear design, 2D pattern making and grading etc.

Please mark the appropriate boxes that best corresponds to your expectations and return your completed questionnaire and the data collection form through e-mail or fax as soon as possible.

Thank you for your time and support of this survey.

6.1.2 PART B - QUESTIONNAIRE

I. General aspects on the training/teaching process

	Information that I will acquire during this course will **enhance my skills and knowledge:**	**To a very limited extent** 1	**To a limited extent** 2	**Neutral** 3	**To some extent** 4	**To a large extent** 5
1	To use Information Technology (IT) in my workplace, free time and for communication purposes					
2	To use computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet					
3	To pursue and persist in learning, to organize my own learning, including through effective management of time and information, both individually and in groups. Lifelong learning approach					
4	To acknowledge my personal learning needs					

I. General aspects on the training/teaching process

	Information that I will acquire during this course will **enhance my skills and knowledge:**	**To a very limited extent** 1	**To a limited extent** 2	**Neutral** 3	**To some extent** 4	**To a large extent** 5
5	To overcome obstacles, to achieve success in the learning process					
6	To turn my ideas into action					
7	To develop my creative thinking					
8	To use innovative solutions					
9	To identify available opportunities for personal, and/or professional activities					
10	To demonstrate communication skills and capacity to work within a team (designers, sales, management, clients etc.)					

II. Technical dimensions on Footwear CAD systems (e.g. ICad3D+)

	Information that I will acquire during this course will **enhance my skills and knowledge:**	**To a very limited extent** 1	**To a limited extent** 2	**Neutral** 3	**To some extent** 4	**To a large extent** 5
1	To gain relevant theoretical knowledge on principles and techniques for footwear CAD					
2	To understand the main differences and advantages of 2D and 3D footwear CAD systems					
3	To import/export various file formats for CAD/ CAM systems					
4	To import lasts in 3D environment					
5	To prepare and to present in an attractive format new footwear design concepts (collections, models) using 3D CAD software					
6	To interpret, to manipulate and to modify designs using CAD software in accordance with the required design specifications					

II. Technical dimensions on Footwear CAD systems (e.g. ICad3D+)

	Information that I will acquire during this course will **enhance my skills and knowledge:**	To a very limited extent 1	To a limited extent 2	Neutral 3	To some extent 4	To a large extent 5
7	To simultaneously use the 3D and 2D CAD tools for developing footwear's uppers and linings. To view/transfer and to control the 3D lines with 2D patterns using CAD software					
8	To produce footwear virtual prototypes by creating panels, adding texture, stitches and decorative elements					
9	To obtain, modify and adjust 2D upper's patterns with CAD software					
10	To lay out the patterns and to estimate specific material consumptions with CAD software					
11	To obtain the footwear sizing series through grading (grading the patterns) with CAD software					
12	To obtain realistic images, panels, boards and technical drawings in order to prepare the collection of models with CAD software					

II. Technical dimensions on Footwear CAD systems (e.g. ICad3D+)

	Information that I will acquire during this course will **enhance my skills and knowledge:**	To a very limited extent 1	To a limited extent 2	Neutral 3	To some extent 4	To a large extent 5
13	To check the final appearance when designing products using CAD systems					
14	To maintain accurate records, documents, sketches, samples, drawings sheets, working progress files (data banks, etc.) for each step of the design process					

6.2 Data collection form

Name of the contact person: _____

Name of the organization: _____

Position within the organization: _____

E-Mail: _____ Telephone: _____

Fax: _____ Address: _____

Type of organization (please mark):

- National Body
- University
- Vocational Education and Training School / Centre (VET)
- Professional Organisation/ Association
- Other Educational Institution
- Enterprise

Number of employees: _____

Number of trainers/teachers/tutors: _____

Number of trainees/students: _____

Please return the filled Questionnaire and Data collection form to:

_____

(Each partner will add the Name and Email of the person who is responsible for gathering the survey results. If necessary, the Questionnaires should be translated in native languages)

7. Annex 2

7.1 Semi-structured Interview - VET professionals, VET experts, representatives of relevant stakeholders/national authorities

7.1.1 PART A: Personal Details

Name:

Position:

Organisation:

Field of expertise / interest:

7.1.2 PART B: Brief Description of the INGA 3D project

Note to interviewer: *The following text should be presented verbally to the interviewee:*

The INGA 3D project aims to transfer and extend innovative software solutions and 3D technologies for computer-aided footwear design. This will be achieved through four complementary activities:

- by transferring the innovation from Spain to other countries, namely Romania, Portugal, and UK;
- by developing skills and competencies in 3D footwear computer-aided design in VET professionals (teachers, trainers and tutors) so that they can teach ICT based technical courses that support creativity and innovation among their own VET students/trainees;
- by developing new training content and supportive e-learning tools based on units of learning outcomes and competencies. This will ensure effective assessment, evaluation and validation;
- by setting up an Online Learning Platform.

7.1.3 PART C: Questions for the interviewee

Note to interviewer: *The goal of a semi-structured interview is to have the interviewees answering a set of predetermined questions but leaving space for other questions that might arise during the interview, either from the interviewer or from the interviewee. So, the interview should follow but not be limited to the following questions:*

1. We are targeting VET professionals (teachers, trainers, tutors) from VET schools, training centres or training departments. What level of education should they have?
2. Do you know any courses of formal education for these target groups?
3. Are there any training/education providers that have relevant training packages for the targeted VET teaching/training staff in their portfolio?
4. Do you know any existing learning content in your language in 3D footwear computer-aided design?
5. Did you discover any gap between the skills/competencies of the target groups and the skills/competences required for teaching/training ICT based technical courses for footwear industry?
6. Could you provide several examples of skills and competencies in 3D footwear computer-aided design, that teachers/tutors/trainers should have in order to support creativity and innovation among their own VET students/trainees

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